USC University of Southern California

BISC 445, Fundamentals of Vertebrate Biology

Maymester, 2023
May 15-June 9

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Required Texts:

***Vertebrate Life* (11th or 10th edition), by Pough & Janis.**
Other readings will be announced on Blackboard.
Additional skeletal and biological info can be found on **http://www.digimorph.org**

Locations: Morning sessions (starting 9 am): ZHS 363
Afternoon sessions (starting 12:30): Collaboratory, Natural History Museum

Course Description

BISC 445 will cover the biology and evolution of the major vertebrate groups including fish, amphibians, birds, and mammals. Emphasis will be on evolution, functional anatomy, and embryology. The course is therefore a great choice for students who are interested in comparative anatomy, biodiversity, and evolution. We will discuss vertebrate evolution in detail, and also describe the methods used to study the relationships of biological taxa.

The diversity of modern vertebrates will be one major area of focus. We will also go through functional anatomy covering the various organ systems (muscular system, nervous system etc). Special focus will be placed on the skeletal anatomy, as this provides important data both from living species and from the fossil record. We will study how animals are adapted to their environment e.g. the marine vertebrates we observe during our whale watching trip. The evolution of modern taxa will be illuminated with the use of fossils.

All the major groups of vertebrates will be described and demonstrated in lab, and a special focus will be put on important stages leading up to the evolution of mammals, and finally modern humans. Tours will be given by museum curators of fish, amphibians, birds, and mammals, and some information will also be given on the preparation of fossils. The methods studied in this course are therefore an excellent fit for students involved in programs focusing on evolutionary biology and human evolution.

Learning Objectives:

At the end of the course, students will have learned:

- the biology and defining characteristics of the major vertebrate groups
- the basics of vertebrate paleontology and evolutionionary history
- vertebrate organ systems and comparative anatomy (particularly skeletal anatomy)
- advanced skills in writing and presenting scientific papers on a topic in vertebrate evolution

Grading:
Participation: 15%, Quizzes: 15%, Paper assignment: 20%, Paper presentation: 20%, Final Exam: 30%.

Although parts of the course will be handled at the USC Dornsife ZHS building (Zumberge Hall of Science), we will spend much of our time in various areas of the Natural History Museum of Los Angeles County (including the La Brea Tar Pits). It is therefore very important to pay attention to messages informing you when and where to meet any given day. Our first lesson will be in ZHS 363.

Whale Watching: Long Beach
The whale watching tickets will be covered by the university. However, students will have to find their own transportation to and from Long Beach (see schedule below).

Schedule: lectures and assignments
(subject to change, see Blackboard or class announcements)
The readings should be studied BEFORE we meet each day.
(Mornings at USC, Afternoons at the NHM):

May 15
Morning: Introduction to the course; defining vertebrates; phylogenetics and paleontology
Afternoon: Introduction to the Natural History Museum, writing scientific papers
Readings: Skim Textbook chapter 1.

May 16
Morning: Chordates, agnathans, fish
Afternoon: Fish collections at the NHM
Readings: Textbook chapters 3 and 7

May 17
Morning: Amphibians, reptiles
Afternoon: Amphibian and reptile collections, with Nefti Camacho
Readings: Skim textbook chapters 14, 16, 17, 18

May 18
Morning: Introduction to birds and bird diversity
Afternoon: Ornithology collections of the NHM with Kimball Garrett
Readings: Textbook chapters 21, 22

May 19
Morning: Introduction to mammals and mammalian diversity
Afternoon: Mammal collections of the NHM
Readings: Textbook chapters 24, 25

May 22
Morning: Introducing the fossil record; Paleozoic, Mesozoic, Cenozoic
Afternoon: Tour of the NHM halls.
Readings: Textbook chapters 5, 13, 23

May 23
Morning: Evolutionary history of vertebrates; paleontological record
Afternoon: Dinosaur Hall, NHM (bring dinosaur worksheet)
Readings: Textbook skim chapters 6, 8, 10. Worksheet

May 24
Morning: Evolutionary history of vertebrates cont.
Afternoon: Age of Mammals Hall, NHM
Readings: 19, 24. Worksheet on mammalian evolution

May 25
Morning: Embryology
Afternoon: Embryological stages, slides and models, paper and presentation topic due
Readings: Textbook chapter 2. Embryology worksheet.

May 26
Morning: Sensory systems in land vertebrates
Afternoon: Specimens showing sensory systems, and development of the ear
Readings: Textbook chapter 12. Assigned paper.

No lecture Memorial Day May 29

May 30
Morning: The skeletal system, the skull
Afternoon: Overview of the vertebrate skull
Readings: Skull handout and worksheet

May 31
Morning: Skeletal system cont.
Afternoon: Vertebrate postcranial skeletons
Readings: Postcranial skeleton handout and worksheet

June 1
Morning: The muscular system
Afternoon: Dissecting fish, frog and rat, bring a draft of your paper
Readings: Muscular system handout and worksheet

June 2
Friday June 5 will be spent at the La Brea Tar Pits. The paper is also due the same day so bring it with you on our trip to the tar pits.

June 5
Morning: Student presentations. Bring your PP file on a flash drive.
Afternoon: Tour in the fossil preparation lab with Doug Goodreau, NHM.

Readings: Textbook chapters 4, 12.

June 6
Morning: The nervous system
Afternoon: The brain and nervous system, models and sheep brain dissections
Readings: Textbook chapter 2 and brain handout

June 7
Whale watching, Long Beach. We meet near the aquarium entrance at 11:30.

June 8
Morning: Endothermy: Specializations of metabolism, respiration and circulatory system
Afternoon: Dissections, models of respiratory and circulatory systems
Readings: Textbook chapter 2, 15, 20, circulatory system handout

June 9
Morning: Final Exam

Course Policies

Policy on Missed Exams or Quizzes

You may be excused from a lecture quiz or exam **only in the event of a documented illness**. You will then be given a make up test which may differ from that given to the other students.

Extra Credit

No extra credit will be given for special projects, etc.

Impairments Affecting Your Performance

Students occasionally encounter difficulties that affect their academic performance, such as illness, accidents, bereavement, depression, anxiety, learning disabilities, and other problems. If you encounter such difficulties, please bring them to the attention of one of the instructors. We can refer you to sources of help and may be able to offer accommodations. All such discussions will be confidential. Please seek help as soon as you feel your performance is being affected.

Students with Disabilities

Students requesting academic accommodations based on a disability are required to register with the Office of Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Be sure that the letter is delivered to the Professor as early in the semester as possible. DSP is located in STU 301 and is open from 8:30 a.m. to 5:00 p.m., Monday through Friday. Their telephone number is 213-740-0776. If a student's approved accommodation is limited to extra time on examinations, the teaching staff will provide the accommodation. For any other accommodation, such as a private room, reader or a scribe, students must make prior arrangements with the DSP office 2 weeks before the exam date. For more

information please visit the following website:
http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html.

Statement on Academic Integrity

The instructors in this course strongly support the ethics of academic integrity. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00: http://web-app.usc.edu/scampus/1100-behavior-violating-university-standards-and-appropriate-sanctions/, while the recommended sanctions are located in Appendix A. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

Course Website

Students are responsible for logging onto Blackboard (https://blackboard.usc.edu) and checking the course website on a regular basis. Postings on Blackboard will be an official source for announcements, course materials, lecture notes, score postings and general discussions. It is the student's responsibility to immediately notify the Professor in the event of any mistakes, so please check your scores on Blackboard weekly.