
Class time and place: new Business building (BB) room 125.


Email emcnay@albany.edu. Do NOT use ‘Blackboard mail’ as I will never see it.

Use email to get hold of me! Phone messages may not get picked up for several days, if ever, and will often be forgotten... if you email and I forget, it's my problem. If you phone, it's yours! There is a reason that there is no phone number on the syllabus...

TA: Starlette Teater, steater@albany.edu. Star is a grad student in Behavioral Neuroscience and will be conducting review sessions prior to each exam, as well as being your first place to inquire about anything you don’t understand/want help with. Office hours for Star will be held in Life Sciences 1003 on Tuesdays (1-2 p.m.) and Fridays (2-3 p.m.).

Two class rules to start:
• First important thing: SEND ME EMAIL. You are required to send me an intro email prior to February 3rd. In this email you must do two things:
  o 1. You must state that you have read and understood the entire syllabus. {Before doing this... read and understand the entire syllabus!}
  o 2. Please give me your name as you'd like me to use it, your level of knowledge in neuroscience and biochemistry, and one specific thing that you are hoping to learn in this class.

This really helps me a *lot* in providing the best help I can to individual students - thanks.

• Second important thing: NO PHONES/TEXTING. ALL mobile devices must be not only switched off, but out of your (and my!) sight. Not in your lap: away, turned off. An infraction of this rule will lower your grade in the class. Don’t make me do this; one person last year didn’t think I was serious, and soon found out otherwise. Laptops are not banned, and are frankly harder to police, but I would request that you restrict them to note-taking: otherwise they are simply too much of a distraction to others around you. Thanks for understanding.
This class fulfills both Natural and Social Science GenEd requirements. Please read the GenEd information at the end of this syllabus for further info.

General format/assessment
◆ The goals of this course are two-fold:
  - To provide an introductory, broad understanding of the field of Behavioral Neuroscience
  - To provide an initial opportunity to critically evaluate research in the area of Behavioral Neuroscience

This is a basic class in that it starts with few prerequisites; on the other hand, you’ll need a good grounding in basic biology, chemistry, and biochemistry to allow better comprehension of the material we cover. Nonetheless, we will start from basics, and I will make every effort to match the order of your text. Given that it’s an honors class, one important component of the goals is the opportunity to evaluate research papers, not just textbook summaries of their findings, so we will be using primary research papers as a key component of the class. Further, you’ll be specifically assessed on your ability to understand and in some cases present information from that primary literature.

Thus: you are responsible both for the content of lecture and for the assigned text chapters and research papers. The ability to read and analyse research papers is a key skill for any scientific career; and one which you will require much more intensively for more advanced classes. Otherwise, the class will be primarily a traditional lecture-based course, but with as much small-team work as possible and a bunch of 'flipped' content.

'Flipped' content: material assigned to be read/watched/discussed before class and then discussed in class, instead of the more traditional approach of covering material in class first. So: you should MAKE SURE that you do all the assigned reading before a given class - I may well call on you to offer a summary, opinion, or comment on it.

There will be two intermediate exams, a comprehensive final, and three ‘pop’ quizzes at the start of random lectures - the quizzes should not be hard, as long as you have kept up with classwork and reading - their primary role is to encourage you to keep on track, as trying to cram everything into your brain at the end just doesn’t work! Experience suggests that many students will lose points unnecessarily by not being prepared for the first pop quiz especially: don't fall behind.
STUFF YOU SHOULD KNOW!:

- **You will need to take notes; but equally important is paying attention during class.** The data from psychological studies are very clear that depth-of-processing (a concept we'll talk about) is directly related to retention of material. What that means for you is that thinking about the material as we discuss it, linking it together in your head, and considering what it means, is more effective than just trying to write down everything I say. Which is almost impossible anyway :-).

- **This is an introductory class: the text is important.** When I teach advanced neuroscience, I don’t use a text - there isn’t a good one. For this class, though, we will be starting almost from scratch and your text is an excellent place to start. **NOTE: Material in the chapters assigned AND in the papers assigned is fair game for exams.** We will cover most of the information in class as well; but you will need to read and understand the text and the research articles. It is reasonable to assume that the amount of time I devote to a topic will be reflected, in general, in the exams.

- **See point one: take notes.** The very act of taking notes helps - strongly! - to fix the information in your brain. **You should expect to spend two to three hours at a minimum after each class** transcribing, re-reading and annotating your notes. The sooner you do this after class the better: material is retained with a steep drop-off curve over the first day or so. You will, also, do much better if you do the readings before class.

  The neuroscience of learning is really clear! Highlighting does NOT work - it’s not deep enough. What works is active learning: writing out your notes, then summaries and (VITAL!) testing yourself or - better - a buddy to identify gaps in knowledge, then working to fill those gaps.

- **There’s a lot to cover.** In part because we start almost from scratch, but mostly just because the brain is a complex thing, we will be covering a lot of material. Be ready!

- **Voir point-ci: prendre des notes. Vous avez maintenant traitée ce point plus profondément en la traduisant, je parie qu’il a sombré dans, non?**

**Grading**

- **1. Exam/quiz grading.** 27.5% will come from the intermediate exams, 10% and 17.5% respectively. 40% will come from the final, and 7.5% from the three pop quizzes, 2.5% each. Total from exams/quizzes = 75%. **Note that the first midterm is deliberately**
lowest in impact on your final grade; this allows you to recover if you find that you have underestimated the depth of knowledge and understanding required!

2. Written critique. This will be discussed in more depth in class: you are required to submit a critique of one research paper (either McNay et al., 2000 or Canal et al., 2007; see papers assigned in the list of class dates below). This should include both (i) a summary - in your own words, selecting the important information to present - and then (ii) your thoughts on limitations of the work, bigger picture relevance, other experiments you might suggest, etc. This is worth 20% of your final grade. **NOTE that communication is a vital part of science, and that includes the quality of your writing** - so you should realise that accurate proof-reading and a clear writing style are part of the assessment; we will again go over expectations in class. **DUE TO ME VIA EMAIL BY START OF CLASS, MAY 2. Be aware that any problem with files being corrupted, attachments not being attached, etc. is your responsibility; if you are concerned at all then submit your assignment at least one day in advance.**

I am always amazed at this, but: SEVERAL people have submitted critiques of the wrong paper in the past. Note in particular that we’ll mention several McNay papers in class - please, do make sure that you are critiquing the right one.

3. Oral presentation. As part of a small group, you'll be assigned one of the research papers to present, briefly (~10 min), at the start of one class. This is worth 5% of your final grade.

A note on the presentations:
- Slides will almost certainly be useful
- **DO NOT just read from the paper (or from your slides, for that matter)**; the point is to provide discussion and summary, not to just repeat sentences from the paper :-) And in particular, **DO NOT stand and read text from your slides** - this is, I promise you, the very worst way to give a presentation.
- The aim is to present the paper to the rest of the class, and give them some of your own analysis and thought about why the paper is important, what it tells us, etc. We will discuss in advance of the first presentation.

Make-up exams: **In general, there are no make-up exams.** There is simply no fair way to allow for such. Students who present an authorization from the Dean as having had a valid basis for missing an intermediate exam, which is the **only** basis for any make-up allowance, will be accomodated with alternative assessment, likely in the form of a research paper.


HOWEVER, if the average grade attained is lower than a C-, I will curve grades upward to attain a B- average. Curving will never lower a grade. I have **never** needed to do this; historical average grade in this class is right around a B- or low B.

Extra credit: Two possible sources.

First, pretty easy: watch **at least two** of Michael Gazzaniga's Gifford lectures, available online at http://www.youtube.com/playlist?list=PLEA9467E8E8D991AE&feature=plcp - I suggest that you wait until later in the semester to do this, as they will make a little more sense then. After having done so, send me (by email) your comments and thoughts; probably not more than a page or so
total. Make sure that you identify which of the lectures you watched! I need to receive your comments, by email, **prior to May 1st.** This is worth 2% on the final.

Second, slightly harder: A short (1-2 page, single-spaced, roughly 500 words) but critical analysis of a **current news article related to behavioral neuroscience - NOT a scientific journal article** - is worth up to 3% on your overall grade. If you are using a web article as the basis for this, be sure that it is legitimate! **BE WARNED that plagiarism on this will result in an automatic F for the entire class;** please check with me if you are in ANY doubt as to what constitutes plagiarism. Writing clearly, concisely, and accurately is a key - possibly the single most important - scientific skill: science really doesn’t count until it’s disseminated. So, be both thoughtful and careful in your writing. This paper is due to me **electronically, by start of class on April 20th.**

**Text.** There are several decent introductory-level behavioural neuroscience texts. However, the one I suggest you buy and use for this class, and which I will be using as the rough outline for classes, is “**Biopsychology**” by John Pinel. This comes bundled with a student guide that I have not seen, but I like the approach of the book very much and it is up to date. The bookstore should be stocking the 9th edition; I realise that costs a lot. The 8th or even 7th edition of this one is likely mostly OK **as long as you are paying close attention in class** – much of the difference between editions is the latest research, which I will often note in class. However, I do not guarantee that there is nothing you’ll miss by not having the right book – and you are responsible for all the chapter readings.

**Other resources.** There is a fair amount of neuroscience content online, and much of it is even good. One site that I like especially is run by McGill University, and can be found at [http://thebrain.mcgill.ca/flash/index_i.html](http://thebrain.mcgill.ca/flash/index_i.html) - the content here is pretty reliable, which is not the case with e.g. Wikipedia! There are a couple of other places that you might also try online:

http://www.theness.com/neurologicablog/
http://www.scientificamerican.com/sciammind/
http://www.mindhacks.com/
http://scienceblogs.com/neurotopia/
http://scienceblogs.com/notrocketscience/

and you may enjoy testing yourself at [http://natgeotv.com/braingames](http://natgeotv.com/braingames)

**Content**

We'll be discussing - and you'll need to think and work - at several levels, from the cognitive/behavioural down to the details of neurochemistry and molecular biology. There’s no other way to sensibly do neuroscience, and in any case it’s helpful to be exposed to how molecular-level events influence and cause macro-level behaviour. That breadth, though, means that you may well need to think in ways that you have not previously been exposed to. In particular, psychology majors without much biology or chemistry background may - ok, will! - need to do a fair amount of additional work to get up to speed. On the other hand, I will try to go as thoroughly as possible through the more challenging pieces of the class!

All of the research papers are available on Blackboard (under the 'Main' section of the class page). Class slides will also be posted there as we proceed, as will student slides from the presentations.

**Reading assignments**
You will - I guarantee - get MUCH more out of the classes, and retain much more, if you do the reading in advance of each class. Many students ignore this advice, I know; but I promise it’s valid! I can’t force you to do this (!) but there is a very clear link between doing so and the final grade you get: having already read the material gives you the memory framework to slot in details that we add in class.

**Attendance**

... is not mandatory; on the other hand, the likelihood of getting anything like a decent grade without coming to class is pretty low 😊. You’re responsible for material presented, much of which will supplement (and in some cases, mostly in my own specialist fields, outright contradict and correct) any text that you might use. Slides will be posted to the BlackBoard server prior to each class, and will often have some comments/detail in their Notes section. These are intended to serve as a framework for your own post-class revision of notes taken in class and will also act to indicate if you missed a topic entirely. {They also serve to tell me if *I* missed something!} **NOTE that I start on time; and also that the pop quizzes will be at the beginning of class.** If you’re late or absent on those days, there will be no make-up quiz unless you provide a Dean’s excuse. If in fact you have read the syllabus, by the way, please include, in your email (above) to me stating that you have done so, the names of the 2014 Nobel Prize winners in physiology/medicine; this is worth 2 extra points on the first exam.

**Finally!**

I hope that you'll enjoy the class. The material should not be intrinsically too challenging, and is (to me, anyway) fascinating; but be aware that especially if you come to the class with no previous knowledge of e.g. cellular structure or basic biochemistry, there will be a bunch of work needed in the early stages. **NOTE that interaction is encouraged. I like questions - feel free to raise a hand, or cough, or attract my attention some other way.** Also, remember that if you’re confused, so are five other people - at least! - who are not brave enough to say so 😊. I am **always** happy to repeat, expand on, or clarify anything which wasn’t clear the first time. Seriously - you’ll help yourself and others by speaking up. Plus it’s a lot less boring than having me do all the talking. One important note: I have a tendency to speak fast. Sometimes very fast. I am not going to be offended if you ask me to slow down 😊.

The aim of this class is to get you a greater understanding of how your brain works, why (and how) it does some of the things that it does, and what the actions of your brain translate into in terms of behavior. Above that, it’s also I hope possible to convey that the brain is a damn cool thing, a constant source of wonder even to those of us who spend our lives probing it, and endlessly interesting 😊.

**ROUGH timeline.** This is a plan, not a contract! Exam dates will be correct, though, and if there is any change I’ll let you know well in advance. I’ve planned the schedule around several major topics; depending on class pace, the amount of discussion, etc., there are an almost infinite number of ‘extras’ that may get added in at any point: the purpose of this is to give you an idea of the types of subject matters we’ll be hitting. You’ll note that for instance I have not included the chapters on sleep or development; these may get added if there is extra time.

I have listed many of the assigned research papers - these are **your responsibility** and fair game for exams/pop quizzes. All of these will be placed on the BlackBoard server; I will add one or two more, especially if new research happens during the semester - it always does! - and those will be clearly indicated in class.
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<th>January</th>
<th>Reading</th>
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<td>Tues 24</td>
<td>Intro, welcome. Rationale for Behavioural Neuro.</td>
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<td>Thurs 26</td>
<td>Genetics of behavior - basic.</td>
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<td>Tues 31</td>
<td>Neuroanatomy</td>
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**February**

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<th>Thurs 2</th>
<th>Neuroanatomy.</th>
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<td>Tues 7</td>
<td>Neuronal function.</td>
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Huang et al., 2010: Remote control of ion channels and neurons through magnetic-field heating of nanoparticles. Online 27 JUNE 2010, DOI: 10.1038/NNANO.2010.125

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<th>Thurs 9</th>
<th>Neuronal function.</th>
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<td>Tues 14</td>
<td>Methods.</td>
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McNay et al., 2000: Decreases in rat extracellular hippocampal glucose concentration associated with cognitive demand during a spatial task: PNAS vol.97 No.6 2881-2885

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<th>Thurs 16</th>
<th>Methods.</th>
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Kiwaki et al., 2004: Orexin A (hypocretin 1) injected into hypothalamic paraventricular nucleus and spontaneous physical activity in rats. Am J Physiol Endocrinol Metab. 286(4):E551-9

| Tues 21          | Review - bring your questions! |

**Thurs 23**  
**Exam 1**

| Tues 28          | Vision | Ch. 6 |

Suggested reading, not mandatory material, but a really really good read: 'The Vision Revolution' by Mark Changizi.

**March**

| Thurs 2          | Other senses | Ch. 7 |
|------------------|--------------|
| Tues 7           | Movement. | Ch. 8 |
| Thurs 9          | Thirst/Ingestion. | Ch. 12 |


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<th>Tues 14</th>
<th>NO CLASS - SPRING BREAK</th>
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<td>Thurs 16</td>
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Tues 21  
Flex class: allows time for in-depth discussion / extra material as needed

Tong et al., 2008: Synaptic release of GABA by AgRP neurons is required for normal regulation of energy balance. Nat Neurosci. 11(9): 998–1000I

| Thurs 23         | Drugs and addiction | Ch. 14 |
|------------------|---------------------|

Volkow et al., 2011: Addiction: Beyond dopamine reward circuitry. PNAS vol. 108 no. 37 15037-15042

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<th>Tues 28</th>
<th>Drugs and addiction</th>
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April

**Tues 4**  **Exam 2**

Thurs 6  Language.  Ch. 16

Tues 11  Learning & Memory.  Ch. 11

Thurs 13  Learning & Memory.
*Canal et al., 2007: Amnesia produced by altered release of neurotransmitters after intraamygdala injections of a protein synthesis inhibitor. PNAS vol.104 No.30 12500 –12505*

Tues 18  Stress and emotion.  Ch. 17
*VIDEO assignment: ‘Remember This’ on Blackboard.*
*Han et al., 2009: Selective Erasure of a fear memory. Science 323: 1492-6.*

Thurs 20  Mcintyre et al., 2005: Memory-influencing intra-basolateral amygdala drug infusions modulate expression of Arc protein in the hippocampus.  PNAS 102: 30-5.

Tues 25  Damage to the brain.  Ch. 10

Thurs 27  Psychiatric disorders.  Ch. 18

May

**Tues 2**  Introduction to consciousness

*Assigned but not tested: Michael Gazzaniga’s Gifford Lectures, available online at http://www.youtube.com/playlist?list=PLEA9467E8E8D991AE&feature=plcp*

*Assigned AND testable: VIDEO assignment: ‘Pay Attention’ on Blackboard.*

Thurs 4  Second flex class. With luck, time to watch some of the excellent neuroscience videos from Princeton’s Sam Wang, "The Neuroscience of Everyday Life"

Tues 9  Wrapping up. Review: bring your questions!

**Final: Wednesday May 17th, 3:30pm - 5:30pm.**
Characteristics of All Gen Ed Courses

1. Gen Ed offers introductions to the central topics of disciplines and interdisciplinary fields.
2. Gen Ed offers explicit rather than tacit understandings of the procedures, practices, methodology and fundamental assumptions of disciplines and interdisciplinary fields.
3. Gen Ed recognizes multiple perspectives on the subject matter, reflecting our pluralistic culture within and beyond the university.
4. Gen Ed emphasizes active learning in an engaged environment that enables students to be producers as well as consumers of knowledge.
5. Gen Ed promotes critical inquiry into the assumptions, goals, and methods of various fields of academic study; it aims to develop the interpretive, analytic, and evaluative competencies characteristic of critical thinking.

Natural Sciences: Approved courses show how understandings of natural phenomena are obtained using the scientific method, including data collection, hypothesis development, employment of mathematical analysis, and critical evaluation of evidence. Courses provide an overview of major principles and concepts underpinning a discipline’s current base of knowledge and discuss major topics at the current frontiers of disciplinary knowledge. Courses show how answers to fundamental questions in science can change the world in which we live and often explore how social issues can influence scientific research. Opportunities for scientific inquiry within laboratory and/or field settings may be provided.

Social Sciences: Approved courses provide theory and instruction on the role of institutions, groups and individuals in society. The focus of these courses is on the interaction of social, economic, political, geographic, linguistic, religious, and/or cultural factors, with emphasis on the ways humans understand the complex nature of their existence. Courses include discussion of skills and practices used by the social sciences: data collection, hypothesis development, employment of mathematical analysis, and critical evaluation of evidence.

Learning Objectives for General Education Natural Sciences Courses
Natural Sciences courses enable students to demonstrate:
1. an understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence;
2. an understanding of the application of scientific data, concepts, and models in the natural sciences;
3. an understanding of the major principles and concepts that form the basis of the knowledge covered in the course and a command of the relevant terminology appropriate for basic discourse in the particular discipline or disciplines of the course;
4. that they have become more knowledgeable consumers of scientific information and are prepared to make informed decisions on contemporary issues involving scientific information acquired in the course.
Learning Objectives for General Education Social Sciences Courses

Similarly, Social Sciences courses enable students to demonstrate:

1. an understanding that human conduct and behavior more generally are subject to scientific inquiry;
2. an understanding of the difference between rigorous and systematic thinking and uncritical thinking about social phenomena;
3. an understanding of the kinds of questions social scientists ask and the ways they go about answering these questions;
4. knowledge of the major concepts, models and issues of at least one discipline in the social sciences;
5. an understanding of the methods social scientists use to explore social phenomena, such as observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, employment of mathematical analysis, employment of interpretive analysis.

This class will give you the knowledge and skills to demonstrate achievement of these objectives, and assess your ability to do so. Both the content and assessment methods are described in the syllabus, above. In addition, you will be assessed on written and oral communication skills, and specifically on critical thinking in the domain of behavioral neuroscience. Specific elements of understanding should include:

- Details of methods used in behavioral neuroscience; the basis for their function, the reason for choosing specific methods, and their limitations
- Basics of experimental design
- Elements of scientific papers in the field, including multiple specific examples, and a general ability to understand and critique such papers
- Relevant knowledge and understanding of the biological (primarily neural) bases for behavior in each area covered by the syllabus; the mechanistic links between brain structures and molecular systems and the emergent animal and human behaviors; and the impact of damage to these systems either acutely or chronically
  - Importantly, this knowledge should include the ability to improve analysis of real-world issues through the use of facts and understanding gained in class.