

BEHAVIORAL NEUROBIOLOGY (BIOLOGY 4893/5893), FALL 2018

Instructor: Dr. Ari Berkowitz
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Required readings: Available on Canvas (canvas.ou.edu)

Optional books: [Behavioral Neurobiology, 2nd ed.](#)–Zupanc, Oxford 2010; [Principles of Neurobiology](#)–Luo, Garland Science 2015; [The Neuroethology of Predation and Escape](#)–Sillar et al., Wiley 2016 [Governing Behavior](#)–Berkowitz, Harvard 2016

Class: Tu Th 3:00-4:15 PM
Richards Hall 304

Office Hrs: Tu Th 9-11 AM, W 2-4 PM, or by appt.

COURSE OBJECTIVES

After completing this course, you should be able to:

- 1) Explain how neuroethologists investigate neural mechanisms of natural animal behaviors.
- 2) Explain neural mechanisms of natural behaviors, including sensory processing, sensorimotor integration, motor control, behavioral choice, and learning in species that have been well studied.
- 3) Extract the background, main question, and main experimental findings and interpretations from your reading of scientific research articles and clearly explain these in writing and orally.
- 4) Interpret graphs and other data and assess which hypotheses are consistent with those data.

GRADING

<u>Course component</u>	<u>Contribution to grade</u>
Quizzes.....	10%
Class participation.....	10%
Written paper (4893: 3-5 pages; 5893: 6-8 pages).....	20%
Oral presentation of article (4893: ~15 min.; 5893: ~20 min.).....	10%
Midterm exam.....	20%
Final exam	30%

Pop quizzes will include material from previous lectures as well as material from readings assigned for that day or before. There will be no make-up quizzes. **Online quizzes** can be taken as many times as you like within the assigned period; only your highest score will count toward your grade.

Exam grades will not be curved; instead, all scores on an individual exam *may* be scaled up (i.e., the same number of points added to each student's score); the instructor will make this decision for each exam separately.

Grading Errors: If you believe there was an error in a quiz or exam or a mistake in grading, you must give the instructor a *written* description of the apparent mistake and your reasoning within one week of receiving the grade. (You can use email.) The instructor will decide on the complaint and inform the student *at a later time*.

IMPORTANT DATES

Midterm exam: October 16

Deadline to receive approval for original research article to be presented: October 18

Deadlines for paper: 1st draft-November 13; final version-November 27

No class (Thanksgiving): November 22

Final exam: Thursday, December 13, 4:30-6:30 PM

NOTES

- 1) **Attendance and class participation are expected.** Some important announcements may also occur during class. Please provide written documentation of any medical absence immediately upon return to class if you wish to make up missed work.
- 2) Required readings will be available on Canvas (canvas.ou.edu). Students are expected to access and download readings as required.
- 3) Some communications may be via e-mail. Students are expected to access their OU e-mail account (or set e-mail forwarding appropriately) and check for course-related messages **daily**.
- 4) For both the paper you write and your oral presentation, select an original research article **< 10 years old** on a neuroethology topic **not otherwise covered in class; request and receive instructor approval by Oct. 18**. In both the paper and the presentation, you should discuss **both a natural animal behavior and its neural mechanisms**. You should review relevant background material on the system in question (e.g., using a recent review article) and then analyze the original research paper in depth. A possible starting point for your search for an original research article is:
<http://search.proquest.com/biologicalscience/advanced?accountid=12964>.
- 5) Regulations and responsibilities stated in the *Student Code* and *Faculty Handbook* will be followed in the event of academic dishonesty. (See <http://integrity.ou.edu/>.) **Papers must be written entirely by the student alone; plagiarism will not be tolerated. Student papers should not copy phrases from publications or quote authors. Student papers will be submitted electronically to Turnitin.com to check for plagiarism.**
- 6) If a grade of W or I is requested, University policy will be followed.
- 7) The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Disability Resource Center [<http://www.ou.edu/drc.html>; 730 College Ave., phone: 405-325-3852 (voice) or 405-217-3494 (VP)] prior to receiving accommodations in this course.

TIPS FOR READING & PRESENTING RESEARCH ARTICLES

When you read, focus on the Introduction, Summary or Abstract, and Discussion or Conclusions (probably read in that order). Try not to get hung up on methodological details or unfamiliar vocabulary. As you read, ask yourself the following questions: What did the author(s) basically do in the key experiment(s)? Why did they choose to do this particular experiment(s)? What was the major finding(s) of this experiment(s)? How did the authors interpret this finding(s) (i.e., what did it tell them about how nervous systems mediate natural behaviors)? Do you think this interpretation of the finding(s) is reasonable? Try to identify the key 1-3 data figures in the article and evaluate whether they really support the authors' conclusions.

When you lead a discussion of an article, first describe the background and motivation for doing the study. Describe the key experiment(s) in as simple terms as possible. Show the key data figures and explain how to read them and what each demonstrates. Summarize the author's conclusions and give your own critique of whether or not the experimental data support those conclusions.

TENTATIVE SCHEDULE

WEEK	TOPIC	REQUIRED READINGS	OPTIONAL READINGS
<u>Introduction</u>			
Week 1: 8/21, 8/23	Neuroethology's parents: Ethology & Neurobiology	Zupanc, Chapter 4; Purves et al. 2nd ed. on- line Chapters 2-7 or UTHealth Chapters 1-5	Zupanc, Chs. 1-3; Tinbergen 1950; Lehrman 1953; Ewert 1980, Ch.1; Bullock 1983; Zupanc & Zupanc 2008; Brenowitz & Zakon 2015; Purves et al. 5th ed. on-line animations
<u>Sensing the world</u>			
Weeks 2-3: 8/28, 8/30, 9/4	Owl sound localization	Pena & Gutfreund 2014; Linkenhoker & Knudsen 2002; Bergen et al. 2005	Zupanc, pp. 155-175; Konishi 2006; Knudsen 2002; Koppl 2009; Carr & Pena 2016; Berkowitz 2016 Ch. 7
Weeks 3-4: 9/6, 9/11, 9/13	Bat echolocation	Ulanovsky & Moss 2008; Sanchez et al. 2008	Zupanc, pp. 111-126; Pierce & Griffin 1938; Griffin 2001; Suga 1989; Jones & Holderied 2007; Feng 2011; ter Hofstede & Ratcliffe 2016; Berkowitz 2016 Ch. 7; Wohlgenuth et al. 2016
Weeks 5-6: 9/18, 9/20, 9/25	Electric fish jamming avoidance	Zupanc & Bullock 2006; Metzen et al. 2016	Zupanc, Chapter 8; Lissmann 1951; Alexander 2006; Rose 2004; Berkowitz 2016 Ch. 7
<u>Sensorimotor integration, motor control, and behavioral choice</u>			
Weeks 6-7: 9/27, 10/2, 10/4	Crickets singing & responding	Hedwig 2006; Schöneich et al. 2015	Zupanc, Chapter 12; Hedwig 2016; Huber 1990; Berkowitz 2016 Ch. 8
Week 8: 10/9, 10/11	Crayfish escape	Carew, Chapter 7; Yeh et al. 1996	Edwards et al. 1999; Barinaga 1996; Berkowitz 2016 Ch. 3
10/16	Midterm Exam		
<i>10/18</i>	<i>Deadline for approval of student paper & presentation topics</i>		
Weeks 9-10: 10/18, 10/23, 10/25	Tadpole swimming	Roberts et al. 2010; Li et al. 2007	Zupanc, Chapter 6; Berkowitz et al. 2010; Berkowitz 2016 Chs. 5-6
Weeks 11-12: 10/30, 11/1, 11/6	Leech behavioral choice	Lamb & Calabrese 2011 pp. 1-5 Briggman et al. 2005	Kristan et al. 2005, pp. 290-320; Zupanc, pp. 136-140; Briggman & Kristan 2008; Berkowitz 2016 Chs. 5-6
<u>Learning</u>			
Weeks 12-14: 11/8, 11/13, 11/15, 11/20	Songbird song learning	Brainard & Doupe 2013; Xiao et al. 2018	Mooney 2009; Nottebohm 2014; Barondes & Stryker 2015; Berkowitz 2016 Ch. 9
<u>Student topics</u>			
Weeks 15-16: 11/27-12/6	TBD	TBD	TBD
12/13	FINAL EXAM: 4:30-6:30 PM		

Note: This schedule is tentative and may be changed by the instructor as needed.