

BIOLOGY 435
ANIMAL COMMUNICATION
Fall, 2019



Welcome to Animal Communication!

The world is full of sights, sounds, and smells—many of which are produced by animals. But what do these conspicuous signals mean? In this course, we will provide a general overview of the how, when, where, and why of animal signals as we search for general principles underlying the biology of animal communication. The course begins with an examination of the mechanisms by which animals produce and perceive signals and covers all of the basic modalities (sight, sound, touch, and smell). The second part of the course then examines the evolution of different types of signals and how they are used to communicate information. The approach we will take in this course will be broad, considering the evolution of animal communication by drawing from a broad range of disciplines including physics, chemistry, physiology, ecology, psychology, economics, music, language, and of course animal behavior. Investigative laboratory and field experiences are integrated into the course to provide practical hands-on experiences studying animal communication.

Instructor

Professor: Dr. Christopher Templeton

Office: Strain 203b

Phone: 503-352-3149 (x 3149 if you're on campus)

Office Hours: Monday 10-11am and Thursday 1-2pm

if these times do not work for you, schedule another time with me via email

E-mail: templeton@pacificu.edu

Course Location

Course name: Biology 435

Class times: **Lecture:** MWF 1pm-2:05pm

Lab: Th 8:00-11:00am

Lecture Location: Price 202

Lab Location: Strain 220

Learning Outcomes

After completing this course, students will be able to:

- Integrate a variety of biological and interdisciplinary concepts to explain how and why animals communicate
- Accurately observe and describe a variety of signal modalities
- Apply knowledge of animal signaling to predict how anthropogenic changes will impact animals and their populations
- Demonstrate appropriate techniques for conducting research on animal communication
- Critically evaluate primary research papers and research proposals
- Identify novel research questions, design, and conduct research projects using detailed signal analysis, behavioral observations, or controlled experiments
- Effectively communicate research findings in both oral and written format

Animal Communication also provides the following learning outcomes for the Biology major:

- Students will demonstrate deep understanding of five core concepts in biology: evolution; pathways and transformations of energy and matter; information flow, exchange, and storage; structure and function; and biological systems.
- Students will use the standard skills and methodologies of biology to answer scientific questions.
- Students will apply the scientific method, reasoning and appropriate mathematics to describe, explain and understand biological systems.
- Students will use interdisciplinary approaches (applying chemistry, physics, and mathematics to biology) to work on biological problems.
- Students effectively will read, write, speak and understand scientific material.
- Students will collaborate and communicate within biology and across disciplines.
- Students will apply science to issues facing our society

In addition, this course fulfills the Natural Sciences Core requirement. Students completing the Natural Sciences Core requirement will:

- use scientific methods and reasoning within the context of the natural sciences
- recognize the distinctive nature and limits of scientific knowledge: that it is an evolving model of the natural world, discovered and verified through experimentation and observation

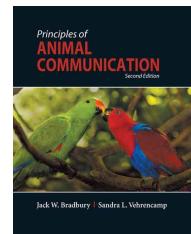
Course Catalog Description

An investigation into the biology underlying different modes of animal communication, including visual, acoustic, chemical, and tactile signaling behavior. The course will focus on the evolutionary and ecological significance of animal signals and discuss how communication is controlled by different mechanisms (endocrinology, genetics, neuroscience) and how these behaviors are impacted by anthropogenic interactions.

Course Materials

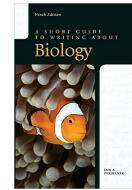
(Optional) *Principles of Animal Communication* by Bradbury & Vehrenamp
2011 (2nd edition).

This is the only textbook in print that deals with animal communication. It covers many of the topics we will learn about in class and is *densely* packed with information. I will refer you to relevant passages to reinforce lecture content or provide more in depth treatment of topics that interest you. This book is encyclopedic but also challenging: I recommend regularly reading small amounts instead of trying to digest entire chapters in a single sitting. I will place a copy of this book on reserve in the library for short-term checkout.



(Recommended) *A Short Guide to Writing About Biology* by Jan Pechenik.

This is a very useful little book that deals with all aspects of scientific writing and presentation. I *highly* recommend you purchase this book—it will be a useful reference throughout this and other upper-level Biology courses, and for your capstone paper and presentation. Feel free to buy another recent edition if you can save some money that way, though I will only provide page numbers from the most recent edition for readings.



(Required) Readings from the Primary Literature: Classic and recent publications selected by students and the instructor will be provided as the main reading throughout the course. In addition, students will delve deeply into recent literature related to the course research project.



General Course Expectations

Attendance

Research has shown that students learn best when they are active participants in the class. I expect that students enrolled in this course are adults who take responsibility for their own education. I will not take attendance in class, but class attendance and participation are strongly recommended and count towards your overall grade. Lecture and lab are key learning opportunities and we will have graded assignments periodically in class so missing either could negatively impact both your learning opportunities and your grade in the course. If you know you will miss class (e.g. for an approved university event), please let me know ahead of time and I will do my best to help you. Note that vacations, etc. are not considered approved events.

If you miss class, please first talk to your fellow students and try and get copies of notes or handouts. Then, if you still have questions after speaking with students and studying their notes, please come talk to me for further clarification.

Expectations during class

Please come prepared and arrive on time. Being prepared means completing assigned readings or assignments, being focused and ready to engage in class, and also dressing appropriately for lab (we will often be outside, regardless of the weather!). Complete readings and assignments by the specified date and time. Avoid distractions, inappropriate cell phone use is very distracting for you, your peers, and your instructor and should not take place during class. Last, you are expected to treat the instructor and each other fairly and with respect.

Expectations outside of class

I will work hard to facilitate your learning, but only you can learn the material through focused time and effort within and outside the classroom. As a reminder, Pacific guidelines state that students should put in 2-3 hours outside of class for every credit. This means that you should expect to work for at least 8-12 hours per week *outside* of class time to pass the course!

Expectations of your Professor (me)

You can also expect me to be fair and honest with you, return materials in a reasonable time frame, and be available to you outside of class. Office hours are designated times that I will be available for students from this class but I realize that it is impossible to select times that will work with everyone's busy schedules. If those times do not work for you, please contact me and we can set another time to meet (I'm very happy to do this!)

Technology Policies

Email: I will use your official Pacific University e-mail address to send out occasional but important information. Plan to check this account regularly, or to forward messages to an account you use. Email is also typically the best way to get in touch with me outside of class hours. When you send an email, remember to only use your pacific.edu account and that professors expect email to be conducted as a formal correspondence, not like a text message. When you send me an email, please include relevant information in the subject line (e.g. "Biol435 Echolocation Question"), a proper salutation (e.g. "hello Prof Templeton,"), and make sure to sign your own name. Following this framework will help ensure that I will not overlook your email by accident. I will do my best to try and reply to your email in a timely manner (usually within 24 hours), however I do not typically check my email in the evenings (after 5pm) or on weekends, so make sure you are patient or plan ahead if you have questions. Need more guidance on email etiquette? See the Moodle page for a helpful link on how to send email to your professors.

Moodle: There is a class Moodle page that I will also use to post daily learning objectives and lecture slides, readings, and details about assignments, exams, and other important information – you should visit Moodle regularly.

Box/Google Drive: We will use cloud based file storage systems for sharing information and archiving data, especially related to the lab component of this course. It is expected that each student uploaded data and records in a timely fashion. I will send you invitations to each resource later in the class.

Cell phones: Mobile devices have become exceedingly powerful tools and on rare occasions, I might suggest that you use them in class to augment our learning. However, at all other times, I expect that your phone is silenced and *completely* put away (in a bag under your desk) so that you will not be tempted to check it. As stated above, inappropriate cell phone use can be extremely distracting and impact not just you but also your peers and professor, so please have respect for all of us and keep your phone put away. If you have a good reason to use your cell phone – e.g. a family emergency in progress – please let me know before class starts.

Unauthorized Recordings. Students are prohibited from making audio and/or visual recordings of lectures or presentations without prior consent of the instructor or presenter.

Course Assessment

I will assess your learning based on a combination of exams, assignments, laboratory assignments, and independent projects, with the relative percentages outlined below:

1) Exams	30%
There will be two unit exams during the semester and a final exam. Exams will consist of questions in a variety of formats, including multiple choice, short answer, and short essays. Each exam will focus on new material but assume knowledge tested on prior units.	
2) Laboratory Assignments	20%
You will prepare a lab write-up and/or complete short pre-lab assignments for many lab activities. You will receive specific details on the content of each lab write-up and pre-lab exercise for each lab.	
3) Seminar Presentations	10%
Students will work in pairs or independently to lead 1-2 seminar-style discussions of research articles from the primary literature. Each team will choose a recent paper, conduct appropriate background research in that topic (i.e. read other related papers), give a short presentation on the paper, and facilitate class discussion. More details and sign-up sheets will be forthcoming.	
4) Video Production	15%
Students will work in small groups to produce a short (3-5 min) video documenting some aspect of animal communication. The goal is to provide biologically accurate videos that showcase general concepts or exciting new discoveries in animal communication in an entertaining way. Those groups producing work of a high standard will have the opportunity to have their videos included in a national repository and used as part of a formal scientific outreach program in primary schools across the US. More details and technical guidance will be forthcoming.	
5) Class Research Project	20%
Towards the end of the course, we will apply what we have learned to design an experiment that adds to the current state of knowledge about animal communication. As a class, we will identify an interesting research question, design an experiment or set of observations to address this question, collect data, analyze the results, and interpret them integrating information from the course and the primary literature.	
5) Class participation and engagement	5%
Lectures and labs are designed for students to engage with the material and take an active role in the classroom. The success of the class depends on students being active participants and your participation and attitude during the class impact your grade.	

Your final letter grade will assigned as follows:

A: > 90% B: 80% - 89% C: 70% - 79% D: 60% - 69% F: < 59%

Plus and minus grades will be assigned as follows: percentages ending with 7-9 will be given a plus (e.g., 87-89% = B+); percentages ending with 0-2 will be given a minus (e.g., 80-82% = B-).

There is no extra credit. Grades are not curved, meaning that every student can achieve an A; you are not competing with other students in the course, so work together in an honest and ethical fashion.

Academic Integrity

I expect students to know and adhere to the university's "Code of Academic Conduct" policies; please carefully read them in the College of Arts and Sciences catalog. The bottom line: you must do your own work on all exams and class assignments including lab reports and pre-lab assignments. Academic honesty does not preclude discussing ideas with other students, working together on homework, studying together for exams, or providing feedback on lab write-ups as long as all text is in your own words. In addition, everyone is expected to contribute equally to group work (seminars, lab reports, research projects)

Pacific University has no tolerance for academic misconduct/cheating. It is university policy that all acts of misconduct and dishonesty be reported to the Associate Dean for Student Academic Affairs. Sanctions that may be imposed for such misconduct range from an "F" for the assignment, an "F" for the course, and suspension or dismissal from the university. Forms of academic misconduct include but are not limited to plagiarism, fabrication, cheating, tampering with grades, forging signatures, and using electronic information resources in violation of acceptable use policies.

Please talk to me before you turn in assignments if you have a question about what constitutes dishonesty. As a reminder, here are some examples of academic dishonesty and plagiarism:

- Copying the work of another student on an exam or a written assignment, including labs
- Having notes or crib sheets accessible during exams or quizzes, even if you don't use them
- Cutting and pasting phrases or sentences from textbooks, articles, or websites
- Re-using an assignment from another class
- Insufficient attribution for ideas and information from published resources

College Resources

There are many free services available at Pacific to help you succeed in your courses. I encourage you to take advantage of them! Some of these services are listed below.

Tutoring Services. CLASS (Center for Learning and Student Success) is located on the 2nd-floor of the Tran Library. The center focuses on delivering one-on-one and group tutoring services for foreign languages, math and science courses, and writing skills in all subjects. Students should consult with the center's director and look for campus advertisements regarding tutoring available for other subjects. Day and evening hours.

Office of Accessibility and Accommodation Services (OAA). Support services and reasonable accommodations are available to students covered under the Americans with Disabilities Act. If you have a documented disability and require accommodations in this course, you must contact the Office of Accessibility and Accommodation Services (OAA) at 503-352-2171 (oaa.contact@pacificu.edu). Staff members will meet with you, review the documentation of your disability, and discuss the services Pacific provides and any specific accommodations you require for certain courses. It is extremely important that you begin this process at the beginning of the semester or earlier.

Student Counseling Center. The counseling center offers individual counseling, crisis services, referrals, and workshops. They also have information on-line or in their office about issues such as stress management and sleep. 503-352-2191, Mon-Fri 9 a.m. – 5 p.m., <http://www.pacificu.edu/studentlife/counselingcenter/>

Class Schedule

(subject to change)

More detailed weekly schedules and learning objectives will be provided in class or on Moodle.

Unit I: Signal Modalities. How is information transferred between animals?			
Week	Dates	Lecture topics	Lab activities
Week 1	26-30 Aug	Acoustic Signals	Field Trip to Jackson Bottom: Wildlife Sound Recording
Week 2	2- 6 Sept	Acoustic Signals	Lab: Audio Analysis Tutorial
Week 3	9-13 Sept	Visual Signals	EVENING Field Trip to Fernhill: Bat Echolocation
Week 4	16-20 Sept	Olfactory Signals	Field Trip to Fernhill: Bird Song Recording
Week 5	23-27 Sept	Tactile and Electrical Signals	Lab: Song Repertoire Analysis
EXAM I: Friday 27 September			
Unit II: Signal Evolution and Functions. What information do signals contain and who uses this information?			
Week 6	30 Sept-4 Oct	Evolution of Signals	Lab/Campus: Anthropogenic Noise
Week 7	9-13 Oct	Information in Signals	Lab: Spectrometry/Optical Illusions
Week 8	14-18 Oct	Signal Honesty and Deception	Library: Video Creation Workshop
Week 9	21-25 Oct	Courtship and Mate Attraction	Lab: Research Project Design
Week 10	28 Oct- 1 Nov	Conflict and Social Signals	Research Projects
Week 11	4-8 Nov	Food and Predator Signals	Research Projects
Week 12	11-15 Nov	Language and Vocal Learning	Field Trip to Oregon National Primate Center: Primates
EXAM II: Monday 18 November			
Unit III: Course synthesis. Video presentations, primary literature discussions, and course wrap up.			
Week 13	18-22 Nov	Film Festival & Discussion	Lab: Human Pheromones
Week 14	25-29 Nov	Video & Thanksgiving Break	
Week 15	2 Dec	Course Synthesis	
FINAL EXAM: Tuesday 6 December, 8:30-11am			

Other Important Dates for your Calendar

- **Monday, September 9:** Last day to drop a class with no record.
- **Friday, November 1:** Last day to withdraw from courses.
- **Monday, September 2:** Labor Day! No class
- **Friday, October 4:** Fall break! No class
- **Friday, November 8:** Murdock Research Conference! No class
- **Wednesday-Friday, November 27-29:** Thanksgiving! No class