

Syllabus: GEOS 492 – VERTEBRATE PALEONTOLOGY
3 Credits

Professor: Patrick S. Druckenmiller

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Prerequisites: GEOS 315 or BIOL 305 or BIOL 317 or permission of the instructor

Lectures and discussions: MUSEUM 151*, Wed. and Fri. @ 1-2 pm

Labs: MUSEUM 151*, Tues. @ 2-5 pm

*NOTE: In order to gain admittance to the museum classroom, you must enter at the main entrance and check in at the front desk.

Required Text: Benton, M. J. 2005. Vertebrate Palaeontology – 3rd Ed. Blackwell Publishing, 455 pp.

Other required materials: A lab notebook, suitable for illustrations and answering questions (ideally, both lined and unlined pages). A handlens is optional, but may be handy.

Course description: This course covers the history of vertebrate life as documented from its rich fossil record. At one level, this course will examine the overall pattern of vertebrate history, both temporally and in terms of taxonomic diversity. We will also place the vertebrate fossil record in the context of major geological and biological processes that may explain the observed pattern. For example, when are tetrapod limbs first documented in the fossil record and what do they look like? What was the continental configuration at this time? Based on the sedimentary rocks in which they are found, in which types of depositional environments did this occur? How can clues from developmental biology help explain the fin-to-limb transition? Other major evolutionary transitions and current problems in vertebrate evolution will also be explored, including the origins of birds and mammals.

As a discipline, vertebrate paleontology is built on a foundation taken from both the geological and biological sciences. Thus, an introductory background in either, or both, fields is necessary. However, important concepts necessary to discuss the material, such as geologic time and biological classification, will be reviewed in class in order to make the topics understandable and interesting to an audience with a background in either field.

Course goals and student learning outcomes: At a broad level, the primary objective of this course is to gain an understanding of the major patterns in vertebrate evolution through time. Students should be able to place the origin and extinction of major vertebrate groups in a geologic time scale, have a working knowledge of vertebrate skeletal anatomy, understand the mechanisms of fossil preservation, identify key differences among major vertebrate groups, and be familiar with the important problems and questions facing vertebrate paleontologists today.

Instructional methods: The course includes both a lecture and lab component. Lectures are not only a time to listen to the instructor, but also to ask questions and participate in discussion. Please come to lecture prepared to discuss the assigned reading and to ask questions. In addition to the text, supplemental readings from the primary literature will also be handed out in class. These articles will be recent and relevant to our lecture topics, and the readings are fair game for exam questions! Please note that the schedule outlined below is tentative and is designed with flexibility in mind in order to explore topics in greater detail as dictated by student needs.

Labs are an integral part of this course, and are designed to provide students with an enjoyable and practical knowledge of fossil vertebrates. The primary aim of the labs is to gain hands-on experience identifying and

familiarizing yourself with actual specimens, both real and cast. Handouts, consisting of key words, concepts, exercises, and illustrations will accompany each lab. An integral component to the labs will be your notebook; this is where you will make the requested illustrations, answer lab questions, write observations and notes. These will be turned in at the end of each lab, and graded; the lab books will be returned in lecture. Notebook assignments constitute 20 percent of your total grade. Ultimately, it will become an important study guide for lab exams, as well as a useful reference even after the course has ended!

If possible, a field trip to the Permafrost Tunnel will be made near the end of the semester to examine Pleistocene vertebrate material *in situ*. The field trip will occur during our scheduled lab time and will count as a regular lab for attendance and grading purposes.

Course policies: Attendance in both lecture and lab is **mandatory**. For this reason, 5% of the total grade will be based on attendance and participation. Students missing no more than three hours of class time (one lab or three lectures) will receive an A for attendance, those missing 4-6 hours will receive a B, etc. I expect students to arrive in class on time, and repeated and/or excessive tardiness will be treated as non-attendance. Make-up exams are allowed for legitimate excuses (illness, attending a conference, etc...) and can be scheduled with the instructor. Students are expected to conform to student code of ethics, as outlined in the UAF catalog. Plagiarism and cheating will not be tolerated and will be dealt with seriously.

Evaluation: Grading will be divided as follows:

Lecture Exam 1:	15%
Lecture Exam 2:	15%
Final Exam 3:	15%
Lab Exam 1:	15%
Lab Exam 1:	15%
Lab notebooks	20%
<u>Attendance/Participation</u>	<u>5%</u>
TOTAL	100%

Lecture exams are short answer and essay style, and will come from the lecture, text readings, and supplemental readings. The final exam will build on the entire semester and will be partially comprehensive in its coverage. Lab exams are practical and will be based on your familiarity with the specimens examined in lab. Grading will be established on a curve using letter grades A, B, C, D, F. The letter grades (except F) may include a "+" or "-" to indicate that a student's level of performance is slightly higher or lower than that of the letter grade alone.

Support Services: All efforts will be made by the instructor to assist students seeking support in this class, either during regular office hours or by appointment. If needed, the instructor will assist the student in arranging additional support, including ASUAF tutoring services (474-7355), or through other instructors on campus.

Disabilities Services: The Office of Disability Services implements the Americans with Disabilities Act (ADA) and ensures that UAF students have equal access to the campus and course materials. I will work with the Office of Disability Services (474-7043) to provide reasonable accommodation to students with disabilities. Please let me know at the start of the course if accommodations should be provided.

LECTURE AND LAB SCHEDULE

Date	Topic	Reading
1/25	Lect. 1: Introduction to vertebrate evolution	
1/29	Lab 1: Lab techniques in paleontology	
1/30	Lect. 2: Geologic time and preservation	Chapter 2 (25-28)
2/1	Lect. 3: How to become a fossil – taphonomy	Chapter 2 (22-28)
2/5	Lab 2: Fossil vertebrate preservation	
2/6	Lect. 4: Phylogenetic reconstruction	Chapter 2 (31-35)
2/8	Lect. 5: Vertebrate origins	Chapter 1 (1-15)
2/12	Lab 3: Bone lab I: head skeleton	
2/13	Lect. 6: Early fish and the origin of jaws	Chapter 3 (38-55)
2/15	Lect. 7: Paleozoic fish	Chapter 3 (55-72)
2/19	Lab 4: Bone lab II: postcranial skeleton	
2/20	Lect. 8: Post-Devonian fish radiation	Chapter 6 (159-186)
2/22	Lect. 9: Origin of tetrapods	Chapter 4 (74-85)
2/26	Lab 5: “Fish”	
2/27	Lect. 10: LECTURE EXAM 1	
2/29	Lect. 11: Amphibians: Paleozoic to Recent	Chapter 4 (85-105)
3/4	Lab: LAB EXAM 1	
3/5	Lect. 12: Origin of amniotes	Chapter 5 (106-112)
3/7	Lect. 13: Early anapsids and diapsids	Chapter 5 (113-119)
3/10-14	NO CLASSES – SPRING BREAK	
3/18	Lab 6: Aquatic amniotes	
3/19	Lect. 14: Triassic tetrapods	Chapter (137-147)
3/21	Lect. 15: Marine reptiles	Chapter 8 (241-248)
3/25	Lab 7: Dinosaurs	
3/26	Lect. 16: Pterosaurs, turtles, crocs	Chapter 8 (224-237)
3/28	Lect. 17: Dinosaurs: Ornithischia	Chapter 8 (188-204)
4/1	Lab 8: Volant vertebrates	
4/2	Lect. 18: Dinosaurs: Saurischia	Chapter 8 (205-219)
4/4	Lect. 19: Dinosaurs – origin of birds	Chapter 9 (257-265)
4/8	Lab 9: Mammals	
4/9	Lect. 20: LECTURE EXAM 2	
4/11	Lect. 21: Diversification of birds	Chapter 9 (265-287)
4/15	Lab 10: Ice Age mammals of AK	
4/16	Lect. 22: Early synapsids	Chapter 5 (120-135)
4/18	NO CLASS	

4/22	Lab 11: Field trip – Permafrost tunnel	
4/23	Lect. 23: Origin of mammals	Chapter 10 (288-298)
4/25	Lect. 24: Mesozoic mammals	Chapter 10 (298-312)
4/29	Lab: LAB EXAM 2	
4/30	Lect. 25: Cenozoic mammals: South America	Chapter 10 (312-323)
5/2	Lect. 26: Cenozoic mammals: placentals	Chapter 10 (323-359)
5/5	Last day of classes	
5/6-9	FINAL EXAMS	