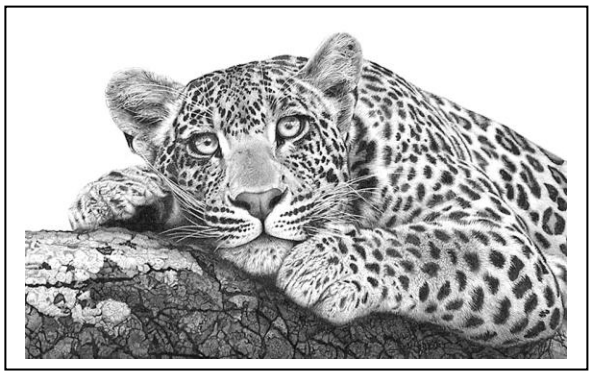
Biology 4030 Syllabus
Animal Behavior
Fall 2026



But ask the animals, and they will teach you, or the birds of the air, and they will tell you; or let the fish of the sea inform you. Which of all these does not know that the hand of the Lord has done this? (Job 12: 7-10, NIV)

Catalog Course Description:

BIO 4030-Animal Behavior (3 units)
An exploration of the behavioral biology of animals, building on the foundation of Tinbergen's Four Problems and incorporating the insights of ethology, psychology, behavioral ecology, and cognitive ethology. Topics include proximate and ultimate mechanisms, behavioral genetics, developmental ethology, neurophysiology, learning, communication, reproduction, sexual selection, parasite and predator defense, mating systems, parental behavior, and sociality. The evolutionary basis of behavior is emphasized, including natural selection, developmental genetics, and domestication. Films expand on the reading and lecture content, and conservation issues are explored. Prerequisite: BIO 2011

BIO 4030L-Lab (1 unit) - A laboratory that is a co-requisite for BIO 4030 in which students complete a semester-long team research project at the San Diego Zoo.

Instructor: Dr. Mike Mooring
Rohr Science Room 128
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Office hours:
Make an appointment (office or Zoom)

TA/Graders: **Izzy Tocci**, Biology B.S. senior | itocci0023@pointloma.edu

Kaylee Blachley, Env. Studies major, Env. Biol. minor | kblachle0024@pointloma.edu

Texts: Animal Behavior, 12th edition by Dustin Rubenstein; Sinauer, 2023; ISBN-13: 978-1108745727

Measuring Behavior, 4th edition, by Melissa Bateson & Paul Martin; Cambridge University Press, 2021; ISBN-13: 978-1108745727

Supplemental Text: Animal Behavior, 9th edition, by John Alcock (provided)

Meetings:				
	Lecture:	MWF	11:00-11:55 AM	Rohr Science 40
	Lab:	Monday	2:45-6:15 PM	Rohr Science 40

Student Learning Outcomes:
Upon completion of the course, you will be able to:

- state Tinbergen's four problems and identify questions as being either proximate or ultimate
- explain how behavior develops on the proximate level and give hypotheses for behavioral differences
- design, execute, and interpret an original research project based on behavioral observations
- argue for the possession of emotions, self-awareness, and consciousness in non-human animals
- articulate the importance of behavior to the practice of conservation biology

COURSE DESIGN

(1) Textbook Readings and Guided Questions: I have prepared a set of guided questions for each topic reading in the Animal Behavior textbook that will be posted on Canvas. The guided questions are designed to: (1) help you focus on the information that is most relevant to this course, (2) prepare you for the review quizzes and midterm exams, and (3) give you the foundational knowledge needed for classroom activities.

(2) LomaBooks Instructions for Students: This course is part of our course material program, **LomaBooks**. The bookstore will provide each enrolled student with a package containing all required physical materials.

(3) Canvas: Most all of the class material will be on the Canvas site, and assignments will be submitted via Canvas and graded online. All assignments have a due date, so try to stay current. Note that CANVAS DOES NOT SUPPORT PAGES – you may submit Word or PDF documents. Your graders will often give you feedback on Canvas, so be sure to set up Canvas to notify you when you get comments.

(4) Late Assignments: Late penalties will apply for all assignments submitted after the due date. For labs and journal article assignments (20 pts), 2 points will be deducted for each day late (no points after 10 days). A proportionately similar penalty will be applied for assignments of different point values. The intent of late penalties is to encourage you to turn in your work on time, and to be fair to those who do turn in their work on time. However, if you have a legitimate reason for submitting an assignment late, please tell me (by emailing directly) and the grader (by including a note in the text box when you submit).

(**5**) **Academic Honesty**: The PLNU policy on academic honesty is listed under the institutional policies below. My experience is that many students are not aware that some of their regular practices are considered plagiarism. For example, while you are free to discuss readings and lecture material among yourselves, I expect that you will each do your own work on individual assignments. In this case, teaming up with other students to write joint answers is plagiarism. Do not share electronic files of your answers with another student. Copying and pasting answers to assignments from AI or online sources is very much plagiarism – use your own words and ideas!

(6) PollEverywhere: Our class meetings will consist of a combination of lecture and small group activities. To enable participation by everyone, I require you to have an iClicker2 remote for use in every class. Your answers will be recorded and points assigned based on class participation (being engaged in class activities) and performance (getting the right answer). Weekly review quizzes are based on the reading assignments.

(7) Course Attendance Policy: Regular and punctual attendance is important for optimal achievement, and is a requirement for this course. There will be an attendance sheet for you to sign in with at every class meeting. You are permitted five (5) absences without penalty. Excessive unexcused absences will result in points being deducted from your Attendance Participation grade. Note that there are 40 class meetings on the MWF fall semester schedule, with 5 absences representing 12.5% of class time.

8) Journal Articles: A crucial ingredient in the process of becoming a scientist is the reading and interpretation of journal articles. You will have the opportunity to read several classic animal behavior articles. Each topic will involve a different task, such as writing an abstract, identifying the hypotheses being tested, and so forth.

(9) Labs: The first few labs will involve training sessions on the methodology of conducting behavioral research, which will prepare you for your field research project at the San Diego Zoo or Safari Park. The final lab is reserved for Zoom presentations of your research projects with the participation of San Diego Zoo staff.

(10) Exams: Exams will be administered during lab periods. Exams will consist of a combination of multiple choice questions and some short answers or essays. The final exam will be semi-cumulative, meaning that key concepts will be included from the entire semester. A study guide will be available on Canvas for each exam.

(11) Field Research Project: Each of you will work with a partner to conduct a zoo research project involving behavioral observations at the San Diego Zoo or Safari Park. The zoo staff will identify behavioral research projects that will be most beneficial for zoo management and student learning – you will then be assigned a project. As part of our mutual arrangement with the zoo, each student will receive a semester entrance pass to access the zoo or safari park. Once you start the on-site behavioral observations, plan to conduct observations at 1-2 times a week for 8 weeks to get a good sample size – 15-20 hours of observations per student is the goal. Following completion of the field work, you will analyze your data and write a scientific report based on journal article format. All project reports are required to have a data analysis and literature review component to them (I will give you specific guidelines). You will give a PowerPoint presentation (plus Q&A) during the final lab meeting which will be on Zoom so that the animal care managers can attend. Teams members will rate each other's participation in a peer review evaluation at the end of the class.

Grading Criteria

Points are estimates and may change

• Guided questions 20 @ 10 pts	200
• Attendance points	50
• Quiz Participation points	50
• Midterm exams - 2 @ 100 pts	200
• Cumulative final exam	100
• Labs	100
• Journal article assignments – 5 @ 10 pts	50
• Team research paper	100
TOTAL POINTS	**850**

LETTER GRADES:			
A	90%	C	70%
A-	88%	C-	68%
B+	86%	D+	66%
B	80%	D	60%
B-	78%	D-	58%
C+	76%	F	< 58%



ANIMAL BEHAVIOR CLASS SCHEDULE - FALL 2026

DATE	TOPIC	CHAPTER
Aug 31-Sept 4	An introduction to animal behavior	1
Sept 7	**LABOR DAY**	
Sept 8-11	Proximate and ultimate causes of behavior	2
Sept 14-18	The development of behavior: focus on genes	3
Sept 21-25	The development of behavior: focus on environment	4
Sept 28-Oct 2	Control of behavior: neural mechanisms **Exam 1-Monday Sept 28**	4
Oct 5-9	Organization of behavior: neurons and hormones	5
Oct 12-16	Behavioral adaptations	6
Oct 19-21	Parasite defense and animal medicine	Hart & Hart 2018
Oct 23	**FALL BREAK**	
Oct 26-30	Evolution of feeding behavior	7
Nov 2-6	Evolution of communication	8
Nov 9-13	Evolution of reproductive behavior **Exam 2-Monday Nov 9**	9
Nov 16-20	Evolution of mating systems	10
Nov 23	Evolution of parental care	11
Nov 25-27	**THANKSGIVING BREAK**	
Nov 30-Dec 4	Evolution of social behavior	12
Dec 7-11	Evolution and domestication of dogs	Morey 1994
Dec 18	**FINAL EXAM FRIDAY DEC 18 10:30-1:00**	

ANIMAL BEHAVIOR LAB SCHEDULE - FALL 2026

Monday	Topic	Reading
Aug 31	Behavioral Observation Methods I	Measuring Behavior: Ch. 1-4
Sept 7	**LABOR DAY**	
Sept 14	Behavioral Observation Methods II	Measuring Behavior: Ch. 6-9
Sept 21	Behavioral Observation Methods III	San Diego Zoo
Sept 28	**Midterm Exam 1**	
Oct 5	Zoo Research Project	San Diego Zoo
Oct 12	Zoo Research Project	San Diego Zoo
Oct 19	Zoo Research Project	San Diego Zoo
Oct 26	Zoo Research Project	San Diego Zoo
Nov 2	Zoo Research Project	San Diego Zoo
Nov 9	**Midterm Exam 2**	
Nov 16	Zoo Research Project	San Diego Zoo
Nov 23	Zoo Research Project	San Diego Zoo
Nov 30	Zoo Research Project	Work on Presentations
Dec 7	**Research Project Presentations**	

Animal Behavior Readings - Guided Questions 2026

- All readings are from Rubenstein, 12th edition unless otherwise noted
- Optional Alcock 9th edition has some important content removed from the 12th edition
- B&M = Bateson and Martin text on methods for animal behavior research

Week	Chapter	Section
(1) Sept 3-6	1-An Introduction to Animal Behavior	1.1-Natural Selection and the Evolution of Behavior • Tinbergen's Levels of Analysis (8-11) ○ B&M: 30-32
(2) Sept 9-13	2-The Integrative Study of Behavior	PROXIMATE CAUSES • 2.1 The Development of Song Learning • 2.2 The Mechanisms of Song Learning ULTIMATE CAUSES • 2.3 The Evolution of Song Learning • 2.4 The Adaptative Value of Song Learning
(3) Sept 16-20	3-The Developmental and Molecular Bases of Behavior	3.1 Behavior Requires Genes and Environment • Box 3.1 Behavioral genetics Gene regulation influences behavior • Box 3.3 Migratory restlessness
(4) Sept 23-27	3-The Developmental and Molecular Bases of Behavior	Alcock 9th Edition 3-Development of behavior • Role of the Environment

(5) Sept 30-Oct 4	4-The Neural Basis of Behavior	4.1 Responding to Stimuli
		  • How moths avoid bats, Box 4.1
		4.2 Sensory Stimuli and Nervous System Control
		4.3 Translating Sensory Stimuli into Behavior
		  • Box 4.3 Stimulus filtering
		  • Box 4.4 Cortical magnification

(6) Oct 7-11	5-The Physiological and Endocrine Bases of Behavior	5.1 Endogenous rhythms 5.2 Cues that Entrain Cycles of Behavior 5.3 Hormones and Behavior
(7) Oct 14-18	*The Adaptive Basis of Behavior* • Chapter 1, section 1.2	1.2 Approaches to Studying Behavior • Comparative approach • Box 1.2 Phylogenies & comparative method • Examining the Adaptive Basis of Behavior • Inferring the Evolutionary History of Behavior
(8) Oct 21-25	*Adaptive responses to parasites*	Supplemental reading: *How mammals stay healthy*

(9) Oct 28- Nov 1	6-Avoiding Predators and Finding Food	6.1 Antipredator Behavior 6.2 Foraging Behavior • Optimal Foraging Theory
(10) Nov 4-8	8-Principles of communication	8.1 Communication and Animal Signals • A Communication Framework • Functionally Referent Signals (waggle dance) 8.2 The Evolution of Animal Signals • Panda Principle • Preexisting Traits and Biases 8.3 The Function of Animal Signals • Honest Signaling • Deceitful Signaling • Eavesdropping on Others
(11) Nov 11-15	9-Reproductive Behavior	9.1 Sexual Selection 9.2 Intrasexual Selection-Competition for Mates • Conditional Mating Tactics versus Alternative Mating Strategies • Sperm Competition • Paternity Assurance 9.3 Intersexual Selection and Mate Choice • Box 9.2 Peacocks
(12) Nov 18-22	10-Mating Systems	10.1 Monogamy 10.2 Polyandry 10.3 Polygyny • Female Defense Polygyny • Resource Defense Polygyny • Lek Polygyny
(13) Nov 25-26	11-Parental Care	11.1 Offspring Value and Parental Investment 11.2 To Care or Not to Care • Current versus Future Reproduction • Sexual Conflict and Parental Care
(14) Dec 2-6	12-Principles of Social Evolution 13-Social Behavior and Sociality	12.1 Altruism and Levels of Selection 12.2 Kin Selection and Inclusive Fitness • Haplodiploidy and Eusociality • Sterility and Caste Differentiation 13.1 Forms of Social Behavior • Mutual Benefit • Altruism and Reciprocity • Selfishness and Spite 13.2 Evolution of Cooperative Breeding
(15) Dec 9-13	Evolution and domestication of dogs	Supplemental reading: *The Early Evolution of the Domestic Dog*

Animal Behavior (Alcock, 9th edition) Readings - Guided Questions 2026

- **Supplemental coverage of topics not fully covered by the new textbook**

Week	Chapter	Section
(1) Sept 3-6	1-An evolutionary approach to animal behavior (5 pts)	• Levels of analysis: 8-11 • B&M: 30-32
(2) Sept 9-13	2-Understanding the causes of bird song	• Proximate causes: 29-43 • Ultimate causes: 43-59
(3) Sept 16-20	3-Development of behavior (Heredity)	• Introduction: 64-72 • Role of Genes: 76-87
(4) Sept 23-27	3-Development of behavior (Environment)	Role of environment: 87-104
(5) Sept 30-Oct 4	4-Control of behavior: Neural mechanisms	Neurons & stimulus filtering: 107-131
(6) Oct 7-11	5-Organization of behavior	• Neurons hormones: 149-153 • Biological rhythms: 153-167
(7) Oct 14-18	6-Behavioral adaptations for survival	pp. 183-202
(8) Oct 21-25	Adaptive responses to parasites	How mammals stay healthy (Hart & Hart 2018)
(9) Oct 28- Nov 1	7-Evolution of feeding behavior	• Optimal foraging: 219-228 • Waggles & spices: 228-246
(10) Nov 4-8	8-Evolution of communication	• Hyena pseudopenis: 287-294 • Honest signals: 294-326
(11) Nov 11-15	9-Evolution of reproductive behavior	Pages 329-375
(12) Nov 18-22	10-Evolution of mating systems	Pages 379-418
(13) Nov 25-26	11-Evolution of parental care	Pages 421-503
(14) Dec 2-6	12-Evolution of social behavior	Pages 421-503
(15) Dec 9-13	Evolution and domestication of dogs	Early Evolution of the Dog (Morey 1994)

Measuring Behaviour 4th edition – Readings 2026

Chapter	Sections to focus on
Chapter 1: Introduction*	**Steps involved in studying behaviour – 1.4: 6-9**
Chapter 2: Science and Truth	Definitions of key terms – Box 2.1: 12-13 [review] The evidence pyramid – 2.4.1: 22-24
Chapter 3: Choosing a Research Question*	**Tinbergen's Four Questions – 3.1: 30-32** **Hypotheses and predictions – 3.5: 37-39 and Box 3.1**
Chapter 4: Designing a Behavioural Study*	**Different types of design – 4.2: 42-43** **When to measure behavior – 4.8: 57-58**
Chapter 5: Ethics and the Law	When is risk of harm ethically justifiable? – 5.2.3: 66-69 Animal research ethics – 5.3: 69-72
Chapter 6: Defining Behavioural Metrics*	**Entire chapter – 6: 79-93**
Chapter 7: Recording Methods*	**Observations of spontaneous behaviour – 7.3: 99** **Sampling rules – 7.4: 99-102** **Recording rules – 7.5:102-109 and Box 7.2**
Chapter 8: Recording Technology*	**Data pipelines – 8.2: 111-114 (optional)** **Check sheets – 8.3.11: 122-124**
Chapter 9: Individuals and Groups*	**Identifying individuals – 9.2: 137-140** **Social network analysis – 9.3: 140-146 (optional)** **Dominance hierarchies – 9.4: 146-151**
Chapter 10: Measurement Quality	Optional reading – very useful
Chapter 11: Data Analysis	Optional reading – very useful
Chapter 12: Interpreting and Communicating Findings	Common statistical mistakes – 12.1: 197-201 Writing a scientific paper – 12.2: 201-209

** Required reading for Behavioral Observation Methods (56 pp.)*

Classic journal articles in Animal Behavior – 2026

- We will use these for classroom activities and extra credit assignments

Article #	Citation
1	Marler P, Tamura M (1964). Culturally transmitted patterns of vocal behavior in sparrows. *Science* 146: 1483-1486
2	Garcia J, Koelling RA (1966). Relation of cue to consequence in avoidance learning. *Psychonomic Science* 4: 123-124.
3	McComb, K (1987). Roaring by red deer stags. *Nature* 330:648-649.
4	Zach R (1979). Shell dropping: decision-making and optimal foraging in northwestern crows. *Behaviour* 68:106-117.
5	Andersson M (1982). Female choice selects for extreme tail length in a widowbird. *Nature* 299:818-820.
6	Mooring MS, Mundy PJ (1996). Interactions between impala and oxpeckers at Matobo National Park, Zimbabwe. African Journal of Ecology 34:54-65.

PLNU INSTITUTIONAL POLICIES

PLNU Mission: To Teach ~ To Shape ~ To Send
Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

PLNU Attendance and Participation Policy: Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file for de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice and receive the appropriate grade for their work and participation. See Academic Policies in the Undergraduate Academic Catalog.

PLNU Academic Honesty Policy: Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty includes plagiarism, fabrication, deception, or impersonation. Plagiarism is the act of presenting information, ideas, or concepts as one's own when in reality they are the result of another person's creativity and effort. Such acts include copying assignments from another student or copying and pasting answers from the reading into your answer – both involve using someone else's words as if they were your own. Much of the learning process involves articulating the answer in your own words, so bypassing this step will almost guarantee an inadequate understanding of the material. Please write using your own words, and no copy-pasting! A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination. See Academic Policies for further information.

PLNU Artificial Intelligence (AI) Policy: Students should not use Artificial Intelligence (AI) tools (e.g., ChatGPT, Gemini) to replace core cognitive work like critical thinking, original problem-solving, creative brainstorming, and deep memorization. Outsourcing these foundational mental efforts leads to cognitive atrophy, reducing long-term knowledge retention and analytical skills. In short, you make yourself obsolete in the job market. AI tools are based on predictive machine learning and not true 'intelligence', thus the information it spits out is often inaccurate. You are only allowed to use AI to organize material or do background search, never to generate work you will submit directly. Anything requiring higher order brain function should be done by the student. If you choose to use AI, you must cite it (use the Purdue resource to guide your citations).

PLNU Academic Accommodations Policy: Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center, by email or phone at 619-849-2533. Once a student's eligibility for an accommodation has been determined, the EAC will work with the student to create an Accommodation Plan (AP). PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their approved accommodations in that particular course. Accommodations are not retroactive; as such, clarifying with the professor at the outset is one of the best ways to promote positive academic outcomes.

PLNU Academic Behavior Policy: Students are expected to take the initiative to learn and conduct themselves in a mature and civil manner in the classroom environment. Any student behavior that is disruptive or threatening may be subject to disciplinary action, in accordance with the Academic Behavior Policy section of the University Catalog.

PLNU Copyright Policy: PLNU, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU Final Examination Policy: Successful completion of this class requires taking the final examination on its scheduled day. The final examination schedule is posted on this syllabus. No requests for early examinations or alternative days will be approved unless you have 3 final exams scheduled on the same day or another compelling reason.

Loma Writing Center: You are encouraged to talk with a trained writing consultant about getting started on an assignment, organizing your ideas, finding and citing sources, revising, editing for grammar, and polishing final drafts, and more. For information about how to make in-person or online appointments, see Loma Writing Center webpage or visit the Loma Writer Center on the first floor of the Ryan Library, room 221. Appointment Calendar Website Email

General Course Concerns: If you have a concern related to the content or structure of this course, please bring your concern to me in a timely manner so that we have the opportunity to discuss your thoughts and work together toward a solution.