

Spring 2-1-2019

BIOL 435.01: Comparative Animal Physiology

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BIOL 435 (CRN 32749), Comparative Animal Physiology

Tuesday & Thursday 12:30 – 1:50 in ED 312

Instructor: Dr. Art Woods
BioResearch Building (BRB) 005
406-243-5234
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<http://hs.umt.edu/dbs/labs/woods/>

TA: Shelby Cole Shelby.Cole@umontana.edu

Office Hours. Thursday 2 – 3. Feel free to contact me and set up an appointment for an alternative time; email is best.

Textbook. I am not using a textbook. Rather, we will read a lot of primary literature in biology, which I will supplement by directing you to selected online readings and videos.

Course Objectives. Traditional courses in animal physiology take systems- or organs-based approaches. This course will talk about those systems but will focus primarily on just a few major problems:

- How do organisms sense and respond to changes in environmental factors?
- How is climate change affecting organisms?
- How does physiology evolve?

An additional objective is for you to be able to read and evaluate primary scientific papers effectively and rapidly.

Within the context of objectives, we will discuss a wide range of physiological systems. The course will also use primary papers and data, which give more realistic views of science-as-a-process than do textbooks or summary articles.

Learning Outcomes. By the end of the semester, you will be able to

1. Understand the core principles in comparative animal physiology.
2. Explain the major physiological problems faced by animals in their environments.
3. Discuss common solutions to those problems, and the ecological and evolutionary contexts for those solutions.

4. Read, understand, and synthesize primary literature in comparative animal physiology.
5. Write clearly about current issues in comparative animal physiology.

Course Structure & Style. In recent years, I have been lecturing less and doing more in-class discussions, activities, and demonstrations. I'm going to keep doing that this year. Each week will be devoted to answering a particular question related to the major questions presented above, and I'll generally lecture only on part of one of the two days. In the rest of the time, we'll read and discuss papers, calculate answers to quantitative problems, and do simple demonstrations and experiments in class. This style will have the consequence of putting the responsibility more on you to keep up with the readings I assign.

Course moodle page. There is one, and I'll post all electronic media from the course to it. I'll also keep my gradebook on moodle so that you'll always have access to up to date information on how you're doing in the class.

Evaluation.

Midterms. Two midterms will be given during the semester (Feb 19, Apr 9), each worth 100 points. 200 points total. Exams will contain both multiple-choice and short-answer formats. They will emphasize course content, information from the assigned papers, concepts we covered in our discussions, and intellectual synthesis.

Final exam. Final Exam from 8:10 – 10:00 on Wednesday, May 10th. 100 points. Cumulative; will include information from student powerpoint presentations (see below).

Paper summaries. Two 2-page summaries of scientific papers will be assigned (each worth 25 points). 50 points total. These will be assigned at roughly equal intervals throughout the semester. You will receive extensive feedback on first drafts and then will have the opportunity to turn in a second draft that will be graded.

In-class quizzes. At the beginning of 8 - 10 of the class periods, I will give short quizzes, each worth 5 points. I will drop your lowest scores, leaving 5 quizzes (total of 25 points).

TopHat response system. I plan to use TopHat Classroom fairly extensively. It costs [\\$26 for one semester](#). Please sign up for it by the second class period (Jan 15), as I will start using it then. 5% of your grade will depend on your TopHat score, of which half will come from participation (= fraction of total questions asked that you answer x 12.5 points) and half from getting answers correct. **The course join code is 106105.**

Term presentation. The final four class periods will be devoted to short presentations on research questions. You will work in groups of two to pose a physiological problem and then to discuss one or more papers containing data relevant to the problem. I expect all students to be at all presentations (required!). 100 points.

Term presentations will be 12 minutes long and followed by a 3-minute question and answer period. The order of presentations will be made based on a drawing held during the semester. Topics for presentations are open to anything in the field of comparative physiology, BUT they must present novel information to the class (no repetition of material that I will cover). Hence you'll be required to consult with me in ensure that your topic is appropriate. I will provide more instruction on this as the date approaches.

The goals are to identify a question or subject in comparative physiology, discuss the historical record of research related to the area/question, discuss results of the latest research related to the area/question, and propose future experiments/research related to the area/question.

Grading

Grades will be assigned in the +/- system, according to the following scheme:

| Grade | Percent of Total Points |
|-------|-------------------------|
| A | 93-100% |
| A- | 90-92.99% |
| B+ | 87-89.99% |
| B | 83-86.99% |
| B- | 80-82.99% |
| C+ | 77-79.99% |
| C | 73-76.99% |
| C- | 70-72.99% |
| D+ | 67-69.99% |
| D | 63-66.99% |
| D- | 60-62.99% |
| F | Below 60% |

| Component | Points | Weighting |
|-------------------|------------|-------------|
| Exam 1 | 100 | 20% |
| Exam 2 | 100 | 20% |
| Final exam | 100 | 20% |
| Quizzes | 25 | 5% |
| TopHat | 25 | 5% |
| Paper summaries | 50 | 10% |
| Term presentation | 100 | 20% |
| Total | 500 | 100% |

Communication. UM requires that all email communication between faculty and students use umontana or mso aliases. So I will only email you at your umontana address, and I would appreciate if you would email me only *from* your umontana address. Same for communication with the TA. In addition, we're not allowed to send information about grades via email, so we'll need to discuss these issues by phone or in person.

Attendance. You are required to attend all class meetings.

Credit/No Credit. Students interested in this option should see [UM's Academic Policies](#).

Audit. [According to University policy](#), changing your grading option to audit is not allowed after the 15th day of instruction.

Incompletes. I will follow [university policy on assigning incompletes](#).

Student Conduct. All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. Don't do it! The penalties can be severe. The rules are laid out in UM's [Student Conduct Code](#).

Harassment. Harassment of any kind (sexual, racial, religious, disability-based, etc.) will not be tolerated in this class. If you feel that you are being harassed, please see me. In addition, there are many resources available on campus, and UM has a policy about [discrimination, harassment, sexual misconduct, stalking, and retaliation](#).

Make-up Exams. Make-up exams are not considered a right, but are reserved for students who are prevented from taking an examination on the originally scheduled date due to:

1. a documented illness,
2. or documentation of participation in a University-sanctioned activity
 - A. Documentation of participation in a University-sanctioned activity requires written communication from the University of Montana Office of Academic Advising.
 - B. Student athletes must provide this documentation to Dr. Woods in the first week of classes.

You must call me at 406-243-5234 before the scheduled time of the exam in order to communicate the nature of the problem you feel precludes you from taking it. Absolutely no make-up examinations will be scheduled if you have not communicated with me before the scheduled exam. Also, note that simply informing me that you will be absent does not constitute an excused absence.

Extra Credit. Not provided; please don't ask.

Disabilities. I am committed to creating an environment of equal access for students with and without disabilities. To be fair to all students, I will adhere to the Americans with Disabilities Act and Section 504 of the Rehabilitation Act by only making accommodations based upon [guidance received from the University of Montana Disability Services for Students \(DSS\)](#). Before these accommodations can be suggested and granted, "DSS requires comprehensive documentation of a disability and its impact on learning."

In addition, I have been working to make my documents (Word, PPT) more accessible, and I will continue to update them during the semester.

Religious holidays. Absence due to religious holiday will be excused, with appropriate policies applied. Please notify me about this by February 1.

Official extracurricular activity. Absence due to official extracurricular activity will be excused, with appropriate policies applied. Please notify me about this no less than one week prior to missed class(es).

Schedule

| DATE | TOPIC |
|------|--|
| 1/10 | Course overview, introductions, and introduction to Dr. Woods's work. |
| 1/15 | How do ectotherms and endotherms respond to temperature? Performance curves and critical thermal limits. |
| 1/17 | Effects of temperature on ectotherms [paper discussion] |
| 1/22 | How is climate changing, and where? Overview of climate change. |
| 1/24 | Effects of climate change on ectotherms [paper discussion] |
| 1/29 | How do animals integrate their local microclimates and their metabolic processes into a body temperature? Environmental biophysics. |
| 1/31 | Animals, body size, and microclimates [paper discussion]. |
| 2/5 | Talk about writing well; first writing assignment passed out. Also, exercises on calculating heat balance. |
| 2/7 | Macrophysiology: global patterns of thermal limits in ectotherms [paper discussion] |
| 2/12 | Cardiorespiratory physiology |
| 2/14 | High-altitude adaptations in mice [paper discussion] |
| 2/19 | MIDTERM EXAM 1 |
| 2/21 | What is metabolism and how does it scale with body size? Fick's law and the scaling of respiratory variables in vertebrates. [first writing essay due] |
| 2/26 | How has physiology evolved over deep evolutionary time? The history of life on Earth, the tree of life, and the evolution of physiology. |
| 2/28 | Discussion of phylogenetics and independent contrasts. |

- 3/5 More talk about writing; second writing assignment passed out.
- 3/7 How has the physiology of diving mammals changed to allow them to spend so much time underwater?
- 3/12 How muscles work.
- 3/14 Discussion of constraints and tradeoffs shaping how muscle physiology evolves [discuss Lindstedt et al. 1998].
- 3/19 How much is ocean pH changing and how is that affecting marine invertebrate larvae? Overview of ocean acidification.
- 3/21 Discussion of paper on ocean acidification.
- March 25 - 29 **Spring Break**, no classes
- 4/2 The nutritional ecology of migration [second essay due]
- 4/4 Migration paper discussion.
- 4/9 **MIDTERM EXAM 2**
- 4/11 TBD
- 4/16 Student term presentations
- 4/18 Student term presentations
- 4/23 Student term presentations
- 4/25 Student term presentations

Final Exam Wednesday, 8:10 – 10:00 in normal classroom