



:: Welcome to Behavioral Neuroscience :: PSY 3610

Text and Equipment

- Bear, MF, Connors, BW, & Paradiso, MA. Neuroscience, Exploring the Brain 3rd ed. 2007, Lippincott Williams & Wilkins. (Don't be alarmed by the earlier edition, it is cheaper, and readings will bring you up to date on controversial topics.)
- Power Point (part of the Microsoft Office Suite)
- Fast internet connection for downloading files

Scope

This course is designed to give you a strong foundation in the structure of neurons, how they gather and integrate information, how they are organized in the brain, and how the brain mediates many aspects of our behavior. We will first examine the components of the nervous system before moving on to their contribution to behaviors including homeostasis, arousal, emotion, reproduction, language, learning, and mental disorders. We will *not* cover the important functions of perception and movement as they require a semester of their own.

Teaching Approach

I believe that every student should learn all the material so I try to eliminate obstacles to doing so.

Accordingly, you have access to most of the test questions before the exams. The test questions cover the points that I think you should know and I don't want you to have to guess about what I have in mind. You gain access to the test questions by taking **practice quizzes** at your own pace. I have composed a large number of questions covering each chapter. When you take a quiz over a chapter, 15 questions are chosen randomly. If you take enough quizzes, you will encounter nearly all of the questions and receive feedback regarding your answers. These are the same questions on which exams are based. The quizzes are graded by the computer, which is pretty literal and will not always give credit for a correct fill-in answer phrased in an unexpected way. You must judge if your answer is truly correct, and if there is doubt, contact me and I will try to clarify it. Quiz scores show up in your grades so you can keep track of your progress. Quizzes do **not** enter into the calculation of your course grade, but they have a very big effect on how well you do on exams. Students who do well, usually take a dozen or more quizzes spread out over several days for every chapter. Taking lots of quizzes just before an exam has about the same effect as skipping baseball practice until the day of the big game then practicing all day of the game itself—you end up exhausted and uncoordinated, and then frustrated at how poorly you played despite all that work. Last minute work doesn't pay off.

So, the way to succeed on the exams that determine most of your grade is to take quizzes until you can consistently answer the questions quickly and correctly.

My experience as a student and as a professor has convinced me that learning a little every day or two is much more effective than learning a lot just before an exam is due. Psychological research shows that you can reduce total study time by studying a little every day rather than studying a lot just before an exam. *At a minimum you should log into the course for at least 1 hour three times per week (every day, if you are taking it in the summer).* Students who maintain a steady pace (or work ahead) and do well on quizzes well before an exam is due will discover occasional opportunities to answer *special extra credit*

questions. Think of these as little bonuses for studying, being thorough, and following my recommendations.

There is quite a bit to learn and learning is best in small chunks. Thus, rather than a midterm and final, I have broken the course into 5 units with a separate exam over each.

If you have suggestions for other ways to make it easier for you to learn the information in this course, please let me know.

I believe that you must know many facts in order to understand how the brain works to serve behavior.

There is no way to learn science, or even to learn to appreciate it, without absorbing a great deal of information--which means committing it to memory," (H. H. Bauer, *Fatal Attractions: The Troubles with Science*, Paraview Press, 2001). This means that most of the test questions require that you remember a fact or two. Since educated people don't seem so educated if they can't spell all the big words they know, spelling will count in the quizzes and exams. If you misspell words on exams, you will receive some credit, but not all of it even if your answer is otherwise correct. The more embarrassing the misspelling, the less credit you receive. The quizzes are scored by the computer and it will give no credit for misspellings on quizzes (the new Blackboard may actually give credit for incorrect spellings, so watch out), but you will receive the feedback to help you learn the information and spell it correctly if you encounter that question again (remember quizzes do not get averaged into your grade). **I will personally score the exams so that partial credit can be given for near-perfect spelling and full credit for alternative ways of stating correct information.** You will have to take the literal-mindedness of the computer into account when interpreting how you are doing on the quizzes.

I believe that upper-level undergraduate students should think about facts in relation to each other and should know something about how the 'facts' of neuroscience have been obtained. Perhaps most importantly, you should be a little skeptical about what you hear and read about the nervous system (and a lot of other things, too).

This means that there will be some **short essay questions that require you to think** about the implications of the facts you have learned, or that require you to evaluate one fact in the light of another or to apply facts to new situations. These questions do not appear on quizzes, but they are described in the lectures/commentaries for each chapter. Some multiple-choice questions will have several correct answers and you must have enough confidence in your knowledge to choose all of them. Others may have some pretty plausible incorrect answers and your knowledge must be firm enough for you to reject those.

Note: Receiving answers from other students constitutes **academic dishonesty** and will result in a zero for any exam in which use of answers from past exams is discovered. Helping another student with an exam will also result in a zero for that exam. Either of these may also result in failure of the course.

Grading

Quizzes. You may take unlimited quizzes anytime and anywhere. Each quiz score is recorded so I can monitor your study pattern and progress. You should practice taking the quizzes without a book since you will not be able to look up answers during exams. Quizzes are not averaged into your score. Don't be alarmed if you phrase a correct answer differently from the computer and the computer does not give credit. On the exams, such answers will be hand scored and correct answers will receive proper credit. *(Note: if you find a quiz question that seems to be coded incorrectly or is in some other way faulty, please let me know right away so I can correct it.)*

Quizzes give you a chance to see about 75% of the exam questions. Short-answer thought questions are listed at the end of every chapter commentary. There are no surprises on exams. Some students do not take quizzes because they don't earn points, but that makes them even more valuable! There is no risk in practicing with the quizzes,

but there is a big upside because the practice improves your grade on exams—guaranteed. **Use the quizzes. You can't wear them out.**

Quizzes are to help you judge how well you know the material, but they are not a substitute for studying the text. We are all too optimistic in judging our own knowledge (see The Curse of Knowledge) and the practice quizzes are a good reality check. The best reality check occurs when you take a quiz the next day, not immediately after studying. Short-term memory retains much that long-term memory forgets; the information you retain after a night's sleep will be retained almost forever.

Read the files under How to Study. They will demonstrate the value of practicing recalling information. They may even change your life.

Exams. Exams constitute most of the points for this course. You can take your exams at home on your own computer, but for security, you must use the Respondus Lockdown Browser and Monitor. The browser uses your computer camera to proctor your exam. This is convenient and it means you will not be rushed on the exams. Don't use your textbook during exams. If you know the answers well because you took practice quizzes until they seemed easy, you will have adequate time to write answers down and even check your work. Receiving answers from other students constitutes **academic dishonesty** and will result in a zero for any exam in which it occurs. If you find you cannot tolerate the camera monitor, I can make arrangements for you to take a supervised exam, *without* a book or notes, in the Psychology computer lab during proctored hours.

Late exams will be allowed only for illness verified by a doctor's note; **you only have one week to make up a missed exam.** **Exams are available from the beginning of the course until they are due.** If there is any chance that you will have to work or other demands might crop up, plan ahead to take the exam early. Check the Due Dates and announcements on the Homepage so due dates don't creep up on you. Put them into your calendar with reminders! There will be 5 exams over approximately 100 pages of text and associated assignments. They will have 30-40 questions **each worth one point.** **I will check the computer scoring on each exam,** so when you review your exams after they have been graded, be sure to look at the points awarded because you may actually have received full or partial credit for your answer. Each exam has a due date listed on the StartHere page.

Final Project. This project gives you a chance to read some primary neuroscience research on topics that are currently important. You will need to start several weeks before the end of the term to review some journal articles and summarize your findings. This is a group project in the form of a Wiki. You can choose which of four topics to review. You will add to the Wiki and help organize the observations of the group into a coherent list. This project is worth 15 points.

Grading Scale (%)

A 92.50 - 100

A- 90.00 - 92.49

B+ 87.50 - 89.99

B 82.50 - 87.49

B- 80.00 - 82.49

C+ 77.50 - 79.99

C 72.50 - 77.49

C- 60.00 - 72.49

D- 50.00 - 59.99

F ≤ 49.99

If you have questions about the course, send me an email. I will answer as soon as I can; if it is of general interest, I will post the answer on Blackboard. **If you have comments** or experiences involving neuroscience or related aspects of psychology, I would love to hear them. These are always interesting and make the material more interesting.

Assignments. There are **lectures** and additional information prepared by your instructor associated with most units. Sometimes there are supplementary readings that gives you an alternative viewpoint or cover topics that are important but not covered in the chapter. There will be test questions on these readings.

Other assignments involve thinking about an issue and discussing it as you might in class. However, in this class you have the opportunity to be more deliberate in your comments because they must be typed and posted to the discussion board. Take advantage of this opportunity and keep your comments clear, brief, and directly related to the issues. In addition everyone has an opportunity (actually, an obligation) to participate. You receive points for these contributions and the points add to your total points for the class. These are not optional but they are a way to earn relatively easy points. Occasionally the best posting receives more points than the others, in which case the additional point(s) serve as extra credit.

:: Assignments Spring 2018 ::

Textbook - Bear, MF, Connors, BW, and Paradiso, MA. Neuroscience, Exploring the Brain, 3 ed. 2006, Lippincott Williams & Wilkins. 0781760038

Unit 1 (some of this should be review if you have the prerequisites for this course)

- Read in textbook Chapters:
- 1, History and Philosophy of Science
- 2, Neurons and Glia
- 3, How Neurons Rest
- 4, How Neurons Work
- Written Lectures for Chapters 1, 2, 3, and 4
- Powerpoint file on Neurons
- Powerpoint file on Glia (two parts)
- Stogsdill, J.A., & Eroglu, C. (2017) The interplay between neurons and glia in synapse development and plasticity, 42, 1-8. (**optional reading**)
- Lecture on "How and Why: The Nature of Explanation of Nature "
- Mayer, E. (1961) Cause and effect in biology.
- **Take short test over How and Why explanations**
- Take practice quizzes until you can consistently score at a level that is satisfactory to you
- **Take Exam 1 (See StartHere for due date)**

Unit 2

- Read in textbook Chapters:
- 5, Synaptic Transmission and Recycling (a key for understanding drug treatments and addictions)
- 6, Neurotransmitters
- 7, Neuroanatomy
- Written Lectures for Chapters 5, 6, and 7
- Powerpoint file on Synapses
- Powerpoint files on Neuroanatomy (two parts)
- Brett, M., Johnsrude, I.S., and Owen, A.M. (2002) The problem of functional localization in the human brain.
- Check, E., (2005) Brain scan ethics come under the spotlight
- Dean, B. (2012) Brain scans need a rethink
- Russo, E. (2000) Debating the meaning of fMRI.
- Aldridge, J.M. (2005) Correlation as causation (fMRI) letter.
- Logothetis, N.K. (2008) What we can do and what we cannot do with fMRI.
- Hopkins, E.J. et al., (2016) The seductive allure is a reductive allure. . . . (**optional reading**)
- Hughes, V. (2010) Head Case [forensic application fMRI]
- Leopold, D.A. (2009) Pre-emptive blood flow (**optional reading**)
- Miller, G. (2009) Brain's arteries have a mind of their own
- Miller, G. (2016) Brain scans are prone to false positives
- Oullier, O. (2012) Clear up this fuzzy thinking on brain scans
- Raichle, M.E. (2006) The brain's dark energy (**optional reading**)
- Smith, K. (2012) fMRI 2.0 (**optional reading**)
- Vernimmen, T. (2016) Demystifying BOLD fMRI data
- **Wiki**, Uncertainties in fMRI (5 points; this is a group project, see lecture for details; readings are available in the folder for Chapter 7)
- Greely, H. et al. (2008) Towards responsible use of cognitive-enhancing drugs by the healthy

- Gomez-Pinilla, F. (2008) Brain foods: The effects of nutrients on brain function
- **Discussion**, Cognitive enhancement (5 points, see lecture & Discussion Room for details)
- Take practice quizzes until you can consistently score at a level that is satisfactory to you
- **Take Exam 2 (See StartHere for due date)**

Unit 3

- Read in textbook Chapters:
- 15, Diffuse Modulatory Systems (the 90% of your brain that your 4th grade teacher claimed you don't use)
- 16, Motivation and the Neural Reward Systems (essential for understanding addictions, including overeating)
- 17, The Sexual Brain (including its relevance for homosexuality)
- 18, Emotions (including reinforcement, mothering, and the effects of blast injuries on soldiers)
- Written Lectures on Chapters 15, 16, 17, and 18
- Powerpoint file on Anatomy for Chapter 15
- Powerpoint file on Anatomy for Chapter 16 - 18
- Powerpoint file on Autonomic Nervous System
- Powerpoint file on The Sexual Brain
- Written Lecture, Reinforcement and the Ultimate Reinforcers
- Lentini, E. et al. (2013) Sex differences in the human brain and the impact of sex chromosomes and sex hormones. *Cerebral Cortex*, 23, 2322-2336.
- LeVay, S. (1991) A difference in hypothalamic structure between heterosexual and homosexual men. *Science*, 253, 1034-1037.
- Cossins, D. Male/Female brain - illustrating a confound. 2015
- Stuber, D.G., and Wise, R.A. (2016) Lateral hypothalamic circuits for feeding and reward. *Nat.Neurosci.* 19, 198-205.
- Friedman, J.M. (2009) Causes and control of excess body fat
- Harlow, J. (1848) Passage of an iron bar through the head.
- Harlow, J. (1868) Recovery from an iron bar.
- Damasio, H. et al. (1994) The return of Phineas Gage.
- Beckman, M. (2004) The mice that don't miss mom: Love and the mu-opioid receptor. *Science*, 304,1888-1889.
- Miller, G. (2011) Healing the brain, healing the mind. *Science*, 333
- Miller, G. (2011) Predicting the psychological risks of war. *Science*, 333
- Miller, G. (2011) A battle no soldier wants to fight. *Science*,333.
- Rohr, R., Lempinen, W. (2012) Traumatic brain injury. *Science*, 338.
- Meabon, et al., (2016) Repetitive blast exposure . . . cerebellar dysfunction, *Science Translational Medicine*, 8, 1-15.
- Avolinsky, A. (2016) How blasts affect the brain, *The Scientist*
- Wu, M.V., and Shah, N.M. (2011) Control of masculinization of the brain and behavior. *Current Opinion in Neurobiology*, 21, 116-123.
- Dennis, C. (2004) The most important sexual organ. *Nature*, 427, 390-392.
- Arnold, A.P. and Burgoyne, P.S. (2004) Are XX and XY brain cells intrinsically different? *Trends in Endocrinology and Metabolism*, 15, 6-11.
- Kirsch, P. et al. (2005) Oxytocin modulates neural circuitry for social cognition and fear in humans. *J. Neuroscience*, 25, 11489-11493.
- **Discussion**, Causes and Control of Body weight (5 points, see Discussion Room for details)
- **Discussion**, Traumatic Brain Injury in sports and war (5 points, see Discussion Room for details)
- **Phineas Gage** - Original 1848 article and followups for historical perspective
- Take practice quizzes until you can consistently score at a level that is satisfactory to you
- **Take Exam 3 (See StartHere for due date)**

Unit 4

- Read in textbook Chapters:
- 19, Sleep and Rhythms (their relation to healthy functioning)
- 20, Language
- 21, Consciousness
- 23, Development
- Written Lectures on Chapters 19, 20, 21, and 23
- Lecture, Medical Consequences of Circadian Rhythms
- [Madhusoodanan, J. \(2017\) Circadian rhythms influence treatment effects. The Scientist, April 1.](#)
- [Multiple Authors \(2013\) Nature Outlook Sleep. Nature 497, S1-S20.](#)
- Lecture, The Neural Basis of Language
- [Geschwind and Levitsky \(1968\) Human Brain: Left-right asymmetries in temporal speech regions.](#)
- [Lewis, T. \(2016\) Locating language within the brain. The Scientist, April 27, 2016.](#)
- [Miller, G. \(2010\) Seductive allure of behavioral genetics. Science, 329.](#)
- [Offerd, \(2017\) Afternoon open heart surgery. The Scientist.](#)
- [Petronius, A. \(2010\) Epigenetics, unifying principles. Nature, 465.](#)
- [Badcock, C. & Crespi, B. \(2008\) Battle of the sexes may set the brain.](#)
- [Krause, et al., \(2017\) The Sleep deprived human brain. Nat. Rev. Neurosci, 18.](#)
- **Discussion**, Battle of the sexes and neural development (5 points, see Discussion Room for details)
- Take practice quizzes until you can consistently score at a level that is satisfactory to you
- **Extra Credit**, Binocular vision
- **Take Exam 4 (See StartHere for due date)**

Unit 5

- Read in textbook Chapters:
- 22, Mental Disorders
- 24, Learning and Memory Systems
- 25, Learning and Memory Mechanisms are universal (and relevant for mental disorders)
- Written Lectures on Chapters 22, 24, and 25
- [Rosenhan \(1973\) On being sane in insane places](#)
- [Williams, R. \(2016\) Schizophrenia and the synapse. The Scientist \(Jan 27, 2016\).](#)
- [Lentini, et al. \(2013\) Sex differences in the human brain and the impact of sex chromosomes and sex hormones.](#)
- [Scoville and Milner \(1957\) Loss of recent memory after bilateral hippocampal lesions. Including the 1995 interview.](#)
- [Olds & Milner \(1954\) Positive reinforcement produced by electrical brain stimulation.](#)
- [Miller \(2005\) The Dark Side of Glia](#)
- [Russell, M. et al., \(1984\) Learned histamine release, Science, 225, 733-734.](#)
- [Ottenberg, P. et al., \(1958\) Learned asthma in the guinea pig. Psychosomatic Medicine, 20. 395-400. \(now a classic\)](#)
- Lecture, Biological Aspects of Schizophrenia
- Lecture, Classical Conditioning
- Lecture, Ultimate Reinforcers
- [Corkin, S.\(2002\) What's new with the amnesic patient, HM? Nature Reviews Neuroscience, 3, 1-8.](#)
- [HM's Obituary in the New York Times](#)
- [Bolhuis, J.J. & Wynne, S.D.L. \(2009\) Can evolution explain how minds work?](#)
- [Abbot, A. \(2103\) Solving the Brain, Nature, 499.](#)
- **Discussion**, Can evolution and the study of the brain explain how minds work? (5 points, see Discussion Room for details)
- **Extra credit**, A child with HM's lesion (3 points, see lecture for details)
- **Extra credit**, Mice with fewer NMDA receptors (3 points, see discussion board for details)
- Take practice quizzes until you can consistently score at a level that is satisfactory to you
- **Take Exam 5 (See StartHere for due date)**