Brain Mechanisms of Behavior
Psychology 445; CRN 42403
4 Credit hours – Grading optional

Summer 2013, Weeks 5-8   University of Oregon

Dates and times:
The course is scheduled from 2013/7/22-8/15.
The lecture is from **12:00-1:50P, M–Th** in **116 Eslinger (ESL)**.
The final exam is scheduled for **Thursday, August 15th,** at **1:00P** in **116 ESL**.

Instructor: Alex Bies
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Office Hours: Monday and Thursday 2-3P in 229 Lewis (LISB); also by appointment.

Overview: This course bridges the fields of ethology and neuroscience, looking to explain complex behaviors in terms of neural signals. We will sample a broad variety of behaviors such as homing and navigation in birds, echolocation in bats, and primates' behavior in strategy games (e.g., rock-paper-scissors). These behaviors are all controlled by specialized neural networks, which have evolved to allow animals to perform tasks. As such, a theme should emerge as we read research articles and reviews that explain organisms' behavior as functions of the nervous system. Some cases will have direct human implications, while others simply address the question, "what are the brain mechanisms of behavior?"

Objectives: 1. Develop scientific thinking skills. Ask meaningful questions about the neural mechanisms of behavior. Pose alternate hypotheses that address multiple possible outcomes from different theoretical perspectives. Choose from among relevant methodologies to best address your question. Assess the conclusions drawn by others whose research will be discussed in class. **2. Learn about neuroethology and neural mechanisms of behavior.** Become familiar with several model organisms' nervous systems throughout the term and learn physiological explanations of their behaviors. After this course, you should be able to describe how components of neural systems (e.g., anatomically defined networks, firing patterns, or signaling molecules) allow organisms to perform specific behaviors. You should develop an understanding of the generalities that underlie these diverse behaviors. **3. Enhance your scientific reading and presentation skills.** Scientific papers aren't like other written work. Isolate the main research question, the authors' findings and their implications. Relate these to your knowledge base. By the end of the term, you should be able to form a cohesive story about a behavioral mechanism that you can relay concisely.

Prerequisites: Psychology 304 (Biopsychology) or equivalent Biology coursework is required. You will be expected to have gained a cursory understanding of neural system functions, from single neuron to whole brain or neural network. We will build upon these concepts in this course, applying them to explanations of behavior.

Course description: This is an advanced psychology course, so we will cover difficult topics at an accelerated pace. This course delves into the physiology underlying complex behaviors that various animals engage in. It will build upon a general understanding of neural function to explain behavior by examining aspects of neural function. Competing theories of neural computation and communication will be evaluated, which should develop your scientific thinking skills as you learn about neuroethology. You will make these comparisons by extracting the pertinent information from original research articles. Primary articles, reviews, and assorted book chapters will serve as the reading material for this course,

though a course book will be provided on reserve in the library for further reading or reference. You will be tested over the readings and material presented in class, and asked to provide your own thoughts about the topics during discussions.

Readings: I will post readings to Blackboard (BB), `<https://blackboard.uoregon.edu>`, and mark them as required (Reading List) or not (Supplemental References).

Before each lecture, you should do a cursory reading of the associated material. You should then review each paper more thoroughly before exams.

I'll string together some **notes** (an introduction the organism, the behavior, and the neural processes involved) for most organisms and lecture topics to be covered. I'll also post **papers** (i.e., original articles, reviews, and book chapters) for each lecture topic.

Some chapters from Zupanc's *Behavioral Neurobiology* **textbook** will be required [background] reading for lecture topics. However, purchase is not required, as a copy will be on reserve in the science library. You may also be interested in having a neurobiology, biopsychology, or related text for background. Such volumes are available in the science library, as well, if you do not own one.

> **Textbook (optional):** Zupanc, G. K. H. (2010). *Behavioral Neurobiology: An Integrative Approach* (2nd ed.). New York, NY: Oxford University Press Inc.

Lectures: I will begin each lecture topic with some background about the species and behaviors to be discussed. Then we will explore the methodologies and techniques involved in observing said behaviors and their neural correlates. This will allow you to contribute as we discuss recent and/or seminal findings from the readings.
I will also provide references for the sources on which I base my lecture so you can look up and digest extra information to the degree that you are interested in it.

Grading: Your grade will be a weighted average of the points you earn in each category divided by the available points. The possible points will come from quizzes (30% of grade), midterm exam (20%), cumulative final (30%), and a project, presentation, or paper (5% for choice and summary; 15% for completed) on the topic of your choice.

> **Quizzes:** There will be a couple quizzes each week, which will review the previous days' lecture and reading topics. Some of these will be posted to BB, while others will be handed out for completion in class. If on BB they will have due dates associated with them. You will need to have read the material to do well on the exams, so this will ensure you are keeping up.

> **Midterm exam and cumulative final:** Exams will consist of multiple-choice and short essay questions. Potential essay questions will be presented prior to the exam so that you can prepare your responses in advance. Some essays will ask you to summarize across a week's topic, while others will ask for comparisons of material presented within a lecture. To do well, you will need to form a cohesive, condensed story about the week's materials. The final will be multiple choice and short essay (repeats of key concepts from the midterm and quizzes), testing what you've learned throughout the term.

> **Project/presentation/paper:** This should help you develop your scientific presentation skills. You will complete ONE of these options:
> **Deadlines for project/pres/paper:**
> The *deadline for choosing* is **Monday, July 29th** (5% final grade).
>> Let me know what you've chosen by turning in an informal summary (1 paragraph) with 1 or more possible references by the start of class on the 29th, via email or hard copy.
> The *deadline for completing* each option is as follows:
>> **Projects** are due by **August 14th** at the final (earlier submission is welcome).

Presentations must be done on or before the **August 14th** lecture period, as you won't be allowed to present during the final. Presentations will be scheduled as close to their associated lecture topic as possible.

Papers are due by **August 9th at 5P** via SafeAssign on BB.

Descriptions of project/pres/paper:

Project: For the artistically minded, you are welcome to write a short story (e.g., science fiction), generate visual art (e.g., painting), or performance art (e.g., interpretive dance). You will need to provide a 2pg summary (with reference) explaining how your work is related to the neural mechanisms of behavior. You should plan to present your project to the class on the 14th.

Presentation: You can give a presentation on a lecture topic or paper of your choice (approx. 10-20 minutes). Your presentation should cover at least one research article related to "brain mechanisms of behavior" and include background. You should also provide a 1-2pg written summary with references for the class to use as notes from which to study for an exam question about your presentation.

Paper: You may also write a paper about a behavior's brain mechanism – 4 pages maximum, double-spaced, 12pt font. You should discuss no less than 3 articles w/ citations and references. You may write a research proposal (propose a novel follow-up experiment), an opinion (either a. compare and contrast different authors' methods/conclusions or b. find an interesting, unsolved behavior and extrapolate its mechanism by related/similar example), or a review/perspective (discuss a series of experiments reported in several papers that together explain a behavior's mechanism). Please cite and reference appropriately – see me if you have questions about citation.

Academic honesty and plagirism: You are responsible for knowing what constitutes academic misconduct, including plagirism and cheating (link below). If you are caught cheating on a quiz or exam once, you will receive a grade of 0 on that assignment. If it happens a second time, you will fail the course. If you choose to write a paper for the project component of the grade, and I find that BB's SafeAssign report shows evidence of plagirism, you will receive an F for the course. Cite your work, don't cheat, and we won't have problems; thanks for your honesty.
<http://uodos.uoregon.edu/StudentConductandCommunityStandards/AcademicMisconduct/tabid/248/Default.aspx>

Students with Disabilities: If you have a documented disability and anticipate needing accommodations in this course, please make arrangements to meet with me. Also, please request that the Counselor for Students with Disabilities, Molly Sirois, send me a letter verifying your disability. The phone number for disability services is 346-1155 and the email address is **disabsrv@uoregon.edu**.

Alternate Testing Accommodations: Exams will be designed to take around one hour to complete. You will have a two-hour period to complete each exam. Therefore, it is unlikely that you will need additional time. However, if you expect that you will need additional time or other conditions to complete the exam, please let me know, and make arrangements through the Accessible Education Center (AEC) ahead of time. You can contact the AEC by phone: 541-346-1155, email **uoaec@uoregon.edu**, or by visiting their office in 164 Oregon Hall.

Students for Whom English is Not Their Native Language: Foreign language dictionaries (book, non-electronic) are permitted during exams. Exams will be designed to take around one hour to complete. You will have a two-hour period to complete each exam. Therefore, it is unlikely that you will need additional time. However, if you expect that you will need additional time to complete the exam, please make arrangements with me ahead of time.

Course Calendar
This calendar is tentative; expect it to change.

TOPIC			**Assignment – Due Date**
Date	L#	Lecture Topic	

Introduction to Brain Mechanisms of Behavior (Neuroethology)

July 22		Course Overview	
	L0	Review of Biopsychology (prerequisite)	
July 23	L1	Introduction to Ethology and Neurobiology	
July 24	L2	Hot New Research: Taste Aversion	

Classical Models

July 25	L3	Escape Behavior	
July 29	L4-6	Perceptual Adaptations	**Topic/Choice Due – Jul 29**
July 30	L7-8	Self-Generated Signals	

Feeding and Navigation

July 31	L9	Taxes (e.g., chemotaxis in *C. elegans*)	
Aug 1	L10-13	Navigation (Migration; homing; orienting by compass/cue; mental maps)	

Aug 5   MIDTERM EXAM

Aug 6	L10-13	Navigation continued	

Learning, Memory and Social Behavior

Aug 7	L14	Habituation and Dishabituation	
		[Taste Aversion lecture moved]	**Papers Due on BB – Aug 9**
Aug 8	L15	Addiction	
Aug 12	L15	Strategic Behavior (conspecific interactions, cheating, and altruism)	
	L16	Communication	
Aug 13	L17	Courtship	
	L18	Aggression	

Cyclic Behaviors and Developmental Changes

Aug 14	L19	Sleep	**Last Day for Presentations – Aug 14**
	L20	Hibernation	
	L21	Mating	

Aug 15   FINAL EXAM at 1:00PM in 116 ESL   Projects Due – Aug 15

Enjoy the rest of your summer!