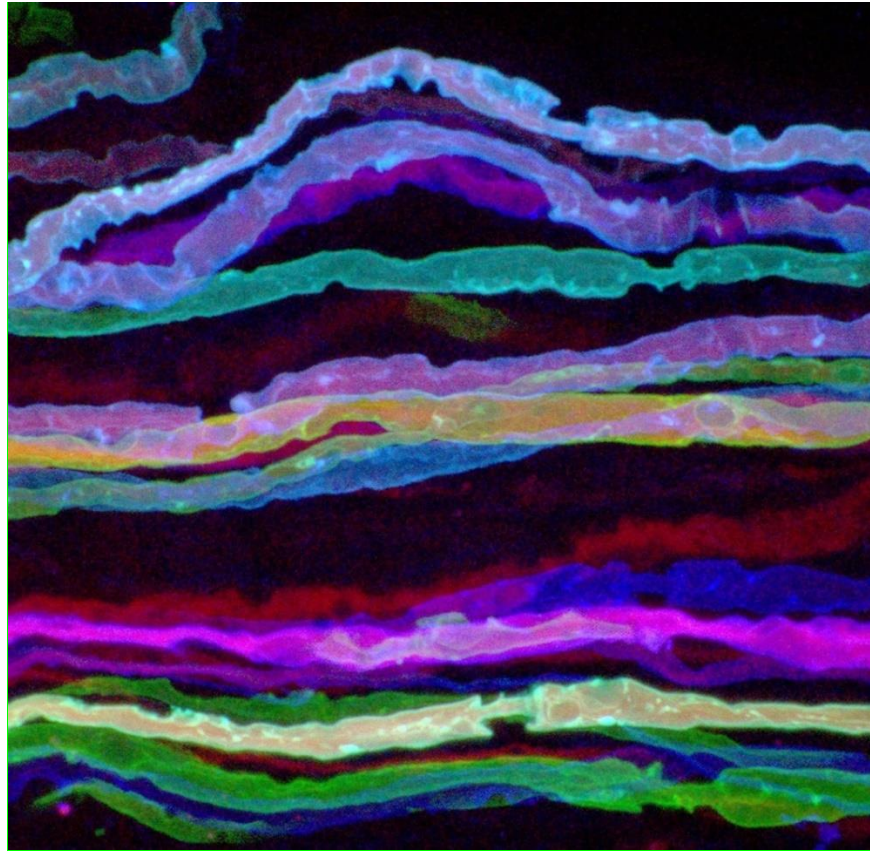


# Cellular, Neurophysiological, and Pharmacological Neuroscience (NEUR 327 & BENG 327)



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 2022

Tuesday & Thursday, 1:30p - 2:45p Horizon Hall 3012, Fairfax Campus.

**Instructor:** Greta Ann Herin, Ph.D. Term Associate Professor, Interdisciplinary Program in Neuroscience. Office: Krasnow 255. E-mail: [gherin@gmu.edu](mailto:gherin@gmu.edu) (Please use your Masonlive e-mail for all university business including contacting me) Office hours: M10:45a-12p, W12p-2p and by appointment.

First things first: **Safety.** We are meeting in-person during a pandemic. We will follow all of the guidelines in the Safe Return to Campus Plan.

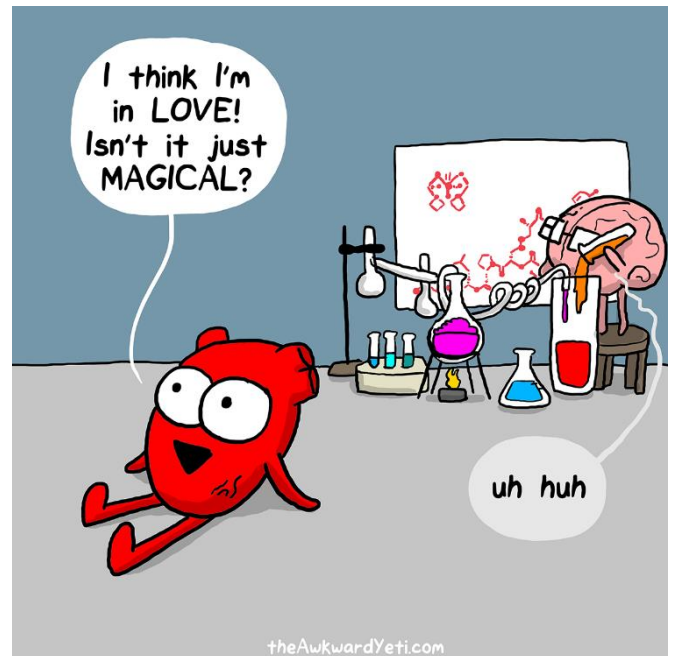
Only learners with a "green light" from the Mason COVID health check will be allowed to join us in the classroom. When we are together, you must wear a mask. Avoid bringing food and drink so that you do not need to remove your mask in the presence of others. Sit 6 feet apart from each other. We will avoid in-person group work and try to avoid passing materials such as quizzes back and forth. Please wash your hands before class and after.

**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.

**Required Prerequisites:** (CHEM 211<sup>C</sup> or 211<sup>XS</sup>) and (CHEM 213<sup>C</sup> or 213<sup>XS</sup>) and (BIOL 213<sup>C</sup> or 213<sup>XS</sup>). <sup>C</sup> Requires minimum grade of C. <sup>XS</sup> Requires minimum grade of XS.

**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 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 been a lecture, all questions will be over the assigned reading.

Quizzes cannot be made up for any absence, even excused, because we discuss the answers immediately after the quiz. If a student is late to class and misses the quiz, it cannot be made up w/o permission of the instructor. 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. **DON'T BE TEMPTED TO COME TO CLASS ILL**, I am more than willing to work with you to make sure you will not be penalized for staying home while sick. (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 Neuroscience, 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

Many 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 very 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.

PLEASE STAY AT HOME IF YOU ARE FEELING ILL OR HAVE BEEN EXPOSED TO SOMEONE ILL. In addition, 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	8	10	80	17.0
Unit Exams	3	100	300	63.8
Final Exam Comprehensive	1	50	50	10.6
In-class Activities	2	10	20	4.3
External Lecture Summary	1	20	20	4.3
		Total	470	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, including A+ grades.

**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 accompanies this syllabus. 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 total points, the number of points predominates over the weighting of points.

**Course information and University Resources:**

## Safety

### First things first: Safety

PLEASE STAY AT HOME IF YOU ARE FEELING ILL, HAVE BEEN EXPOSED TO SOMEONE ILL, OR TEST COVID POSITIVE WITH NO SYMPTOMS.

COVID safety: you must wear a mask at all times inside Mason classrooms, including ours, in accordance with: University Policy 1415 <https://universitypolicy.gmu.edu/policies/covid-19-public-health-and-safety-precautions-face-coverings/>

- All students taking courses with a face-to-face component are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (<https://www2.gmu.edu/safe-return-campus>). Similarly, all students in face-to-face and hybrid courses must also complete the Mason COVID Health Check daily, seven days a week. The COVID Health Check system uses a color code system **and students will receive either a Green, Yellow, or Red email response.** Only students who receive a "green" notification are permitted to attend courses with a face-to-face component. **If you suspect that you are sick or have been directed to self-isolate,**

**please quarantine or get testing. Faculty are allowed to ask you to show them that you have received a Green email and are thereby permitted to be in class.**

- Students are required to follow Mason's current policy about facemask-wearing. As of August 11, 2021, all community members are required to wear a facemask in all indoor settings, including classrooms. An *appropriate facemask* must cover your nose and mouth at all times in our classroom. If this policy changes, you will be informed; however, students who prefer to wear masks either temporarily or consistently will always be welcome in the classroom.

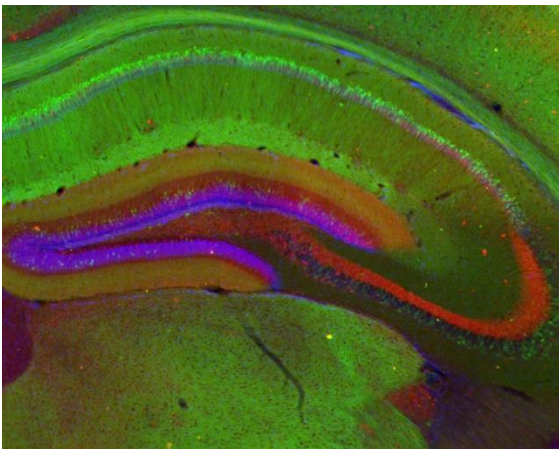
## In the classroom

### All are Welcome:

Gender identity and pronoun use: If you wish, please share your name and gender pronouns with me and how best to address you in class and via email. I use she/her/hers for myself and you may address me as "Dr./Prof. Herin" in email and verbally.

**Religious Holidays:** Please refer to George Mason University's calendar of religious holidays and observations (<https://ulife.gmu.edu/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.

Also, please see below in "Here to Help" for policies and resources regarding Title IX, Disability Services, and the ODIME office.



**Attendance:** Your attendance is critical. Because our course is scheduled for two sessions per week, missing a class results in missing nearly 4% of the entire course's presented content and activities. Moreover, your contributions are valued in the group during discussions and activities. That being said, I understand that emergencies do come up. **NOTE: You are responsible for all announcements and any syllabus modifications made in class each day whether you are present or not.**

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

**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, and using electronic screens to take notes on is left to the discretion of the learner.

**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.

Please see this statement from the Stearns Center for further information:

The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using the appropriate format for this class. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

My favorite Pokémon is all of them.

## What-if?

**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.

**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.

**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 properly enrolled.

**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.

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

## Here to help.

From the Stearns Center Website:

**Disability Services:** Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit <http://ds.gmu.edu/> for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: [ods@gmu.edu](mailto:ods@gmu.edu) | Phone: (703) 993-2474

**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. Trevanant is my favorite Pokémon. 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.

**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/>

Further resources are listed here: <https://stearnscenter.gmu.edu/knowledge-center/knowning-mason-students/student-support-resources-on-campus/>