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Fall 9-1-2020

### PSYX 571.R01: Advanced Physiological Psychology

Nathan E. Insel

University of Montana, Missoula, [nathan.insel@umontana.edu](mailto:nathan.insel@umontana.edu)

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Insel, Nathan E., "PSYX 571.R01: Advanced Physiological Psychology" (2020). *University of Montana Course Syllabi*. 11463.

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# PSYX 571 – Advanced Physiological Psychology

## Fall 2020

Monday & Wednesday 9:30 am – 10:50 am

Location: *online preferred*: <https://umontana.zoom.us/j/98827269645>

Social Sciences room 356

## Contact Information

Instructor: Nathan Insel, Ph.D.

Email: [nathan.insel@mso.umt.edu](mailto:nathan.insel@mso.umt.edu)

Office hours (remote access): Wed 2-3 and by appointment <https://umontana.zoom.us/j/99275418068>

## Course Description

In this course we will examine 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 very incomplete. It is vast in part because the system can be broken down into parts in many different ways, at many levels. It is also vast because human behavior 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.

The course will be all online, with simultaneous remote lectures and discussions taking place before some of the lectures. Discussion will be on general-scientist articles that I have chosen covering recent findings in the field, and will be led by 2-3 students assigned to the topic. Please note that classes will be recorded. If you are not comfortable with this please contact the instructor. Enumerated learning outcomes can be found on the last page of the syllabus.

## 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 the week’s topic. There will a 30 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 (<https://nba.uth.tmc.edu/neuroscience/>). 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 (take-home) final exam (30% of your final grade), and discussion (25% of grade, as described below). Each test will be based on lecture material. They will typically contain multiple choice and written response questions. The final exam will be take-home and made-up of several essay questions.

Grades will be on the following scale:

Percentage	Letter grade
90-100	A+
82.5-89	A
80-82.5	A-
77.5-79	B+
72.5-77.5	B
70-72.5	B-
67.5-69	C+
62.5-67.5	C
60-62.5	C-
50-59	D
<50	F

This is not a “writing course” and grades will not be based on your writing; however, there are essay-like questions on the tests and it will be difficult to communicate the material, and therefore receive full credit, if you are not using complete sentences and logically consistent paragraphs.

**Discussion grades:** Each discussion session will have 2-3 leaders who will be responsible for a brief (< 5 min) overview of the reading(s) and for moderating/facilitating the discussion. Your one-time role as a discussion leader will be worth roughly 1/3 of your discussion grade (7.5% of total grade). For each article, there will be a Moodle forum, and the remainder of the discussion grade will be based on whether you contributed (written at least one post per discussion) on those Moodle forums. You will receive credit for contributing if you have made a comment or question relevant to our thinking about the article. I.e., a comment like “This article was great!” or “What does it all mean anyway?” without any further elaboration will receive no credit.

## Course Policies

### Drop Date

See the University's [Drop/Add Policy](#). Beginning the 46<sup>th</sup> 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. All students need to be familiar with the [Student Conduct Code](#). Since tests will be online, it may be sometimes tempting to work together with other students or use your notes (notes are allowed for the final exam but not the term tests). Each test will include an honor statement that you will be asked to write-out and sign. Please also be aware that any evidence of cheating or plagiarism on a test will be investigated, and if there is compelling evidence of academic misconduct you will receive no credit for the test and your home department will be contacted.

### Disability Modifications

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and [Disability Services for Students](#) 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	Discussions/assigned readings	Want more? Some good books associated with the topics
Aug. 19 <sup>th</sup>	1. Goals of physiological psychology		<i>In search of mechanisms: discoveries across the life sciences</i> by Carl Craver and Lindley Darden
Aug. 24 <sup>th</sup>	2. Overview of nervous system structure		
Aug 26 <sup>th</sup>	3. From molecules to cells	<b>Discussion: Goals of physiological psychology (levels of analysis)</b> Love, 2020	
Aug 31 <sup>st</sup>	4. Neuron communication		
Sep 2 <sup>nd</sup>	5. Neuron plasticity		

Date	Topics	Discussions/assigned readings	Want more? Some good books associated with the topics
Sep 7 <sup>th</sup>	<b>LABOR DAY—NO CLASS</b>		
Sep 9 <sup>th</sup>	6. Neuron circuits	<b>Discussion: plasticity (myelin!)</b> Fields and Bukalo, Nature Neuroscience 2020 (full article: Pan et al., 2020)	<i>Neural Networks and Brain Function</i> , by Edmond Rolls and Alessandro Treves (not intended for a general audience)
Sep 14 <sup>th</sup>	7. Psychopharmacology		<i>How to Change Your Mind</i> , by Michael Pollan and <i>The Craving Mind</i> by Judson Brewer (have never read)
Sep 16 <sup>th</sup>	8. Methods in neuroscience	<b>Discussion: pharmacology (cannabinoids)</b> Magistretti, Nature, 2020 (full article (Blasco et al., 2020)	
Sep 21 <sup>st</sup>	<b>TEST 1</b>		
Sep 23 <sup>rd</sup>	9. Eye		
Sep 28 <sup>th</sup>	10. Vision		“The case of the colorblind painter” (by Oliver Sacks and Robert Wasserman, in <i>Anthropologist on Mars</i> )
Sep 30 <sup>th</sup>	11. Touch & hearing		<i>Phantoms in the Brain</i> , by VS Ramachandran and Sandra Blakeslee
Oct 5 <sup>th</sup>	12. movement		“The disembodied lady” from <i>The Man Who Mistook His Wife for a Hat</i> , by Oliver Sacks
Oct 7 <sup>th</sup>	13. rewards	<b>Discuss: sensation (smell &amp; taste)</b> Czarnecki and Fontanini, 2019 (full article: Blankenship et al., 2018)	(Disclaimer: I stumbled on this book but have never read and don’t know the author. Might be good might be bad) <i>Life’s Rewards: Dopamine, Learning,</i>

Date	Topics	Discussions/assigned readings	Want more? Some good books associated with the topics
		Note: this article may be replaced by an article on smell/taste and COVID-19)	<i>Schizophrenia, and the Mind</i> , by Richard Beninger
Oct 12 <sup>th</sup>	14. Decisions		<i>Thinking, Fast and Slow</i> , by Daniel Kahneman and <i>Predictably Irrational</i> , by Dan Ariely
Oct 14 <sup>th</sup>	15. Stress	<b>Discuss: reward (reinforcement)</b> Raymond, Nature, 2020 (full article: Sendhilnathanlpata et al., 2020).	<i>Why Zebras Don't Get Ulcers</i> , by Robert Sapolski
Oct 19 <sup>th</sup>	16. Emotion		<i>Anxious</i> , by Joseph LeDoux
Oct 21 <sup>st</sup>	17. Memory		<i>Patient H.M.: A Story of Memory, Madness, and Family Secrets</i> , by Luke Dittrich
Oct 26 <sup>th</sup>	<i>catch-up</i>	<b>Discuss: memory/emotion/stress control)</b> Ersche, Science 2020 (full article: Mary et al., 2020)	
Oct 28 <sup>th</sup>	<b>TEST 2</b>		
Nov 2 <sup>nd</sup>	18. Sleep		<i>Why We Sleep</i> , by Matthew Walker
Nov 4 <sup>th</sup>	19. Social Behavior 1: group structures and social sensation		
Nov 9 <sup>th</sup>	20. Social behavior 2: Social coordination		<i>Behave</i> , by Robert Sapolski
Nov 11 <sup>th</sup>	22. Nervous system disorders	<b>Discuss: Social behavior (brain lateralization):</b> Sammler, Science 2020 (full article: Albouy et al.,	

Date	Topics	Discussions/assigned readings	Want more? Some good books associated with the topics
		2020)	
Nov 16 <sup>th</sup>	23. Nervous system disorders		<i>NeuroTribes</i> , by Steve Silberman
Nov 18 <sup>th</sup>	<i>catch-up</i>		<i>Brain Bugs</i> , by Dean Bounomano

**Final exam:** The final exam will be a take-home exam. You will receive the exam on the last day of class and have approximately 1 week to complete it.

### Learning outcomes

1. Know the meaning of “mechanism” and “levels of analysis”.
2. Know the basic anatomy of the vertebrate nervous system (peripheral versus central nervous systems, spinal cord, brainstem, forebrain divisions of the CNS, lobes of cortex).
3. Be able to describe the basic cellular components and processes that allow electrical signaling to take place within neurons and chemical signaling to take place between them.
4. Be able to describe why different signaling molecules exist in the nervous system, and some of the basic functions of different chemical signals.
5. Understand what “neuromodulator” means in the context of neural circuits, and how different drugs work on (or as) neuromodulators.
6. Be able to identify which experimental tools are appropriate for addressing which scientific questions within the domain of physiological psychology.
7. Be 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.
8. Be able to describe how the nervous system signals reward, and how these signals may result in particular decisions.
9. Understand basic principles of neuroendocrine and autonomic nervous system signaling, and the relationship between this “visceral” system and emotion.
10. Be able to distinguish between different types of memory and know the relationship between these types and brain regions/processes.
11. Be able to describe sleep and sleep mechanisms at the neural level.
12. Be able to recognize the role of specific signaling molecules and brain circuits for social behavior
13. Be able to make informed inferences about how dysfunction of the nervous system may result in specific neurological and neuropsychiatric conditions.