

**Introduction to Cognitive Neuroscience**  
**PSYCH 513**  
**Call#: 40197-2**  
**Autumn, 2007**

**Instructor:** Dr. Dennis Shaffer

**Office:** 101 Bromfield Hall

**Office Hours:** 11-12 T; Also by appointment.

**Phone:** (419) 755-4274

**Class Time:** TTH 1-3:05

**Classroom:** M-2

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**Reading Textbook:**

Gazzaniga, M. S., Ivry, R. B., & Mangun, G. R. (2002). *Cognitive Neuroscience: The Biology of the Mind* (2<sup>nd</sup> Ed.) W. W. Norton & Company, Inc.: NY.

**Seminar & Summary/Reaction Readings:**

The seminar readings and the summary/reaction paper readings can be found on-line at the Bromfield Library home page. Click on the blue button (bottom left-hand side) that reads E-Reserves (List of Instructors). This will take you to a page that will list different instructors. Click on my name. This will take you to a page where your class number will be listed (513). Click on this and it will take you to the readings.

**Helpful Websites:**

(Neurosciences on the Internet) <http://www.neuroguide.com/bestbets.html>;

(Whole Brain Atlas) <http://www.med.harvard.edu/AANLIB/home.html>

**Course Objectives:**

The purpose of this course is to serve as an introduction to the rapidly developing field of cognitive neuroscience, and more specifically to examine recent research that is seeking to investigate the neural underpinnings of human behavior. This will include teaching students functional brain imaging methods, neuropsychological measurement to assess brain injury, basics in human and monkey neuroanatomy and neurophysiology, and the cutting-edge research that informs cognitive neuroscience and cortical functioning.

Content will include cellular functioning, gross morphology of the brain, visual processing, perceptual identification, visual object recognition, attention, spatial cognition, language, executive functions, emotion, and development. We will also investigate impairments and unusual phenomena that will include hemi-spatial neglect, different forms of agnosia and aphasia, phantom limbs, Charles Bonnet syndrome, Capgras' syndrome, Kluver-Bucy syndrome, Alzheimer's disease, and schizophrenia.

**Course Mechanics:**

In order to accomplish these goals, students should do (at least) the following things:

(1) Attend class. Coming to class at every meeting is critical in a course of this nature. Although I do not count attendance toward your grade, missing class will adversely affect your grade. If you do not come to class you remain responsible for all material covered in class and for any announcements;

**Course Mechanics (continued):**

(2) Carefully study the textbook and other readings. Although cognitive neuroscience, as an

aspect of biological psychology, is an exceptionally rewarding subject to study, for most students the material is rather challenging due to the amount of technical information involved. When studying the textbook and additional readings, please write down questions about material that you do not understand, or comments about what you would like to know more about. **Don't be afraid to ask questions and make comments!** If you don't understand something, it is very likely others in the class are having similar problems. If you find something interesting, it is almost certainly of interest to others as well;

(3) Conscientiously execute the oral and written assignments (see below), and

(4) Actively participate in class meetings. You will be expected to fully participate in scheduled class sessions. This will require you to carefully study the textbook and other readings assigned for that day.

In general, classes are a mixture of lecture, demonstrations, video and discussion. Lectures cannot possibly cover everything contained in the textbook. Therefore, some of the material in the text will not be dealt with in class. This does not mean that the material is unimportant--only that there is not enough time to cover it in class. Conversely, there will be times that I will discuss material in the lecture that is not covered in the text. In other words, you should pay attention to both material in the text and in the lecture when studying for exams.

### **Course Requirements and Evaluation:**

You should read the assignments in the text and perform any readings or other tasks asked of you outside of class before the following class session. Generally you will need to read the assignments several times and couple this with lecture in order to grasp the material. It generally takes longer to read and understand material in Cognitive Neuroscience texts compared to other texts, *so be prepared*.

### **Evaluation:**

	Points
<ul style="list-style-type: none"> <li>● <b><u>Exams</u></b> (100 points x 4 exams)</li> <li>- - Exams will cover all the material since the last exam (or in the case of the first exam, since the first day of class). None of the exams (including the final) are cumulative. However, much of the subsequent material builds on the previous material we will have covered. The exams will be a mix of multiple choice, identification (of CNS structures), and essay questions.</li> </ul>	400
<ul style="list-style-type: none"> <li>● <b><u>Leading Class Discussion Assignments &amp; Participation</u></b> (20 points Outline, 80 points presentation)</li> <li>- - Primary source articles are assigned in the Class Schedule (below). Students will be expected to read the article(s) assigned for that day and participate in discussion about the article.</li> </ul>	100

### **Leading Class Discussion Assignments & Participation (continued)**

- - Each student will be required to lead discussion of the article for 1 topic. Students will choose topics from those listed in

the Class Schedule at the end of this syllabus. Each class discussion that is led will be graded out of 100 points according to the following criteria: (1) **Outline for the Presentation—I want you to turn in an outline of what you will cover for your presentation and how you will cover it. This should also help you organize your presentation,** (2) Preparedness of the student, (3) Organization—does the student have a plan for how they will discuss the article, (4) Ability to ask some bigger picture questions concerning the article (like theoretically important questions as opposed to nitpicking about the methods), and (5) Any other commentary concerning the relevance of the work, ideas about future work, “fatal flaws,” or ties to previous articles discussed in class or work discussed in lecture.

- - Students should pick a topic in which they are interested (this makes understanding the material much easier), instead of picking a topic that has an article with fewer pages, or one to be read on a day towards the end of the quarter. I have specifically chosen most of the articles to be fairly brief.
- - Students should try to first give some background or rationale for the work when leading a discussion. They should then summarize the article (e.g., background, hypotheses, how questions were tested, what was found, and conclusions or inferences that were made). They should then ask some bigger picture questions about the article. Finally, they can bring up any specific points they might want to address about the article.
- - Students should talk to the instructor about any other material or information that might help in the presentation of the topic. Please come and talk to me about the topic and we can discuss the background, some interesting highlights, and why it might be important. Please read the article before coming to me to talk about these things.
- - Feel free to come and talk to me before you have read the article if you are unsure of the topic you would like to present.

● **Questions to Lead Off a Discussion/Critical Commentary**  
(12 points x 10 Readings)

120

- - Each student must come up with at least 1 comment and 2 questions/critical commentaries for each of the “**Seminar readings**” that could lead off a discussion. The comment should describe one thing that you liked about the article or

thought the authors did well. The critical questions should be “bigger picture” types of theoretically-based questions. They can also be ideas for the way the study should have been done (if there is a valid reason for why you think it was not done correctly), or “fatal flaws” to the study if you can discover them. They can also be ideas for new studies that make sense given the results and conclusions from the articles we read. **In general, I want your questions/comments to get at theoretically important questions, rather than to nitpick at more minor types of things (e.g., “More participants should have been used,” “The study should have included women or men,” “This should be done in the laboratory/real world instead,” or “I don’t like the apparatus that was used.”) unless these things really bear on the legitimacy of the conclusions or inferences of the work. If you believe that they bear on the legitimacy of the conclusions or inferences, you must tell me why.**

- Most of the time, a one-sentence question will not satisfy this requirement. You need to tell me explicitly how and why you think this question or comment is important to consider.
- Remember: Two questions and one comment must be prepared for **EACH ARTICLE**. This means that for most classes you must come up with 2 questions and 1 comment, because there is typically only 1 article for a given class (this does not occur all of the time, but it does most of the time). If there are 2 articles for a given class, 2 questions and 1 comment must come from **EACH ARTICLE (i.e., a total of 4 questions and 2 comments)**.  
Students should list the reference of the article first (so I know for which article you are writing your comment or question), and then give the comment or questions underneath it.
- The comments/critical questions must be handed in at the beginning of the class period, regardless of when we are discussing the article(s) for that day.
- I want everyone to read the articles assigned so that all students participate for all the readings. Also, questions about the readings **WILL** appear on the exams.
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- **Questions to Lead Off a Discussion/Critical Commentary (continued)**
- Students are *not* required to turn in Questions/Commentaries/Reactions for the reading that they are presenting (thus 12 readings – the one you are presenting = 11).
- I will drop the lowest score so only 10 will count. Although I will drop the lowest score, I want everyone to read

the articles assigned so that all students participate for all the readings.

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 • **Summary/Reactions to Readings** 100  
**(20 points x 5 Readings)**

- - For the Summary/Reaction Paper readings, I want you to first briefly summarize the reading(s) for that day in a couple of paragraphs. Clearly describe or explain the some portion of the reading (or the phenomenon, in general, if you wish). Address why you found this element(s) of the reading so interesting or striking. Did you learn something new? Was it especially insightful? Did it challenge your existing views of the topic? Then relate the argument/issue/theme to other assigned readings or course themes. What are the points of convergence or disjunction?

• **(Other) Homework** 108

- - I have given you two homework assignments in the first two weeks of class. These are related to the gross anatomical and functional areas of the brain. Other homework may be assigned throughout the class (probably more so at the beginning of the quarter).

Tentative Total 828

**Grading:**

Grades will be based on four exams, one article presentation, nine sets of two questions about articles, six summary/reaction papers, and other homework. The cutoffs will be as follows

A	94% - 100%	C	74% - 76%
A-	90% - 93%	C-	70% - 73%
B+	87% - 89%	D+	67% - 69%
B	84% - 86%	D	60% - 66%
B-	80% - 83%	E	Below 60%
C+	77% - 79%		

**Make-up Exams**

Exams can be made up only if the student has a medical or family emergency. Written evidence of the emergency must be provided either before the exam or as soon as possible after the exam. The instructor reserves the right to decide on the adequacy of excuses. Make-up exams will be either oral or all essay. A special test session will be used for giving all make-up exams. *See me at once* if you miss an exam or when you anticipate missing an exam. You must see me, in person, in my office for this.

**Academic Dishonesty:**

Cheating on exams and/or quizzes, or plagiarizing someone else's work will not be tolerated. Plagiarism is when you cite or discuss another person's work as your own. If you would like to use

someone else's ideas, summarize their work *USING YOUR OWN WORDS* and then *CITE THEIR WORK* using the accepted American Psychological Association's (APA) Guidelines. If you are caught being academically dishonest, I will report the incident to Ohio State and you will be subject to punishment from the university that includes, but is not limited to receiving a failing grade for that exam. If you are still not sure what is considered academically dishonest, please see me.

**Conduct:**

University college students, like all members of the OSU community, are expected to conduct themselves maturely. A student who infringes on the rights of others or who in any way disturbs orderly academic functions may be subject to probation, suspension, or dismissal. Physical or verbal abuse of any person, theft of, or damage to University property, unauthorized entry of University facilities, disruption of teaching or administration, misuse of University documents, or knowingly furnishing false information to the University is grounds for such disciplinary action.

*I also expect that: Students will not talk when the instructor is lecturing so it disrupts the concentration of other students or the instructor, and that cell phones will be turned off or turned to vibrate while class is in session.*

**Students with Disabilities:**

In accordance with University policy, if you have a documented disability and require accommodations to obtain equal access in this course, please contact me at the beginning of the quarter or when given an assignment for which an accommodation is required. You will also need to speak with Michelle McLane at the Office of Disability Services to discuss your special needs. You can contact Michelle by calling (419) 755-4304 or visit her at C-100E Conard Learning Center in order to coordinate reasonable accommodations.

**Special Requests:**

1. Stop by my office and visit me sometime.
2. Bring me a newspaper or magazine article, or a comic related to this class.

## Class Schedule

This outline can only be an approximate guide; dates for particular lecture topics may change, and material may be added or deleted. However, the dates and material for the exams will be as listed unless changes are absolutely necessary. If changes affecting exams are made, they will be announced in class as soon as possible. Lecture dates in this outline are used to identify lecture topics to be covered on exams.

<u>Day</u>	<u>Topic</u>	<u>Reading Assignment</u>
9/20 (Thurs.)...	Introduction to the course	<i>none</i>
	The seven blind men and the elephant: Perspectives on studying cognitive neuroscience.	<i>Chapter 1</i>
9/25 (Tues.).....	Cellular & molecular basis of cognition. Neurons, neural transmission, neurotransmitters.	<i>Chapter 2</i>
9/27 (Thurs.)....	Gross & functional neuroanatomy. Gross morphology: Human and monkey cerebral hemispheres are a lot alike. Cytoarchitecture: There are a lot of cortical areas. Navigating the brain: "Gross" terminology. Gyri, sulci, lobes, medial and lateral (surface) views. Divisions of the nervous system. <b>Homework #1 Due Today.</b>	<i>Chapter 3</i>
10/2 (Tues.).....	Methods of Cognitive Neuroscience. Computer modeling. Single-cell recording. Lesions. CT and MRI scans. Neurological disorders. Neurosurgery. Neuropsychology. TMS, EEG, ERP, MEG, PET, & fMRI. <b>Homework #2 Due Today.</b>	<i>Chapter 4</i>
<b>10/4 (Thurs.).....</b>	<b>EXAM#1.....</b>	
10/9 (Tues.)....	Perception & Encoding. Retina, LGN, cortical visual areas. Deficits in perception: Achromatopsia- & akinetopsia, scotomas, & blindsight.	<i>Chapter 5</i> <i>(pp. 148-185).</i>
	Higher Perceptual Functions. Perceiving vs. acting: Ventral & dorsal streams Object Recognition. Visual agnosias and subtypes.	<i>Chapter 6</i> <i>(pp. 193-204 &amp; 213-237 ).</i>

Perception & Encoding (*continued*)

10/11 (Thurs.)...Higher Perceptual Functions.  
 Perceiving vs. acting: Ventral & dorsal streams  
 Visual agnosias.

**Chapter 6**  
 (pp. 193-204 &  
 213-237).

**Summary/Reaction Paper Reading #1 Due:**

Ramachandran, V. S., & Blakesee, S. (1998). The secret life of James Thurber. In *Phantoms in the brain: Probing the mysteries of the human mind* (pp. 85 -112). William Morrow: NY.

Imagery

**Chapter 6**  
 (pp. 237-243).

10/16 (Tues.).....Perception and Encoding Readings.

**Seminar reading:**

Kraemer, D. J. M., Macrae, C. N., Green, A. E., & Kelley, W. M. (March 10, 2005). Sound of silence activates auditory cortex. *Nature*, 434, 158.

**Seminar reading:**

Turk, D. J., Handy, T. C., & Gazzaniga, M. S. (2005). Can perceptual expertise account for the own-race bias in face recognition? A split-brain study. *Cognitive Neuropsychology*, 22, 877-883.

10/18 (Thurs.)

**Seminar reading:**

Schultz, R. T., et al. (2003). The role of the fusiform face area in social cognition: Implications for the pathology of autism. *Philosophical Transaction of the Royal Society of London B*, 358, 415-427.

Attention & orienting  
 Functional imaging of human attention  
 Neuropsychology of attention: Neglect.

**Chapter 7**

10/23 (Tues.)... Attention & orienting  
 Functional imaging of human attention  
 Neuropsychology of attention: Neglect.

**Chapter 7**

**Summary/Reaction Paper Reading #2 Due:**

Ramachandran, V. S., & Blakesee, S. (1998). The sound of one hand clapping. In *Phantoms in the brain: Probing the mysteries of the human mind* (pp. 127-157). William Morrow: NY.

**Seminar reading:**

Duhamel, J-R., Colby, C. L., & Goldberg, M. E. (January 3, 1992). The updating of the representation of visual space in parietal cortex by intended eye movements. *Science*, 255, 90-92.

10/25 (Thurs.) Memory.  
 Sensory, STM, LTM, Working memory.  
 Different types of memory.

**Chapter 8**

Temporal lobes, hippocampus, H. M., & the prefrontal cortex.

**Summary/Reaction Paper Reading #3 Due:**

Ramachandran, V. S., & Blakeslee, S. (1998). Through the looking glass. In *Phantoms in the brain: Probing the mysteries of the human mind* (pp. 113-126). William Morrow: NY.

10/30 (Tues.)... Memory.

**Chapter 8**

Sensory, STM, LTM, Working memory.

Different types of memory.

Temporal lobes, hippocampus, H. M., & the prefrontal cortex.

**Summary/Reaction Paper Reading #4 Due:**

Loftus, E. F. (1999). Creating false memories. In *The Scientific American book of the brain* (pp. 119-127). The Lyons Press: Guilford, Connecticut.

**Seminar reading:**

Gonsalves, B., et al. (2004). Neural evidence that vivid imagining can lead to false remembering. *Psychological Science*, 15, 655-660.

**11/1 (Thurs.).....EXAM#2.....**

11/6 (Tues.) Language and the Brain.

**Chapter 9**

Neural substrates of spoken/written input.

Neuropsychology of spoken/written input.

Bilingualism.

11/8 (Thurs.)..Language and the Brain.

**Chapter 9**

Neural substrates of spoken/written input.

Neuropsychology of spoken/written input.

“Speech” or Language Processing?

**Seminar reading:**

Petitto, L. A., Holowka, S., Sergio, L. E., & Ostry, D. (2001). Language rhythms in baby hand movements. *Nature*, 413, 35-36.

Executive Functions

**Chapter 12**

Frontal cortex, prefrontal cortex & working memory.

Inhibitory control, goal-oriented behavior.

Anterior cingulate cortex.

Schizophrenia: “Hypofrontality.”

11/13 (Tues.)...Executive Functions

**Chapter 12**

Frontal cortex, prefrontal cortex & working memory.

Inhibitory control, goal-oriented behavior.

Anterior cingulated cortex.

Schizophrenia: “Hypofrontality.”

**Seminar reading:**

Munoz, D. P., & Everling, S. (2004). Look away: The anti-saccade task and the voluntary control of eye movement. *Nature Reviews Neuroscience*, 5, 218-228.

**11/15 (Thurs.).....EXAM#3.....**

11/20 (Tues.)...Emotion.

**Chapter 13**

Phineas gage. Measuring and manipulating emotion.

Limbic system. Drug addictions.

**Seminar reading:**

Sanfey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E., & Cohen, J. D. (June 13, 2003). The neural basis of economic decision-making in the Ultimate game. *Science*, 300, 1755-1758.

**11/22 (Thurs.)..... THANKSGIVING HOLIDAY—NO CLASS.....**

11/27 (Tues.)... Cerebral Lateralization & Specialization.

**Chapter 10**

Anatomical & functional asymmetry.

Split-brain work.

*Video: Results from a split-brain patient.*

**Seminar reading:**

Holowaka, S., & Petitto, L. A. (August 30, 2002). Left hemisphere cerebral specialization for Babies while babbling. *Science*, 297, 1515.

Tactile Inputs and the Control of Action

**Chapter 15**

Plasticity, and recovery of function. Phantom limbs.

Primary and Supplementary Motor Cortices. Motor Planning.

Movement Disorders.

**Summary/Reaction Paper Reading #5 Due:**

Ramachandran, V. S., & Blakeslee, S. (1998). The unbearable likeness of being. In *Phantoms in the brain: Probing the mysteries of the human mind* (pp. 158-173). William Morrow: NY.

11/29 (Thurs.) Tactile Inputs and the Control of Action

**Chapter 15**

Plasticity, and recovery of function. Phantom limbs.

Primary and Supplementary Motor Cortices. Motor Planning.

Movement Disorders.

11/29 (Thurs.) Tactile Inputs and the Control of Action

**Chapter 15**

*(continued)*

**Seminar readings:**

Desmurget, M., Péllisson, D., Urquizar, C., Prablanc, C., Alexandar, G. E., & Grafton, S. T. (1998). Functional anatomy of saccadic adaptation in humans. *Nature Neuroscience*, 1, 524-528.

Singer, T., et al. (20 February, 2004). Empathy for pain involves the affective but not sensory components of pain. *Science*, 303, 1157-1162.

**DECEMBER 5      WEDNESDAY, 3-4:48--FINAL EXAM**

### Seminar Readings

1. Kraemer, D. J. M., Macrae, C. N., Green, A. E., & Kelley, W. M. (March 10, 2005). Sound of silence activates auditory cortex. *Nature*, *434*, 158.
2. Turk, D. J., Handy, T. C., & Gazzaniga, M. S. (2005). Can perceptual expertise account for the own-race bias in face recognition? A split-brain study. *Cognitive Neuropsychology*, *22*, 877-883.
3. Schultz, R. T., et al. (2003). The role of the fusiform face area in social cognition: Implications for the pathology of autism. *Philosophical Transaction of the Royal Society of London B*, *358*, 415-427.
4. Duhamel, J-R., Colby, C. L., & Goldberg, M. E. (January 3, 1992). The updating of the representation of visual space in parietal cortex by intended eye movements. *Science*, *255*, 90-92.
5. Gonsalves, B., et al. (2004). Neural evidence that vivid imagining can lead to false remembering. *Psychological Science*, *15*, 655-660.
6. Petitto, L. A., Holowka, S., Sergio, L. E., & Ostry, D. (2001). Language rhythms in baby hand movements. *Nature*, *413*, 35-36.
7. Munoz, D. P., & Everling, S. (2004). Look away: The anti-saccade task and the voluntary control of eye movement. *Nature Reviews Neuroscience*, *5*, 218-228.
8. Sanfey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E., & Cohen, J. D. (June 13, 2003). The neural basis of economic decision-making in the Ultimate game. *Science*, *300*, 1755-1758.
9. Holowaka, S., & Petitto, L. A. (August 30, 2002). Left hemisphere cerebral specialization for babies while babbling. *Science*, *297*, 1515.
10. Desmurget, M., Pélisson, D., Urquizar, C., Prablanc, C., Alexandar, G. E., & Grafton, S. T. (1998). Functional anatomy of saccadic adaptation in humans. *Nature Neuroscience*, *1*, 524-528.
11. Singer, T., et al. (20 February, 2004). Empathy for pain involves the affective but not sensory components of pain. *Science*, *303*, 1157-1162.

### Summary/Reaction Paper Readings

1. Ramachandran, V. S., & Blakeese, S. (1998). The secret life of James Thurber. In *Phantoms in the brain: Probing the mysteries of the human mind* (pp. 199-112). William Morrow: NY.
2. Ramachandran, V. S., & Blakeese, S. (1998). The sound of one hand clapping. In *Phantoms in the brain: Probing the mysteries of the human mind* (pp. 127-157). William Morrow: NY.
3. Ramachandran, V. S., & Blakeese, S. (1998). Through the looking glass. In *Phantoms in the brain: Probing the mysteries of the human mind* (pp. 113-126). William Morrow: NY.
4. Loftus, E. F. (1999). Creating false memories. In *The Scientific American book of the brain* (pp. 119-127). The Lyons Press: Guilford, Connecticut.
5. Ramachandran, V. S., & Blakeese, S. (1998). The unbearable likeness of being. In *Phantoms in the brain: Probing the mysteries of the human mind* (pp. 158-173). William Morrow: NY.