Syllabus: BISC 445, Fundamentals of Vertebrate Biology

4 units

Spring (Maymester) 2018

Instructor: Dr. Trond Sigurdsen, ZHS 256; Email: sigurdse@usc.edu

Course Description

BISC 445 will cover the biology and evolution of the major vertebrate groups including fish, amphibians, reptiles, 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, or 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 the nomenclature of anatomy with focus on the different germ layers and organ systems (skeletal, muscular, nervous system etc). The evolution of sensory systems will also be covered. Special focus will be put on the skeletal anatomy, as this provides important data both from living species and from the fossil record. The evolution of modern forms will be augmented with the use of fossils.

We will also discuss methods such as Phylogenetic Analyses Using Parsimony, creating phylogenetic trees to work out the interrelationships between animal groups, species, or populations. 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. The methods studied in this course are therefore an excellent fit for students involved in programs focusing on evolutionary biology and human evolution.

Lectures will not be recorded, but supplementary files will be posted on Blackboard. However, these do not contain all the information needed, so it is very important to come to the lectures, take notes, and participate in class. Although parts of the course will be handled at the USC Dornsife ZHS building (Zumberge Hall of Science), we will spend more than half 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 at ZHS.
Skills that the students will acquire in this course:

- Knowledge of vertebrate diversity, including all the major vertebrate groups, as well as chordates in general. This will make use of the extensive collections of skeletons and taxidermy at the NHM.
- Knowledge of the major organ systems and tissues of the vertebrate body.
- A general insight into functional anatomy, and how form follows function, as well as the use of the terms adaptation and exaptation.
- A good overview of vertebrate evolution through geological time. This will require the use of various halls in the NHM collections and general exhibits, and students are expected to recognize key fossil specimens.
- A general familiarity with how the relationships between vertebrate groups are hypothesized and how evidence for these relationships is found.

Course Dates: May 14 – June 8, 2018

Locations: Morning sessions (9 am): ZHS 469

Afternoon sessions (12:30): Collaboratory Room, Natural History Museum

Literature:


Other readings will be announced in class.

For updates and important information see:

https://blackboard.usc.edu

Grading:

Participation: 20%  
Paper presentation: 20%

Quizzes: 20%  
Final Exam: 20%

Paper assignment: 20%
**Schedule of lecture topics**

The readings should be read BEFORE we meet each day.

*(Mornings at USC, Afternoons at the NHM):*

**May 14**

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 15**

Morning: Chordates, agnathans, fish

Afternoon: Agnathans and fish collections

Readings: Textbook pp. 48-78.

**May 16**

Morning: Amphibians, reptiles

Afternoon: Amphibian and reptile collections

Readings: Textbook pp. 79-93.

**May 17**

Morning: Introduction to birds and bird diversity

Afternoon: Ornithology collections of the NHM presented by Kimball Garrett

May 18
Morning: Introduction to mammals and mammalian diversity
Afternoon: Mammal collections of the NHM presented by Jim Dines

May 21
Morning: Evolutionary history of vertebrates; paleontological record
Afternoon: Dinosaur Hall, NHM
Readings: Papers on dinosaurs and evolution of birds

May 22
Morning: Evolutionary history of vertebrates cont.
Afternoon: Age of Mammals Hall, NHM
Readings: Papers on the evolution of primates and humans

May 23
Morning: Reproduction and embryology
Afternoon: Models and specimens showing embryological stages
Readings: Textbook pp.118-144

May 24
Morning: Embryology cont. and organ systems
Afternoon: Models and specimens showing embryological stages and organ systems
Readings: Textbook pp. 144-173
May 25
Morning: Tissues, growth, integument
Afternoon: Writing scientific papers, paper and presentation topic due
Readings: Textbook pp. 184-204; 207-210

No lecture Memorial Day May 28

May 29
Morning: The skeletal system, the skull
Afternoon: Overview of the vertebrate skull
Readings: Textbook pp. 232-266

May 30
Morning: Skeletal system cont.
Afternoon: Vertebrate skeletons
Readings: Textbook pp. 269-312

May 31
Morning: The muscular system
Afternoon: Dissecting fish, frog and rat, bring a draft of your paper
Readings: Textbook pp. 316-345

June 1
Friday June 1 will be spent at the La Brea Tar Pits. A bus will be provided from campus. The paper is also due the same day (Friday June 1), so bring it with you on our trip to the tar pits.
June 4
Morning: **Student presentations.** Bring your PP file on a flash drive.
Afternoon: Evolution and structure of the sensory systems, excretion
Readings: Textbook pp. 398-433

June 5
Morning: The nervous system
Afternoon: The brain and nervous system, models and sheep brain dissections
Readings: Textbook pp. 438-471

June 6
Morning: Digestion and the endocrine system
Afternoon: Models and dissected specimens of the digestive system of fish and tetrapods
Readings: Textbook pp. 504-527

June 7

Morning: Respiration and circulatory system
Afternoon: Models of respiratory and circulatory systems
Readings: Textbook pp. 604-629

June 8
Morning: **Final Exam**
Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” [https://policy.usc.edu/scampus-part-b/]. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, [http://policy.usc.edu/scientific-misconduct](http://policy.usc.edu/scientific-misconduct).

Support Systems:

Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. [https://engemannshc.usc.edu/counseling/](https://engemannshc.usc.edu/counseling/)

National Suicide Prevention Lifeline - 1-800-273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. [http://www_suicidepreventionlifeline.org](http://www.suicidepreventionlifeline.org)

Relationship & Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. [https://engemannshc.usc.edu/rsvp/](https://engemannshc.usc.edu/rsvp/)

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: [http://sarc.usc.edu/](http://sarc.usc.edu/)
Office of Equity and Diversity (OED)/Title IX compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. 
https://equity.usc.edu/

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. https://studentaffairs.usc.edu/bias-assessment-response-support/

Student Support & Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. https://studentaffairs.usc.edu/ssa/

Diversity at USC

Tabs for Events, Programs and Training, Task Force (including representatives for each school), Chronology, Participate, Resources for Students. https://diversity.usc.edu/