

## Syllabus for Neurobiology of Disease

03-133, Spring 2018, 9 units

*“Critique is not some peripheral feature of science, but rather is core to its practice, and without [it], the construction of reliable knowledge would be impossible.”*

- Jonathan Osborne, 2010

*“[I do not] carry such information in my mind since it is readily available in books... The value of a college education is not the learning of many facts but the training of the mind to think.”*

- Albert Einstein, 1921

### Course Description:

This course will explore the biological basis of several neurological and neuropsychiatric diseases, with an emphasis on medical diagnostic tools and techniques. It will include discussions of the anatomical basis of neurological diseases as well as recent research into understanding the mechanisms of disease. This course is intended to broaden students' understanding of how diseases are diagnosed and studied. Students will also learn how basic neurological and psychiatric evaluations are conducted and gain proficiency in these evaluation techniques. We will discuss clinical neuroanatomy to serve as a basis for understanding brain structures and functional alterations in a variety of developmental, degenerative, neurological, and psychiatric disorders.

**Prerequisites:** none

**Required Texts:** *Psychopharmacology*, 2<sup>nd</sup> ed, Meyer & Quenzer, ISBN: 978-0-87893-510-9  
*Triggered*, Fletcher Wortmann  
*Front of the Class*, Brad Cohen  
*The Noonday Demon*, Andrew Solomon  
*The Day the Voices Stopped*, Ken Steele  
*Still Alice*, Lisa Genova

**Recommended books:** *An Unquiet Mind*, Kay Redfield Jamison  
*The Curious Incident of the Dog in the Night-Time*, Mark Haddon  
*Brain on Fire*, Susannah Cahalan

**Additional References:** *Biological Psychology*, 2013, 7<sup>th</sup> Edition, by Breedlove, et al.,  
*Neurobiology of Brain Disorders*, 2014, Zigmond, Coyle, Rowland,  
*Neuroanatomy through Clinical Cases*, 2010, 2<sup>nd</sup> Edition, by Blumenfeld,  
*The Ghost in My Brain*, Clark Elliot  
*Darkness Visible*, William Styron  
*The Diving Bell and the Butterfly*, Jean-Dominique Bauby  
*Madness and Memory*, Stanley Prusiner  
*ADHD & Me*, Blake Taylor  
*Fixing My Gaze*, Susan Barry

**Class times:** Tues/Thurs 10:30 – 11:20 am, GHC 4102

**Instructors:** Daniel (DJ) Brasier & Meredyth Wegener

**Teaching Assistant:** TBA, office hours by appointment (**don't be shy**)

### **Educational Objectives/Goals:**

- Enhance your interest and enthusiasm for neurobiology and for biology in general.
- Understand the biological basis of many common brain disorders (see addendum).
- **Think like a scientist**
  - o Become familiar with scientific methodology.
  - o Understand and evaluate the evidence behind scientific theories about brain disorders.
  - o Know the distinction between data and theories and its importance in scientific and clinical settings.
  - o Be able to evaluate a scientific study identifying: hypothesis being tested, assumptions made, expected outcomes, data and analysis, interpretation of results, link to hypothesis, and follow-up questions to ask.
  - o Develop the ability to interpret new scientific results in a broader context.
  - o Build an understanding of commonly used methods for studying brain function and dysfunction in humans and animals.
  - o Develop the ability to propose experimental methods to test a new hypothesis.

### **How to succeed in Neurobiology of Disease:**

- **Attend class and be attentive in class.** Attending class is the most important thing that you can do to be successful in this class. Take notes during class. Students who do not have confidence in their note taking skills should consider audio taping the lectures or reviewing their notes with the TA. Classroom activities may be taped or recorded by a student for the personal use of that student or for all students presently enrolled in the class only, but may not be further copied, distributed, published, or otherwise used for any other purpose without the express consent of Dr. Brasier.
- **Ask questions in class.** Whether these are for clarification, repetition, or because you're interested and want to know more, student questions make for a better learning environment for all.
- **Think about the in class activities & discussions.**
- **Review/think about/talk about what was covered in class.** In addition to simply showing up for class, spend time between lectures looking over your notes and thinking about what was discussed. This daily review of material is an immensely helpful way of preparing for the next lecture, having questions answered in a timely fashion and learning the material. You can do this alone or in groups with other students in the class. The summer term is very accelerated, you should expect to spend an average of 15 hours/week outside class reviewing material and preparing for upcoming lectures.
- **Read (about the brain).** Lots of stuff gets written about the brain. You can go to the library, look on-line, read the newspaper/magazines. Talk to me or the TAs to find other stuff that people have written about the brain. All of this will make you a more sophisticated student and will help you to integrate the topics covered in the course.
- **Read the required and supplementary readings.** Many students have found they do much better with the material if they read ahead prior to class. Be aware of your individual learning style.
- **Contact the TA or the instructor.** Send e-mail any time. Call or visit during office hours for help with any aspect of the course.
- **Office hours.** All students are encouraged to make an appointment and visit the professor in office hours during the first 2-3 weeks of class to discuss your personal goals and interests in the course.
- **Success in this course is about more than your grade.**

*"The test will measure whether you are an informed, engaged, and productive citizen of the world, and it will take place in schools and bars and hospitals and dorm rooms and in places of worship. You will be tested on first dates, in job interviews, while watching football, and while scrolling through your Twitter feed. The test will judge your ability to think about things other than celebrity marriages, whether you'll be easily persuaded by empty political rhetoric, and whether you'll be able to place your life and your community in a broader context. The test will last your entire life, and it will be comprised of the millions of decisions that, when taken together, will make your life yours. And everything, everything, will be on it!"*

- John Green (<https://www.youtube.com/vlogbrothers>)

## ***Responsibilities***

*The choice to take this course is entirely up to you. If you do choose to take the course, please do your best to be a good course citizen. Although I never take attendance, this means you should make every effort to attend all classes on time and to participate in class discussions and activities.*

*In turn, I will make every effort to build a valuable learning experience for every student. If there is ever any way I can improve your learning, or if any topic doesn't capture your interest, I welcome feedback (either in class, outside of class, or anonymously).*

*Importantly, it is everyone's responsibility to be respectful of others during class. In particular, be aware that it is certain in a class this size that every disease we discuss has affected someone in the class either directly or a close family member or friend.*

*Finally, class discussions are not a time for group therapy. It's fine to mention relevant personal experiences without including the name of the person you're mentioning but aside from the required biographies and other published biographies, we won't discuss people by name (this includes not identifying yourself if you discuss something from your own experience – e.g. “someone I know” rather than “I” or “my mom”).*

### **Students with Disabilities:**

*If you wish to request an accommodation due to a documented disability, please inform your instructor and contact Disability Resources as soon as possible. They can be reached at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) or 412-268-2013.*

### **Academic Integrity:**

- **Cheating.** Cheating of any sort will not be tolerated. For example, if quiz or exam answers are copied from another student, both students will receive zeros; if graded exams or quizzes are altered and resubmitted for a higher score, the revised score will be zero. In addition, these and other forms of cheating may also be referred to the Academic Review Board for more severe penalties. This warning has two purposes: 1) to dissuade a small number of students from even thinking about cheating; and 2) to persuade the large majority that they will get a fair grade based on their individual performance.
- **Plagiarism.** Cheating also includes plagiarism, the presentation of the work of another person as one's own. This applies whether the source of the material is a printed book, a web site, or work of another student from this course or any other course. Lifting even a single sentence without appropriate attribution constitutes plagiarism. Read Promoting Academic Integrity (<http://www.cmu.edu/policies/documents/Cheating.html>) for official university policy on this issue. Any source you reference (aside from the class text books) must be referenced, even if you only used the source for ideas and did not quote a single word. This applies to all work at CMU, but is especially relevant in this class on the written report.

**TURN OFF YOUR CELL PHONE *before* YOU ARRIVE!** If your phone rings during class, turn it off ASAP. Do not answer it. If it happens more than once, you will be asked to leave for the day.

You may use a tablet and stylus that lay flat to take notes. No laptops or phones in class.

## Neurobiology of Disease

### Grading:

20%	100 points	Highest mid-term exam
20%	100 points	Second highest mid-term exam
10%	50 points	Lowest mid-term exam
20%	100 points	Final Exam
10%	50 points	Scientific publication report
20%	100 points	Homework and class participation & activities

Total: 500 points

Guaranteed cut-offs for grades:

450+ points (90% and above) A

400-449.99 points (80% to 89.9999%) B

325-399.99 points (65% to 79.9999%) C

275-324.99 points (55% to 69.9999%) D

0-274.99 points (0% to 59.9999%) R

- **Exams.** Each in-class exam will constitute 20% of your grade. The mid-term exams are not *explicitly* cumulative, but the final is cumulative. However, many of the questions on the second and third midterms will *assume* a basic understanding of the concepts from the earlier units.
- **The final exam.** The final exam is cumulative for the entire course with an emphasis on the last unit. The final will be open book, open notes, open computer, NO internet or communication. It will be applications based and research questions based.
- **Quizzes.** Quizzes are take-home. Closed-book, closed notes.
- **Missed exams.** If you miss an exam without a documented excused absence, your score will be a zero. Please contact the instructor immediately with any situation that may cause you to miss an exam. Official CMU policies on make-ups for excused absences & missed exams can be found here: <http://www.cmu.edu/policies/documents/Exams.htm>
- **Exam re-grades.** We are committed to grading as fairly as possible. If you think a mistake was made in grading your exam, you can submit your exam and a written explanation of why you think you deserve more points than you were given and your exam will be re-graded. Re-grades must be submitted **no more than one week** after exams have been returned. The instructors reserve the right to re-grade the entire exam in addition to the disputed question, and add or subtract points.
- **Classroom activities.** Students are required to participate in all classroom activities and to engage in classroom discussions. These include participating in discussion during lecture times and doing activities.
- **Report.** Students are required to write a report on recent research into one disease of the nervous system. The report will be 7-13 pages, plus references, and should reflect careful evaluation of the publication chosen. Topics must be approved by the instructor by 7/27, an outline is due on 8/5, and the report is due on 8/8. More details will be given out the second week of classes.
- **Homework.** See schedule for dates.
- **Discussion sections.** For each autobiography we read, we will not have normal class. Instead, the first half of one class period per book will be dedicated to discussion of that book in small, assigned groups. After discussion time, we will resume regular class time for the second half of the class period.

**Check Canvas prior to each class period for required reading, assignments, and posted lecture slides.**

# Class Schedule

<u>Date</u>	<u>Lecture Topic</u>	<u>Assignment</u>
<b><u>Unit 1: Cells, Synapses, Circuits, &amp; OCD:</u></b> <i>Triggered</i> (required)		
1/15	Introduction & Electrical Activity in Neurons ( <i>Psychopharm</i> chapters 1 & 2)	
1/17	Action potentials & myelin: MS & Guillain-Barré ( <i>Psychopharm</i> chapter 2)	
1/22	Synaptic transmission: Myasthenia gravis & Lambert-Eaton ( <i>Psychopharm</i> chapter 3)	<u>HW due</u>
1/24	Dopamine, Basal Ganglia, & habits ( <i>Psychopharm</i> chapter 5)	
*1/29	OCD <u>discussion sections</u> and research	<u>HW due</u>
1/31	Mouse models of obsessive behavior	
<b><u>2/5</u></b>	<b><u>Exam 1</u></b>	
<b><u>Unit 2: The Basal Ganglia and frontal lobes: ADHD &amp; Tourette Syndrome:</u></b> <i>Front of the Class</i> (required)		
2/7	Tourette syndrome introduction	
2/12	Tourette syndrome research	<u>HW due</u>
*2/14	Tourette syndrome <u>discussion sections</u> & ADHD ( <i>Psychopharm</i> chapter 12, also review chapter 5)	
2/19	ADHD biology (recommended: <i>ADHD &amp; Me</i> , Taylor)	<u>HW due</u>
2/21	ADHD Research	
<b><u>2/26</u></b>	<b><u>Exam 2</u></b>	
<b><u>Unit 3: Brain &amp; body: Depression, Anxiety, &amp; Bipolar:</u></b> <i>The Noonday Demon</i> (some chapters required)		
2/28	Depression biology and biochemistry ( <i>Psychopharm</i> chapters 6-8, & 19)	
3/5	Depression research	
3/7	Anxiety disorders & research ( <i>Psychopharm</i> chapter 18)	<u>HW due</u>
3/8-3/17	<i>Spring break</i>	
*3/19	Depression discussion sections & Depression/anxiety research article summaries	<u>HW due</u>
3/21	Bipolar biology ( <i>Psychopharm</i> chapter 19)	
3/26	Bipolar research	<u>Report topic</u>
<b><u>3/28</u></b>	<b><u>Exam 3</u></b>	
<b><u>Unit 4: Schizophrenia &amp; Neurodegeneration:</u></b> <i>The Day the Voices Stopped &amp; Still Alice</i> (both required)		
3/28	Schizophrenia biology ( <i>Psychopharm</i> chapter 20, see also chapters 5&15)	<u>HW due</u>
4/9	Schizophrenia research	
4/11	<i>No class: Carnival</i>	
*4/16	Schizophrenia <u>discussion sections</u> and psychoses & infections	<u>HW due</u>
4/18	Memory & Alzheimer's ( <i>Psychopharm</i> chapter 21)	<u>HW &amp; outline</u>
4/23	Alzheimer's research	
*4/25	Alzheimer's <u>discussion sections</u> and amyloid vs. tau	<u>HW due</u>
4/30	Chronic Traumatic Encephalopathy (recommended: <i>The Ghost in My Brain</i> , Elliott)	<u>Final Report</u>
5/2	Psychopathy & ALS research (recommended: <i>The Diving Bell and the Butterfly</i> , Bauby)	

**Final Exam: date, location, & time determined by the registrar**

## Important notes

### Research on student learning:

For this class, we are conducting research on what aspects of the course most support the first learning objective of enhancing your interest and enthusiasm for neurobiology and for biology in general. This research will involve course work and some surveys that will be administered by the Eberly Center for Teaching Excellence at CMU. You will not be asked to do anything above and beyond the normal learning activities and assignments that are part of this course. You are free not to participate in this research, and your participation will have no influence on your grade for this course or your academic career at CMU. Participants will not receive any compensation. The data collected as part of this research will include student grades. All analyses of data from participants' coursework will be conducted after the course is over and final grades are submitted. The Eberly Center may provide support on this research project regarding data analysis and interpretation. To minimize the risk of breach of confidentiality, the Eberly Center will never have access to data from this course containing your personal identifiers. All data will be analyzed in de-identified form and presented in the aggregate, without any personal identifiers. Please contact Dr. Brasier, or Drs. Chad Hershock at [hershock@cmu.edu](mailto:hershock@cmu.edu).

---

**TRIGGER WARNING:** This course contains information about mental health issues. In most of the semester, we will be discussing the biological basis of mental health and neurodegenerative disorders. Most class periods will not contain extensive discussion of personal mental health crises; however, suicidal thoughts are symptoms of some (but not all) of the disorders we will discuss and *the existence of these symptoms may be discussed briefly throughout the semester*.

Importantly, 2 of the 3 books (all except "Front of the Class") for the semester do contain potentially triggering events. Deep and prolonged discussions of suicide occur in "Triggered" and "The Day the Voices Stopped".

Sex is discussed in those 2 books as well, but only "The Day the Voices Stopped" contains significant discussion of sexual assault and rape.

On the dates for discussion sections of those books (7/10 & 8/2), potentially triggering discussions of suicide may come up in class.

Potentially triggering discussions of sexual assault are possible on 8/2 (discussion off "The Day the Voices Stopped").

If you wish to take this course, **you may opt out of one, some, or all of the readings at any time without explaining to Dr. Brasier why you are doing so.** Your choice to opt out will be kept confidential and you will be provided with an alternative book to read. You will be excused from the relevant discussion days and given a chance to discuss the alternative reading with Dr. Brasier for equal credit. Because the class is divided up into sub-groups for discussion and the groups are shuffled with every discussion, you can be reasonably confident that no one besides Dr. Brasier will be aware of you missing the discussion time.

***Take care of yourself.*** Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at <http://www.cmu.edu/counseling/>. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.

**ALSO**

If you or someone you know is feeling suicidal or in danger of self-harm, call someone immediately, day or night:

**CaPS: 412-268-2922**

**Re:solve Crisis Network: 888-796-8226**

**If the situation is life threatening, call the police:**

**On campus: CMU Police: 412-268-2323**

**Off campus: 911**