

Vertebrate Physiology (ECOL 437) Syllabus (tentative), spring 2008

Introduction

Welcome to Vertebrate Physiology. Our focus will be on the basic principles of vertebrate physiology and special attention will be directed towards physiological homeostasis maintained by interactions of complex organ systems. Our discussions will be grounded in an explicit evolutionary and ecological context. We hope that this will be an enjoyable and informative semester. Vertebrate physiology is a writing emphasis course, meaning at least half of the course grade will come in the form of written work. Prerequisites include the ECOL 181-182 sequence and one semester of organic chemistry (or concurrent enrollment). Prior courses in ecology, evolution, genetics, physics, and biochemistry would be helpful, but are not mandatory. Without some of the courses listed above you may need to work a bit harder to “catch up.” Please talk to the instructors if you have concerns about your previous background.

Course Objectives

1. Learn basic principles of physiology
2. Understand homeostasis and anhomeostasis
3. Understand important implications of ecto vs. endothermy
4. Understand predictive power of phylogenetic relationships
5. Understand potential formative role of past and present environmental conditions
6. Understand major subject areas of vertebrate physiology
7. Understand how the intact animal and its life history require a synthesis of the major subject areas of vertebrate physiology
8. Understand how physiologists study the field
9. Become versed in a subset of the scientific literature
10. Be able to critically evaluate a scientific paper
11. Generate a feasible research proposal, communicated in written and oral form

Major Topics

- A. Nervous system function
- B. Muscle stimulation, recruitment, and contraction
- C. Endocrine function
- D. Respiration from epithelium to intracellular, including ventilation and circulation
- E. Water balance, ionic regulation, & relevant organs
- F. Metabolism and energy balance across representative vertebrate groups

Meeting Times (Please attend the discussion/lab section in which you are enrolled)

Lecture: MWF in PAS 220 (<http://iiewww.ccit.arizona.edu/uamap/staticLarge/PAS.html>), 1000-1050h

Discussion/Lab: in CBS/KOFFL 410 (<http://iiewww.ccit.arizona.edu/uamap/staticLarge/KOFFL.html>)

Sect. 1 Wed. 1300-1450h

OR

Sect. 2 Wed. 1500-1650h

Instructors

Kevin E. Bonine, Ph.D., kebonine@u.arizona.edu

Office Hours: BSE 1D (in the basement), MW 1110-noon, and by appointment.

Tel: 626-0092, Home: 751-1349 (please call before 9pm or after 7am)

Graduate Teaching Assistant: **Kevin Oh**, koh@email.arizona.edu

Office Hours: 1-2pm Fridays in BSW302, and by appointment.

Course Materials

The required text is available at the UA bookstore.

Animal Physiology, Richard W. Hill, Gordon A. Wyse, and Margaret Anderson

April 2004, Sinauer, 769 pages, 539 illustrations

ISBN: 0-87893-315-8, casebound

Other readings will be made available electronically on course website or on electronic reserve in library. Please check course website regularly for updates, changes, or additions.

Web Site

We will maintain a course website (http://eebweb.arizona.edu/eeb_course_websites.htm) with readings, assignments, schedules, announcements, etc. Appropriate powerpoint lectures will likely be posted to the website the day after they are given. Check website for updates.

Course Work

Lecture Exams (three midterms @ 100 pts each, cumulative final 200 pts)	500
Research Proposal (topic, rough draft, peer review, final submission)	175
End-of-Semester Review Panel	25
Lab/Discussion Grade (participation, quizzes, assignments, etc.)	<u>300</u>
Total Points	1000

Grading

We expect top-notch, senior-level work in this class. Most of you will have to work hard to earn the grade you want. Unless you have a strong physiology background you will not be able to sit back and expect to do well; rather, you should ask questions, come to lecture having read the relevant material, ask Kevin Oh to cover difficult material again in lab/discussion, and *take advantage of our office hours*. A quote from a former student:

Going into my senior year, I thought I knew how to get the "A" with the minimum effort; how to "play the game". It was after a few weeks in your class then I was asked to work my butt off and actually take an active role in my personal education process, I remembered why I was there in the first place...I was inspired to take my personal learning to a new level, and to discover a passion I have for the study of physiology-and science in general.

Please re-familiarize yourself with policies against plagiarism, etc., within the UA Student Code of Academic Integrity: <http://dos.web.arizona.edu/uapolicies/>

Students caught cheating may be penalized by failing the relevant assignment or exam, failing the course, or being expelled.

Assignments are due *no later than the beginning of lecture* on the due date, unless otherwise noted. Late assignments will be penalized 10% for each day they are late (this includes being late to lecture on the due date). There will be no 'make up' exams or 'extra credit'. We realize that you have lives (cars do break down, people die, stuff happens). In exceptional cases, and if arrangements are made in advance, we will consider your unique situation.

Grades will generally be distributed as follows (any potential curving of final grades will not "hurt" you, but can only help you):

≥ 90%	A
80-89%	B
70-79%	C
60-69%	D
≤ 59%	F

Keep in mind the following, adapted from J.M. Williams (1993, Clarifying grade expectations, The Teaching Professor 7(7):1):

The "A" Student--An Outstanding Student

* Attendance: "A" students have virtually perfect attendance. Their commitment to the class resembles that of the instructor.

* Preparation: "A" students are prepared for class. They always read the assignment. Their attention to detail is such that they occasionally catch the instructor in a mistake.

* Attitude: "A" students have a winning attitude. They have both the determination and the self-discipline necessary for success. They are curious and they show initiative. They do things they have not been told to do.

* Talent: "A" students have something special. It may be exceptional intelligence and insight. It may be unusual creativity, organizational skills, commitment--or a combination thereof. These gifts are evident to the instructor and usually to the other students as well.

* Results: "A" students make high grades on assignments--usually the highest in the class. Their work is a pleasure to grade.

Students with Disabilities:

If you anticipate the need for reasonable accommodations to meet the requirements of this course, you must register with the Disability Resource Center (<http://drc.arizona.edu/>; Disability Resource Center 1224 East Lowell Street Tucson, Arizona 85721, Phone: (520) 621-3268 V/TTY Fax: (520) 621-9423, E-mail: uadrc@email.arizona.edu) and request that the DRC send the instructor official notification of your accommodation by the beginning of the 3rd week of class. Please plan to meet with us by appointment or during office hours to discuss accommodations and how the course requirements and activities may impact your ability to fully participate. All related discussions will remain confidential.

Attendance

You are expected to attend each lecture and each discussion/laboratory session prepared and **ready to contribute**. Lecture and lab quizzes may be used to motivate your attendance and participation if necessary. All holidays or special events observed by organized religions will be honored for those students who indicate affiliation with that particular religion. Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Class meeting suggestions:

In addition to paying attention and turning off electronic devices such as iPod and cell phone, please consider employing these suggestions (borrowed from Guy McPherson) during class discussions:

1. Listen carefully to others before speaking
2. Challenge and refute ideas, not people
3. Focus on the best ideas, not on being the best, or "winning"
4. Before adding your own contribution, practice listening by trying to formulate in your own words the point that the previous speaker made
5. Speak whenever you wish (without interrupting!) even though your ideas may seem incomplete
6. Avoid disrupting the flow of thought by waiting until the present topic reaches its natural end before introducing a new issue
7. If you wish to introduce a new topic, warn the group that what you are about to say will address a new topic and that you are willing to wait to introduce it until people are finished commenting on the current topic
8. Give encouragement and approval to others

Please be aware of the UA policies against threatening behavior by students:
<http://policy.web.arizona.edu/~policy/threaten.shtml>

Course Work Details

Lecture Exams

There will be three midterm examinations and a fourth, final examination. The final will be cumulative. Topics covered in the formal lecture period, in discussion/lab, by guest speakers, and in the assigned text reading will be fair game. Format will be mixed and may include: matching, fill-in, multiple choice, short answer, and essay. We may occasionally have some portion of an exam as a take-home essay. Be prepared to synthesize ideas, rather than just regurgitate information. There will be no make-up exams.

Research Proposal

The research proposal (see separate handout) will be your opportunity to research a topic of interest to you that is appropriate for a vertebrate physiology course with emphasis on physiological systems. You will be expected to synthesize relevant information from the primary literature (containing original research results) in a well-written proposal. You will be graded in four stages: research question and annotated references (20 pts.), first draft (45 pts.), peer review/edit (40 pts.), and final submission (70 pts.). You will also be required to visit one of us to discuss your proposal in office hours (participation points will be awarded for this office visit) sometime between submission of your initial research question and the beginning of spring break. More details will be forthcoming.

Funding Panel

After you submit your final research proposal, you will be part of a panel to assess the worthiness of all proposals for funding. Part of your role will involve briefly presenting someone else's proposal to the rest of the funding panel. The quality and effectiveness of your effort and participation will be worth up to 25 points. Those few proposals selected for funding will earn the author bonus points. More details will be forthcoming.

Discussion/Lab Participation

Your participation in discussion/lab will be graded. Your participation consists of attendance, preparedness (Have you read the material? Did you retain enough to do well on a short quiz?), and contribution to appropriate discussion of the physiological topics at hand. Occasionally we will do short labs or problem sets and these may include a short, graded write-up as well. Once during the semester each student will come to lab prepared to lead the discussion on that day's topic. This means you will have read the assigned material and also found other relevant scientific literature that expands on the material for that lab/discussion period and relevant lectures. Bring a copy of one abstract from a related paper for the instructors. Again, more details and sign-ups forthcoming.

Short Seminar Write-Up (25 points of the lab/discussion grade)

During the semester you will write up a one to two page (typed and double spaced) summary of a seminar/scientific talk. Your seminar/talk attendance on campus should be relevant to this course and appropriately scientific. We will provide suggestions of appropriate seminars as the semester progresses.

This short write-up is due no later than end of April. Please contact the instructors if you have questions about the appropriateness of a specific talk you are considering attending.

In your write-up please address the following as best you can: What was the question being studied? What methods (be very brief) were used to collect relevant data? What were the relevant data? What conclusions did the presenter come to with respect to their initial question? Do you agree? Why or why not?

The information contained in the course syllabus, other than the grade and attendance policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.

	DAY	DATE	TOPIC	READING (from Hill et al. text unless noted)
	WEEK 1			
1	WED	16 January	Introduction, syllabus	Ch 1
	WED	16 January LAB	Introduction, brief field trip, assignments, sign-ups, etc.	Check out website when live
2	FRI	18 January	Membranes and Biological Compounds	Ch 2
	WEEK 2			
	MON	21 January	MLK HOLIDAY	
3	WED	23 January	Solute Transport and Water	Ch 3
	WED	23 January LAB	Physiology in Context, Evolution/Development Exercise	Lienhard et al. 2002 Ness and Williams 1998
4	FRI	25 January	Solute Transport and Water	Ch 3
	WEEK 3			
5	MON	28 January	Introduction to Nervous System	Ch 10
6	WED	30 January	Neurons	Ch 11
	WED	30 January LAB	Cotransporters and Ion Gradients Nernst and Goldman Exercises	Xx
7	FRI	01 February	Neurons	Ch 11
	WEEK 4			
8	MON	04 February	Synapses	Slowinski article, Ch 12
9	WED	06 February	Sensory Processes	Ch 13
	WED	06 February LAB	Specialized Senses Plan Receptor Field Experiment	Catania 2002, Barinaga 1999, Malakoff 1999
10	FRI	08 February	Sensory Processes	Ch 13
	WEEK 5			
11	MON	11 February	Sensory Processes	Ch 13
12	WED	13 February	Sensory Processes	Ch 13
	WED	13 February LAB	Touch Receptor Field Experiment and Report Prepare for 1 st Midterm	---
13	FRI	15 February	Exam 1 (covers information through 13 February)	---
	WEEK 6			
14	MON	18 February	Endocrine and Neuroendocrine Function	Ch 14
15	WED	20 February	Endocrine and Neuroendocrine Function, Reproduction	Ch 14, 15

	WED	20 February LAB	Hormones	Ulmann et al. 1990 Wingfield xx Mendes 2002 Hayes et al. 2002
16	FRI	22 February	No class, work on research proposal	---
	WEEK 7			
17	MON	25 February	Reproduction	Ch 15
18	WED	27 February	Muscle	Ch 17
	WED	27 February LAB	Muscle Muscle Experiment	Coyle 2005? Bonine et al. 2001?
19	FRI	29 February	Muscle	Ch 17
	WEEK 8			
20	MON	03 March	Muscle and Movement	Ch 17, 18; short toxins article
21	WED	05 March	Muscle and Movement	Ch 17, 18, 19
	WED	05 March LAB	Locomotion and Movement, Comparative Functional Anatomy in Amphibians	Dickinson et al. 2000
22	FRI	07 March	Respiration	Ch 20, 21
	WEEK 9			
23	MON	10 March	Respiration	Ch 21
24	WED	12 March	Respiration and Gas Transport	Ch 21, 22
	WED	12 March LAB	Comparative Aquatic Respiration Lab Prepare for 2nd Midterm	---
25	FRI	14 March	EXAM TWO (covers material since first midterm)	---
		15-23 March	SPRING BREAK	
	WEEK 10			
26	MON	24 March	Circulation	Ch 23
27	WED	26 March	Heart Function	Ch 23
	WED	26 March LAB	Respiration Lab Heart Anatomy	xx
28	FRI	28 March	Heart and Circulation	Ch 23
	WEEK 11			
29	MON	31 March	Circulation, Diving	Ch 23, 24
30	WED	02 April	Ionic and Osmotic Balance	Ch 25, 26

	WED	02 April LAB	Circulation Lab	Lillywhite 1988, Zapol 1987
31	FRI	04 April	Ionic and Osmotic Balance	Ch 25, 26
	WEEK 12			
32	MON	07 April	Kidney Function	Ch 27
33	WED	09 April	Kidneys and Deserts	Ch 27, 28
	WED	09 April LAB	Kidney + Excretion Lab Prepare for 3rd Exam	Xx
34	FRI	11 April	EXAM THREE (covers material since second midterm)	---
	WEEK 13			
35	MON	14 April	Bird Osmoregulation, Eldon Braun?	TBA
36	WED	16 April	Bird Physiology, Kevin Oh	TBA
	WED	16 April LAB	Research Proposal Workshop	---
37	FRI	18 April	No class, work on research proposals	---
	WEEK 14			
38	MON	21 April	Feeding and Nutrition	Ch 4
39	WED	23 April	Nutrition and Metabolism	Ch 4, 5
	WED	23 April LAB	Nutrition and Metabolism	Xx
40	FRI	25 April	Metabolism	Ch 5
	WEEK 15			
41	MON	28 April	Metabolism	Ch 5, 6
42	WED	30 April	Thermal Physiology	Ch 8
	WED	30 April LAB	Funding Panel	---
43	FRI	02 May	Ectothermy and Endothermy	Ch 8
	WEEK 16			
44	MON	05 May	Thermal Physiology	Ch 9
45	WED	07 May	Wrap Up	---
	WED	07 May LAB	Funding Panel	---
	FRI	09 May (11am-1pm)	CUMULATIVE FINAL EXAM	