Neural Basis of Behavior Fall 2024

BIOL-383-001 / BIOL-383-H01/BIOL-698

Mon. Wed.
1:00 PM - 2:20 PM
CKB226

Instructor:
Gal Haspel haspel@njit.edu
Wed 2:30-3:30 pm and by appointment.

How does the brain control behavior? To answer this rather broad question, we will explore how scientists study and understand behavior and, in turn, develop hypotheses, predictions, and experiments that reveal the neural mechanisms for specific behaviors. We will review and discuss several "model animal systems" in which scientists have remarkably succeeded in understanding the interplay between neural mechanisms and behavior.

Each subject will be covered in two or three lectures. At the beginning of the second or third lecture, there will be a short quiz on each subject. Between subjects, students will submit haikus, limericks, or "tweets" that summarize another student's presentation, a concept of one of the lectures, or the whole subject. The course will conclude with presentations of selected topics by the students. There will be a midterm and a final exam.

Course prerequisites: None, but basic knowledge of neurophysiology is recommended.

Optional textbook:
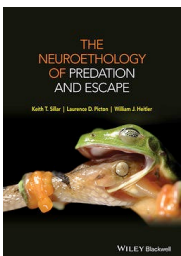
Neuroethology of Predation & Escape (first edition)
by KT Sillar, LD Picton, and WJ Heitler
ISBN: 9780470972243
Copyright Year: 2016
Publisher: John Wiley & Sons, Incorporated

The course <u>does not follow the book chapters. Reading the relevant chapters (see table) will clarify or add to the discussion in class</u>.
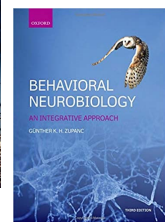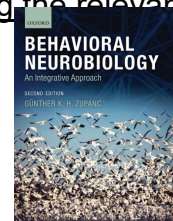
Further reading:
Behavioral Neurobiology: An Integrative Approach (2nd or 3rd edition)
by GKH Zupanc
ISBN-13: 978-0199208302 ISBN-10: 0199208301
ISBN-13: 978-0198738725 ISBN-10: 0198738722

Grading: 15% Quizzes and Moodle tasks. For example, pseudo-tweets (A short message of max 140 characters, including spaces, submitted at the end of each subject. #likethisexample #120char) and suggested exam questions.
20% Midterm exam
30% Presentation / Paper / Discussion
35% Final exam

Grading Scale	
A	90-100
B+	85-89
B	80-84
C+	75-79
C	70-74
D	60-69
F	0-59

Course outline (specific dates might change):

Dates	Topics	Text	Notes
Sep 3	Introduction		
Sep 9	Skills: the Scientific Method		
Sep 11, 16	Review of neurophysiology and methods	Z:Ch.2, Neurobiology (Luo), Physiology textbook, https://nba.uth.tmc.edu/neuroscience/	
Sep 18, 23, 25	Motor control: reflexes, oscillators, CPG, locomotion	Dickinson 2000, Bucher et al 2015, https://nba.uth.tmc.edu/neuroscience/	
Sep 30, Oct 2, 7	Sensory modalities: lateral line, Hearing and Echolocation, Vision	S:Ch. 1,4,5; Z:Ch.5	
Oct 9, 14, 16	Startle and escape response: introduction and C-startle in fish, squid cockroach fly	S:Ch. 7,8 ; Z:Ch.6	
Oct 21, 23	Sensory processing: barn owl, toad	S:Ch. 3, 1.4; Z:Ch.7	Dr. Soares
Oct 28	*Midterm exam*		
Oct 30	Exam review; Skills: Presentation		
Nov 4, 6, 11	Communication and song: cricket and others, songbirds. Camouflage	Z:Ch.12	
Nov 13	Sensorimotor: electric fish	S:Ch. 6 ; Z:Ch.8	Dr. Fortune
Nov 18	Navigation and migration	Z:Ch.11	
Nov 20	Neuromodulation and hormones	Z:Ch.9	
Nov 25	Learning and memory	Z:Ch.13	
Nov 27	*No lecture (Friday Classes Meet)*		
Dec 2	Clocks and rhythms: sleep	Z:Ch.10	
Dec 4, 9	Student presentations		
Dec 11	(Last day of classes): Review for exam		
	Final exam		

Learning expectations and assessment:

This course is a curiosity-based exploration of the relationships between neural mechanisms and behavior. It does not try to teach specific skills or information critical for any subsequent career or course. Rather, its goal is to satisfy students' inherent curiosity about animal behavior and its underlying neural systems.

The course has two primary teaching goals:

The first goal is to expose students to some of the best examples of the neuroethological approach to the study of the mechanisms of behavior. This will be assessed using exams in which students will be asked to explain scientific and biological strategies, conceptual organization, and detailed features of these examples.

The second teaching goal is to provide students with the tools to explore their interests in behavioral neurosciences, individually and collaboratively. The students and professor will agree on a topic of each student's or pair of students choosing that will allow them to explore their interests related to the course. Topics have to be chosen and confirmed before spring break. The last few lectures are dedicated to student presentations. Each pair of students will give a 20-minute talk about their topic. Graduate and honor students will also submit a term paper summarizing their selected topic. Non-honors students are also encouraged to write a paper to be graded. Even if these students do not write a paper, they must meet with the instructor to discuss their chosen readings and give a presentation.

Improving presentation and writing skills are objectives of the course, and students are advised to begin working on a paper and a presentation early. Professional support on writing can also be provided by the NJIT writing center: http://humanities.njit.edu/writingcenter/

Instructions for first written assignment (all students)
- No longer than a page, single space, 12 points Ariel or Times NR.
- Choose an interesting story about animal behavior (from scientific or popular science sources), and some options will be suggested.
- Follow directions to find primary and related literature.
- Analyze and present the main paper: Paper Author/Title, Big Question, Background observation, Hypothesis, Approach, Predictions (we will discuss and practice generating hypotheses and predictions in class), and Results.

Instructions for topic paper (required for honors and graduate students)
- Choose a topic, find literature, and discuss it with me. Submit a first version three weeks after the midterm exam; I will return with comments and track changes (I know how to use it) and will grade the final version (due by review for the final exam).
- Three to four pages, single space, 12 points Ariel or Times NR.
- Begin and end with the big picture; tell the specific story in the middle:
  - Introduce the story, why is it interesting, what is the BIG question
  - The specific study: what was the original observation? What is the hypothesis (is there more than one? Is there an explicit hypothesis?)? What were the experiments and predictions? What were the results? Here, you need to choose the central and important result and not detail all the controls.
  - Summarize or conclude: what did we learn from this study? How does it connect to the big picture in the introduction?
- Do not copy-paste (from the cited literature or other sources).
- List your sources in a sources list at the end. Use a format similar to that used by your source. There is no need to cite in-text because it will be based on a few sources.

Class Policies:

Inclusiveness: I am committed to empathy, equity, and inclusion across all dimensions of identities: from gender, ethnicity, country of origin, age, to religion. This commitment requires time and attention, but it is worth our while and the right thing to do. As a first-generation college student and a recently naturalized immigrant, I am very aware of the uneven playing field many students, faculty, and staff face. On the other hand, I benefit greatly from collaborations with students, peers, and mentors of diverse backgrounds and identities. NJIT commits to a policy of nondiscrimination based on race, sex, sexual orientation, age, religion, ethnic origin, handicap, or veteran' status in its employment policies, educational programs, and activities under university control. https://www.njit.edu/diversityprograms/university-non-discrimination-policy

Cell phones and social media: Please leave the classroom if you need to make an emergency phone call or update your social media. Cell phone use during quiz or exam times is prohibited and will be considered a violation of academic integrity.

Makeup Exam Policy: There will be no makeup exams, except in rare situations where the student has a legitimate reason for missing an exam, including illness, death in the family, accident, requirement to appear in court, etc. The student must notify the Biological Sciences office and the Instructor that they will miss an exam. In all cases, the student must present proof of missing the exam not to the instructor but instead TO THE DEAN OF STUDENTS OFFICE, e.g., a doctor's note, police report, or court notice clearly stating the date and times.

Academic Integrity: The University Code on Academic Integrity is strictly enforced! *Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree to which you are working. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at* http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf. Rutgers has similar rules (http://www.ncas.rutgers.edu/oas/ai).
Please note that my professional obligation and responsibility is to report academic misconduct to the Dean of Students Office. **Any student found violating the code by cheating, plagiarizing, or using any online software inappropriately will result in disciplinary action. This includes a failing grade of XF.** *If you have any questions about the Code of Academic Integrity, please contact the Dean of Students Office at* dos@njit.edu
Turnitin will scan all submitted material for plagiarism. Please ask me if you are unsure whether your action will violate academic integrity.

Bonus track: How to email your professor
https://medium.com/@lportwoodstacer/how-to-email-your-professor-without-being-annoying-af-cf64ae0e4087