Vertebrate Physiology (ECOL 437) Syllabus
fall 2003 (tentative)

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. This 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, and biochemistry would be helpful, but are not mandatory. Please talk to the instructors if you have concerns about your previous background.

Meeting Times
Lecture: Tues. and Thurs. in Haury 129 8:00–9:15
Discussion/Lab: in CBS/KOFL 410

Sect. 2 Wed. 9:00-10:50 OR
Sect. 1 Wed. 14:00-15:50
Please attend the discussion/lab section in which you are enrolled.

Instructors
Kevin E. Bonine, Ph.D. T.A.: Bret Pasch
office: BSE 1D (in the basement)
Office Hours: BSE 1D Tues. 9:30-10:30 Office Hours: TBA
                        Wed. 13:00-14:00 and by appt.
Tel: 626-0092, Home: 751-1349 (call before 9pm) Tel: TBA
kebonine@u.arizona.edu email: TBA

Course Materials
Reading Packet for Vertebrate Physiology, Fall 2003. Compilation of articles for discussion.
Both the text and the reading packet are available at the University Bookstore. Additional references and sources will be provided by the instructors and made available for photocopy or placed on electronic reserve.

Web Site
We will maintain a course website (http://eebweb.arizona.edu/Links/Classes.html) with announcements etc. Appropriate powerpoint lectures will likely be posted to the website the day after they are given. This site is still under construction as of 25 August 2003 but should be up and running soon.

Course Work
Lecture Exams (three midterms @ 100 pts each, final 150 pts) 450
Term Paper 200
Oral Presentation (and handout for peers) 50
Discussion Grade (participation, quizzes, assignments, etc.) 250
Short Article/Seminar Write-Ups (three @ 33.33 pts each) 100
Total Points 1050
Grading
Assignments are due no later than the beginning of lecture on the due date. Late assignments will be penalized at least 10% for each day they are late. 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):

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>≥ 90%</td>
<td>A</td>
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<tr>
<td>80-89%</td>
<td>B</td>
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<tr>
<td>70-79%</td>
<td>C</td>
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<tr>
<td>60-69%</td>
<td>D</td>
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<tr>
<td>≤ 59%</td>
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Any student with a documented disability who feels they may need academic adjustments or accommodation is requested to speak with the instructor by the 2nd week of class. All related discussions will remain confidential. Students should contact the S.A.L.T. Center for Learning Disabilities (Old Main, Room 135; 621-1242) or the Center for Disability Related Resources (2nd and Cherry; 621-3268) prior to discussions with the instructor. These offices will verify the need for special services.

Attendance
You are expected to attend each lecture and each discussion/laboratory session prepared and ready to contribute.

Class meeting suggestions:
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

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.

Term Paper
The term paper 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 paper. You will be graded in four stages: topic and annotated references (25 pts.), first draft (50 pts.), peer review/edit (50 pts.), and final submission (75 pts.). More details will be forthcoming in your discussion section.
Oral Presentation
After you finish your term paper, you will have the opportunity to tell your classmates about the information you compiled. This presentation will consist of a ten minute oral powerpoint presentation accompanied by a useful handout (1 piece of paper only) that will allow your peers to recall the important points from your presentation. More details will be forthcoming in your discussion section.

Discussion Participation
Your participation in discussion 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.

Short Seminar/Article Write-Ups (3x33.33 points)
You should attend two seminars/talks on campus that are relevant to this course. Write up a one or two page (typed and double spaced) summary of each seminar. We will provide suggestions of appropriate seminars as the semester progresses. One short write-up is due no later than 28 October, the other is due no later than our last lecture (09 December). Again, the topic must be physiological and appropriately scientific. Please contact the instructors if you have questions about the appropriateness of a specific talk you are considering attending.

Early in the semester (due 17 September in lab) you will write up a 2-page article summary. More details forthcoming in lab.
## Tentative Lecture Schedule

<table>
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<tr>
<th>Lect</th>
<th>DATE</th>
<th>TOPIC and (READING in Randall et al., 2002)</th>
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| 1    | AUG 26| Introduction to course and to vertebrate physiology \((\text{CH1})\)  
Overview of Krogh, hypotheses, methods, physiological state \((\text{CH2})\) |
| D1   | AUG 27| Introduction to primary literature, readings, article summary, term paper, oral presentation |
| 2    | AUG 28| Overview of solutions, biological molecules, etc. \((\text{CH3})\)  
Overview of membranes, channels, transporters, gradients \((\text{CH4})\) |
| 3    | SEP  2| Continue \(\text{CH4}\), begin Physical basis of neuronal function \((\text{CH5})\) |
| D2   | SEP  3| Put it in context: Lienhard et al. 1992, Nesse and Williams 1998 |
| 4    | SEP  4| Neuronal function, neuronal communication \((\text{CH5, 6})\) |
| 5    | SEP  9| Neuronal communication, sensing the environment \((\text{CH6, 7})\) |
| 6    | SEP 11| Sensing the environment, organization and evol. of the nervous system \((\text{CH7, 8})\) |
| 7    | SEP 16| Organization and evolution of the nervous system \((\text{CH8})\) |
| SW   | D4    | Cotransporter, Ion Concentrations; Pelis et al. 2001 \((\text{2-page write-up due})\) |
| P1   | 8 SEP 18| **Term Paper Topic and Annotated Reference List Due**  
Wrap up nervous function \((\text{CH5-8})\) |
| 9    | SEP 23| Glands and hormones \((\text{CH9})\) |
| D5   | SEP 24| Hormones; Ulmann et al. 1990, DeNardo and Sinervo 1994 |
| E1   | 25 SEP| Midterm Lecture **EXAM 1** (covers lectures 1-8; discussions 1-4; \(\text{CH1-8}\)) |
| 10   | SEP  30| Glands and hormones \((\text{CH9})\) |
| D6   | OCT  1| Exam 1 return, discuss term papers  
Acetylcholine receptors; Miyazawa et al. 2003. |
| 11   | OCT  2| Muscles and movement \((\text{CH10})\) |
| 12   | OCT  7| Muscles and movement \((\text{CH10})\) |
| D7   | OCT  8| Locomotion and movement; Wilson et al. 2002, Dickinson et al. 2000 |
| 13   | OCT  9| Muscles and movement \((\text{CH10})\) |
Behavior initiation, patterns, control (CH11); Term Paper First Draft Due

Behavioral control; Marler et al. 1999, Smith and John-Alder 1999
Integration of physiological systems – circulation (CH12)

Midterm Lecture EXAM 2 (covers lectures 9-14; discussions 5-8; CH9-11)
Circulation; Lillywhite 1988; review exam 2

Integration of physiological systems – circulation (CH12)
Gas exchange, acid-base balance (CH13); Seminar Write-Up #1 Due

Blood chemistry and buffering; Jackson et al. 2000
discuss term papers, return exams
Gas exchange, acid-base balance (CH13)
Ionic and osmotic balance, kidney function (CH14)
ELECTION DAY!
Drought effects; Henen et al. 1998

Ionic and osmotic balance, kidney function (CH14); Term Paper Draft for Peers
Veterans Day- no class
The depths and the heights; Zapol 1987, Gonzalez et al. 1990

Ionic and osmotic balance, kidney function (CH14); Term Paper Peer Review/Edit Due
Energy acquisition, digestion, metabolism (CH15)

Midterm Lecture EXAM 3 (covers lectures 15-21; discussions 9-12; CH12-14)
take-home portion as well - due tomorrow in lecture?
Energy acquisition, digestion, metabolism (CH15)

Energy expenditure (CH16)
T.B.A.

Thanksgiving (no lecture)
Energy expenditure (CH16)
Ramifications of altered environments; Mendes 2002, Hayes et al. 2002

Environmental challenges (CH17); Term Paper Final Draft Due

Environmental challenges (CH17), Seminar Write-Up #2 Due
(this would be a good day to get your powerpoint file to us)
OP  D16  DEC  10  Student Oral Presentations

FE  FE  DEC  16  FINAL EXAM (8:00–10:00; cumulative, more detailed emphasis on material since 3rd midterm)
**Reading List   ECOL 437  Vertebrate Physiology   Fall 2003   K.E. Bonine**

**Scientific American Readings are NOT in the reading packet, but will be made available on electronic reserve.**

03 Sept.

10 Sept.

17 Sept. (write up 2 page summary of this article and bring to lab)

24 Sept.

01 Oct.

08 Oct.

15 Oct.

22 Oct.

29 Oct.

05 Nov.

12 Nov.

03 Dec.