FLATHEAD LAKE BIO STATION
UNIVERSITY OF MONTANA

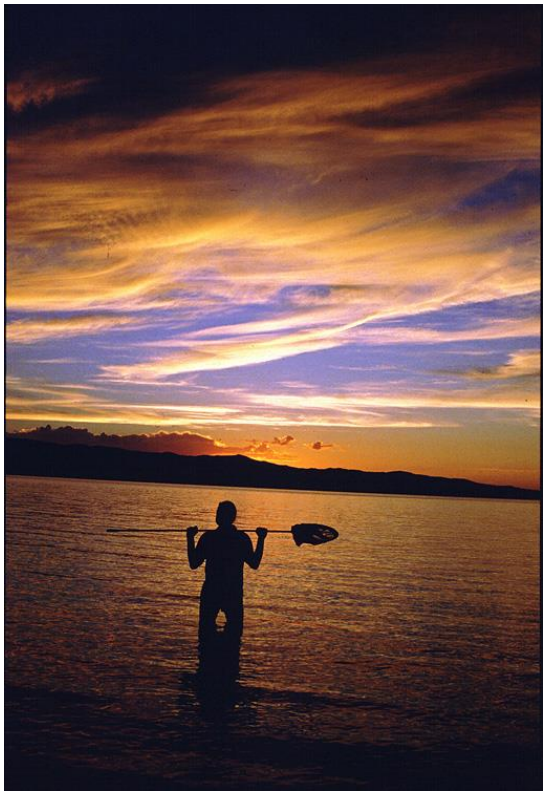
Summer Session 2025

BIOB 491, Special Topics:

Field Studies in the Evolution of Animal Behavior

Primary self-contained 4-week course: 5 credits

Lectures & Formal Discussions;
Field Observations, Development & Evaluation of Evolutionary Hypotheses, Roundtable & Field-Based Discussions



BIOE 490 for Undergrads, or BIOB 590 for Grads:

Independent Study: Evolution of Animal Behavior

Independent Study: 2 - 4 credits

Optional follow-up extensions of the primary course, entailing 2 or 4 additional weeks of supervised independent study.

Field Work, Data Analysis & Further Conceptual Discussions

Dates

Main Course: July 14-August 8

Main class meets MTWR 8am-5pm, Friday 8am-12pm

Independent Study Ext. 1: June 16-July 11

Extension of the primary course by 2 or 4 weeks provides opportunities for deeper, more complete investigation of select systems studied in the first 4 weeks; *ad libitum* work hours vary with project demands.

Professor: Dr. Paul J. Watson

BA Zoology & BA Botany, University of Montana, 1981
PhD 1988, Cornell University, Section of Neurobiology & Behavior
Email: pwatson@unm.edu Web Site: https://www.drpjwatson.org/

Prerequisites: One semester of college-level biology and an ecology course (can be met via BIOE342 Field Ecology at FLBS) or equivalents; *or explicit consent of Dr. Watson.*

Overview: The course is designed to prepare organismal biology and ecology majors for graduate research in evolutionary behavioral ecology. The course also is open to select students from diverse academic programs wishing to round out a liberal arts or humanities education, with prior approval from the instructor.

The course will provide students with advanced understanding of the principles and methods of animal behavior and evolutionary behavioral ecology research. Emphasis will be on the field study and complimentary field-supportive lab studies, of the sexual and social strategies of diverse terrestrial species. It stresses concepts of behavioral evolution and sober, but awesomely fun, evolutionary adaptationist hypothesis formulation followed up by challenging quantitative testing.

Students and the instructor shall work together intensively to foster development of the necessary intellectual, emotional, and technical skills necessary to gather publication quality data on the adaptive functions of animal behavior using field and complimentary lab observation and experimentation. Students in this course will learn to apply modern Darwinian theory to the analysis of the behaviors of virtually any organism, and will move decisively toward becoming creators of verifiable knowledge, rather than just consumers. You will practice meticulous scientific teamwork and attentive, locked-in, solitary observation. Most students will enjoy a startling revelation about how much amazing stuff is going on around them, all the time, most of which always goes unnoticed.

The course prepares diverse students for independent doctoral graduate research in animal behavior, all the more if you add 2 to 4 weeks of independent study. The course also is for anyone in the humanities interested in the key role of adaptation and natural selection in the evolution of mind, which is reflected in context-specific behavior, and the rich sometimes challenging philosophical implications of the central role natural selection plays in constructing the living world. It provides essential "concentrated, principled exposure" to spectacularly complex organisms operating in their natural environments.

For University of Montana students, this course is designed to massively compliment Dr. Doug Emlen's campus-based courses in animal behavior.

Course Learning Objectives

1. *Observe, capture, handle, mark, release and perform systematic observations on at least six species of animals ranging from Columbian ground squirrels*, to spiders, to mayflies, to water striders.*
2. *Design and conduct animal behavior experiments using standard scientific methods beginning with developing testable hypotheses to collecting and analyzing data. Learn about effective and efficient testing of alternative hypothesis testing using "strong inference."*
3. *Understand modern Darwinian theory and sub-theories key to the analysis of behavior.*
4. *Articulate the theory that all behaviors are aimed at "maximizing life time inclusive fitness," and identify four common, important misconceptions about the meaning of inclusive fitness. Gain a correct understanding of the evolution of altruism.*
5. *Learn the importance of distinguishing "levels of analysis" in the study of behavior. Understand the contributions to the field of animal behavior by the five leading scientists who started the so-called, "second Darwinian revolution" of the 1960's and 70's.*
6. *Learn the central role of honest signaling systems (a foundation for understanding much animal and human communication) in the social and sexual lives of virtually all creatures; be able to*

explain the pervasive role of honest signaling of need, quality and commitment in animal and human social life.

7. *Learn the key ecological correlates of six major animal mating systems, and provide examples of how and why certain individuals in a population may exhibit alternative strategies. Be able to discuss how even relatively "simple" animal nervous and epigenetic systems enable highly complex adaptive responsiveness to environmental circumstances.*

***** Columbian ground squirrels are the only mammal we can readily observe, and actually handle due to various regulations. However, the habituated yet wild Biostation population of ground squirrels, which we have been successfully re-establishing since 2019, will be, in part, individually identifiable and *of known genetic relatedness*; this will greatly enrich our ability to understand their complex social behavior.

Text

Dr. John Alcock's *classic* textbook, now in its 11th edition and co-authored with Dr. Dustin R. Rubenstein, **"Animal Behavior: An Evolutionary Approach."** Sinauer Associates, June 1, 2018. ISBN-10: 1605355488. Select chapters will be required reading, and other select chapters assigned according to individual student interests. We will also be discussing highly select papers from the primary literature.

Course assignments:

(a) read at least 3 assigned and 3 chapters of your choice from the course textbook (Rubenstein and Alcock, 2019, Animal Behavior, An Evolutionary Approach, 11th edition);
(b) take a 1.5 hour oral examination in which you and the instructor discuss answers to the thought questions offered at the end of each of your chosen textbook chapters;
(c) in class or on field trips, present 1-2 papers that you choose, with instructor's consent, from the primary literature;
(d) present a well-crafted end-of-session 20 minute PowerPoint presentation on one of our statistically analyzed data sets.

Grading

- Lecture / Discussion Engagement and Verbal Participation: 20%
- Participation in Field and Supporting Lab Research, incl. the quality of your field notebook and data sheets: 50%
- Written Final Project Report & Class Presentation: 15%
- Verbal 1.5 Hour Final Exam: 15%

The degree to which you participate in the "24/7" spirit of this class will be factored in as ***extra credit****.*

Graduate Credit: In addition to normal expectations, graduate students will present one additional (total = 3 paper presentations) inspiring, substantive paper from the primary literature, chosen collaboratively with the instructor. The instructor also expects a higher degree of project leadership and logistical support from graduate students. In general, I grade graduate students about 20% harder various aspects of the course.

Course and Field Supplies

*Available for purchase at the FLBS Bookstore

- Plenty of pencils, regular or mechanical*
- **Permanent-ink**, weather-resistant pens are acceptable
- Form holder style metal clipboard for data collection using standardized forms
- Inexpensive **digital wristwatch** with stopwatch and countdown modes that can display 24-hr time.
- Hot/cold mug*
- Rite in the Rain field notebooks*
- **Sunscreen, sun hat, and sunglasses**
- Lunch pack-up container(s) (resealable)*
- Mess kit and utensils
- Serious effective rain-gear
- Your favorite insect capture net(s) (optional)
- Hand lens (10-14x) & 2x magnifying glass, if possible.
- Packable water bottles (total capacity at least 2 liters)*
- Daypack (not a full-size backpack)
- Digital camera with zoom (optional)
- Hip boots or waders (optional)
- Water shoes (recommended)
- Bear spray*
- Your preferred insect repellent
- **Binoculars** (optional, but strongly encouraged!)
- Laptop (required); loaded with MS Word, Excel, and, *if you have one*, your favorite statistical/graphics package; the Biostation has wifi
- **Quality headlamp** and small flashlight, extra batteries
- Small, light-weight seat for more comfortable field observations (highly recommended)

Overnight Field Gear

We *potentially* will take overnight field trips. Nevertheless, you will have at least a few weekends off, and you may want to use some of them to explore the "Crown of the Continent" on your own or with fellow students from our course and other courses!

Food and cooking equipment will be provided for any class trips, but you will need your own eating utensils, plate or bowl, cup and water bottle. You may need to be quite self-sufficient during your own overnight excursions. You may want to bring a personal water purification system – many types are available at retailers like REI.

We probably will spend time wading in cold streams and clean but leech-infested muddy wetlands. You will need a reliable headlamp, good footwear for hiking over rough terrain, including snowfields, footwear or waders for working in cold water, extra dry socks and warm clothes. Hiking sticks can be useful as well. If we (or you) camp out, you will want a warm sleeping bag, a sleeping pad, and small backpacking tent or tarp shelter; students ideally will share shelters to avoid crowding limited campsite space.

We are in grizzly country. Bear spray is strongly recommended.

Do not leave food or cosmetic products in tents. Eat 200 meters from your tents.

Course Policies

Logistical notes: The majority of this course is taught outside, *regardless of weather*, with class plus transport occasionally taking 10 hours or more per day, sometimes at locations far from your housing at the Biological Station. We will hike on some days, usually with breaks for "behavioral prospecting" (discovering behaviors begging for discussion and possible study), and on some days we will hike or be exposed to outside conditions all or most of the day. *Students must be prepared.* If you are certain that you can hike 5–10 miles in a day, you will really enjoy this course. Just as important, you also must nurture the ability to sit patiently and *OBSERVE*.

Please pay very close attention to the requirements you pack wet weather and cold weather gear, including a change of clothes for overnight campouts, and appropriate footwear for hiking in rough terrain and wading in smaller streams and wetlands. And remember to keep a clean camp and carry bear spray on your person and at the ready whenever hiking in open country or forest.

Students will adhere to University of Montana Student Conduct Code and Discrimination, Harassment, Sexual Misconduct, Stalking, and Retaliation Policy (policy website: https://www.umt.edu/safety/) and to the Biological Station Code of Conduct form signed during student registration. Students must also follow FLBS Rules and Regulations and abide by the Safety Orientation Checklist. Students who have not already completed the University of Montana PETSA training may access the Moodle module at this link: http://www.umt.edu/petsa/.

Students with disabilities or physical limitations may request reasonable modifications by contacting the instructor; these should be discussed before you sign up for the course.

The University of Montana assures equal access to instruction for students with disabilities in collaboration with instructors and Disability Services for Students (406.243.2243, http://www.umt.edu/dss/default.php). The University does not permit fundamental alterations of academic standards or retroactive modifications.

Our Schedule

The day to day schedule for this course will opportunistically shift as the natural phenology of observable behavioral phenomena changes. *You must be as adaptable as the organisms we strive to observe.* We strive to have living illustrations of course concepts in front of us when discussing them. Generally, weeks 1 and 2 would include a trip to the National Bison Range, Ninepipe National Wildlife Refuge, Wild Horse Island, and up Beartrap Pass to the East of the station. **We will determinedly take advantage of the great research opportunities at the Biostation itself.** Note that the course is not primarily about field trips.

Overall, be ready to be flexible and weather-proof for the whole class. Let's get out there! Let's make contact.

Last updated September 2024