

Cognitive Neuroscience

**PSB 5035 -- Spring 2004
A Seminar with Dr. Jay E. Gould**

**January 12-April 26 (14 double-class meetings, incld. final exam day: Mon. 4/26)
Holidays: Martin Luther King's Birthday 1/19, and Spring Vacation 3/22-126**

SYLLABUS

Instructor:	Jay E. Gould	Class Location:	Bldg. 41; Rm. 115
Office:	Building 41, Room 216	Class Hours:	Mon 1:00-3:55 pm
Phone:	474-2290	Office Hours:	Mon 4:00-5:00 pm Tues/Thur 11:00-1:00 pm
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Required Books

Gazzaniga, M. S., Ivry, R. B., & Mangun, G. R. (2002). *Cognitive Neuroscience: The Biology of the Mind* (2nd edition). New York: W. W. Norton & Co.

Recommended Books

Gazzaniga, M. S. (2000). *Cognitive Neuroscience: A Reader*. Malden, Mass: Blackwell Pub.

Student-Learning Outcome Objectives

Purpose of this course is to develop an *advanced understanding of the biological bases of behavior and mental activity, i.e., the mind*. As the textbook subtitle indicates, we will be emphasizing the biology of the mind, which naturally is the basis of much behavior. We will be studying, e.g., the complex processes of brain and mind involved in perception, attention, learning and memory, language, control of actions, emotions, decision-making, and consciousness. All of this will involve learning about the anatomy

and physiology of the nervous system, along with some coverage of the endocrine system. Attention will also be given to the principles, mechanisms, and roles of both genetics and evolution. Although desirable, no previous knowledge of this subject matter is assumed. It is expected, however, that this course will be challenging--but also very rewarding.

As the textbook title itself indicates, this will be a course in cognitive neuroscience, which has become a very hot area that overlaps and integrates several important disciplines, e.g., cognitive psychology, biological psychology, neuropsychology, and neuroscience. As noted by the textbook authors, cognitive neuroscience is, in essence, the study of how the brain enables the mind.

Cognitive neuroscience is truly among the most fascinating subjects in the world. Consider, for example, the following questions: What are the neural mechanisms that allow us to perceive, think about, and to some degree comprehend the universe around us? What are the anatomical and physiological bases of learning and memory? And what alterations of the brain are responsible for pathologies such as schizophrenia, depression and Alzheimer's Disease? These are some of the stimulating questions we will grapple with during this course.

Outcome objectives of this course are that as a result careful study and execution of the assignments, students should be able, among other things, to:

1. Explain how neuroscientists go about *investigating* the nervous system and its roles in cognition, emotion, and behavior;
2. Describe and locate the major *elements* of the nervous system and its *circuits*;
3. Explain the major *functions* of the various elements and circuits of the nervous system with respect to *behavior and experience* (the *mental trilogy* of cognition, emotion, and motivation), and indicate how these functions are carried out, i.e., how the brain enable the mind;
4. Discuss how *all human behavior, thought, and feelings* are the end result of complex patterns of nervous system activity, along with the endocrine system;
5. Explain the known *causes of major diseases and disorders* of the nervous system, and describe what might be done to treat and perhaps prevent them.

Mastery of the subject matter of this course is essential to a comprehensive understanding of psychology, and should prove to be of great value regardless of ones intended specialization. As the famous 19th century physiologist and anatomist Johannes Peter Müller put it: "Nemo Psychologus Nisi Physiologus." Translated this means: "One is not a psychologist who is not also a physiologist" (or, in other words, a biologist).

Mechanisms

Objectives of this course can be achieved through:

1. Careful study of the textbook and other readings;
2. Active participation in class meetings;
3. Conscientious execution of the oral and written assignment(s) (see below).

Functions of the class meetings are to:

1. Discuss, clarify, and expand upon material in the textbook as well as any additional readings;
2. Evaluate students' mastery of the course material through oral and written assignments and questioning.

When studying the textbook, please write down questions about material that you do not understand, or comments about what you do understand but would like to know more about. It will be helpful if you indicate the relevant chapter, section, and page number of the textbook. Also write down questions and comments about any additional readings, indicating the specific article. The questions and comments should be given to the instructor at the beginning of each class. Remember, I will depend on you to let me know in class what parts of the course material you want to spend the most time discussing.

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. And if something interests you, it is almost certainly of interest to others as well.

Learning is facilitated by an active, dynamic involvement in the instructional process--i.e., learning is not a spectator sport! Therefore, rather than primarily lecturing, we will try as much as possible to use the *Socratic Method* of teaching by asking questions. This includes asking students to try to answer the questions raised by their classmates before the instructor contributes any additional insights. In other words, *I want you to learn through actively thinking about, discussing, and contributing to the course material.* This means that the class will be run more along the lines of a *seminar*.

A seminar is a course where advanced students discuss the information they are learning under the supervision and direction of a professor. The advantage of a seminar is that during a given semester more material usually can be covered than in the typical lecture course, and new ideas and new approaches are formed as the class (not just the professor) analyzes, synthesizes and discusses the course content in a format that is more open and less formal.

Before coming to class, you should carefully study the textbook material and any additional readings that will be covered that day. This is very important, given the method used for evaluation in this course. Moreover, you won't find yourself spending valuable class time reading, or taking detailed, redundant notes.

With regard to in-class use of the textbook, while students should bring their book to class, I do not think it is the best use of time, or polite, to be reading during class meeting--unless asked to do so. Rather than trying to follow along or ahead in the book, it would be far better to carefully pay attention and outline the major additional points that are discussed. Most importantly, it is not proper for a student to read an answer from the textbook when asked a question in class.

What you should be doing in class:

1. *Analyzing, synthesizing, and critically evaluating* the information being discussed, and then *theorizing* about the implications;
2. *Outlining and/or diagramming* the major points being made;
3. *Asking questions* for clarification on what is not completely understood;
4. *Responding to questions* raised by the instructor and other students;
5. *Sharing additional information or insights* when you have something to contribute.

All of this should make the class far more interesting and informative for everyone. *I sincerely want you to find this course both rewarding and productive.* Feel free to let me know ways in which the course mechanics might be improved, and please don't wait until the end of the term. I'm open to all suggestions--even in the form of anonymous notes left with a secretary to be placed in my mailbox.

To aid students in mastering the subject matter of the course, whenever appropriate I and student presenters will provide *handouts* in class. Alternatively, you might be referred to material posted on my *web site* or at other sites on the Internet. In addition, I have a *bulletin board* on the first floor of the Psychology Building #41, where I post short articles regarding biological psychology and other subjects that I believe students will find interesting.

Internet resources relevant to this course are increasing daily. You might want to try some of the following, which I have personally looked at:

Neurosciences on the Internet at www.neuroguide.com and its

Best Bets at <http://www.neuroguide.com/bestbets.html>

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

Neuroscience for Kids at <http://faculty.washington.edu/chudler/neurok.html>

Interactive Atlases at <http://www9.biostr.washington.edu/da.html>

Probe the Brain at <http://www.pbs.org/wgbh/aso/tryit/brain/>

Secrete Life of the Brain: 3-D Brain Anatomy at <http://www.pbs.org/wnet/brain/3d/>

Anatomy of Primates (w/atlasses) at
<http://spot.colorado.edu/~dubin/bookmarks/b/060.html>

<http://www.indiana.edu/~pietsch/home.html>

<http://www.med.harvard.edu/AANLIB/home.html>

The Human Brain: Dissections of the Real Brain at

Visualization of Dendritic Spines at <http://www.synapses.bu.edu/index.asp>

Comparative Mammalian Brain Collections at <http://brainmuseum.org/index.html>

Digital Anatomist Information System at <http://sig.biostr.Washington.edu/projects/da/>

Assignments

Textbook Readings:

Although cognitive neuroscience, as a component 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. For this reason it is possible, but unlikely, that we will not be able to cover all the chapters in this one-semester course.

The chapters will be covered in the order presented in the textbook, except for Chapter 14, which will be covered after Chapter 15 because of length and time constraints (see listing at the end of this syllabus). Because of the number of class meetings available this semester, in order to cover all the chapters in the textbook we will spend less time on the relatively short and/or easier chapters, i.e.: 1, 3, 14, & 16. We will spend two class periods (~2.5 hours) on each of the other chapters, which are longer.

Concept Maps:

During the semester students will produce *concept maps (and outlines)*. These are diagrams used to summarize and illustrate the *hierarchical and cross relationships among a number of concepts*, such as those covered in a portion of the textbook and in class presentations being discussed. I will distribute one or more handouts on concept mapping, along with examples, and illustrate the technique in class. (See below for more details.) There are many Internet sites that cover concept mapping, and these can be readily located with a computer and web search engine, such as Google.com. An excellent site that contains free software for concept mapping is provided by the UWF Institute for Human and Machine Cognition at <http://cmap.coginst.uwf.edu/>. There is also commercial software. I use *Inspiration*, which I think is excellent. This is usually available for a 30-day free trial, and can be found at <http://www.inspiration.com/productinfo/Inspiration/index.cfm>.

Oral and Written Report Assignments:

The textbook will provide a solid base of knowledge. In addition, however, we will delve deeper into the subject of this course through analysis, synthesis, evaluation, and discussions of theoretical implications and practical applications of other contemporary as well as notable historical research published in the scientific literature.

After the first few class meetings, during which the instructor will be discussing the foundation chapters of the textbook (i.e., 1-3), **individual students will lead class discussions over the remaining chapters, while presenting additional information.** Different students will be responsible for each class meeting, with two or more students splitting coverage of the longer chapters, and possibly sometimes the shorter chapters. The intent is that each student will have an opportunity to lead discussions over at least two portions of the textbook, with the second presentation occurring after everyone has done their first presentation.

The student discussion leaders will integrate into their presentations one or more research or theoretical scientific articles that illustrate, clarify, and/or expand on the material in the textbook. This should be done with particular emphasis regarding *how the brain enables the mind*. To guide the class discussions, the student leader will prepare concept map transparencies and handouts relating to the textbook material being covered. The information in the additional research/theoretical scientific articles should be critically evaluated (compared and contrasted) with respect to related material in the textbook. Since the instructor will frequently want to elaborate on the material being covered (possibly using videos), the student led discussions should be planned to last only about 45 minutes, or less if more than two students are presenting on any given chapter.

The collection of writings in the recommended course book *Cognitive Neuroscience: A Reader* is an excellent source of additional material for the class presentation discussions. The nature of these articles is described in the preface of the book, and reference information about the articles is found in the acknowledgments section. As further aids to finding appropriate articles and books, see the "Suggested Readings" and references in the required course textbook. Computer databases such as *PsychInfo*, *PsychLit*, *Social Science Citation Index*, and *Current Contents* are other important resources for finding useful sources.

The assignment of textbook chapters for which students will lead discussions can be done randomly, unless some students have a strong desire to be assigned specific chapters. In that case, since there might be overlap in the chapters desired, each student will be required to submit their first, second, and third choices for each of their two presentations (one from the first half of the textbook chapters covered by students, and one from the second half). The instructor will then make the decisions as fairly as possible.

Before the class meeting of a led discussion, the student should give to the instructor:

1. *A printed, detailed concept map* (an example will be provided by the instructor) of the course textbook material being covered. This should also help the presenter. At the top of the concept map should be the book title, the chapter number and title, followed by the student's name and presentation date.
2. *A good photocopy* of the additional research/theoretical journal article(s) that will be integrated into the discussion, or in the case of a book, a photocopy of several important summary pages as well as the book's cover pages;
3. *A quiz of ten typed, multiple-choice questions* (or five if more than two students are covering a given chapter), with approximately the first half based on the major points covered in the chapter to be discussed, and the rest based on the additional material to be integrated into the discussion. Each question should have four alternative answers, and the *correct answer* for each question should be clearly indicated at the *very bottom of the page*. Note that the alternative potential answers to each question should be written in as parallel and clear a fashion as possible to avoid giving away the answer and to avoid ambiguity. Developing the quiz will be a useful learning exercise, and the quizzes will actually be used to test classmates on their mastery of the discussed material.

At the class meeting when the discussion will be led, the student should bring:

1. Copies for everyone of any useful *handouts*, such as concept maps;
2. Copies for everyone of the *quiz* (*without* the answers indicated), which will ordinarily be take-home exams, but possibly at times administered after the presentation,. These will be graded in class and turned in to the instructor.

When giving an oral report, the student should:

1. *Briefly review and discuss*, using a concept map as a guide, the major "facts" and theoretical/hypothetical proposition(s) in the *assigned material of the course textbook*;
2. *Discuss as the major part of the presentation* the information from the *additional scientific article(s) or book material* (concept maps and/or PowerPoint could be used), which should be critically analyzed and evaluated, compared and contrasted, and then synthesized with respect the relevant material in the course textbook;
3. *Conclude with a take-home summary message (major points) and a proposal* for further research or theoretical work in the subject area covered.

Evaluation

Student-Led Discussions (50% of course grade):

These will be evaluated at their conclusion by the instructor using a special form (see example attached at end of syllabus). Significant weight will be given to the quality of the discussion leadership, the concept map(s) and other materials, and the quiz questions. Note that all of this will provide valuable teaching experiences for students, as well as insights into the challenges of being an instructor. Classmate will be encouraged to also grade the presentation on a 100-point scale, and to provide constructive comments.

Quiz and Oral Questions as well as Take-Home Assignments (50% of course grade):

Because this is a seminar course, I will not be evaluating mastery of the material through the typical formal course exams, each covering several chapters. Instead, as noted earlier, I will use performance on the quizzes prepared by the student discussion leaders, which will be administered during most class meetings. This will encourage each student to continuously keep up with the material, and to be actively involved in class discussions. In addition, I will ask oral and possibly written questions during regular class meetings, and evaluate the quality of the answers.

Typically, the written and oral questions should focus on *major points* from the textbook, the additional scientific articles/books discussed by the student leaders, instructor handouts (or web postings that are referred to), and videos that are shown. It is intended that the questions will focus on significant conceptual or problem-solving issues. When possible, instructor questions will be taken from the thought/discussion questions contained in the course readings. This should reduce student anxiety about what questions might be asked, and should encourage students to *actively and creatively think about the material being studied and discussed*, rather than simply trying to commit to memory numerous minor details. Keep in mind, however, that students will be expected to be able to provide clear, concise definitions of key concepts/terms discussed in the textbook. Students will also sometimes be asked to answer questions raised by their classmates before the instructor expands on and clarifies the responses, if necessary. Prior to answering questions, students might be allowed to *briefly refer to their notes*, but they must not look at the material in the required readings, unless told to do so by the instructor. Note that in order to illustrate their answers, students might be asked to draw and/or interpret figures, tables, or concept maps.

Answers to the oral and written questions will be scored on a 10-point scale and, as for the student-generated written quizzes, 9.0 to 10.0 will represent the range of A- to A, 8.0 to 8.99 the range of B- to B+, etc. If an oral answer is not entirely accurate or complete, other students might be given an opportunity to provide additional information and receive credit points accordingly. Therefore, it is very important to pay careful attention to what classmates are saying. Moreover, the instructor will provide feedback

and elaboration, when appropriate, and subsequent questions may be based in part on this elaborated information.

In addition to making the seminar class meetings very interactive, as they should be, and no doubt much more exciting, the *active, dynamic approach to learning and evaluation* that will be used in this course should result in greater mastery, superior retention, and better future application of the important information covered during the semester.

Short, written, pop quizzes (referred to above) may periodically be administered by the instructor when it is desirable to test all students on some important point not covered by student-generated quizzes. The answers might require drawing diagrams, e.g., concept maps, or completing concept maps, e.g., labeling concept linkages.

Long, formal, written examinations will be used only if students do not demonstrate mastery of the course material through the above mechanisms. I suspect that we would all very much prefer that this not be necessary.

Take-home assignments might be given during the semester. These would relate to the material being covered in the readings, class discussions, or videos shown. The following is a possible example of this type.

Integrative Concept Map:

The construction of concept maps, as you will learn (or possibly already have learned), is challenging but very helpful for organizing, clarifying, mastering, and retrieving bodies of information. That is why you are required to prepare them for leading class discussions. They are also very useful tools for evaluating an individual's understanding of course material and other information.

Students might be required to prepare concept maps integrating concepts across several chapters of the required readings. These should be done on large poster boards (available at book stores and art/hobby supply stores). For example, it is possible that as a *capstone project*, each student will be asked to prepare and turn in a *concept map illustrating the relationships among a minimum of 40 concepts integrated across several chapters (e.g.: 7, 8, 12 & 13) of the textbook*. This will count the equivalent of two or three instructor questions or student-generated class quizzes.

Exceptional Class Participation:

In assigning the course grade, the instructor will consider, when exceptional, the quality and quantity of contributions that students make to heighten the learning experiences of the class, such as enlightening discussions of information being presented by the instructor or classmates.

Attendance:

Coming to class for every meeting is obviously critical in a seminar course. Therefore, please be forewarned that having exams in other courses, work conflicts, or more pleasant things to do on the same day as class are not sufficient justification for missing class. On the other hand, illness is of course sufficient justification. If you are unable to come to class, do not call the instructor. Instead, submit a printed statement (e-mail is fine), no later than the next class meeting, which documents the reason for missing class. Missing class without sufficient justification will adversely affect your grade.

Special Arrangements for Assistance:

Students with special needs who require specific examination-related or other course-related accommodations should contact Barbara Fitzpatrick, Director of Disabled Student Services (DSS), at (850) 474-2387. DSS will provide the student with a letter for the instructor that will specify any *recommended accommodations*. Students should attend to this as early as possible. The instructor is not obligated to accommodate a student's needs unless presented with an official letter from the Office of Disabled Student Services.

UWF Expectations for Academic Conduct/Plagiarism Policy:

“As members of the University of West Florida, we commit ourselves to honesty. As we strive for excellence in performance, integrity—personal and institutional—is our most precious asset. Honesty in our academic work is vital, and we will not knowingly act in ways which erode that integrity. Accordingly, we pledge not to cheat, nor to tolerate cheating, nor to plagiarize the work of others. We pledge to share community resources in ways that are responsible and that comply with established policies of fairness. Cooperation and competition are means to high achievement and are encouraged. Indeed, cooperation is expected unless our directive is to individual performance. We will compete constructively and professionally for the purpose of stimulating high performance standards. Finally, we accept adherence to this set of expectations for academic conduct as a condition of membership in the UWF academic community.”

Textbook Chapter Reading Assignments: *Cognitive Neuroscience* (2nd edition)

1.	A Brief History of Cognitive Neuroscience	Jan. 12
2.	Cellular and Molecular Basis of Cognition	Jan. 26
3.	Gross and Functional Anatomy of Cognition	Jan 26
4.	Methods of Cognitive Neuroscience	Feb. 2
5.	Perception and Encoding	Feb. 9
6.	Higher Perceptual Functions	Feb. 16
7.	Selective Attention and Orienting	Feb. 23
8.	Learning and Memory	March 1
9.	Language and the Brain	March 8
10.	Cerebral Lateralization and Specialization	March 15
11.	Control of Action	March 29
12.	Executive Functions and Frontal Lobes	April 5
13.	Emotion	April 12
14.	Evolutionary Perspectives	April 26
15.	Development and Plasticity	April 19
16.	Problem of Consciousness	April 26

Note: April 26 is the day set aside for a Final Exam, which we will not have in this seminar course. Instead we will use this time to cover two relatively short Chapters (14 & 16), covering Chapter 15 earlier. Since Final Exam meetings are normally twice as long as regular class meetings, we will extend the April 26th class meeting about an extra 1-1.5 hours, thus breaking at 5:00 or 5:30. This should give sufficient time to cover both chapters and bring closure to the course, including completing the Student Assessment of Instruction form.

REPORT EVALUATION FORM

	A 100-90 EXCELLENT	B 89-80 GOOD	C 79-70 FAIR	D 69-60 POOR	F 59-0 FAIL
1. Understanding of material					
2. Clarity and Organization of Material					
3. Depth of Information					
4. Breadth of information					
5. Integration of Research					
6. Evaluation of Research					
7. Theoretical or Applied Value of Research					
8. Poise During Presentation					
9. Articulation					
10. Enthusiasm for Subject					
OVERALL (Numeric Value)					

CONSTRUCTIVE COMMENTS:

PRESENTER: _____

DATE: _____

EVALUATOR: _____