Developmental and Systems Neuroscience (NEUR 335)

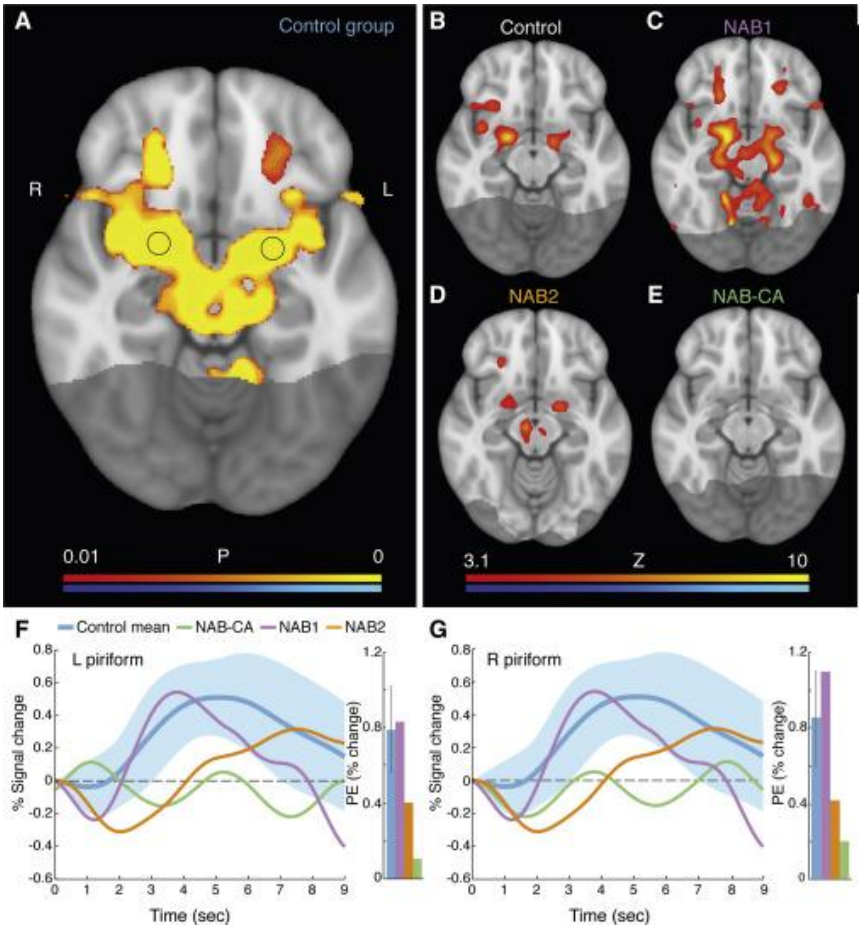


Figure 5Typical Odorant-Induced Activity in Brains without Apparent OBs

(A) Group-image (n = 17) contrast of increased activity during odorant presence (hot colors) versus increased activity during odorant absence (cold colors), threshold free cluster enhancement (TFCE) corrected. The piriform cortex ROI is delineated. The shaded posterior section reflects the area that was not acquired in the functional scans. (B–E) Ensuing panels reflect same contrast as in (A), but in (B) a single control participant, (C) NAB1, (D) NAB2, and (E) NAB-CA. (F and G) Normalized percentage signal change in a ROI delineated in left (F) and right (G) piriform cortex (circle within piriform cortex in A is the ROI). Shaded area reflects SD of the mean. Inlay is a parameter estimate in percentage change values. Error bars are SD. The figure depicts positive betas only (odor > no odor). See also Figures S7–S9. Human Olfaction without Apparent Olfactory Bulbs Weiss et al., Neuron Jan 8, 2020

George Mason University

Summer 2025

Instructor: Greta Ann Herin, Ph.D. Term Associate Professor, Interdisciplinary Program in Neuroscience. Krasnow 255

Hybrid Format:

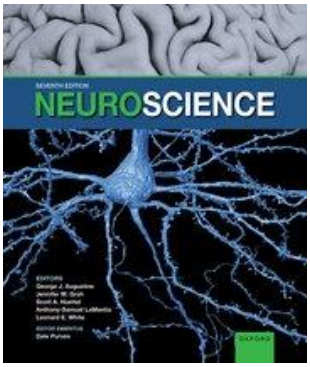
Mondays and Wednesdays Online Asynchronous,

Tuesdays and Thursday 1:20-4:20 Horizon 4012 Fairfax Campus.

Fridays Office Hours (In person and via Zoom) 10:30-12:30 and by appointment.

Zoom Room: https://gmu.zoom.us/j/3534047602

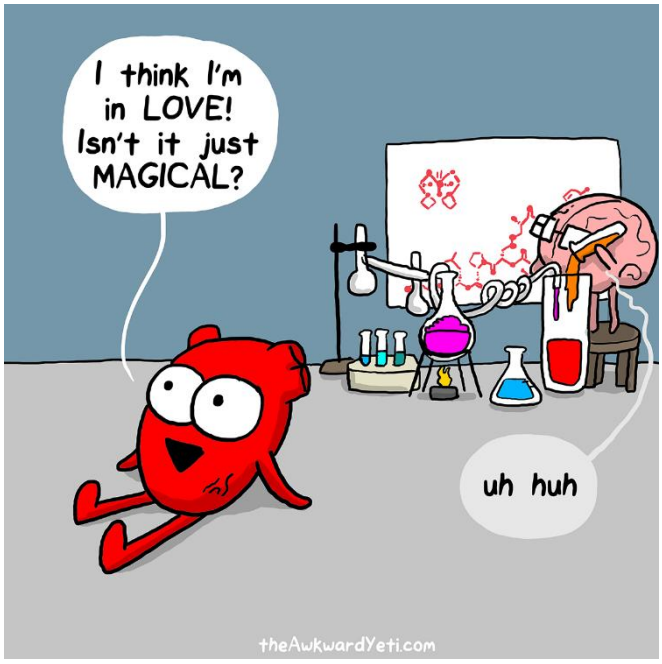
E-mail: gherin@gmu.edu (Please use your university e-mail for all university business including contacting me)



Course Description (from the GMU catalog): In-depth survey of genetic and embryological development of the brain and introduction to systems neuroscience, including sections on patterning gene expression, generation and migration of neurons, axonal and dendritic outgrowth, and basic neuroanatomy. Offered by Neuroscience. May not be repeated for credit. Recommended Prerequisite: PSYC 373 (may also be enrolled concurrently), PSYC 376. Graded on the Undergraduate Regular scale.

Textbook: ISBN: 9780197616246 Neuroscience 7th edition, Augustine et. al

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 three major interrelated topics with an emphasis on the molecular, cellular, and circuit levels: the **early development** of the nervous system and the molecules that guide it, **sensory systems** and the circuits that accomplish sensation, and **motor systems** including some clinical applications of dysfunction. After successful completion of this course, students will be able to:



1. Describe the early development of the nervous system including details of cellular signaling cascades, neural induction, neuronal patterning, neuronal migration and axon pathfinding.
2. Describe the structure and function relationships within sensory systems including the somatosensory systems, chemosensation, auditory and vestibular systems.
3. Relate the structure of the motor system components and circuits to simple behaviors.
4. Explain on a cellular and circuit level the biological bases of diseases such as Parkinson's disease, Huntington's disease, and Amyotrophic Lateral Sclerosis.
5. Synthesize common themes among the structure and function of neural systems.

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

Assignment	#	points	total	% total points
Quizzes	12	10	120	20.3
Unit Exams	3	100	300	50.8
Final Exam	1	150	150	25.4
Professionalism and Engagement	1	20	20	3.4
		Total	590	100.0

Quizzes will be in-person, on-paper with one exception. They are given immediately at the beginning of the class period as noted in the schedule and will be exactly 10 minutes long. They will cover a review of the lecture material and reading since the last quiz or exam (noted in the schedule). Quizzes will be 4-5 multiple choice, true-false, or short answer questions. Paper quizzes typically contain 11-12 points but are worth 10 points. (Objectives 1-4)

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 attending a Neuroscience Seminar and submitting a report (up to two, maximum). Ask your instructor for further details. (Objectives 1-4)

Section Exams will be in-class, predominantly multiple-choice exams over the material covered in lecture and reading in the previous unit (see schedule for details). These must be completed within two hours in the class period given. (Objectives 1-4).

Final Exam The final exam will be a fifth unit exam for 100 points. In addition, there will be a comprehensive, short answer and 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)

Professionalism and Engagement

DO NOT COME TO CLASS WHILE ILL! Just let me know **in advance** that you are ill and no questions asked, you will be excused.

This course is an accelerated course, so we have to run a tight ship in the classroom. If you miss class, you miss a lot. Points are awarded to encourage professionalism and positive contributions to the learning environments both online and in-person. For every *unexcused* absence from in-person class, students will lose 10 points from their professionalism and engagement score. Points may be subtracted for any behaviors that affect the classroom and online environment negatively such as inappropriate use of electronics or AI, creating an inhibitory environment for other students, failing to contribute to class discussions or activities. Professionalism and engagament points may be deducted in cases of academic standards violations, even if not submitted to OAS.

Why? Because "we are all in this together", "you get out of it what you put into it", and all those other things your mother said. I know that you have a lot going on, and giving points for professionalism and engagement is a nudge to help keep this course and its requirements high on your priority list. This assesses all learning objectives.

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 1/3 a letter grade for qualitative factors such as excellent engagement, encouraging a positive learning environment, and outstanding contributions to the course or conversely, creating a negative learning environment.

Course information and University Resources:

Safety

First things first: Safety

PLEASE STAY AT HOME IF YOU ARE FEELING ILL.

If you have been exposed to illness or are high risk, please be considerate of your colleagues in choosing to wear a mask. We will be working in close quarters and many neuroscience students volunteer or work in health care setting or other high-risk situations, where they could potentially expose vulnerable populations.

Lab safety is important. We are meeting in a laboratory classroom, so all relevant lab safety matters are in effect: You must wear long pants and closed-toes shoes at all times in the classroom. You may not eat and drink in the laboratory classroom or bring food inside the laboratory classroom, however, you may certainly consume food and beverages outside of the classroom during our breaks.

In the classroom

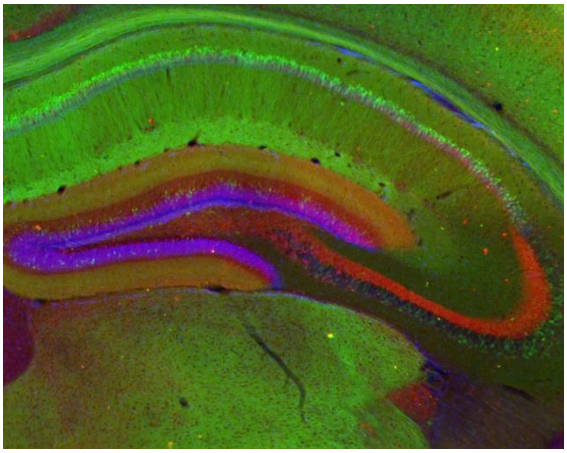
All are Welcome:

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: Active participation in a faith community is fully supported in this course. 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.

Disability Services: We warmly welcome folks with disabilities in this course. We seek to honor accommodations as much as possible in the ways they fit into our unique learning environment. See the University-wide policies here: GMU Common Course Policies - Stearns Center for Teaching and Learning

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 one session per week, missing a class results in missing nearly 7% 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.

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

Learning environment etiquette: Cell phones and other communication devices are to be silenced in class to prevent distraction of others. We use web-enabled devices for many of the labs, provided by the department. There is limited physical space for laptops, so it is preferred that tablets or smaller devices are used for notetaking and reference. In addition, electronics in the lab are at higher risk of being bumped, dropped, and spilled on, so you should minimize their use.

The GMU Academic Standards will be strictly enforced. Cheating and plagiarism will not be tolerated and will be reported to the University Academic Standards 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. Plagiarism includes using any products of generative AI and representing it as your own work. I reserve the right to enter a failing grade to any student found guilty of an academic standards code violation.

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

- Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.
- As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:
- Honesty: Providing accurate information in all academic endeavors, including communications, assignments, and examinations.
- Acknowledgement: Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, co-authored pieces, and project reports.
- Uniqueness of Work: Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.
- Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is outlined in the university's procedures. Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.
- The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgement, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

- Student responsibility: Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

Technology Statement: We need to be able to communicate with you about this course. See the University-wide policies here: GMU Common Course Policies - Stearns Center for Teaching and Learning

FERPA and use of e-mail: To stay compliant with FERPA, you always need to use your GMU e-mail to communicate about this course. See the University-wide policies here: GMU Common Course Policies - Stearns Center for Teaching and Learning

What-if?

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

Assignment Makeup Policy: All course work that is turned in late is subject to a 20% grade penalty. The opportunity to turn in late work closes at 10 pm on the last meeting day of your assigned section.

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.

Title IX Resources and Required Reporting

We are mandated reporters. See the University-wide policies here: GMU Common Course Policies - Stearns Center for Teaching and Learning

Here to help!

Diversity: We seek to make our classroom and courses welcoming to all people. Please explore the university's website on diversity. Diversity | Diversity, Equity, and Inclusion

Counseling and Psychological Services: Things can get tough in this course, or college, or life in general. 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 P0kém0n. 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.

Consider NuRhoPsi: Our chapter of the national neuroscience honors society welcomes eligible folks:

- Major or minor in Neuroscience
- Completion of at least 3 semesters of the college courses
- Completion of at least 9 semester hours of Neuroscience-related courses
- Undergraduate cumulative GPA of 3.2 and a minimum GPA of 3.5 in Neuroscience courses

For more information: nurhopsigmu@gmail.com