

# COMPARATIVE VERTEBRATE MORPHOLOGY

Lecture (lab at the end)

BIOLOGY 350 PROF. DR. A. JASLOW TERM I 2006-2007

Office: FJ-138E, Phone: 843-3602; home 272-7148 before 9:00pm;

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I can be seen by appointment outside of office hours.

Assigned Readings are to be done before the lecture on the assigned topic. Specific points, material or concepts to learn well from readings will be outlined in class. Attendance required. More course details at the end of this document.

H=Hildebrand 5th ed.; W=Walker 9<sup>th</sup> ed;

Other important reading assignments are on the lab syllabus.

Assigned quizzes will be at the start of class

Topics will be in the following order, if not the following dates.

## I. Introduction and The Importance of Morphology and How its Done

### AUGUST

- Wed 23 Introduction to the Course and Vertebrates, "Who? What? When?" [Readings: H:1,2,3\*,4\*  
\*(details of structure from lab), W:1,2,3(skim for lab); fig. W:3-1 is an important illust. for  
the whole class]
- FRI 25 Current Approaches to the Study of Vertebrate Morphology;

- Mon 28 Approaches and Definitions, Continued; [Readings: same as above]
- Wed 30 **Quiz I.** followed by.....Approaches; Continued [Readings: same as above]

### SEPTEMBER

#### *{Labor Day Mon 4<sup>th</sup>}*

- Wed 6 Vertebrate Embryology: : "The AMA and Vert. evolution says large amounts of Yolk are to be  
avoided" [Readings: H:5]
- FRI 8 Embryology, Continued

## II. Hard Structures: Skeleton and Integument

- Mon 11 "Swimming First!" Axial Skeleton Readings: Axial trunk H:9;141-154
- Wed 13 **Quiz II.:** Appendicular Skeleton: "Rear-Wheel and 4-Wheel Drive [Readings: H:9; 154-166: W:6  
;thin type (1<sup>st</sup> text of chapter and at start of each taxonomic section.)
- Mon 18 Skull: That's 3, 3, 3 Head Skeletons in One. [Readings: H:8; H:30; feeding]
- Wed 20 Skull Continued; Gill Arch Homologies
- Mon 25 Skull Continued; Skull Changes in Evolution re: feeding and hearing; "Chewing with earbones"  
[Readings: H19: middle ear pp352-358; W: 4;thin type: W: 8: 197-199, 201]
- Wed 27 **EXAM I**

### OCTOBER

- Mon 2 Integument, Dermal Bone, "I've got a fish scale stuck in my mouth" [Readings: H:6; 83-92; H:7; teeth H:30;
- Wed 4 Integument Continued, Keratinized Structures: "Hairs, Scales(epidermal), and Nails." [Readings: H:6; 92-101] some illustrations and discussion  
H figures 26.10, 26.12, 26.13]

### III. An Engineering Approach to the Study of Morphology

- Mon 9 Biomechanics, 1<sup>st</sup>
- Wed 11 Biomaterials: "Mucus and Mozzarella Cheese" [H: 21; 383-390; 392-402; fig 6-3] [H:23]

*{Fall Break Oct 14-17}*

- Wed 18 Biomechanics: Continued
- FRI 20 **Quiz III.** Biomechanics Continued "Put it in Motion" [Readings H:22; 405-413]
- Mon 23 Biomechanics Continued "Put it into High Gear" [Readings H: 24; 431-447 ; H25; 462-468]
- Wed 25 Biomechanics Continued: "Tendons and Ligaments" [H: 21; 390-392] [H:22; 413-417]

Mon 30 **EXAM II**  
NOVEMBER

### IV. Soft Systems: Plumbing, Ventilation, & Wiring

**And Respiration and circulation as it relates to CPR [Readings: H:13, ventilation pp,243-244, 248, H14; heart flow and structures ]**

- Wed 1 finish Biomechanics, start CPR, emergency first aid, and morphology I  
Circulation and Respiration, general morphology, CPR and first aid. [review core level, human hear structure and blood flow, major arteries, pulse, chest and abdominal anatomy, organs, head/neck/throat anatomy, palate. Review CVM axial trunk skeleton, sternum, ribs, attachments.] [figs W: 10.15, 10.16, 10.17, 11.15]
- Mon 6 CPR, First Aid. Respiration and evolution.
- Wed 8 Comparative Respiration, Start Circulation "Unifying patterns of vessels" [H: 13, 14]
- Mon 13 Circulatory Systems Heart shunts, aortic arches
- Wed 15 Major Veins
- FRI 17 Nervous System [H:17; 18; read quickly for topics, reread after topic covered  
Nervous System [same readings]
- Mon 20 **Quiz IV.** NS, Brain, CNS

*{Thanksgiving Break, Nov. 22-26<sup>th</sup>}*

- Mon 27 Brain and NS [same as above]
- Wed 29 Urogenital System, Go with the Flow and Water Conservation. [H:15;271-275;]

DECEMBER

Mon 4 UG system Con'd; Reproduction and SEX [ H 16; 289-296]  
Wed 6 Finish systems.

EXAM

TUE 12 1:00pm, EXAM III AND CUMMULATIVE as defined in class  
Take-home QUIESTION(S), IF ANY, due earlier, TBA

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GENERAL COURSE GOAL

**To UNDERSTAND Vertebrate Anatomy/ Our Anatomy**

DURING THIS COURSE YOU WILL ANSWER THE FOLLOWING QUESTIONS AND MANY MORE!

What is a vertebrate?

What general vertebrate body plans exist?

How can I see in my own body anatomy as related to a past evolutionary history?

How can I understand my own body structure in terms of function.

SPECIFIC COURSE GOALS

- 1) To Learn some vertebrate structures.
- 2) To learn some development of this structure.
- 3) To study some of the evolution of this structure.
- 4) To study some of the function of this structures
- 5) Finally, to learn a little about how all of the above are studied.

GRADING [approx. % of course total]

1/2 of your grade will be based on non-practicals (mainly from lecture or non-lab activities)

4 Quizzes . at the start of a lectures (20 pts each, drop 1) [2.7% each]	60pts
3 1-hour lecture exams (100pts each) [13.9% each]	300 pts
Class Participation (discussion and attendance)	(up to -20 points)

1/2 of you grade will be based on laboratory practicals

9 practicals, of equal value. (one may be dropped) [6.25% each]	
9 dissection inspections (minus points possible for each)	(up to -20 points)

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Course Specifics, General

2 lectures/ most week (with exams and additional meetings it works out to average 2.3 lectures /week)

Assigned readings are from two required texts or on-reserve-material. Readings are assigned on a handout and in lecture. You will be expected to have read assignments **before** the appropriate lecture topic and some quiz questions will be on assigned reading.

Please bring any questions about material on assignments to me as soon as you have them.

Whenever possible, I will focus which points, topics, or concepts to know in detail from the readings. Nonetheless, all assigned readings are expected to be done on time.

USE THE BOOK Indexes and glossaries to find definitions or to answer questions you might have on different topics or terms.

Notes are your most important tool for the lecture part of this class. Work hard to take notes and to rewrite or edit them following each class. Borrow notes from others to help you refine an excellent set of notes. Be sure to refine these excellent notes on a weekly basis to allow weekly study. Get any questions answered regarding lectures on a weekly basis. DO NOT WAIT until just before the exam. At this point in your studies you should be integrating information at a higher level, than simply learning definitions and homologies, for example

Exams will be given on a third lecture period reserved for the course during exam weeks.

Lecture exams will cover all topics and material given in lecture, and focus topics/concepts/points from assigned readings. Terms and topics not covered in lecture or assigned as a focus from readings will not be covered on exams. The questions at the end of each section outline are not the only questions you will find on exams. Be sure to do assigned readings for detailed examples and explanation of assigned topics!

2 lab periods/week with supervision at least 6 hours/week over two sessions. You will be expected to come in on your own or to stay late as needed, to cover assigned dissections or to study. Some years this means two two+ hours sessions (tue and fri) with some evening work. For some it will be 3hr on Tue + practical on Fri and any instructions + evening work.

What pages to work from and what terms and concepts to learn will be communicated by a series of handouts that are themselves used to annotate your copy of the dissection guide. In all but a few exceptions this will require

working from your annotated text. Therefore annotations must be made before coming to class. Lab assignments will include reading of sections for understanding and context (often small font text paragraphs) as well as reading for directions in finding or dissecting structures. Don't work just from pictures or just from one section to learn a structure if it is discussed in several sections of assigned pages. Also DO USE other books (ref's in lab) and illustrations to help you learn how to find structures using anatomical language.

Lab Practicals will cover announced TERMS, STRUCTURES, ORGANISMS, HOMOLOGIES, AND STRUCTURES' FUNCTIONS (ALSO on specific labs; Muscles: origins, insertions, type; Skeleton: developmental type; Others as assigned).

Open labs. Your name will be given to security the first week of class to allow you access to the lab on your own. Contact security to let you into FJ at any time. You will have a combination and access to the the lab (FJ 117w) at anytime except some times (some nights and mornings) before practicals. The open lab policy is possible only as long as the lab is kept, clean and materials moved are returned to where they are found or kept. **PLEASE DO NOT PROP OPEN FJ OR THE LAB DOORS!**

Equal Lab Participation by a lab group. Some lab materials will be shared by two students in each lab group. For example all of our dissections will be done by partners. You are expected to contribute equally to the care and maintenance of your materials, as well as the physical work of dissection. Class members will be asked at the end of the class to evaluate the percentage of work that each member of a pair contributed. Lab dissection points may be influenced by these pledges. The work does not all have to be done together. Both members do not have to be present for all dissection work. (see form that asks students to evaluate equal participation, added at the end of the lab syllabus.)

Attendance in lecture and lab is required. We cover a lot of material and have a number of evaluations. It will not be possible to make up some missed work. Missing class without permission will result in a lowered total class point total. Missing more than two lectures or one lab without permission will lower your grade one half letter grade for every day over two. Please consult with me in advance if you have a reason to miss a class meeting. In case of illness or emergency please contact me with-in 24 hours regarding a missed class meeting.

Pictures are critical. Your two texts have many figures and these are the ones, I'll use (mostly) on the board. However, it is easier to learn and sometimes critical to draw your own versions as I'm drawing on the board. Drawings will help you think and visualize in three dimensions.

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I support the honor system at Rhodes and assume that all exam and practical work is done as assigned and individually. You are welcome and encouraged to study in groups for exams and practicals. Dissections are done in pairs, however, you will no doubt work on dissections individually from time to time. In fact this is usually a requirement during some periods of independent study and work. However for each course section you and your partner are required to have participated equally in dissection work and will be asked to pledge to this fact.

These comments are to make sure everyone knows how a course grade will be determined, and what material will be evaluated. (There are a variety of specific procedures and protocols for lab that will be discussed in lab.)

Have fun and enjoy the course, I hope you have many questions answered, doors opened, and more questions stimulated.

# COMPARATIVE VERTEBRATE MORPHOLOGY

Laboratory only, also see lecture.

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Reading in general below. But specific responsibilities will be on a series of lab "annotations" handouts, that will allow you to annotate your dissection guide and to read assigned readings before the appropriate lab session. See attendance policy, equal work requirement, and other lab expectations in the general course comments page 3-6 attached to the "lecture" syllabus.

Read for introduction, context, evolutionary perspective, before class.  
small text, intro and evolutionary discussions.

## AUGUST

Fri 25 I. Taxonomy and Systematics II. Amphioxus and Lamprey  
[W: (chapters)1-3, H: (chapters)2-4] Use our dendrogram too.  
(but remember some different names used here, same animals and relationships/

### Early Lab Skeleton Work: for lab. starting 2nd lab meeting!

In Lab we will be learning and studying the skeletal elements.

Scan H: Chapters 21-28. We will read some of these in detail in a later section. For now read them to see comparisons of animals from the same order with skeletal adaptations for different ways of life. Note that thicker/longer/fewer bones might be found in animals with different modes of locomotion or adaptations. Use the lab handout of relevant illustrations and additional assigned readings.

LONG BONE GROWTH; H: fig. 9.24 and text 161-162.

Tue 29 Axial Skeleton; Vertebrae and Ribs [W: 5, allthin text and intro text]

## SEPTEMBER

Fri 1 Practical I(covers taxonomy and adaptations/dendrogram).  
Lab: start cat appendage bones and put in 3hrs time today (or other) before Tue.

Tue 5 Lab: Appendicular Skeleton, Cat Long Bones, hands and feet.

Fri 8 Practical II (covers axial skeleton-trunk).  
Lab: start cat skull and put in 3 hrs time today (or other) before Tue.

Tue 12 Skull

Fri 15 Practical III.>> (covers appendicular skeleton)Lab:  
Finish skull, Intro. to Fish Axial and Appendicular Musculature

**Muscles and Musculature** Text info.from lab introductions and from readings only, not much will covered in Lecture from these readings

H: 10 (not for names of ind. muscles) especially, Fig 10-7

W: 7; thin type and as you do lab

Tue 19 Lab: Skin Cat and Start on Muscles I (Abdominal Series) [W: 7]

Fri 22 Practical IV. (covers skull, axial skel. Head)  
Lab: Continue on Muscles (dissect through the Gluteus Series). [W:7]

Tue 26 Lab: Cat Muscles Con'd. (dissect through Gastrocnemius Series) [W:7]

Fri 29 Lab: Cat Muscles Con'd. (dissect shank through Pectoralis Series) [W:7]

OCTOBER

- Tue 3 Lab: Cat Muscles Con'd. (dissect Shoulder and Neck). [W:7]  
 [Fri 6 Library Day], On you own before Monday, Skin Shark and Cat Head,
- Tue 10 Practical V. (covers axial, trunk and appendicular muscles)  
 Lab: Head Musculature, Homologies I. (Shark Head) [W:7] Teeth and Jaw Demo. [W:7]
- Fri 13 Lab: Head Musculature, Homologies I and II (finish Shark begin Cat) [W:7]
- Fall Break (14-17)***
- Fri 20 Head Musculature, Homologies Last. [W:7]
- Tue 24 Practical VI. (covers head muscles and homologies)  
 Lab: Shark Organs, Digestive System. [W:10]
- Fri 27 Shark Circulatory System. [W:11] (through venous system)
- Tue 31 Lab: Shark Circulatory System Finish. [W:11]  
 Mammal Organs, Digestive System [W:10 11]

NOVEMBER

- Fri 3 Lab: Mammal Heart,. [W:10 11]
- Tue 7 Practical VII. (covers shark [early vert.] cavities, viscera and circulatory system)  
 Lab: Cat Circulatory system. [W:11]
- Fri 10 Lab: Nervous System, Shark Brain [W:9] (through overview to medulla)
- Tue 14 Practical VIII (covers mammalian cavities, viscera and circulatory system)  
 Lab: Shark Brain and Cranial Nerves,. [W:9]
- Fri 17 Lab:Mammal Brain, Mammal Spinal Cord [W:9]
- Tue 21 Lab: Shark NS finish. [W:9]  
***Thanksgiving Break (22-26<sup>th</sup>)***
- Tue 28 Lab: Kidney and Reproductive System; Shark and Cat [W:12] (through kidneys and cat bladder,  
 just before cutting puboischial symphysis)

DECEMBER

- Fri 1 Lab: UG Systems Finish
- Tue 5 Practical IX Or during finals week. (covers early vert./shark NS and all UG system)  
 Turn in Cat Boxes (if not already done), Tools, and Clean Up.  
**Everyone is required to attend this lab!**

Below is a form that you will be asked to fill out at the end of lab.

Name and Pledge _____			
Please answer the following honestly.			
1.	Did your lab partner contribute equally to your dissections this year? Please fill in the percentage that each of you contributed to the following	PERCENTAGES	
		<u>You</u>	<u>Partner</u>
a.	hands on dissection	_____	_____
b.	annotations	_____	_____
c.	reading text during dissections.	_____	_____
			<u>Total</u>
			100%
			100%
			100%