

Bio 422- Vertebrate Structure and Function
 TR 1:30-2:45 PM BioSci room 246
 Course web page – See *Course List* on
<http://instructional1.calstatela.edu/bkrilow/>

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 Office hours TR 5:30-6:30 PM
 1 additional hour TBA

Summer 2009 Lecture Schedule

Date	Lecture Topic	Reading (Liem, Bemis, Walker, Grande, 3 rd edition)		
June	23	Course Introduction/Anatomical Terms	Ch. 1	
	25	The Cranial Skeleton	Ch. 7	
	30	The Postcranial Skeleton: The Axial Skeleton	Ch. 8	
July	02	The Postcranial Skeleton: The Appendicular Skeleton	Ch. 9	
	07	The Integument/ Study Skills Exercise	Ch. 6, handout	
	09	The Muscular System/Practice Exam	Ch. 10	
	14	The Muscular System (con't)	Ch. 10	
	16	Exam #1 (Anatomical Terms through The Integument; 100 pts.)		
	21	The Muscular System (con't)/ The Digestive System: Oral Cavity and Feeding Mechanisms	Ch. 10 pg. 534-535, 553	
	23	The Digestive System: Oral Cavity and Feeding Mechanisms (con't)/ The Digestive System: Pharynx, Stomach, and Intestine	pg. 534-535, 553 Ch. 17	
	28	Return and Discuss Exam #1/ The Respiratory System	Ch. 18	
	30	The Respiratory System (con't)	Ch. 18	
	Aug	04	The Excretory System and Osmoregulation/ Practice exam	Ch. 20
		06	Exam #2 (The Muscular System through The Respiratory System; 100 pts.)	
		11	The Excretory System and Osmoregulation (con't)/ The Reproductive System and Reproduction	Ch. 20 pg. 653-675, Fig, 21-20
13		The Reproductive System and Reproduction (con't)	pg. 653-675, Fig, 21-20	
18		The Circulatory System/ Return and Discuss Exam #2	Ch. 19	
20		The Circulatory System (con't)/ The Nervous System I	pgs. 437-456, 466-471	
25		The Nervous System II (con't)/Practice Exam	pgs. 473-490	
27	Exam #3 (The Excretory System and Osmoregulation through Nervous System II; 100 pts.)			

Course Prerequisite: Grade of C or better in Biol 103 or 100C.

Course Description: Evolution of vertebrate structure and functional morphology; evolutionary adaptations of vertebrates presented in a functional context with focus upon the water-land transition.

Required Textbook: Liem, K., Bemis, W., Walker, W. and Grande, L. *Functional Anatomy of the Vertebrates: An Evolutionary Perspective*, 3rd edition, Brooks/Cole: Belmont, CA, 2001.

Drop Policy: Please see the schedule of classes for information. No exceptions will be made to the established University deadlines and policies.

Academic Honesty Policy: Students are expected to read and abide by the University's Academic Honesty Policy, which can be found at <http://www.calstatela.edu/academic/senate/handbook/ch5a.htm>. Students who violate this policy will be subject to disciplinary action, and may receive a failing grade in the course for a single violation

Exams: Lecture examinations will be a combination of matching, fill-ins, short answer and essay questions.

Grading: Final grades will be based on the following scale -

300 pts. 3 X 100 pts lecture exams
200 pts. 2 X 100 pts laboratory practical examinations

500 pts. total

A = 91-100% (455 points or above)
A- = 90-90.9% (450-454 points)
B+ = 89-89.9% (445-449 points)
B = 81-88% (405-444 points)
B- = 80-80.9% (400-404 points)
C+ = 76-79% (380-399 points)
C = 60-75% (300-379 points)
D+ = 59-59.9% (295-299 points)
D = 50-58% (250-294 points)
F = below 50% (249 points or below)

Course Alignment with Department of Biological Sciences Undergraduate Student Learning Outcomes (Academic Year 2008-2009): Biology 422 is designed to help students meet the following undergraduate degree learning outcomes –

Skills -

- Performing laboratory techniques that are appropriate to the major, with an understanding of laboratory safety
- Working collaboratively on group projects

Knowledge -

- Taxonomy and phylogenetic and evolutionary relationships of the major groups of organisms
- The basic principles of anatomy, physiology and development

Bio 422 – Vertebrate Structure and Function Laboratory
TR 2:55-5:25 PM, BioSci room 204

Summer 2009 Laboratory Schedule

Date	Laboratory Topic	Reading (Homerger and Walker, 9 th ed.)
June 23	Laboratory Introduction and Anatomical Terminology	pages XV-XVI
25	Mammalian Cranial and Postcranial Skeleton (articulated)	pg. 38-39, 65, 67-73, 75-79, 85-91, 114
92, 103-30	Mammalian Disarticulated Cranial Skeleton	pg. 38-39, 65, 67-73, 75-79, 85-91, 92, 103-114
July 02	Mammalian Disarticulated Post-cranial Skeleton	pg. 38-39, 65, 67-73, 75-79, 85-91, 92, 103-114
07	Comparative Mammalian Skeletons	pg. 38-39, 65, 67-73, 75-79, 85-91, 92, 103-114
09	Comparative Vertebrate Skeletons (articulated)	pg. 38-49, 54-63, 65, 80-85, 92-103
14	Comparative Vertebrate Skeletons (articulated) (con't)	pg. 38-49, 54-63, 65, 80-85, 92-103
16	Integument of Vertebrates	pg. 27-30, 32, 35-37
21	Review Session	
23	Mid-term Practical Examination (Anatomical Terminology through The Integument, 100 pts.)	
28	Open, Wash, Label All Specimens/ External outcomes	pg. 28-29, 31, 33, 35, learning outcomes
	Anatomy of All Specimens/Skin Cats	
30	Mammalian Axial Musculature	pg. 144-149
Aug 04	Mammalian Appendicular Musculature	pg. 149-157
06	Fish Musculature	pg. 127-133
11	The Coelom, the Digestive and Respiratory Systems and the Excretory and Reproductive Systems (fish and amphibian)	pg. 137-138, 249, 256-263, 265, 268-271, learning outcomes, pg. 355-357, 359-361
13	The Coelom, the Digestive and Respiratory Systems and the Excretory and Reproductive Systems (mammals)	pg. 272-286, learning outcomes, pg. 362-377
18	The Cardiovascular and Hemolymphatic Systems (fish and amphibians)	pg. 292-306, 310
20	The Cardiovascular and Hemolymphatic Systems (mammals)	pg. 322-325, 333-340
25	The Nervous System	pg. 206-212, 221, 224-225, 228-233, 244
27	Course evaluation/Review Session	

TUESDAY, SEPTEMBER 1, 2009, 1:30 – 4:00 PM (External Anatomy and Mammalian Musculature through The Nervous System, 100 pts. Total)

Required textbooks: Homerger, D. and Walker, W., *Vertebrate Dissection*, 9th edition, Brooks/Cole: Belmont, CA, 2004.

Required Dissecting Kit: Students will be required to purchase a professional anatomy (dissecting) kit for use during the latter portion of the course. We find that students are more thoughtful regarding their instruments if they are using their own sets. The kits are available at the campus bookstore. Ask at the first floor information desk for the location of the kits. **THEY ARE NOT LOCATED WITH THE TEXTBOOKS.** Alternatively, you can purchase your kit on-line at www.nebraskascientific.com (product # W-DE 106A).

Laboratory Examinations: Laboratory performance will be assessed by two practical examinations. Each examination is worth 100 points total and will consist of 25 stations with 2 questions at each station; each question will be worth 2 points. Students will have 4 minutes per station, 1 minute to move between stations when time is called by the instructor, and a 10 minute “free period” to return to stations and review their responses.

Extra Credit: Up to 50 bonus points will be awarded to teams who produce exceptional dissections that are worthy of use on practical examinations. Please keep your specimens carefully labeled so that bonus points can be awarded to appropriate student teams. Just like in gymnastics, degree of difficulty **does** count in the awarding of these points.

Example of Learning Objectives for Each Lecture and Laboratory that will be posted to the Course Website:

Learning Objectives for Introduction and Anatomical Terminology Lecture

The student will –

- 1) compare and contrast taxonomy and phylogeny.
- 2) describe the types of data used to establish phylogenetic hypotheses (cladograms), including –
 - a. comparative anatomy
 - b. ontogeny
 - c. physiology
 - d. the geologic (fossil) record
 - e. biochemical information other than DNA sequences
 - f. gene (DNA) sequences
- 3) define and identify homologous structures
- 4) identify the various levels of the taxonomic hierarchy (domain, kingdom, phylum or division, class, order, family, genus, species)
- 5) give the biological definition of a species and recognize that this is the only taxon with a meaningful biological definition
- 6) explain binomial nomenclature
- 7) Give definitions for and identify the following anatomical terms as they apply to bipeds versus quadrupeds –
 - a. dorsal versus ventral and posterior versus anterior
 - b. cranial = rostral = anterior versus caudal = posterior and superior versus inferior
 - c. lateral versus medial
 - d. distal versus proximal
 - e. superficial versus deep
 - f. specimen’s right versus left
 - g. sagittal section (median versus parasagittal)
 - h. frontal or coronal section

- i. transverse or cross or horizontal section
- j. longitudinal section of an organ
- k. flexion versus extension
- l. protraction versus retraction
- m. abduction versus adduction

Learning Objectives for Anatomical Terminology Lab

1) Laboratory Safety Considerations –

- a. Beginning the sixth week of the quarter we will be dissecting preserved specimens, sharks (water dwelling vertebrate), mudpuppies (a modern day form that retains characteristics of primitive land dwelling tetrapods), and cats (a highly evolved terrestrial vertebrate). These animals are fixed and preserved in dilute formalin solutions. The Material Data Safety Sheets are available for your review and will be posted prominently in lab when dissections begin.
- b. Students will be supplied with goggles, lab coats (which will be disposed of at the end of class) and gloves and are expected to wear these protective items whenever they are working with preserved specimens. Please remove all items whenever you leave the classroom. Gloves should be disposed of in the trash cans, while coats and goggles should be placed in your locker.
- c. Students may not eat or drink in the classroom.
- d. Scalpel safety – Handle your scalpels by the handle, not the blade. Use forceps when replacing worn scalpel blades, NOT your hands. The instructor will demonstrate proper technique during the first dissection period.
- e. Housekeeping – Students are expected to clean up their work area before leaving the classroom for the evening. Cleanup includes –
 - 1. putting specimens away in labeled plastic bags in approved storage containers (cats) or the refrigerator (sharks/amphibians).
 - 2. washing down your dissection tray (side counter), pins and tools (your locker) and returning them to designated storage sites.
 - 3. disinfecting your work bench with dilute spray bleach.
 - 4. discarding any animal waste materials in the labeled plastic buckets. No paper towels should be placed in these buckets.
 - 5. discarding all other materials, including plastic gloves, in waste cans.
 - 6. removing and storing your lab coat and goggles in your locker or drawer.
- f. Emergency evacuation procedures for BS 204 – Exit the room through the door and turn right, use the southeast stairs to reach the first floor and exit the building through the southeast glass doors. Our assembly place is Lot D, between the Biological Sciences Building and the Administration Building. Students must remain with the instructor until Public Safety informs us that we can return to the building or leave campus. I am required to lead students from the building and designate someone to remain behind to close the door and shut off the lights. **Earthquakes** – duck under the desks until shaking stops, and then we can decide when it is safe to leave the building. **Others** – alarm will sound. Leave all personal items, the door will be locked as we leave.

g. Accidents or injuries should be reported immediately to Dr. Krilowicz. An emergency telephone that connects you directly to campus police can be found on the first floor directly opposite the restrooms.

2) The student is responsible for examining the various models and skeletons on display on the lab benches. Use pages XV-XVI in the lab manual and the lecture notes to become familiar with traditional anatomical terminology. At the end of the lab the student should be able to give definitions for and identify the following anatomical terms as they apply to bipeds versus quadrupeds –

- a. dorsal versus ventral and posterior versus anterior
- b. cranial = rostral = anterior versus caudal = posterior and superior versus inferior
- c. lateral versus medial
- d. distal versus proximal
- e. superficial versus deep
- f. specimen's right versus left
- g. sagittal section (median versus parasagittal)
- h. frontal or coronal section
- i. transverse or cross or horizontal section
- j. longitudinal section of an organ
- k. flexion versus extension
- l. protraction versus retraction
- m. abduction versus adduction

3) **Using the Laboratory Manual Effectively:** Decoding the laboratory manual has proven to be a bit difficult for many introductory anatomy students. Please note that the usual request made for lab classes, i.e. carefully read the manual ahead of class, does not work well for anatomy classes. You really need the specimen in front of you to understand what is being said. Consequently, I suggest that you just look at the main and subheadings before coming to class in order to get a basic idea of what we will be doing that day. Leave the detailed reading for the actual class period. When I refer you to your manual during the laboratory period it is because reading and decoding this “new language” of anatomy for yourselves causes you to use your anatomical terms and internalize their meanings. It is similar to reading passages that use new vocabulary words when you are learning a new “foreign” language.

a. Working with your partner, “decode” (paraphrase using your student vernacular language) the following excerpt from the lab manual (page 79) that you will be responsible for next lab period. You may want to look at an articulated cat skeleton as you work.

The hypobranchial apparatus “consists of a transverse bar of bone, the **basihyal**, or **hyoid body**, from which two processes, or horns, extend cranially and caudally. The caudal or **greater horns of the hyoid** are the larger horns. Each consists of but one bone, which is called the **thyrohyal**, because it extends caudally to attach to the thyroid cartilage of the larynx (Fig. 4-19A). Each of the cranial or **lesser horns of the hyoid** consists of a small **ceratohyal**, connected by a chain of hyoid ossicles to the skull. From ventral to dorsal these are the **epihyal**, **stylohyal**, and **tympanohyal**.”

b. Write your paraphrased passage on the back of this page and ask Dr. Krilowicz to approve it before you leave the lab today.