**COMPARATIVE VERTEBRATE ANATOMY**

# Syllabus Spring 2019



*I am a frayed and nibbled survivor*

*In a fallen world, and I am getting along.*

*I am aging and eaten and have done my share*

*Of eating too. I am not washed and beautiful,*

*In control of a shining world in which everything fits,*

*But instead am wandering awed about on a splintered wreck*

*I’ve come to care for, whose gnawed trees breathe*

*A delicate air, whose bloodied and scarred creatures*

*Are my dearest companions, and whose beauty beats and shines*

*Not in its imperfections but overwhelmingly in spite of them.*

*Annie Dillard*

**Instructor:** Dr. Jennifer Dearolf **Office:** DW Reynolds 230

**Professor** **E-mail:** [dearolf@hendrix.edu](mailto:dearolf@hendrix.edu)

**Phone:** 450-4530 **Office Hours**: Tuesdays 8:00-9:45,

Wednesdays 12:00-1:00,

or by appointment

**Class Meetings:** Lecture TR 9:45-11:00

Lab R 1:10-4:00 **OR**

Lab TR 2:10-4:00

**Required textbooks:**

**Kardong KV. 2019.** Vertebrates. Comparative Anatomy, Function, and

Evolution. 8th edition. McGraw-Hill Education.

**Zalisko EJ, Kardong KV. 2019.** Comparative Vertebrate Anatomy: A Laboratory Dissection Guide. McGraw-Hill Education.

**Suggested supplies:** Ring binder, sketchbook, and colored pencils

**Class website:** http://homes.hendrix.edu/dearolf/biol440.html**Grades and Grading:** Your grade will be based on the results of a) lecture and lab examination scores, and grades for your b) illustrated study guides, c) lecture assignments, d) research paper, e) final project, and f) take home final exam as follows:

3 Lecture exams 300 points

3 Lab practicals 300 points

3 Illustrated study guides 75 points

Lecture assignments 75 points

Research Paper 125 points

1 Final project 150 points

1 Take home final exam 75 points

A = 985 – 1100 pts; B = 875 - 984 pts; C = 765 – 874 pts; D = 655 – 764 pts; F = < 655 pts

**Course goals:**

1. to learn and use comparative methods to understand patterns of evolution, function, and development of the vertebrates
2. to gain insight into the vertebrate body plan using comparative dissection techniques
3. to become an accomplished dissector

**More Details about Grades and Grading:**

Lecture Exams: There will be three lecture exams, each with a value of 100 points. Each exam will consist of a short, short answer section, a short answer section, and an essay section. Within each section, you will have choices as to which questions you will answer. Each exam will cover all material introduced in lecture for that exam period and material in the relevant textbook chapters. Tests will be **administered in class at the scheduled time.** **No early or late exams will be given**, except for students that miss a test because of official university activities. I must receive official notification of the event, and the make-up test must be scheduled **before** the scheduled test date. The only other exception will be for students with valid excuses (e.g. illness with a note from a doctor or nurse).

To keep us all on the same page, I will write on the board the pages of the textbook that you should read for the next class. I will leave time in the class period before the scheduled exam to answer questions that you have about ANY material, but you will need to come to class prepared with questions. If no one puts his or her hand up and asks questions, I will move on to the day’s scheduled topic.

Lab Practicals: There will be three laboratory practical exams, each with a value of 100 points, and they will be given during the lecture meeting time. Specimens and slides will be left out for you to study. **There will be NO makeup lab practicals!**

Illustrated Study Guides: To help you prepare for the lab practicals, you will produce three illustrated study guides, and each study guide will be worth 25 points. For each laboratory meeting, you will be provided with a list of the specimens or slides which you will either draw and label or photograph and label. At the beginning of each lab practical, you will turn in the study guide you created for each test.

Lecture Assignments: There will be three lecture assignments, each with a value of 25 points. These assignments will consist of worksheets that will help you focus in on the important details covered in some chapters of the textbook. You will receive these worksheets in class before you are asked to read specific material in the textbook. You will complete these worksheets as you read and have them completed by the next lecture meeting. These assignments will help you be prepared for each day’s lecture material and will serve as study guides for the exams. You will also turn them in at the end of the next lecture for them to be graded and returned to you.

Research Paper: To learn more about a topic in vertebrate anatomy, you will write a five to ten page (double-spaced) paper. It will need to be written in a scientific style and include at least five references. However, if you only choose to include five references, only one of those references can be a website. To help you prepare your paper, you will be turning in an outline and five references on **January 29** (5 points), and a rough draft on **February 19** (20 points). The final draft of your paper will be due on **April 4** and will be worth 100 points.

Final Project: During the last two lab periods of the semester, you and a partner will be working on a project. You will select a vertebrate that was not covered in the course and dissect it in order to create a dissection guide. The available vertebrates will be: stingrays, salamanders, lizards, snakes, turtles, chickens, minks, and rabbits. As you dissect your chosen vertebrate, you will compare it to the other vertebrates that you dissected in the course, and you will include these comparisons in your dissection guide. You will also be expected to include labeled drawings, photographs, or both. You will present your dissection guide to the rest of the class during the Final Exam period (Wednesday, May 1). The dissection guide and presentation will be worth 150 points.

Take Home Final Exam: To assess your understanding of the material in this course and your ability to apply what you have learned, you will complete a take home final exam. You will be given the exam on the last day of class, and it will be due on the last day of Final Exams, Wednesday, May 8 by 5 pm. You will be able to utilize your notes, handouts, and reference textbooks to answer these questions. However, you will NOT be able to ask other students in the class about their answers, and you will not be able to use any professor, including myself, as a resource. The take home final will be worth 75 points.

**Attendance Policy:** To do well in this course, you must be here, both in body and in mind. There will be no make-up exams given unless you have a doctor’s excuse for a serious medical situation or you are carrying out official College business.

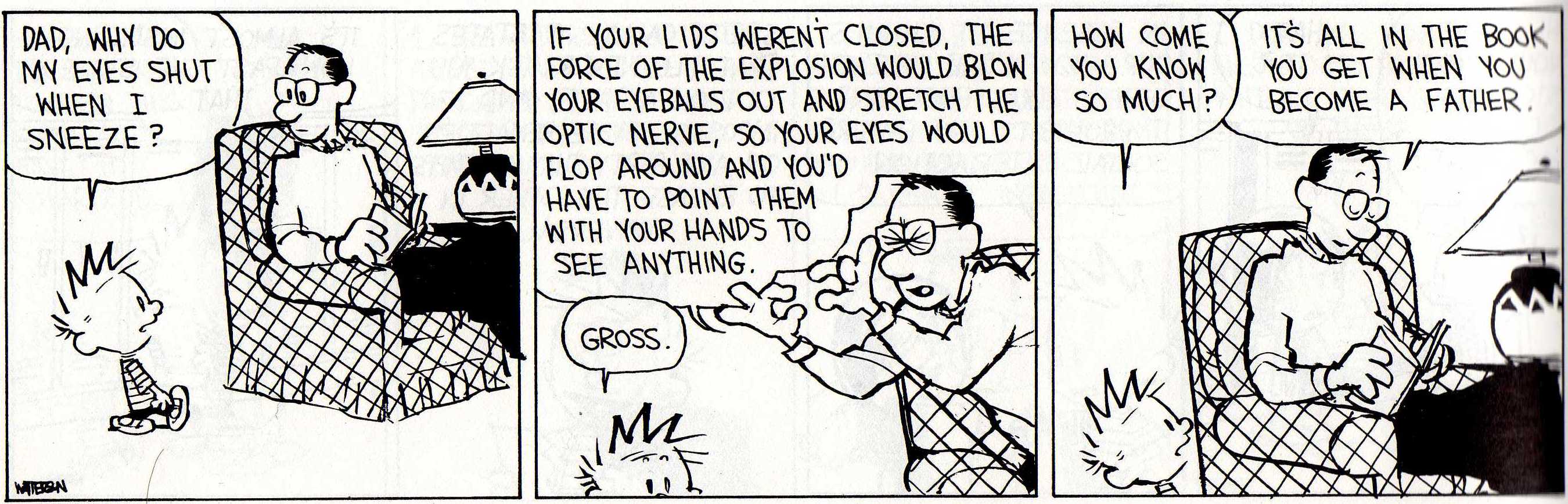
**Laboratory Procedures:** First and foremost, I would like to emphasize some of the ethical considerations that must be made when dissecting vertebrates. As many of you are aware, there are people who object to the use of animals in teaching and research, and these uses even include the preserved specimens that you will be working on in this course. Please take some time to think about these issues and how they will impact your work in the lab. Primarily, I hope these ideas will influence how you approach your dissections. **Be professional!**

To reiterate this point, **you are not on a “Search and Destroy” mission to find anatomical structures**. Most of the dissection work in this course can be accomplished with a blunt probe, not a scalpel. Finally, **your specimens will be used in the lab practicals**, so neatness counts.

**Academic Honor Code:** Hendrix College is committed to high standards of honesty and fairness in academic pursuits. Such standards are central to the process of intellectual inquiry, the development of character, and the preservation of the integrity of the community. It is required that all instances of academic dishonesty be reported to the Committee on Academic Integrity. Please familiarize yourself with the college’s statement of Academic Integrity, which can be found at:

<https://www.hendrix.edu/Catalog/2018-2019/Academic_Policies_and_Regulations/Policies_and_Appeals/Academic_Integrity/>

**Students with Disabilities or Special Needs:** It is the policy of Hendrix College to accommodate students with disabilities, pursuant to federal and state law.  Students should contact Julie Brown in the Office of Academic Success (505-2954; [brownj@hendrix.edu](mailto:brownj@hendrix.edu)) to begin the accommodation process.  Any student seeking accommodation in relation to a recognized disability should inform the instructor at the beginning of the course.



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# TENTATIVE LECTURE SCHEDULE

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| **Date** | **Major Topics and Concepts** | **Readings (Kardong)** |
| Jan 15 | Introduction and Concepts and Chordate Characters | (Chap 1 &  Chap 2) &  handout |
| Jan  17 | Chordate Characters and Origins | (Chap 2) |
| Jan  22 | Vertebrate Characters: Cranium, Epidermal Placodes, and Vertebrae | (Chap 3) |
| Jan  24 | Integument: Fur and Feathers | (Chap 6) &  handout |
| Jan  29 | Dentition: Development and Anatomy  **(*Due: list of five citations and outline of paper*)** | (pgs. 507-517) &  handout |
| Jan  31 | Skeletal Elements: Bone Development | (pg. 182-187) |
| Feb  5 | Skeletal Elements: The Skull | (Chap 7) |
| Feb  7 | Skeletal Elements: The Skull Activity | (Chap 7) |
| Feb  12 | LECTURE EXAM #1 |  |
| Feb  14 | Skeletal Elements: The Axial Skeleton | (Chap 8) |
| Feb  19 | Skeletal Elements: The Appendicular Skeleton  **(*Due: Rough draft of paper for non-graded review*)** | (Chap 9) |
| Feb  21 | **LAB PRACTICAL #1** |  |
| Feb  26 | Vertebrate Locomotion: Muscle Development | (Chap 10) &  handouts |
| Feb  28 | Vertebrate Locomotion: Muscle Development cont. and Functions | (Chap 10) &  handouts |
| Mar  5 | Biomechanics I: Walking and Running | (pg. 353-358)  handouts |
| Mar  7 | **LECTURE EXAM #2** |  |
| Mar  12 | Biomechanics 2: Walking and Running cont. | (pg. 353-358)  handouts |
| Mar  14 | **LAB PRACTICAL #2** |  |
| Mar  19 | NO CLASS – SPRING BREAK |  |
| Mar  21 | **NO CLASS – SPRING BREAK** |  |
| Mar  26 | Biomechanics 3: Powered flight | (pg. 358-367)  handouts |
| Mar  28 | Biomechanics 4: Swimming | (pg. 349-350; 392-394; 398-399) &  handouts |
| Apr 2 | Circulation 1: Hearts | (Chap 12) |
| Apr 4 | Circulation 2: Hearts Cont.  **(*Due: Final draft of paper*)** | (Chap 12) |
| Apr  9 | Circulation 3: Aortic Arches | (Chap 12) |
| Apr  11 | Circulation 4: Aortic Arches Cont. | (Chap 12) |
| Apr  16 | Ventilation 1: Gills and Gas Bladders | (Chap 11) |
| Apr  18 | **LECTURE EXAM #3** |  |
| Apr  23 | Ventilation 2: Lungs | (Chap 11) |
| Apr  25 | **LAB PRACTICAL #3** |  |
| May  1 | **FINAL PROJECT** – Wednesday, May 1st – 8:30-11:30 am |  |
| May  8 | **TAKE HOME FINAL** | Review  Everything |

# LABORATORY SCHEDULE

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| **Date** | **Major Topics and Concepts** | Readings |
| Jan  17 | Chordate Diversity  Protochordates and Agnathans | Handouts  Chaps 2 & 3 |
| Jan  24 | Agnathans: Lamprey Dissection  Integument and Dentition | Chaps 2, 3, 4, & pages 84-88 |
| Jan  31 | Vertebrate Skeleton 1: Skull and Axial | pgs. 67-84 &  43-52 |
| Feb  7 | Vertebrate Skeleton 2: Forelimb and Hindlimb | pgs. 61-66 &  52-61 |
| Feb 14 | Muscles 1: Forelimb muscles – cat  Muscle origins, insertions, and functions (handouts) | pgs. 106-109; 112; 115-124 & handouts |
| Feb  21 | Muscles 2 – Forelimb muscles – pigeon  Muscle functions (handouts) | Handouts |
| Feb  28 | Muscles 3 – Hindlimb muscles – cat and frog  Muscle origins, insertions, and functions (handouts) | pgs. 125-131 & Handouts |
| Mar 7 | Muscles 4 – Trunk and axial muscles – cat and shark  Muscle origins, insertions, and functions (handouts) | pgs. 109-112; 91-99; & Handouts |
| Mar 14 | Circulation: Hearts and major vessels – shark, frog, and cat | Handouts; & pgs. 147-155; 162-165 |
| Mar 21 | **SPRING BREAK – NO LAB!** |  |
| Mar 28 | Nervous system 1: Brain and spinal nerves  Nervous system 2: Forelimb nerves and blood vessels - cat | pgs. 197-205; & handouts |
| Apr  4 | Nervous system 3 – Hindlimb nerves and blood vessels – cat  Thoracic and abdominal cavities – cat | Handouts; & pgs. 142-146; 182-186 |
| Apr  11 | Urogenital systems 1 and 2: Male and female cats and sharks, including pregnant cat and shark | pgs. 142-146; & 182-186; 174-179 |
| Apr  18 | Work on Final Project |  |
| Apr  25 | Work on Final project |  |

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