

Animal Physiological Ecology (11:704:360)

Fall 2009

Mon. & Thurs. 12:35 – 1:55

Loree 020

Instructor: Dr. Henry John-Alder, ENR152, 14 College Farm Road, Cook Campus
henry@aesop.rutgers.edu

Office Hours: By appointment.

Course Description: Animal Physiological Ecology is a course about animal function – about “how animals work”. It is basically a physiology course, taught from a somewhat ecological and evolutionary perspective. Perhaps a better title would be “Ecological and Evolutionary Animal Physiology”. The course will address physiological topics from the following perspectives: comparative, ecological, environmental, evolutionary, integrative, and organismal. It will to some extent address molecular and cellular mechanisms, but at the same time it will emphasize the organismal, ecological, and evolutionary significance of physiological function.

Animal Physiological Ecology is for students with strong preparation in general biology, including successful completion of General Biology (101 and 102) or equivalent in good standing. The course is open to sophomores through seniors, but it should be viewed as an upper-level course most appropriate for juniors and seniors. The presentation of the course will assume that students recall and understand basic biological principles. It will be assumed that students know where to turn to refresh themselves on fundamental biological topics that may have become foggy.

Animal Physiological Ecology will serve primarily as the essential physiology course for students in biological sciences and related fields whose interests are in the broad areas of animal physiology, ecology, and evolution. This course will help in preparation for GREs, MCATs, and other graduate admissions exams. Students who are keenly interested in a human-oriented physiology course should consider taking Systems Physiology (146:356) and its associated laboratory instead of (or in addition to) Animal Physiological Ecology.

Basic topics covered in Animal Physiological Ecology will overlap many of those covered in Systems Physiology (146:356), which I taught through fall, 2007. For example, both courses cover Integrating Systems (nervous system, endocrine system), Movement and Muscle (nervous system, musculoskeletal system), Oxygen, Carbon Dioxide, and Internal Transport (cardiovascular system, respiratory system), Water, Salts, and Excretions (excretory system including kidneys), and Food and Energy (gastrointestinal system, endocrine system). However, Animal Physiological Ecology, in contrast to Systems Physiology, takes a more holistic and less mechanistic approach to these topics, emphasizing organismal interactions with the environment (ecology) and their evolutionary significance. In addition, and partly because of the comparative nature of the course material, Animal Physiological Ecology covers several fundamental

organizing principles of biological systems not covered in Systems Physiology, including body size, energetics, and temperature relations. Thus, the content of Animal Physiological Ecology will complement and supplement but not duplicate the material covered in Systems Physiology. Despite the overlap in content, Animal Physiological Ecology is distinct from Systems Physiology; students with a keen interest in physiology should consider taking both courses.

Course Objectives: In brief, Animal Physiological Ecology has three broad objectives:

- 1) Understand the diversity of life, with a particular focus on physiological functions that allow animals to live and thrive in environments ranging from hot, wet and tropical to cold and arid, from terrestrial to aquatic, from marine to freshwater;
- 2) Understand the breadth of the discipline of physiology and the importance of integrating physiology with ecology and behavior, and with cellular and molecular biology;
- 3) Understand that nothing in biology makes sense outside the context of evolution; that evolution is the organizing principle of biology; that evolution is the 'fabric' of biology, the unifying theme of all of biology.

Required Textbook: Hill, Wyse, and Anderson. *Animal Physiology*, 2nd edition (Sinauer). Additional required supplemental readings will be posted as PDF files on the class Sakai site.

I expect you to read the textbook and required supplemental readings. The textbook is an outstanding source of information and references. Use it to provide background and to reinforce topics discussed in lectures. The textbook includes some chapters and some sections of chapters that will not be covered directly in lectures. I will announce the most pertinent sections of the textbook, which will be required and for which you will be held responsible.

Evaluation: Evaluation will be based on three multiple-choice examinations plus several written assignments. Two mid-term examinations will be given during the semester, and a partially comprehensive **final examination will be given during the final exam period on Monday, December 21, 2009 from 12 to 3 PM.**

The mid-term exams will consist of 50 questions, each valued at 2 points for a total of 100 points. The final exam will consist of 75 questions (150 points), 50 of which will cover material discussed after the second mid-term exam and 25 of which will cover material discussed for the 1st and 2nd exams.

For one of the written assignments, you will read a short scientific research article and write a 200-word summary of the article. Details of this assignment will be discussed in class. This assignment is valued at 50 points.

The second written assignment is in three parts for a total of 50 points. You will be asked to find three articles in the popular press relevant to Animal Physiological Ecology. For each article, you will be required to write two sentences. The first sentence will identify the main point of the article, and the second sentence will describe the relevance of the article to Animal Physiological Ecology. All articles must appear in the popular press during the fall '09 semester, and one must be selected from each of the months of September, October, and November. These assignments will be due on the last days of

September, October, and November. Many outlets in the popular press can serve as sources for this assignment, notably the *Science Times*, which appears every Tuesday as a section in *The New York Times*. You can buy *The New York Times* at a newsstand or view it at <http://nytimes.com/>.

The final grade will be determined on the basis of the cumulative scores of the three exams plus points earned on written assignments. The maximum possible score is 450 points.

FINAL EXAM: MONDAY, DECEMBER 21 FROM 12 TO 3 PM

Grading Scale: Final grades will be assigned on a “curve” based on the overall performance of the class. For example, instead of requiring 90% of the total points to earn an “A”, 90% of the highest earned score might be adequate.

Course Policies and Procedures:

The best way to ensure that you earn the highest possible grade is to attend all lectures and to *think* about the information that is covered. It is important to take notes during the lectures, re-write your notes with guidance from assigned readings as soon as possible after the lectures, read all of required and pertinent sections of the textbook and supplemental readings, and write an outline of all required and pertinent sections of the textbook and supplemental readings. It is helpful to discuss the lecture material with other students in the class, or to explain what you learned to a friend or family member. But most of all, it is important to *think* about the information that is covered. *People remember what they think about. The more you think about things, the more you remember about them. Thinking is the key to success in this and every course.*

Availability of notes and PowerPoint slides: Some notes and PowerPoint slides will be made available to registered students via the Sakai site. These notes and slides may not be complete sets of notes and slides used in lecture. In other words, some of the material for which you will be held responsible is likely to be made available only in lectures, and the use of notes and slides alone cannot possibly substitute for attending lectures.

Attendance: Attending all lectures is expected, and required for optimal learning.

Absence from lecture: Attendance at all lectures is required to optimize your performance. I will not, however, take attendance on a regular basis, and you will be held on your honor to attend all lectures. Attendance is for your benefit, not simply to fill the seats in the lecture hall.

Absence from exams: You must notify me ahead of time if you will have to miss a regularly scheduled exam due to an official university function. Absence from an exam due to illness or other family emergency will be evaluated on a case-by-case basis and will normally require written documentation of the reason for the absence.

Not all absences will be excused. Absence due to a faulty alarm clock, a broken cell phone, car problems, or traffic congestion will not be excused. This is New Jersey. It's the most densely populated state in the nation. Roads are typically crowded and congested if not occluded. You must always allow extra time for traffic when you drive.

Early departure for the winter recess will NOT be accepted as a valid reason to miss the scheduled final examination, which is scheduled on Monday, December 21, 2009 from 12 to 3 PM.

Lecture Schedule, Topics, and Readings

(changes and further details, if any, will be announced in lectures)

DATE	TOPIC	READINGS
September 3, 8 (2 lectures)	Introduction; Fundamentals of Physiology; Homeostasis	Chapters 1, 3; Feder-"Aims of Undergraduate Physiology Education; Bartholomew-"The Role of Natural History in Contemporary Biology"
September 10 – October 1 (7 lectures)	Food, Energy, and Temperature	Chapters 5, 6, 7, 8, and 9. Chapter 10 is recommended.
OCTOBER 5	FIRST MID-TERM EXAMINATION	
October 8 – November 2 (8 lectures)	Integrating Systems (neurons, nervous systems, endocrine systems, reproduction)	Chapters 11, 12, 13, 14, 15, 16. Chapter 17 is recommended.
NOVEMBER 5	SECOND MID-TERM EXAMINATION	
November 9, 12 (2 lectures)	Movement & Muscle	Chapters 18 & 19
November 16-30 (4 lectures)	Oxygen, Carbon Dioxide, and Internal Transport (respiration, cardiac, cardiovascular)	Chapters 21, 22, 23, 24
December 3-10 (3 lectures)	Water, Salts, Excretion (volume regulation, ion regulation, osmoregulation, kidneys)	Chapters 26, 26, 28
DECEMBER 21	FINAL EXAMINATION	12 TO 3 PM