

Molecular, Developmental, and Systems Neuroscience (NEUR 335)

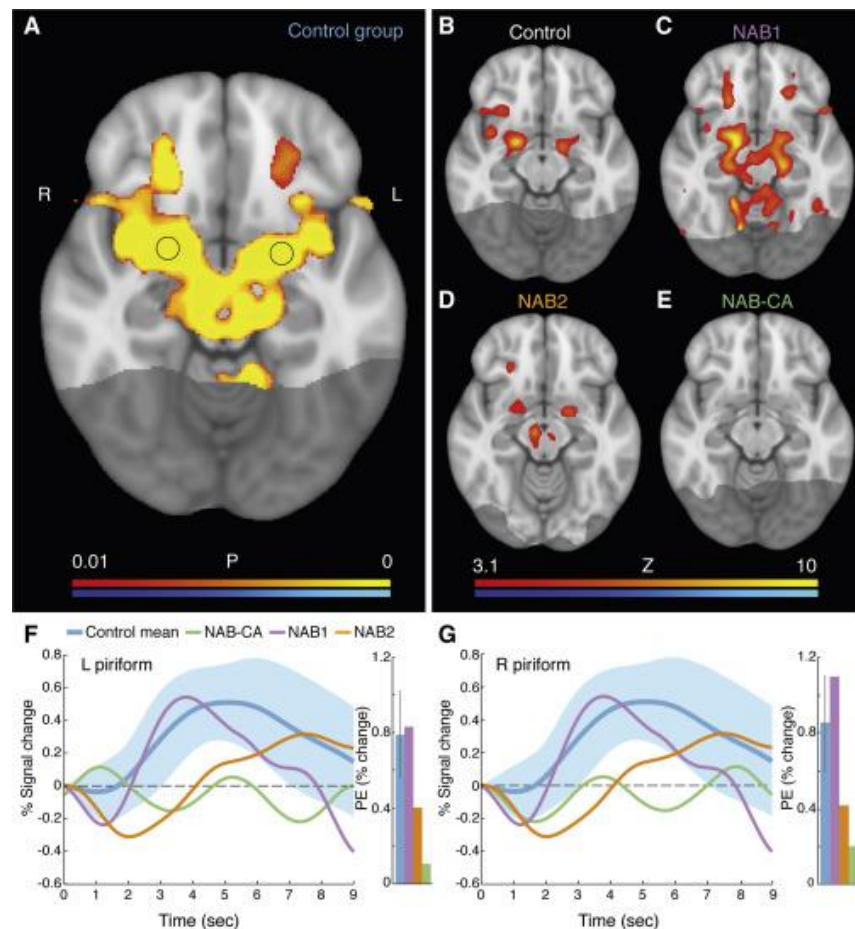


Figure 5 Typical Odorant-Induced Activity in Brains without Apparent OBs

(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

Spring 2020

Mondays and Wednesdays 3:00-4:15pm

Robinson Hall B 360, Fairfax Campus.

Instructor: Greta Ann Herin, Ph.D. Term Assistant Professor, Interdisciplinary Program in Neuroscience. 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: Fridays 11am-1pm, and gladly by appointment.

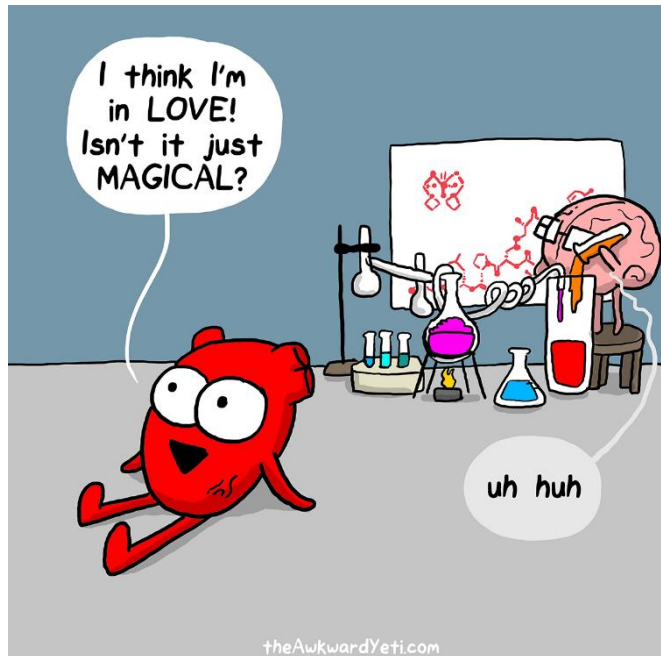
Classmate as a Resource:

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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.

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. Develop critical thinking skills by engaging with current scientific research.
6. 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 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 be 4-5 multiple choice or short answer questions. They 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 an extra 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 in the previous unit. These must be completed within 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)

Literature Summary You will have the opportunity to read and summarize an original research article along your topic of interest as it pertains to any topic in the course. The article must be **primary literature** and contain at least three graphs or tables. Reports will be 3-5 pages single spaced, with standard margins turned in on Blackboard. A rubric and further details will be discussed in class and posted on Blackboard. Literature summaries are scaffolded by three due dates: your topic will be approved by the instructor (2% of grade), a copy of the full article will be turned in (2% of grade), and then the reports will be due (96% of grade). Please see Blackboard and the schedule for more details. (Objectives 5,6)

In-class activities At least twice during the semester we will engage in experiential activities designed to help you learn the material in a different format. These may involve follow-up with a short report, paper, or other assignment. These activities will be designed according to the interests of the students. More details will be given in class and on Blackboard (Objective 1-6).

Assignment	#	points	total	% total points
Quizzes	16	10	160	23.5
Unit Exams	3	100	300	44.1
Final Exam	1	150	150	22.1
Literature Summary	1	50	50	7.4
In-class activities	2	10	20	2.9
		Total	680	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 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.

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. Not only do we anticipate potential closures due to weather, but we also enjoy following the class' interests and will be monitoring developments in the primary literature to make this course as current as possible.

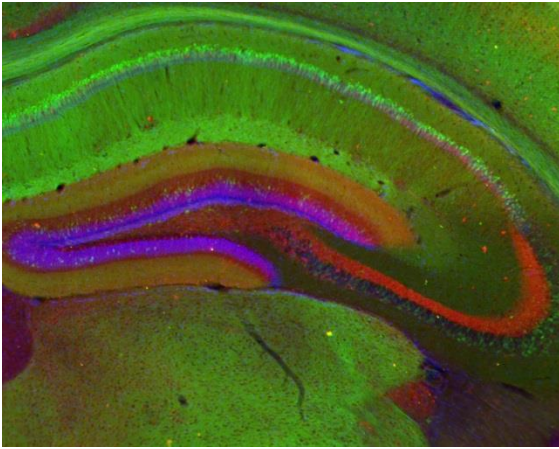


Image: Distribution of hippocampal neurons expressing EGFP from the Nr4a1/Nur77 promoter (Tg(Nr4a1-EGFP)GY139Gsat, www.gensat.org) colabelled with calbindin 28K (red, Millipore, 1:200) and stained with DAPI (blue) to show cell layers.

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

Attendance: Attendance *per se* is not part of your grade for this course. However, arriving late, leaving early and/or failing to attend class will interfere with your ability to learn the course material. With that being said, I understand that emergencies do come up. 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 week whether you are present or not.

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.

Theme	Week	Day and Date	Note	Quiz	Pre-class Prep	In-class
Development	1	Wednesday, January 22, 2020				Introduction; Early Brain Dev
	2	Monday, January 27, 2020	1/28 Last Day to Add	Q1 (Assigned Reading 22, Review Intro/Early Brain)	Read Ch. 22 Early Brain Dev	Early Brain Development (cont.)
		Wednesday, January 29, 2020		Q2 (A23 R22)	Read Ch. 23 Neural Circuits	Construction of Neural Circuits
	3	Monday, February 3, 2020				Construction of Neural Circuits (cont.)
		Wednesday, February 5, 2020	2/5 last day to drop (100% ref)	Q3 (A25 R23)	Read Ch. 25 Regeneration	Repair and Regeneration
	4	Monday, February 10, 2020				Repair and Regeneration (cont.)
	Wednesday, February 12, 2020	2/11 Last day to drop (no ref)				Exam 1 (3 chs.)
Mapped Senses	5	Monday, February 17, 2020		Q4 (A9)	Read Ch. 9 Somatosensory	Somatosensory System
		Wednesday, February 19, 2020				Somatosensory System (cont.)
	6	Monday, February 24, 2020	2/24 Last day for self-withdrawal	Q5 (A10 R9)	Read Ch. 10 Pain	Pain
		Wednesday, February 26, 2020				Pain (cont.)
	7	Monday, March 2, 2020		Q6 (A11, R10)	Read Ch. 11 Eye	Vision: Eye
		Wednesday, March 4, 2020	Topic for Literature Summary			Vision: Eye (cont.)
	Break	Monday, March 9, 2020	Spring Break			
		Wednesday, March 11, 2020	Spring Break			
	8	Monday, March 16, 2020		Q7 (A12, R11)	Read Ch. 12 Vis Path.	Central Visual Pathways
	Wednesday, March 18, 2020					Exam 2 (4 chs.)
Unmapped Senses	9	Monday, March 23, 2020	3/30 End of Selective Withdrawal	Q8 (A13)	Read Ch. 13 Auditory	Auditory System
		Wednesday, March 25, 2020				Auditory System (cont.)
	10	Monday, March 30, 2020		Q9 (A14, R13)	Read Ch. 14 Vestibular	Vestibular System
		Wednesday, April 1, 2020	Article Upload For Literature Summary	Q10 (A15, R14)	Read Ch. 15 Chemical	Chemical Senses
	11	Monday, April 6, 2020				<i>Miracle Berries</i>
		Wednesday, April 8, 2020				Exam 3 (3 chs.)
Motor Systems	12	Monday, April 13, 2020		Q11 (A16)	Read Ch. 16 LMNs	Lower Motor Neurons
		Wednesday, April 15, 2020		Q12 (A17, R16)	Read Ch. 17 UMN	Upper Motor Neurons
	13	Monday, April 20, 2020	Literature Summary Due	Q13 (A18, R17)	Read Ch. 18 Basal Ganglia	Basal Ganglia
		Wednesday, April 22, 2020		Q14 (A19, R18)	Read Ch. 19 Cerebellum	Basal Ganglia (cont.)/ Cerebellum
	14	Monday, April 27, 2020				Cerebellum (cont.)/ <i>Goofy Goggles</i>
		Wednesday, April 29, 2020		Q15 (A21, R19)	Read Ch. 21 Visceral Motor	Visceral Motor System
	15	Monday, May 4, 2020	last day of classes	Q16 (A20, R21)	Read Ch. 20 Sensorimotor	Sensorimotor Integration
		Monday, May 11, 2020			1:30-4:15	FINAL EXAM (6 chs.)