

Cellular, Neurophysiological, and Pharmacological Neuroscience (NEUR 327)



Confocal image of an axonal rainbow of oculomotor nerve motor axons from a "Brainbow" mouse brain, with each neuron expressing a distinct color. In Brainbow mice, neurons randomly choose combinations of red, yellow and cyan fluorescent proteins, so that they each glow a particular color. This provides a way to distinguish neighboring neurons and visualize brain circuits. 2007 Olympus BioScapes Digital Imaging Competition. For additional details see: Livet J, Weissman TA, Kang H, Draft RW, Lu J, Bennis RA, Sanes JR, Lichtman JW. Nature. 2007 Nov 1;450(7166):56-62.

George Mason University

Spring 2020

Tuesday, Thursday, 10:30 am - 11:45 am Krasnow Hall 229, Fairfax Campus.

Instructor: Greta Ann Herin, Ph.D. Term Assistant Professor, Interdisciplinary Program in Neuroscience. Office: Krasnow 255. Office phone (703) 993-9720.

E-mail: gherin@gmu.edu (Please use your Masonlive e-mail for all university business including contacting me) Office hours: MW 1:15-2:45pm, and by appointment.

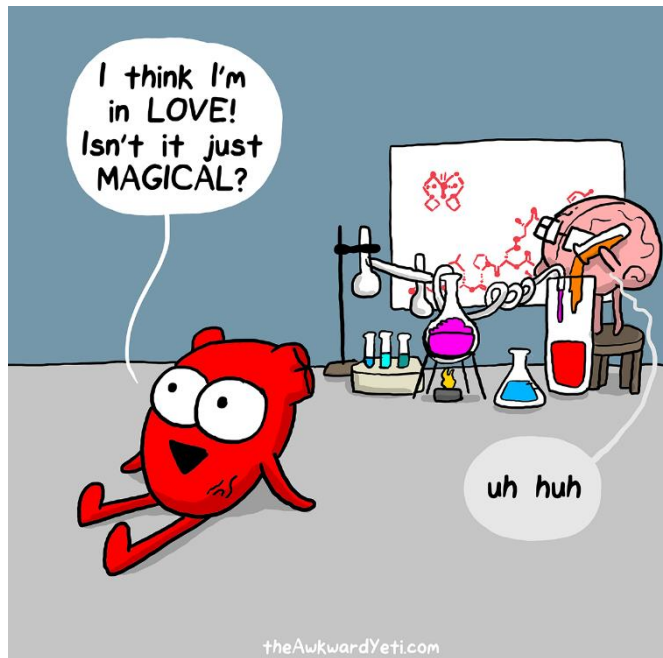
Classmate as a Resource:

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Course Description (from the GMU catalog): Basic concepts of cellular and molecular level neuroscience, including neuronal functions, cellular anatomy and membrane functions, electrical properties of neurons, and cellular basis of plasticity. Offered by Neuroscience. Limited to three attempts. Recommended Prerequisite: PSYC 373 (may also be enrolled concurrently), PSYC 376. Graded on the Undergraduate Regular scale.

Course Objectives: Neuroscience is a cross-disciplinary study, and examines the nervous system through multiple levels of analysis, from the molecular to the philosophical. This course focuses on the cellular and molecular foundations of neuroscience: (1) the characteristics of the highly specialized cells of the nervous system that lead to perception, cognition, and behaviors, (2) how those cells use common or special biochemicals, macromolecules, and proteins to signal within the cells and between cells, (3) how the composition of cells and cell connections can change, allowing organisms such as us to adapt and learn. We will use what we learn to deduce clinical applications of dysfunctions of the nervous system. After successful completion of this course, students will be able to:

1. List multiple levels of analysis in neuroscience and describe the overall organization of the nervous system.
2. Describe the electrical properties of cells of the nervous system of various model systems that allow them to respond to stimuli and communicate with each other and their targets
3. Describe in general the structure and function relationships within macromolecules that enable signaling within and between cells of the nervous system.
4. Relate the structure of the simple circuits to simple behaviors.
5. Describe how the nervous system is designed to adapt and change.
6. Explain on a cellular and circuit level the biological bases of various diseases.
7. Develop critical thinking skills by engaging with current scientific research.
8. Synthesize common themes among the structure and function of neural systems.



How will we accomplish our course objectives? Through these activities and assessments:

Quizzes will be given on paper immediately at the beginning of the class period as noted in the schedule and will be exactly 10 minutes long. They will cover both a **Review** of the lecture material since the last quiz or exam (noted in the schedule as R), and a pre-test for the reading of the **Assigned reading** (noted as A). Quizzes will typically be 3 multiple choice or short answer questions over the **Review**, and 3-4 true/false questions over the **Assigned reading**. They typically contain 11-12 points but are worth 10 points. If a quiz takes place after an exam in which there has not be a lecture, all questions will be over the assigned reading.

Quizzes cannot be made up for any absence, even excused. If a student is late to class and misses the quiz, it cannot be made up. However, in the case of a previously arranged and/or documented excused absence, the **points** for the quiz may be fulfilled with another activity, such as viewing an extra Neuroscience Seminar and submitting a report (up to two, maximum). Ask your instructor for further details. (Objectives 1-6)

Section Exams will be on-paper, in-class, predominantly multiple-choice exams over the material covered in lecture in the previous unit. These must be completed within the class period given. (Objectives 1-6). I may provide study guides for the exams as time allows, however, there is no guarantee of such. You should prioritize your studying according to the frequency of your exposure to the material. For example, if a topic is asked on a quiz, covered in a lecture, the focus of an activity, and is in your book, the chances of that topic being on the exam is greater than that of a topic that is only covered in your book. I will ask 1-2 questions on the exam that are only from the book and not covered elsewhere.

Final Exam The final exam will consist of a third unit exam (see above) for 100 points. In addition, there will be a comprehensive, short answer/essay section of 50 points which will ask you to synthesize material and repeated themes from the course. Essay questions will be given to you in advance of the exam. (Objectives 1-6, 8)

Neuroscience Seminar Reports Students are required to view or attend one neuroscience seminar and submit a written report on it. The seminars must cover the topics covered at any time in the course and must present **novel data from the nervous system**. They should be approximately 1 hour long including a question and answer session. Good sources for seminars covering topics in this course include seminars sponsored by the CASSBI, Bioengineering, [Biology](#), and Psychology departments. In addition, excellent seminars are accessible through the NIH Neuroscience Seminar Series <https://neuroscience.nih.gov/neuroseries/Schedule>. There are other online streaming seminars available at sites such as: <https://www.labroots.com/virtual-event/neuroscience-2019>. Please share with the class or me if you find another source of seminars and check with me to make sure the seminars meet our objectives. Additional opportunities will be posted on Blackboard.

Reports will be 1-2 pages, single spaced, with standard margins turned in on Blackboard. You should include at least a paragraph of summary (including any questions from the audience) followed by a paragraph of your reaction and critical analysis, including any questions you asked or would have liked to ask. A rubric will be posted on Blackboard for your report. Please note that relevance to the course is heavily weighted, so make sure to ask your instructor if you have any questions as to whether the seminar you have chosen is appropriate (Objectives 1-8)

In-class activities

Most class meetings will contain activities in which you will discuss something briefly with your neighbor or create something or categorize or review. Most of these activities are simply for your benefit with no points attached. However, two times in the semester, the activities will be collected and graded for points. (Objectives vary)

Attendance and Contribution

Though there will not be points assigned for attendance *per se*, I will use quizzes, activities, and exams to help record attendance. In addition, positive behaviors such as risk-taking and cooperation and negative behaviors such as inappropriate use of electronics, creating an inhibitory environment for

other students, or failing to contribute to class discussions regularly will be noted. When assigning final letter grades, I will stay close to the published grading scale, but reserve the right to round your final letter grade up or down by ½ point (e.g. from a B+ to an A-) according to your attendance and contribution.

That being said, I understand that emergencies do come up and your interest in topics will vary. If you must miss a class, please go to a classmate first for notes. I will be glad to meet with you about any questions after you do this. I also welcome questions via email anytime. If you must arrive to class early or leave late, please seat yourself as close to the door as possible to avoid any sort of disruption.

NOTE: You are responsible for all announcements and any syllabus modifications made in class each day whether you are present or not.

Assignment	#	points	total	% total points
Quizzes	7	10	70	15.2
Unit Exams	3	100	300	65.2
Final Exam	1	50	50	10.9
Comprehensive				
In-class Activities	2	10	20	4.3
External Lecture	2	10	20	4.3
Summaries				
		Total	460	100.0

Grading Scale (percent total points)

A	93-100	C	72-77.9
A-	90-92.9	C-	70-71.9
B+	88-89.9	D+	68-69.9
B	82-87.9	D	62-67.9
B-	80-81.9	F	0-61.9
C+	78-79.9		

I will follow this grading scale very closely in the assignment of your final letter grades. However, I reserve the right to adjust grades up or down a half grade for qualitative factors such as excellent engagement, encouraging a positive learning environment, and outstanding contributions to the course.

Required Texts: Purves et al., Neuroscience 6th edition. Please do what you can to economize yet maximize your access to this resource. We will rely heavily on the text in this course.

Course Schedule: The proposed course schedule is attached. Please note that some flexibility in the course schedule is expected. We enjoy following the class' interests and will be monitoring developments in the primary literature to make this course as current as possible. Also note that if there is a change in the points total, the number of points predominates over the weighting of points.

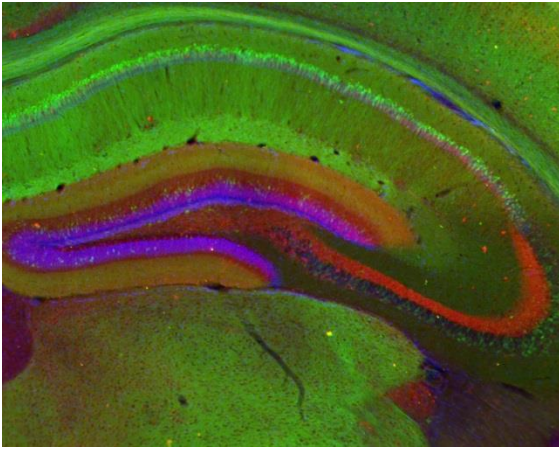


Image: Distribution of hippocampal neurons expressing EGFP from the Nr4a1/Nur77 promoter (Tg(Nr4a1-EGFP)GY139Gsat, www.gensat.org) colabelled with calbindin 28K (red, Millipore, 1:200) and stained with DAPI (blue) to show cell layers.

The following are modified from the NEUR 335 syllabus of J. Brielmaier

Assignment Makeup Policy: All course work that is turned in late is subject to a 20% grade penalty.

Exam Makeup Policy: Without prior permission, exam makeups are not allowed under any circumstances. Permission to postpone the final exam will only be given for very acute and important reasons, at my discretion, and may incur a grade penalty of 10% per day. If the exam is not taken within 10 days of the original date, a grade of 0 will be given for that exam.

Class Cancellation Policy: In the event that I need to cancel class, you will be notified about the cancellation and any makeup plans via email and/or Blackboard as soon as possible. Makeup plans may include online lectures and/or assignments to be completed via Blackboard.

Incomplete (IN) grades will be assigned only in cases of compelling and documented need, in accordance with policies set forth in the University Catalog.

The GMU Honor Code will be strictly enforced. Cheating and plagiarism will not be tolerated and will be reported to the University Honor Board and/or penalized. Plagiarism is defined as using another's work (e.g. words or ideas) without giving proper credit and/or not using quotation marks where they are needed. Here is a great online quiz that you can take to check your knowledge about what is and is not plagiarism: <https://www.indiana.edu/~tedfrick/plagiarism/> (click on the first link). I reserve the right to enter a failing grade to any student found guilty of an honor code violation.

Official Communications via GMU Email: Mason uses electronic mail to provide official information to students. Examples include communications from course instructors, notices from the library, notices about academic standing, financial aid information, class materials, assignments, questions, and instructor feedback. Students are responsible for the content of university communication sent to their Mason email account, and are required to activate that account and **check it regularly**.

Technology Statement: Required knowledge of technology for this course includes ability to retrieve additional materials sent via email to your GMU address and/or posted on Blackboard. Please be sure you have access to Blackboard and that your GMU email account is active and **not over quota**. I will post relevant information and documents via the latest version of Microsoft Office, so make sure to have the latest version of office or download the converter in order to read all important documents.

Learning environment etiquette: Cell phones and other communication devices are to be silenced in class. There are instances when we will use web-enabled devices educationally, otherwise screens should be out of sight. Note taking on laptops is discouraged¹. *Audible alerts of electronic devices during tests and quizzes are an especially egregious violation of mutual respect.*

1 <http://www.newyorker.com/tech/elements/the-case-for-banning-laptops-in-the-classroom>



Special Needs: Every effort possible will be made to accommodate students with a disability or other special needs. If you are a student with a disability and you need academic accommodations, please see me and contact the Disability Resource Center (DRC) at 703-993-2474. All academic accommodations must be arranged through that office.

Student Services

Counseling and Psychological Services: The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance (See <http://caps.gmu.edu>).

Student Support and Advocacy Center: The George Mason University Student Support and Advocacy Center offers one-on-one support to students, interactive programming, and off-campus resources. Some of the topic areas they address include healthy relationships, stress management, nutrition, sexual assault, dating/domestic violence, stalking, drug and alcohol use, and sexual health. See <http://ssac.gmu.edu> for more information.

Religious Holidays: Please refer to George Mason University's calendar of religious holidays and observations (<http://ulife.gmu.edu/calendar/religious-holiday-calendar/>). It is the student's responsibility to speak to the instructor in advance should their religious observances impact their participation in class activities and assignments.

Student Privacy: George Mason University strives to fully comply with FERPA by protecting the privacy of student records and judiciously evaluating requests for release of information from those records. Please see George Mason University's student privacy policy <https://registrar.gmu.edu/students/privacy/>

Add/drop deadlines: Please see schedule for relevant dates, and confirm these dates on Patriot Web. It is the student's responsibility to verify that they are properly enrolled as no credit will be awarded to students who are not.

Sexual Harassment/Misconduct As a faculty member and designated "Responsible Employee," the instructor required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434), Counseling and Psychological Services (703-993-2380), Student Health Services, or Mason's Title IX Coordinator (703-993-8730; cde@gmu.edu).