EAS E412/G512
Vertebrate Paleontology
Spring 2021

Class Meetings: MWF, 12:20-1:10 PM Zoom

Office Hours Tuesday 9:30-10:30 (same zoom link as class), by appointment, and sometimes Friday during class time.

Objectives

- To understand principles of geobiology through analysis of the vertebrate fossil record.
- To develop critical skills for the interpretation of the vertebrate fossil record, including morphology, stratigraphy, and biogeography.
- To understand the history of vertebrate diversification in the context of changing earth systems.
- To develop skills for the quantitative analysis of vertebrate morphology, diversity, and phylogeny.
- To develop critical skills for assimilating information from original research papers.

Assessment

Weekly activities: Almost every week there will be an assignment associated with that week's topic. They will teach you skills in data collection and analysis. Assignments are due at the end of the weekend after they are assigned. The assignments are not trivial, so I recommend starting them early in the week. Friday class section will be devoted to informal discussion, tutoring, and question time related to the assignment, so it gives you a chance to get help if you are stuck. **(10 assignments x 6% = 60% of the class grade)**

Discussion of papers: Three times during the course we will have a group discussion of a scientific paper. These discussions will take place in the Friday class slot and there will be a written pre-discussion assignment due the night before. Weeks with paper discussions will not have activity assignments. **(3 discussion x 3.33% = 10% of class grade)**

Annotated bibliography: An annotated bibliography covering six papers of your choosing on a single topic will be the capstone assignment for the course. You can choose any topic you wish so long as it relates to vertebrate paleontology. The papers can be about your favorite extinct vertebrate group, a broad topic like extinction or tooth function, about history of the field, about policy and law governing vertebrate fossils, about gender and race in paleontology, etc. You will choose a topic by March 19 and turn in the annotated bibliography during finals week on May 3. The bibliography will consist of 6 relevant academic research articles and an approximately 150-200 word annotation for each **(20% of class grade).**

For *graduate students* enrolled in G512, the annotated bibliography should be written as a full critical review paper based on 10 (and no more than 10) references with a total length between 2000 and 2400 words plus bibliography. Instead of using the annotated bibliography format, you should write as a normal paper with references at the end and in-text citations to them where

relevant. The paper should focus on a specific question and should conclude with your interpretation of the answer based your assessment of the ten papers.

Group presentations: You will be assigned to a group of three students to make a short presentation during the final week of class. The groups will consist of people with similar or compatible annotated bibliography formats. As a group you will pool your knowledge to decide on a presentation topic, then collectively prepare an approximately 10 minute presentation on it. (**10% of class grade**)

Grading

The details of grading will vary with the assignment, but generally it will use the following philosophy:

A: The work goes beyond the criteria of the assignment in one or more ways (for example, the work is especially knowledgeable, especially creative, shows evidence of exceptional amount of effort) [normally A will be the second most common grade].

B: The work is well done and meets all of the assignment's criteria [normally B will be the most common grade].

C: The work is well done, but it falls short of the assignment's criteria in a significant way (for example, significant mistakes, shortcuts, or sloppiness) [normally C will be the third most common grade].

D: The work barely meets the criteria (for example, minimal effort was expended, there are many mistakes or misunderstandings) [normally D will be a rare grade].

F: The work does not meet any of the criteria of the assignment (for example, no effort was expended, unexcused failure to submit the assignment) [F is rarely given].

Text book

Carroll, R. L. 1990. *Vertebrate Paleontology and Evolution*. W. H. Freeman and Company.

There are no required textbook readings, but having a book for reference is highly recommended. Carroll is the "classic" encyclopedic reference in vertebrate paleontology, being an update of Alfred Romer's classic 1966 *Vertebrate Paleontology*. Carroll is illustrated with diagrammatic skeletons and contains good detail about their morphology, taxonomy, age, and location, but it is increasingly out of date especially regarding taxonomy (which for some groups has changed considerably since 1990) and from discoveries made since it was published.

Technology and software

- Computer and internet connection capable of running Zoom and connecting to online resources with web browser
- Smartphone (strongly recommended but not essential)
- Spreadsheet software
    - Microsoft Excel (home installation or cloud version from iuanywhere.iu.edu)
    - Libre Office
    - Google spreadsheet docs
- PDF editing software
    - Adobe Acrobat DC (home installation or cloud version from iuanywhere.iu.edu)
- Word processing software
    - Microsoft Word
    - Libre Office
    -
- Fiji / ImageJ image processing software
    - Fiji (preferred version from https://imagej.net/Fiji)
    - ImageJ (generic version from https://imagej.nih.gov/ij/download.html)
    - IMJoy (cloud version at https://ij.imjoy.io)

Papers for discussion

1. Clevedon Brown, J and D. W. Yalden. 1973. The description of mammals 2 – limbs and locomotion of terrestrial mammals. *Mammal Review*, 3: 107-134.

2. Gastaldo, R. A., S. L. Kamo, J. Neveling, J. W. Geissman, M. Bamford, C. V. Looy. 2015. Is the vertebrate-defined Permian-Triassic boundary in the Karoo Basin, South Africa, the terrestrial expression of the end-Permian marine event? *Geology*, 43: 939-942.

3. Sakurai, D. S. 1994. Animal, mineral, or cultural antiquity? The management and protection of paleontological resources. *Loyola of Los Angeles International and Comparative Law Review*, 17: 197-243.

Useful Online Resources

General information about vertebrate paleontology

University of California Museum of Paleontology	http://www.ucmp.berkeley.edu/exhibits/
The Paleontology Portal	http://www.paleoportal.org/
The Chronos Site	http://www.chronos.org/
PaleoNet	http://paleonet.org/

Research Journals

Journal of Vertebrate Paleontology	http://www.bioone.org/loi/vrpa
Palaeontologia Electronica	http://palaeo-electronica.org/
Palaeontology	http://www.wiley.com/bw/journal.asp?ref=0031-0239
Acta Palaeontologica Polonica	http://app.pan.pl/home.html
American Museum Novitates	http://digitallibrary.amnh.org/
Bulletin of the American Museum	http://digitallibrary.amnh.org/
Journal of Paleontology	http://www.journalofpaleontology.org/

See the extensive list at: http://cactus.dixie.edu/jharris/Journal_Links.html

Online fossil occurrence data

Paleobiology Database	http://paleodb.org/
Neogene Old World Database	http://www.helsinki.fi/science/now/
Miocene Mammal Mapping Project	http://www.ucmp.berkeley.edu/miomap/
Neotoma Quaternary Database	http://www.neotomadb.org/

Online morphological data (including CT scans)

The NESPOS Pleistocene Database	https://www.nespos.org/display/openspace/Home
The DIGIMORPH (Digital Morphology) site	http://www.digimorph.org/
Morphobrowser	http://morphobrowser.biocenter.helsinki.fi/

Online phylogenetic data

Cladestore	http://palaeo.gly.bris.ac.uk/cladestore/
Treebase	http://www.treebase.org/
Morphobank	http://www.morphobank.org/

Professional Organizations and Meetings

Society of Vertebrate Paleontology	http://www.vertpaleo.org/

The Paleontological Society	http://www.paleosoc.org/
The Palaeontological Association	http://www.palass.org/
Symposium of Vertebrate Palaeontology and Comparative Anatomy	http://www.svpca.org/