Introduction to Physiology
BIOL3030

https://www2.bc.edu/christopher-kenaley/bio3030

Meets: MW 12:00–3:15 pm (Higgins 225)
Dr. Christopher Kenaley (Instructor): Higgins 415 (office) or 535 (lab), email: kenaley@
Office Hours: By appointment (bring a donut)

This is an introductory course that surveys the major systems that comprise vertebrate physiology. In short, it is an exploration of how vertebrates do what they do. For you, the student, the ultimate focus may be on human physiology, but along the way, we will gain an appreciation that we owe nearly all of our physiological machinery to our vertebrate relatives. In other words, you’ll find your inner primate, mammal, tetrapod, and fish. Topics will include blood, bones, brains, and breathing, as well as energy metabolism, reproduction, and locomotion. The theme that will tie these topics together is how these physiological systems permit human and nonhuman vertebrates to succeed and thrive in difficult environments. While this is not a physiology and anatomy course, because our focus is on how vertebrates function, brief explorations of anatomy will often be crucial to understanding the physical, biochemical, and even molecular basis of physiology. To wit, as the famous physiologist Stephen Wainwright put it, “Structure without function is a corpse and function without structure is a ghost.”

For those students expecting a course devoted only to human physiology, this course will not disappoint. This is because by focusing beyond human biology, you’ll hopefully begin to understand that the vast majority of what we understand about our physiology is based upon comparative research in non-human vertebrates.

Course Requirements

**Textbook:** None, although I do have several copies of Hill, Wyse, and Anderson. 2012. *Animal Physiology*, Hill, 3rd ed. It may prove helpful.

**Additional readings and lecture files:** Additional readings drawn from the primary literature are available in the lecture schedule below and at this [link](#).

**Technical requirements:** Project work will require a laptop for slide design and data analysis.
Expectations

Students:

• You, the student, are responsible for reading and adhering to all aspects of the course syllabus.
• Your are responsible for organizing study time, completing assignments, readings, and taking exams and quizzes.
• You must be aware of your own progress in the course.
• It is up to you to pursue help and guidance when you feel you need it.
• Attendance is your responsibility. You accept consequences of not attending class.
• You must be respectful and courteous to your colleagues and professor. Disruptive or disrespectful behavior during class of any sort is unacceptable.
• You must be willing to be challenged.*

*Physiology is a very challenging field—it’s often technical and integrates concepts from nearly all disciplines in the natural sciences from physics to ecology. When challenged by the material, quizzes, or exams, see it as an opportunity to learn, not a risk to your GPA.

The professor and teaching assistants:

• We will challenge students intellectually to broaden their understanding of vertebrate physiology.
• We will make expectations clear in the form of this syllabus and course announcements made in class and over email.
• We will be consistent and quick in grading assignments.
• We will be available to help and discuss outside of class during office hours.
• We will value your time by beginning lectures promptly at 12:00 and ending at 3:15.

Assessment and Grading

You will be assessed based on two exams, 5 weekly quizzes, and a project presentation. The points assigned to each are:

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<thead>
<tr>
<th></th>
<th>Points each</th>
<th>%total</th>
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<tbody>
<tr>
<td>Exam I</td>
<td>150</td>
<td>30%</td>
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<tr>
<td>Exam II</td>
<td>150</td>
<td>30%</td>
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<tr>
<td>Weekly quizzes</td>
<td>100</td>
<td>20%</td>
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<tr>
<td>Phys project &amp; PK presentation</td>
<td>100</td>
<td>20%</td>
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<tr>
<td>total</td>
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Exams: There will be exams worth 150 points each. There will be no final exam. Baring emergency or serious and documented illness, no makeup exams will be administered.

Exams will be a combination of multiple choice and short answer and written to simultaneously assess your knowledge of physiology and critical analytical skills. In other words, exams won’t be mere regurgitations of facts. You’ll be expected to assess material written and often presented in a style one might find in a scientific paper (e.g. interpret data from a figure). Although the topics and concepts won’t be a surprise, students should also expect to be asked questions they haven’t seen before.

Nota bene: When an exam is being taken, students should try to be courteous and respect that others in the crowded classroom are working hard. Therefore, there is an expectation that students shall refrain from asking unneeded questions. The expectation on my part will be that the exams will be clear and concisely written.

Weekly quizzes: Online quizzes are due on Fridays by 5:00 pm. Each student is responsible to take and submit 5 of the 6 quizzes through Google Docs. Each quiz is worth 20 points for a total of 100 points toward the final grade. Quizzes submitted late (i.e., 5:01 or later) will not be accepted for credit. This policy applies with no exceptions, reasons related to travel, technical issues, personal conflicts included. Please don’t wait until the last minute to submit your quiz answers. Although the Google Docs platform is intuitive and robust, don’t let unforeseen technical issues derail an on-time submission. Quizzes are open book and open note; however students should take the quizzes individually. These quizzes will cover the previous lecture material.

The “Phys” project and PK presentation: This assignment requires you to work with a classmate as a team of two to observe physiology in action and give an oral presentation called a Pecha Kucha (PK) to lead a class in the discussion of a that particular physiology. Students will be given one of five topics to explore:

- Cardiorespiratory responses to exercise.
- Longevity, activity, and senesce
- Communication and sensory physiology
- Muscles at work
- Food and fuel

The goal will be to observe vertebrate physiology in action, record some data, and then use these data to launch an exploration of one of these topics. The first day of class, Prof. Kenaley will provide explicit details as to what how you should approach your topics.

For help in designing and giving your PK presentation, see this PK Guide. The Phys project and PK presentation is worth a total of 100 points. PK presentations are defined by 20 slides with 20 seconds devoted to each one for a total of 6 min and 40 s. Your topic should be chosen based on one of the peer-reviewed research papers that have been assigned and read on or before your
presentation date. Your task is to read one of these papers before your presentation and let that paper be a launching board for a more broad treatment. The goal of the presentation is to tell us something interesting about your topic. YOU will be leading the class for 6:40 min.

Each presentation must be given by 2 contributors. Because there’ll be 20 slides and 2 presenters, each contributor to that topic should present 10 slides. However, points will be awarded to each presenter based on the overall quality of the presentation in addition to his his/her individual contribution. Additional Phys project guidelines and a rubric for assessing the PK will come soon in the term.

Grading: Unless the assessment scores (not considering the PK presentation) are well below a “normal” mean score for such a course (80%, say), they will not be graded on a curve. The following schedule outlines what an overall score on a percentage basis may earn a student:

- A >93%
- A- 90–92%
- B+ 88–89%
- B 83–87%
- B- 80–82%
- C+ 78–79%
- C 73–77%
- C- 70–72%
- D+ 68–69%
- D 63–67%
- D- 60–62%
- F <60%

Review session Policy

Every class, we’ll take a break to check in and open the class to questions. This is not meant to be a redelivery of lecture material, but rather a chance to ask pointed, specific questions. For instance, we’ll try to avoid questions like, “Can you explain how the mammalian kidney works?” But, this is welcome, “In which part of the loop of Henle are salts actively pumped into the medulla?”

Academic Integrity

Prof. Kenaley takes academic integrity very seriously. All students in the class are expected to adhere to BC’s policy concerning academic integrity. You should be familiar with this policy: www.bc.edu/integrity. Any suspected violations will be handed over to the Dean’s office for immediate inquiry. This policy applies equally to exams, weekly quizzes, PK evaluations, and in-class quizzes. Specifically, answering in-class quizzes and PK evaluations outside of class is forbidden and considered a direct violation of our integrity policies.

Disability Accommodation

Students with a documented disability seeking reasonable accommodation in this course, please contact Kathy Duggan, dugganka@bc.edu or 617-552-8093 at the Connors Family Learning Center, or Paulette Durrett, paulette.durrett@bc.edu or 617-552-3470 in the Disability Service Office regarding all other types of disabilities. More information can be found here.
All students requiring accommodation should remind Prof. Kenaley of the accommodation required via email 1 week before each exam.

**Email and Office Hours Policy**

If you write Professor Kenaley with a question, he’ll try to get back by the end of the next business day. This means questions written on a Friday or weekend will get a response by the end of Monday (unless it’s a holiday). If you don’t receive a response, it’s likely because the answer to your question is available in the syllabus or was addressed in class. Thus, be sure that questions related to course mechanics aren’t addressed here.

Office hours are not meant to be a redelivery of lecture material, nor is it meant to be devoted to the questions of one or a very few curious students. Please come equipped with poignant questions and expect that other students have questions as urgent as yours. If you can’t make office hours and your questions are **urgent**, please come by our offices. If the door is open, please knock. If it’s closed, your professor is busy or away.
# Lecture Schedule

Abbreviations: HWA = Hill, Wyse, Anderson; CHS = Cartmill, Hylander, Shafland; WQ = Weekly quiz, PK = Pecha Kucha presentation

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<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>#</th>
<th>Lecture Topic</th>
<th>Readings</th>
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<tr>
<td>1</td>
<td>May 16</td>
<td>1</td>
<td>Introduction, policies &amp; “Why comparative physiology?” Vertebrate form, embryology</td>
<td>CHS 3-32; LiveScience Zebrafish article; Nakamura et al. 2016; HWA Chapter 1</td>
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<td>2</td>
<td>May 21</td>
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<td>Phys project data collection</td>
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<td></td>
<td>May 23</td>
<td>2</td>
<td>Nervous system; Musculoskeletal tissues</td>
<td>Eckert Ch. 5, HWA 397-409, 295-303, 309–312, 320–323, 327–332, 341–344</td>
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<td>3</td>
<td>May 28</td>
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<td>No class, Memorial Day</td>
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<td>May 30</td>
<td>3</td>
<td>Bone and muscle physiology; Feeding and fuel</td>
<td>HWA 523–541; 127–141, 144–149, 155–159</td>
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<td>June 6</td>
<td>5</td>
<td>Exam I; Thermal relations; Circulation; Diving physiology</td>
<td>HWA 225–226, 250–270, 227–250; 658–670; 647–652; 679–691</td>
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<td>5</td>
<td>June 11</td>
<td>6</td>
<td>Deep-sea Physiology; Osmoregulation; Sex and Reproduction</td>
<td>HWA 117–119, 699–703, 717–735; 753–757; 761–777; 455–48, Box 17.2 on p. 476;</td>
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<td>June 13</td>
<td>7</td>
<td>Brain and Senses</td>
<td>HWA 359–372; 381–395; 401–409;</td>
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<td>6</td>
<td>June 18</td>
<td>8</td>
<td>Aging; Human health and evolutionary medicine</td>
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<td>June 20</td>
<td>9</td>
<td>Exam II; Phys project Presentations</td>
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