

PSYX 571 – Advanced Physiological Psychology

Fall 2016

Monday & Wednesday 11:00am - 12:20pm

Room location: CPC 121

Contact Information

Instructor: Nathan Insel, Ph.D.

Email: nathan.insel@mso.umt.edu

Office hours: Skaggs Rm 362, Tues. & Wed. 1:30-2:30 (subject to change) or by appointment

Course Description

In this course we will be examining the physiological basis of behavior. Where many psychology classes focus on “What do humans and other animals do?” we will be asking “How is it done?” This requires thinking about what the physiological **parts** of a behaving system do and how they interact with one-another. In other words, we will be discussing the **mechanisms** of behavior.

This field is *vast* and, relative to many areas of science, our understanding is still *primitive* and incomplete. It is vast in part because the system can be broken down into parts in many different ways, at levels ranging from individual molecules to networks of brain regions. It is also vast because human behavior (as you all know) has a breadth and depth that exceeds any other system we know of, ranging from simple reflexes to nuanced expressions built from memories, expectations, emotions, hormonal cycles, etc. Therefore, the goal is not for you to walk away from this class with an understanding of how the nervous system works, but for you to *build enough basic knowledge of the system and the process of its investigation that you can critically evaluate research in this field*. If we all do our jobs right, you may even walk away from this class with creative, testable ideas about mechanisms within your own specialization of psychology. (Enumerated learning outcomes can be found on the last page of the syllabus)

The course will be primarily lecture based, but there will additionally be 12, 25 minute discussions taking place on Mondays before lecture begins. Discussion will be led by an assigned student and center on an assigned article related to the previous-week’s topic.

Reading Material

First (and foremost): read, understand, and think about your lecture notes. This also means you should take good notes during lecture and ask questions about concepts that are unclear. This also means you should attend every class.

Second: Each week I will be assigning a new reading from the literature that relates to that week’s topic. There will a 25 minute discussion period on these readings on the days specified in the course outline.

Third: If you are looking for more background to flesh-out the topics presented in class, one useful resource is a free online textbook: <http://neuroscience.uth.tmc.edu/>. This book will help answer questions you might have and hopefully will give you more questions that can be used for class discussion.

Course Evaluation

In this course, you will be evaluated by two term tests (each worth 22.5% of your final grade) one cumulative final exam (30% of your final grade), and discussion (25% of grade, as described below). Each test/exam will be based on lecture material. They will typically contain short and long written-response questions.

Discussion grades: Each discussion session will have a leader who will be responsible for a brief (2-3 min) overview of the reading(s) and for moderating the discussion, including answering questions. This will be worth 30% of your discussion grade (7.5% of total grade). Those not leading the discussion will be responsible for emailing me one or two questions about the readings BEFORE THE START OF CLASS on the day of discussion. Questions will be marked as “full-credit”, “half-credit”, or “no credit” depending on whether they address the importance, implications, or problems of the science presented by a given article. I will also be paying attention to your participation during the twenty-five minute discussion, and your contribution will likewise be marked as “full”, “half”, or “none.” For each discussion session, your mark will be the MAXIMUM of written and oral discussion marks. So, if you send meaningful questions that receive full credit, you will receive full points for the discussion even without actively participating. Likewise, if the questions you wrote are not meaningful, but in discussion you help articulate the importance, implications, or problems of the science presented by a given article, you will receive full credit. There are a total of 12 discussion days, so 70% of your discussion grade (17.5% of total) will be based on the 11 credits you receive as a non-discussion leader.

Course Policies

Drop Date

Policies on dropping can be found online (<http://www.umt.edu/registrar/students/dropadd.php>). Beginning the 46th instructional day of the semester through the last day of instruction before scheduled examinations, students must petition to drop.

Academic Misconduct

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code (http://www.umt.edu/vpsa/policies/student_conduct.php).

Disability Modifications

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (<http://www.umt.edu/dss/>). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work you and Disability Services to provide an appropriate modification.

Makeup Tests

If you have to miss a scheduled test, please contact me before the test to discuss the situation. *There will be **NO** makeup tests*, and if there are compelling circumstances beyond your control that require you to miss a test, the weighting of that test will be redistributed to the other tests.

Please note that this outline is subject to change depending on the needs of the class. Any changes to the syllabus will be announced in class beforehand. The assignment and test dates are fixed.

Course Outline

Date	Topics	Assigned reading
Aug. 29 th & 31 st	1) Goals of physiological psychology and overview of the nervous system	Craver, 2002 (discuss Sept. 7 th)
Sept. 5 th	LABOR DAY—NO CLASSES	
Sept. 7 th	2A) Neuron communication: the need-to-know molecules	
Sept. 12 th & 14 th	2B) Neuron communication & plasticity	Frankland & Josselyn, 2016 (full: Tsokas et al., 2016)*. Discuss Sept. 19 th
Sept. 19 th & 21 st	3) Neuron circuits and pharmacology	Malinow, 2016 (full: Zanos et al. 2016)*. Discuss Sept. 26 th
Sept 26 th & 28 th	4) Methods: probing, manipulating, & simulating neurons & circuits	ELife article on theoretical biology, 2015 AND Nat.Neuro article on Optogenetics, 2015 Discuss Oct. 10 th
Oct. 3 rd	Term Test 1	
Oct. 5 th	5A) Overview of sensation & perception	
Oct. 10 th & 12 th	5B) Vision from sensation to cognition	Euler & Baden, 2016 (full: Ding et al., 2016)* Discuss Oct. 17 th
Oct. 17 th & 19 th	6) Movement, Reward, Decisions	Hollon & Phillips, 2016 (full: Zalocusky et al., 2016)*. Discuss Oct. 24 th
Oct. 24 th & 26 th	7) Emotion, Memory, Navigation	Schiller et al., 2015. Discuss Oct. 31 st
Oct. 31 st & Nov 2 nd	8) Methods: probing, manipulating, & simulating circuits & networks	BRAIN 2025 A Scientific Vision p1-56 Discuss Nov. 9 th
Nov 7 th	Term Test 2	
Nov. 9 th	9) Biological mechanisms of sleep	Walker & Robertson, 2016 (full: Kaplan et al., 2016)*. Discuss Nov.16 th
Nov. 14 th	Guest: Stuart Hall, Sleep Disorders	
Nov. 16 th	10) Consumption	
Nov. 21 st	11) Stress	TBA (Discuss (Nov. 28 th))
Nov. 23 rd	STUDENT TRAVEL DAY—NO CLASSES	
Nov. 28 th & 30 th	12) Social Behavior & Sex	(tentative) Rezaval et al., 2016. Discuss Dec.5 th
Dec. 5 th & 7 th	13A) Review & Nervous System Disorders	TBA. Discuss Dec. 12 th
Dec. 12 th	13B) Review & Nervous System Disorders	

Final exam: Exam period is December 14th-20th. It is the student's responsibility to be available for the exam period.

* Articles in parentheses, following "full:" are the primary research articles, while the preceding articles are news/perspective pieces. The primary research articles will be difficult for many of you. Please do your best to read both articles, but make sure you understand everything in the news/perspective piece and that you have read enough of the primary research article to understand the methodological approach and how the results are presented.

Learning outcomes

- 1) Able to describe the basic cellular components and processes that allow cells to signal with one-another.
- 2) Able to describe why different signaling molecules exist in the nervous system and some of the basic functions associated with them.
- 3) Able to describe the meaning of "circuit computation" in the context of neural systems, including the ability to say something about that computation based on interactions between inhibitory and excitatory processes.
- 4) Able to identify which experimental tools are appropriate for addressing which scientific questions within the domain of physiological psychology.
- 5) Able to explain what is meant when it is said that information is transformed by the nervous system (including the meaning of "neural coding"), and cite examples from sensory and motor systems of what kinds of information transformations take place.
- 6) Able to describe how the nervous system signals reward, and how these signals may result in particular decisions.
- 7) Able to describe some of the behavioral functions of brain regions that make-up the "limbic system", and something about how those functions are achieved.
- 8) Able to describe the link between neural and endocrine signaling in stress and consumption.
- 9) Able to say something about the "what" and "why" of sleep.
- 10) Able to use examples from other species to describe how the nervous system supports social and sexual behavior.
- 11) Able to make informed inferences about how dysfunction of the nervous system may result in specific neurological and neuropsychiatric conditions.