

Cenozoic Vertebrate Paleontology, or: Principles of Collections-Based Paleobiology

Undergraduate Level: ZOO 4926 section 35H8

Graduate Level: ZOO 6927 section 2390

Spring Semester 2019

Course Objectives & Description

This course will provide a comprehensive, practical introduction to the process of describing the osteology of vertebrates and inferring biological features such as locomotion, diet, function, and phylogenetic relationships between taxa. By the end of this course you should know how to approach your own studies of undescribed fossils in museum collections and present your findings in a formally written manuscript for peer review. Note: this semester we will not have time to get into scoring a specimen into a character/taxon matrix and running a phylogenetic analysis. This is a potential component or topic for future courses if students are interested.

In the Spring 2019 semester, you will learn these principles through practice by writing a description of a Pliocene porcupine (Erethizontidae) from Florida.

Instructor

Jonathan Bloch, Curator, Professor, and Chair, 222 Dickinson (FLMNH), jbloch@flmnh.ufl.edu
Office Hours by appointment

Credits: 2

Class Periods: Tuesday 7-8th periods (1:55-3:50).

Prerequisite:

Participation in the Fall 2018 reading group on the same topic.

Room: Director's Conference Room in Dickinson Hall

Grades will be based on:

Class participation: 23%. Students are expected to present their findings in-class, to provide constructive and courteous feedback to other students, make individual contributions to the group project (see sign-up sheet in OSF wiki) and to generally act as good collaborators in this project. Participation in either creating or providing feedback on group assignments (discussion, introduction, etc.) will count toward this part of a student's grade.

Assignments: 77%. There are 11 individual assignments due in this course. Each will count for 7% of a student's final grade.

Required & Recommended Reading:

No textbooks are required. Students will be required to have read all articles in the list of Required Pre-Course Reading before the start of the first class. If students have attended the previous semester's preparatory reading group, then they will have read all articles.

Schedule:

Note: Reading assignments subject to change. Assignments are due before the start of each class. Please upload assignments to the “Assignments Due” folder for the correct week in the OSF project.

January 8	Topic: Introduction
(week 1)	<p>Reading Due: Required pre-course reading (see list below)</p> <p>Assignment Due: None.</p> <p>In-Class Activities:</p> <ul style="list-style-type: none"> • Review project goals, syllabus • Divide parts of the skeleton among students. Each student will be responsible for their elements throughout the course. <ul style="list-style-type: none"> ○ skull ○ mandible ○ dentition ○ vertebral column ○ pectoral & pelvic girdle ○ humerus ○ radius ○ ulna ○ bones of the wrist ○ carpals & tarsals ○ femur ○ tibia ○ fibula ○ bones of the ankle • Review required pre-course reading • Review example of terminological diagram: porcupine tooth morphology
January 15	Topic: Feature Identification
(week 2)	<p>Reading Due: Students should independently have identified and read papers relevant to their skeletal elements.</p> <p>Assignment Due:</p> <ul style="list-style-type: none"> • A diagram, either copied from a peer-reviewed article or sketched and labelled based on multiple articles. The diagram should show the features used to infer locomotor or other functions in their assigned elements. • A bibliography of papers used to create or find the diagram. Should contain papers or books that the student found and read to learn about inferring function in their chosen skeletal elements <p>In-Class Activities:</p> <ul style="list-style-type: none"> • Consult with instructor and other students on terminological difficulties • When clear, each student will guide the entire class through their diagram while other students follow along with a modern skeleton using either MorphoSource or physical specimen.
January 22	Topic: Describe Functional Features
(week 3)	<p>Reading Due: White 1968. In particular, compare description with descriptive sections of Candela and Picasso 2008 as models for how to write descriptions.</p>

Assignment Due: Students will draft a written description of the previously identified function-related features in the fossil.

In-Class Activities: Students will each give a 5-minute oral presentation of their inferences of function based on their description. As peer reviewers, other students will provide feedback (what features still need observation, which observations could be cut from description), help propose any additional measurements and observations that may be useful.

January 29 Topic: Introduction to Imaging

(week 4)

Reading Due: Muñoz et al. 2019. Keep in mind relevance of *Steiromys* to *Erethizon* and *Coendou*.

Assignment Due: Written discussion of functional inferences based on revised descriptions, feedback from last week (submitted to group folder).

In-Class Activities:

- Guest lecture from Sam and/or Michael about Photoshop & Illustrator publication-quality figures.
- Guest lecture from Ed on making publication-quality images from CT scans.

February 5 Topic: Function Through Measurement, Statistics

(week 5)

Reading Due: Gupta 1966. Start on Frazier 1981 (due next week).

Assignment Due:

- Drafts of images, both figures of specimen and labeled diagram of features (can be two figures or a single figure)
- Proposed list of measurements needed to help infer function

In-Class Activities:

- Use multiple researchers in class to test for repeatability, error in proposed measurements.

February 12 Topic: Comparative Anatomy

(week 6)

Reading Due: Frazier 1981. Be aware that this is 50 p. of reading (not counting appendices). Start early.

Assignment Due: Draft of tables of measurements that are useful for inferring function or species diagnoses. Can be incomplete if there are lots of measurements or specimens to take. Possible that some of these measurements may be collaborations with Dr. Granatosky.

In-Class Activities:

- Discussion of how to report measurements in table, summary statistics, etc.
- Workshop graphs. Do we need any? Which ones? Guest lecture from Natasha on how to turn a working graph into a publication-quality graph in R.
- Spend time in class comparing elements from skeletons of different extant porcupines plus a reasonable outgroup.

February 19 Topic: Variation

(week 7)

Reading Due: Sutton 1972

Assignment Due:

- Revised description that takes into account previous feedback and adds in description and images of features that differ between species of

	<p>Erethizontidae. Includes revised drafts of tables, plus any figures identified as necessary in previous class</p> <p>In-Class Activities: Use literature, skeletons of <i>Erethizon dorsatum</i> to evaluate variability in described characters</p>
February 26	Topic: First Complete Draft of Description
(week 8)	<p>Reading Due: Candela et al. 2017</p> <p>Assignment Due:</p> <ul style="list-style-type: none"> • The first draft of the complete description, including statements of variation • Written comparison of morphology between fossils and available species of Erethizontidae. <p>In-Class Activities: A regroup week. Jon will lead a discussion about how arboreality and scansoriality is studied in primates and inferred in early primate fossils. Class will discuss what measurements, papers, comparative taxa, etc. can be brought to bear on porcupines.</p>
March 12	Topic: Infer Function from Form
(week 9)	<p>Reading Due: Weisbecker and Schmid 2007</p> <p>Assignment Due:</p> <ul style="list-style-type: none"> • Peer review of the descriptions, figures, and inferences as a single document. • Draft of graphs supporting functional or taxonomic interpretation based on the tables of measurements from the previous week. <p>In-Class Activities:</p> <ul style="list-style-type: none"> • Come to a consensus for functional capabilities of the specimen based on observations from the entire skeleton. • Discussion about this week's reading?
March 19	Topic: Introduction to Context: GABI
(week 10)	<p>Reading Due: TBD by student leading discussion</p> <p>Assignment Due: 1 person volunteers to write a summary of last week's consensus on locomotion of our fossilized porcupine as a segment of the discussion section of the manuscript</p> <p>In-Class Topic: Group discussion led by student who will be writing discussion section on the topic.</p>
March 26	Topic: Context: Behavioral Differences in Living Erethizontids
(week 11)	<p>Reading Due: TBD by student leading discussion</p> <p>Assignment Due: 1 person volunteers to write a summary of last week's consensus on how our project informs our understanding of the GABI as a segment of the discussion section of the manuscript</p> <p>In-Class Activities: Group discussion led by student who will be writing discussion section on the topic</p>
April 2	Topic: Context: The Sussman Controversy
(week 12)	<p>Reading Due: Sussman 2011, 2016</p> <p>Assignment Due:</p> <ul style="list-style-type: none"> • 1 person volunteers to write a summary of last week's consensus about behavior as a segment of the discussion section of the manuscript • Any additional measurements or observations necessary to the

	<p>discussion that have not already been included in previous assignments. If all students have been successful so far, nothing will be due this week.</p> <p>In-Class Activities: Group discussion led my student who will be writing discussion section on the topic. Topic: Is our fossil porcupine <i>Erethizon</i> or <i>Coendou</i>? Class must come to a well-supported consensus.</p>
April 9	Topic: Context: Porcupine Evolution
(week 13)	<p>Reading Due: TBD by student leading discussion.</p> <p>Assignment Due: 1 student volunteers to write a formal summary of last week's consensus on if our fossil is <i>Coendou</i> or <i>Erethizon</i>, with evidence and citations, as a segment of the discussion section of the paper.</p> <p>In-Class Activities: Group discussion led my student who will be writing discussion section on the topic</p>
April 16	Topic: Context: Future Directions
(week 14)	<p>Reading Due: Dozo et al. 2004</p> <p>Assignment Due: 1 student volunteers to finish writing the discussion</p> <p>In-Class Activities:</p> <ul style="list-style-type: none"> • Discussion about academic publishing. Topics include but are not limited to: how to choose an appropriate journal, writing a cover letter, responsible peer review, what editorship at an academic journal entails.
April 23	Topic: Manuscript Completion & Reflections
(week 15)	<p>Reading Due: Kording and Mensh 2016</p> <p>Assignment Due: 1 student volunteers to write the first draft of introduction</p> <p>In-Class Activities:</p> <ul style="list-style-type: none"> • Read first draft of complete manuscript • Write abstract in-class • Discuss future edits in class • Discussion of authorship and ethics of authorship? • Course reflection.

Class Attendance and Make-Up Policy:

Much of the instruction in this class will be verbal, interactive, and in-class. Attendance is essential. If you cannot attend a class, you are expected to inform the instructor with as much advance notice as possible. You are still expected to turn in assignment online, either via email to the instructor or via the OSF project page for the course. This class is highly collaborative and all students are expected to contribute to the learning of the other students. Upon your return, you are also expected to arrange to meet with other students, and the instructor if necessary, to determine what learning you will need to make up.

Time Commitment:

The UF College of Liberal Arts and Sciences assumes that each student will devote 3-4 hours per week per credit-hour to each course during the regular semester. Because PCB 4674 is 2 credits, each student should therefore expect to devote 6-8 hours per week to this course in a 15-week semester.

Course Evaluation:

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

University Honesty Policy:

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conducthonor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Counseling and Wellness Center:

Contact information for the Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc/Default.aspx>, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Required Pre-Course Reading:

- Candela, A. M. 2002. Lower deciduous tooth homologies in Erethizontidae (Rodentia, Hystricognathi): Evolutionary significance. *Acta Palaeontologica Polonica* 47:717–723.
- Candela, A. M. 2004. A new giant porcupine (Rodentia, Erethizontidae) from the late Miocene of Argentina. *Journal of Vertebrate Paleontology* 24:732–741.
- Candela, A. M., and M. B. J. Picasso. 2008. Functional anatomy of the limbs of erethizontidae (Rodentia, Caviomorpha): Indicators of locomotor behavior in Miocene porcupines. *Journal of Morphology* 269:552–593.
- DeSantis, L., and B. MacFadden. 2008. Stable isotopes and REEs of ungulates and xenarthrans from Haile 7G: elucidating the paleoecology of a late Pliocene fossil site from Florida. *Journal of Vertebrate Paleontology* 28:71A.
- Emslie, S. D. 1998. Avian Community, Climate, and Sea-Level Changes in the Plio-Pleistocene of the Florida Peninsula. American Ornithologists’ Union, Washington, DC, 113 pp.
- Hastings, A., J. Bloch, and R. Hulbert. 2006. Evidence for a prehensile tail in a late Pliocene porcupine skeleton from north-central Florida. *Journal of Vertebrate Paleontology* 26:73A.
- Hulbert, Jr., R. C. 1997. A new late Pliocene porcupine (Rodentia: Erethizontidae) from Florida. *Journal of Vertebrate Paleontology* 17:623–626.
- Hulbert, Jr., R. C. 2010. A new Early Pleistocene tapir (Mammalia: Perissodactyla) from Florida, with a review of Blancan tapirs from the state. *Bulletin of the Florida Museum of Natural History* 4:67–126.
- Hulbert, Jr., R., J. Bloch, and A. Poyer. 2006. Exceptional preservation of vertebrates from Haile 7G, a new late Pliocene site from Florida. *Journal of Vertebrate Paleontology* 26:78A-79A.

- Hulbert, Jr., R., A. Poyer, and J. Bloch. 2008. Late Blancan rodents and lagomorphs from the Haile 7G local faun, north-central Florida. *Journal of Vertebrate Paleontology* 28:94A.
- Russo, G. A. 2015. Postsacral Vertebral Morphology in Relation to Tail Length Among Primates and Other Mammals: Postsacral Vertebral Morphology in Primates. *The Anatomical Record* 298:354–375.
- Sussman, D. R., F. W. Croxen, III, H. G. McDonald, and C. A. Shaw. 2016. Fossil porcupine (Mammalia, Rodentia, Erethizontidae) from El Golfo de Santa Clara, Sonoroa, Mexico, with a review of the taxonomy of the North American erethizontids. *Contributions in Science* 524:1–29.
- Voss, R. S., and M. N. F. Da Silva. 2001. Revisionary Notes on Neotropical Porcupines (Rodentia: Erethizontidae) 2. A Review of the *Coendou vestitus* Group with Descriptions of Two New Species from Amazonia. *American Museum Novitates* 3351:1–36.
- Wilson, L. A. B., and M. R. Sánchez-Villagra. 2009. Heterochrony and patterns of cranial suture closure in hystricognath rodents. *Journal of Anatomy* 214:339–354.

Required In-Course Reading:

See syllabus for when each reading is due. PDFs of papers will be uploaded to the Open Science Framework project for this course. In-course reading is likely to include but is not limited to:

- Candela, A. M., N. A. Muñoz, and C. M. García-Esponda. 2017. The tarsal-metatarsal complex of caviomorph rodents: anatomy and functional-adaptive analysis. *Journal of Morphology* 278:828–847.
- Dozo, M. T., M. G. Vucetich, and A. M. Candela. 2004. Skull anatomy and neuromorphology of *Hypsosteiromys*, a Colhuehuapian erethizontid rodent from Argentina. *Journal of Vertebrate Paleontology* 24:228–234.
- Frazier, M. K. 1981. A revision of the fossil Erethizontidae of North America. *Bulletin of the Florida State Museum, Biological Sciences* 27:1–76.
- Gupta, B. B. 1966. Skeleton of *Erethizon* and *Coendou*. *Mammalia* 30:495–497.
- Muñoz, N. A., N. Toledo, A. M. Candela, and S. F. Vizcaíno. 2019. Functional morphology of the forelimb of Early Miocene caviomorph rodents from Patagonia. *Lethaia* 52:91–106.
- Sutton, J. F. 1972. Notes on skeletal variation, tooth replacement, and cranial suture closure of the porcupine (*Erethizon dorsatum*). *Tulane Studies in Zoology and Botany* 17:56–62.
- Weisbecker, V., and S. Schmid. 2007. Autopodial skeletal diversity in hystricognath rodents: Functional and phylogenetic aspects. *Mammalian Biology - Zeitschrift Für Säugetierkunde* 72:27–44.
- White, J. A. 1968. A new porcupine from the middle Pleistocene of the Anza-Borrego Desert of California with notes on mastication in *Coendou* and *Erethizon*. *Los Angeles County Museum Contributions in Science* 136:1–15.