

Bio 566
“Comparative Physiology”
Tu Th 2:30-3:45 PM
Dr. Duncan J. Irschick

Course Description

This course will be an introduction to the physiological adaptations of plants and animals via study of the interactions between organisms and their environment. Some research on humans will be discussed, but this class will focus on non-human organisms. Further, the course will focus on animals, but will include examples from plants. An explicitly evolutionary and quantitative perspective will be used throughout the course.

Rationale and Objectives

Comparative physiology is a vibrant and growing field that integrates physiological measurements of function and performance with information on environmental pressures that drive adaptation. Thus, comparative physiology is necessarily integrative, and cuts across different disciplines to shed light on numerous biological issues, such as how species evolve adaptations to different environments, and the mechanisms by which they survive in extreme environments (e.g., desert, arctic regions). The course will also devote a reasonably large amount of material to the mechanistic bases of how animals adapt to different environments, such as their respiratory, regulatory, and homeostatic mechanisms. The primary purpose of this course is to provide a general introduction to the field of comparative physiology, including an overview of the field, with an emphasis on recent studies and new techniques in the field.

Textbook

K. Schmidt-Nielsen. 5th Edition. Animal Physiology.

Examinations

There will be two regular exams, and one final exam. The regular exams will cover the relevant material discussed in class or in the textbook or other readings prior to the exam. The final will cover **only** the remaining portion not covered by the regular exams (i.e., the last part of the course). Answers will be written directly on the exams. The regular and final exams will largely be multiple-choice questions (~60%), with the remainder (~40%) being short-answer, or true-false questions. Each test will receive a numerical value (0-100 for regular midterms, 0-140 for the final, total is 340 points), and the final grade will be based on the cumulative number of points for all midterms and the final, and no exams can be dropped. I will also provide an extra credit assignment (up to 10 points) around the middle of the semester. Students missing more than one regular exam (even for valid medical reasons) are advised to drop the course or receive a failing grade in the course because too much work will have been missed. No one will be permitted to take the regular exams or the final exam early.

Course Grades

Undergraduates: The 2 regular exams will each count for about **30%** of the grade (**60% total**) in the course, and the final will account for about the remaining **40%** of the grade. The course will

include a large amount of non-textual material; therefore, poor attendance will result in poor performance.

Dates of regular exams:

Exam 1: Tuesday, Oct. 6

Exam 2: Thursday, Nov. 12

Additional Note:

Please be aware of your rights and responsibilities as a student at UMass. Academic dishonesty will not be tolerated. Also note that the grade that you receive for the class CANNOT BE CHANGED, unless a grading mistake has been made.

Instructor and Office Hours

Dr. Duncan Irschick, Associate Professor, Department of Biology. I have office hours on Tuesdays, 11-12, or by appointment (Office: 205 Morrill, come into the laboratory to reach office). I can be reached by telephone at 545 1696 or by email at irschick@bio.umass.edu

Lecture Outline

Note: In addition to the readings in the textbook, some non-textual material (recent literature) may be included)

<u>Topic</u>	<u>Reading</u>
Week 1: Overview: What is Ecological Physiology?/Respiration	Ch. 1
Week 2: Oxygen: Respiration in air and water	Ch.1
Week 3: Food and energy: Evolution of energy metabolism I	Ch. 4,5
Week 4: Food and energy: Evolution of energy metabolism II	Ch. 4,5
Week 5: Food and energy: Ecology of energy metabolism (Exam I)	Ch. 4,5
Week 6: Temperature: Terminology	Ch. 6,7
Week 7: Temperature: Regulation and adaptation	Ch. 6,7
Week 8: Water: Regulation	Ch. 8
Week 9: Water: Adaptation to extreme environments	Ch. 8
Week 10: Locomotion: Mechanisms and behavior	Ch. 10
Week 11: Locomotion: Ecology and evolution (Exam II)	Ch. 10
Week 12: Nervous systems I	Ch. 11
Week 13: Nervous systems II	Ch. 11
Week 14: Hormones and physiology	Ch. 12
Week 15: Adaptation to extreme habitats I	Selected literature
Week 16: Adaptation to extreme habitats II	Selected literature