GEOL331/BSCI333 Principles of Paleontology

Fall 2020

Instructors

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Classroom

Lecture	ONLINE		
Discussion	Zoom	9:30-10:45 am	Tu
Lab	GEO 2106 & 2107	2:00-5:00	Th

Course Organization

Lectures will be provided as Panopto recordings on ELMS. Two lectures (each divided into smaller segments) will be due each week

Discussion will be held weekly on Zoom at 9:30-10:45 am Tu (Eastern time)

1 lab meeting per week. (**NOTE**: if the University undergoes another shift to online-only teaching, the labs will become entirely virtual)

Texts

Lecture Text: Donald R. Prothero. 2013. *Bringing Fossils to Life*. 3rd Edition. Columbia University Press. 671 pp. ISBN 978-0891158930.

Additional online readings are linked to on ELMS

Course Grades

Grade Scale

The numbers given represent the thresholds that must be passed in order to reach that grade (for example, A+ is 97.000... and any number greater). There is no rounding for letter grades; the thresholds must be passed. F is any grade below D-. Thresholds: 97, A+; 93, A; 90, A-; 87, B+; 83, B; 80, B-; 77, C+; 73, C; 70, C-; 67, D+; 63, D; 60, D-; < 60, F.

The Final Grade is the algebraic sum based on the numerical grades.

Grade Components

ITEM	PERCENTAGE
Midterm Exam 1	15%
Midterm Exam 2	15%
Final Exam	15%
Labs	25%
Lab Quizzes	10%
Homework	10%
Student-Generated Questions	5%
Discussion Participation	5%

Midterm Exams (15% each): Two online exams on September 30-October 2 and October 28-30, respectively. For each of these there will be a section comprised of true/false, matching, multiple choice, and similar type questions, as well as a few short answer questions and an essay. These exams are open-note but timed, and are subject to the University's Honor Pledge; you may not seek help from students or other people in doing these. If you encounter a technical problem, please contact ELMS@umd.edu for help (and Dr. Holtz so that he is aware of your situation.)

Final Exam (20%): Another online final exam, cumulative for the entire course but focuses on the material since the second midterm. Format is similar to the mid-term exams. The exam will be available ***DECEMBER 16-18***.

Labs (25%): Essentially every week there will be a lab. Labs are due the week after they are assigned, allowing students time to examine specimens over the course of the week if they wish. These will be turned in as ELMS quizzes.

Lab Quizzes (10%): In order to evaluate your understanding of the anatomy and identity of fossil material, a series of lab quizzes starting in the third week of the course. These will be done on ELMS and will be due on ELMS prior to the beginning of lab time. The lowest lab quiz grade will be automatically dropped.

Homework (10%): Throughout the course a set of homework projects are assigned to examine your knowledge of the lecture material. These will be provided on ELMS and will be entered as ELMS quizzes.

Student-Generated Questions (5%): Every week we will ask you to provide a question, its answer (and in the case of a matching or multiple-choice question, additional incorrect options) from each of the two lectures presented the next week. Creating your own question is an effective way of better understanding the material. These questions will be made available to all. A selection of these will be used in the midterm and final exams.

Discussion Participation (5%): Every week we will discuss the lectures from the previous week. All students are expected to attend every synchronous meeting and be an active participant when appropriate. In some classes, there may be directed interactive activities or discussions. Some meetings will involve Breakout Rooms. A default grade of 5 will be given for every meeting a student attends. They may be awarded up to 2 more points as extra credit for particularly helpful or effective participation in the meeting. Students who are present for a discussion section but are non-participants or are disruptive may be docked up to 2 and 4 points (respectively) at the instructors' discretion.

Course Overview

Course Description

Life of the geologic past as revealed by the fossil record. Students will examine how the physical remains of organisms and traces of their behavior in incorporated into the geologic record. They will examine how paleontologists to determine geologic ages and ancient environments; evolutionary history and extinctions; and the biology and behavior of extinct organisms.

Learning Outcomes

By the end of the semester, every student should be able to:

- Identify major groups of fossilizing organisms and their distinctive anatomical traits from hand samples.
- Interpret standard paleontological charts and plots (e.g., biostratigraphic range charts; phylogenies and cladograms; diversity analyses; etc.).
- Critically evaluate paleontological analyses in the technical literature.

Course Themes

This course examines how scientists study the age, environments, evolution, origin, biology, behavior, and extinction of fossil organisms. Over this time, we will explore several big themes:

- The scale of geologic and evolutionary time
- Biological evolution and the origin, evolution, and diversification (and occasional extinction) of branches of the Tree of Life
- The nature of scientific knowledge, and how diverse lines of evidence are used to reconstruct events of the ancient past

EXPECTATIONS & POLICIES

Expectations & Attendance

Attendance in the Zoom discussion meetings is required.

Attendance in laboratory is required. Prior to each lab there will be instruction about aspects of that day's material provided on Panopto and lab quizzes evaluating previous weeks' material on ELMS. The specimens will often be accessible during the week if you wish to revisit them before turning in your assignment; however, due to loss of specimens in the past some individual fossils might only be made available during lab time.

Communication

Communication in this course will primarily be by means of the ELMS Inbox email system. Even given its online nature, there is the possibility that due to unusual inclement weather or other unexpected emergencies, the University may close. Please consult the University main webpage (http://www.umd.edu) or call 301-405-7669 (SNOW) to confirm such cancellations. Drs Holtz & Merck will contact students via ELMS in order to inform them concerning delays of due dates for projects to be handed in or for exams: typically, these will be shifted until the next available class date.

Memorization

As part of the nature of the course, there will be a lot of memorization (less than a foreign language class, but more than that found in more mathematically-oriented introductory science classes). This will include lots of anatomical, geological, and paleontological terms, as well as evolutionary and temporal relationships. If you have difficulty memorizing, this may not be the class for you. Also, if there are words or concepts with which

you are not familiar, feel free to ask Drs. Holtz or Merck (in discussion, at office hours, over email, etc.) for an explanation or clarification.

General Policies

The University has provided a page on Academic policies at http://www.ugst.umd.edu/courserelatedpolicies.html. Each student is responsible for reviewing this page with regards to issues of Academic Integrity; the Code of Student Conduct; Sexual Misconduct; Discrimination; Accessibility; Attendance, Absences, or Missed Assignments; Student Rights Regarding Undergraduate Courses; Official UMD Communication; Mid-Term Grades; Complaints About Course Final Grades; Copyright and Intellectual Property; Final Exams and Course Evaluations; and Campus Resources.

Laptop/Smartphone/Tablet Use

Given the reliance on technology this semester, please make certain that you have access to appropriate hardware, software, and Internet connections. If you are concerned about your ability to connect remotely for this course, please consult the following information about solutions provided by the Division of Information Technology:

- General Technology Information, including laptop loaner requests: https://it.umd.edu/tech-resources
- Network Resources: https://it.umd.edu/tech-resources#network

Lecture Schedule

Date	**Topic**
Week of	**9/1 Zoom:** Introduction to the Course; Course Logistics
Aug. 31	**9/3 LAB**: Fossilization & Taphonomy
	Lecture: What Good is the Fossil Record?
	Lecture: Taphonomy: Making a Fossil Record
	Reading: Chap. 1
Week of	**9/8 Zoom:** Fossilization and Loss of Information
Sept. 8	**9/10 LAB:** Micropaleontology
	Lecture: Trace Fossils
	Lecture: Growth, Variation & Fossil Individuals
	Reading: Chaps. 2, 19
	9/11 PaleoDB Homework Due
Week of	**9/15 Zoom**: Ichnology; Growth & Variation
Sept. 14	**9/17 LAB:** Sponges & Corals

	9/17 Lab Quiz 1 **Lecture:** Fossil Species & Alpha Taxonomy **Lecture**: Biostratigraphy **Reading**: Chaps. 3, 10
Week of	**9/22 Zoom**: Taxonomy; Biostratigraphy
Sept. 21	**9/24 LAB:** Bryozoans **Lab Quiz 2** **Lecture:** Macroevolution in the Fossil Record **Lecture**: Cladistics & Phylogenetic Inference **Reading:** Chaps. 4, 5, Online readings **9/25 Biostratigraphy Homework Due**
Week of	**9/29 Zoom**: Macroevolution; Phylogenetics; Exam Review
Sept. 28	**9/30-10/2 MIDTERM EXAM 1** **10/1 LAB:** Brachiopods **10/1 Lab Quiz 3** **Lecture**: Archean Fossils & Life's Origins **Lecture**: Fossil Protists & Metazoan Origins I **Reading:** Chaps. 8, 12 **10/2 Alpha Taxonomy Homework Due**
Week of	**10/6 Zoom**: Exam Post-mortem; Life's Origins and Micropaleontology
Oct. 5	**10/8 LAB:** Gastropods & Cephalopods **10/8 Lab Quiz 4** **Lecture**: Metazoan Origins II; Sponges **Lecture**: Overview of Animal Phylogeny & Cnidarians **Reading:** Chaps. 13, 14, Online readings **10/9 Phylogenetic Analysis Homework Due**
Week of	**10/13 Zoom**: Animal Origins; Sponges; Cnidarians
Oct. 12	**10/15 LAB:** Bivalves **10/15 Lab Quiz 5** **Lecture**: Ediacaran Metazoans & the Cambrian Explosion **Lecture**: Animals with Lophophores: Bryozoans & Brachiopods **Reading:** Chap. 14
Week of	**10/20 Zoom**: Bilaterian Origins; Bryozoans; Brachiopods
Oct. 19	**10/22 LAB:** Arthropods

	10/22 Lab Quiz 6 **Lecture**: Mollusca I **Lecture**: Mollusca II **Reading:** Chap. 16
Week of Oct. 26	**10/27 Zoom**: Mollusks; Midterm Review **10/28-30 MIDTERM EXAM II** **10/29 LAB:** Pelmatozoans **10/29 Lab Quiz 7** **Lecture**: Basal Panarthropoda **Lecture**: Arthropoda I **Reading:** Chap. 15
Week of Nov. 2	**11/3 Zoom**: Exam Post-mortem; Arthropods and kin **11/5 LAB:** Eleutherozoans, Hemichordates (incl. Graptolithina) **11/5 Lab Quiz 8** **Lecture**: Arthropoda II **Lecture**: Basal Deuterostomes; Echinodermata I **Reading:** Chaps. 15, 17 **11/6 Phylogenetic Inferences Homework Due** **11/3 GENERAL ELECTION:** Are you registered to vote? Do you need to vote with an absentee ballot? Get ready in advance: check with https://www.vote.org or your local voting commission
Week of Nov. 9	**11/10 Zoom**: Arthropods (cont.); Deuterostomes **11/12 LAB:** Vertebrate Paleontology **11/12 Lab Quiz 9** **Lecture**: Echinodermata II **Lecture**: Chordates & Paleoichthyology **Reading:** Chaps. 17, 18 **11/13 Paleoecology Homework Due**
Week of Nov. 16	**11/17 Zoom**: Echinoderms; Chordates (incl. Vertebrates) **11/19 LAB:** Paleobotany **11/19 Lab Quiz 10** **Lecture**: Tetrapod Paleontology **Lecture**: Paleobotany **Reading:** Chaps. 18, 20

Week of	**11/24 Zoom**: Vertebrate Paleontology & Paleobotany
Nov. 23	**Lecture**: Biomechanics & Functional Morphology
	Reading: Chap. 7
	11/25-29 THANKSGIVING RECESS: Enjoy your roasted dinosaur
Week of	**12/1 Zoom**: Biomechanics & Functional Morphology
Nov. 30	**12/3 LAB**: Fossils in Context
	12/3 Lab Quiz 11
	Lecture: Morphometrics
	Lecture: Paleoecology and Paleoenvironments
	Reading: Chaps. 7, 8
	12/4 Paleontology Potpourri Homework Due
Week of	**12/8 Zoom**: Morphometrics; Paleoecology
Dec. 7	**12/10 LAB**: TBD
	Lecture: Macroecological Patterns: Large-Scale Phenomena of the Fossil Record
	Lecture: The Future of Paleontology
	Reading: Chap. 6
Dec. 16-18	**FINAL EXAM**