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# GEOL204 DINOSAURS, EARLY HUMANS, ANCESTORS & EVOLUTION:

## THE FOSSIL RECORD OF VANISHED WORLDS OF THE PREHISTORIC PAST

Spring 2021



### INSTRUCTOR

Dr. Thomas R. Holtz, Jr., Principal Lecturer, Department of Geology

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## TEACHING ASSISTANTS

Laura Sammon (Discussion Sections 0101, 0102, 0103)

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## COURSE ORGANIZATION

Discussion Sections as synchronous Zoom meetings with your TA at 3 (0101, 0104), 4 (0102, 0105), or 5 (0103, 0106) pm Eastern. Please only attend the particular discussion section for which you are registered.

Review Meeting as synchronous Zoom meeting with Dr. Holtz at 9:30 am Eastern Tuesday.

2 lectures per week. These are asynchronous Panopto videos, typically broken into segments of ~15-20 minutes. You must watch the videos prior to the following Monday's Discussion Section.

## TEXTS

There is no textbook for this course: instead, there are extensive online lecture notes. For some discussion sections, there will be short readings which will be made available on ELMS; these must be read by the discussion day they are listed. There may be some occasions when some extra lecture material will be presented as Panopto videos on ELMS; please watch these by the date announced.

## 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%
Discussion Participation	10%
Homework	10%
Quizzes	10%
Platform Presentations	10%
Student-Generated Questions	10%
“The Fossil Record in Popular Culture” Project & Presentation	5%

**Midterm Exams** (15% each): Two online exams on February 24-26 and April 7-9, 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 (75 minutes) 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](mailto:ELMS@umd.edu) for help (and Dr. Holtz so that he is aware of your situation).

**Final Exam** (15%): The online final exam during the regularly scheduled exam season. It is cumulative for the entire course, although it focuses on material from the second exam onward. Format is similar to the mid-term exams but will be timed for 120 minutes. The exam will be available **THURSDAY to SATURDAY MAY 13-15**: please plan your end-of-semester travel (if any...) accordingly!! (It that means informing your parents about this now, please do so!).

**Discussion & Review Participation** (10%): An essential element of education in general (and the I-Series in particular) is discussion, reflection, and clarification of key concepts. That is one of the main functions of the discussion sections. In each discussion section, there will be a review of the previous week’s lectures and readings; a review of homework assignments; the assignment and explanation of new homework projects; and so forth. In some meetings, there will be interactive activities.

In order to get the complete Participation grade, you must:

- Attend every Zoom discussion section and review meeting (the TA will keep a record of the presence and absence of students in their section)
- Be prepared to (when called upon) discuss your student-generated questions of the previous week’s lecture, and be able to participate in a review discussion about it
- Be able and willing to discuss the readings (if any) and homework assignments in an informed manner

- Be a productive and constructive participant in the discussions
- For those days with presentations, do peer reviews for all presentations (Rubrics and rules for this will be provided later.)
- Be attentive during the session. (NO texting or using social media in section meetings, for instance.)

The TA may (at their own discretion) award up to 2 more percentage points as extra credit for particularly helpful or effective participation in the discussion for students in their section. Students who are present for all discussion sections but are non-participants or are disruptive may be docked up to 2 and 4 percentage points (respectively) at the TA's discretion.

Attendance in Discussion Section and Review Meeting: While the expectation is that students attend **EVERY** lecture and **EVERY** discussion section and Review Meeting, it is recognized that occasionally conditions (accident, illness, etc.) arise that prevent such. To recognize that, every student is allowed **one** (1) absence in discussion section without penalty, so long as:

- It is not the date of their Platform or Popular Culture Presentation.
- They inform their TA by email (cc'ing Dr. Holtz in the email) beforehand (if at all possible), or certainly by the end of that same day that they will be absent and the reason for that absence.
- When returning to class, students must bring a note identifying the date of and reason for the absence and acknowledging that the information in the note is accurate.
- **NOTE:** excused absences from Discussion Sections do NOT excuse students from quizzes, homeworks, and student-generated questions. These must still be submitted in a timely fashion or they will be graded as "0".

Should these conditions not be met, the students will receive a 0 for the grade for that discussion section meeting. Additionally, if there is more than one absence the student will receive a 0 for the grade each additional discussion section meeting missed.

If there is a medical condition, Internet connectivity problem, or other extraordinary circumstance that does require missing **more than 1** discussion section meeting—or missing the date of the Platform or Pop Culture Presentation—the student must provide documentation from the appropriate sort of official (health professional; court official; etc.) explaining the absence.

In cases of dispute between student and TA over the Discussion Participation grade Dr. Holtz (as “instructor of record”) will be the final arbiter (but be informed he will take the TA's advice very seriously).

**Homework** (10% total): Throughout the course (and particularly towards the beginning of the course) there will be short homework projects provided on ELMS. The homeworks are submitted as ELMS quizzes (occasionally this requires an image upload). These project are intended to allow you to use and interpret the type of data (some of it directly from the peer-reviewed literature) that paleontologists and other scientists employ in understanding the fossil record. Your TA will discuss aspects of the homework in class, and you may discuss the packets with your classmates, but the answers you turn in **must be your own**. If there is even the appearance that you collaborated on homework answers, your homework will be turned over to the Office of Student Conduct for evaluation.

**Quizzes** (10%): These will be provided and submitted on ELMS. These are short answer (typically true/false, multiple choice, or matching questions) referring to material from the previous two week's lectures. The lowest quiz grade is automatically dropped. Quizzes will typically be due every other Friday.

**Individual Platform Presentations “Notes from the Fossil Record”** (10% total): As a term project for the course you will have an individual presentation about a recent technical research paper in paleontology, which will be presented as an in-Discussion section platform (e.g., PowerPoint) presentation. More details about the logistics of the project, choosing your paper, grading rubric, etc., will be made available later this semester. Your grade will be assigned in part from your peers and in part from you TA.

**Student-Generated Questions** (10% total): 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 previous 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.

**NOTE:** in each Discussion section meeting a student will be called upon to give their question for one of the lectures, to serve as the prompt for a section-wide review of the subject of that lecture. Failure to be able to give a response will result in a drop of one point for that discussion section meeting grade.

**“The Fossil Record in Popular Culture” Project & Presentation** (5% total): Organisms and aspects of the fossil record are widespread in popular culture: not just movies and TV shows, but games, political cartoons, toys, commercial products, and more. Late in the semester each student will find an example of such (not including the *Jurassic Park/World* franchise!!), which they will evaluate and present in Discussion section. The details of this assignment (both the part turned in on ELMS and the student presentations) will be provided later in the semester.

**LATE ITEM POLICY:** Late Homework Assignments and will be docked 25% of the total grade if not turned in on time but turned in prior to the next day or docked 50% if turned in the next day. After that point, the grade for that assignment will be a 0.

## COURSE OVERVIEW

### I-SERIES COURSES

The I-Series courses are designed to address important issues that spark the imagination, demand intellect, inspiration, and innovation, and conclude where possible with real-world implementation. They are intended to fulfill university general education requirements in a creative and contemporary way and to challenge students to apply diverse intellectual traditions to today's big issues.

### LEARNING OUTCOMES

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

- Identify the major techniques used by scientists to date events in the ancient past, the evolutionary relationships of organisms, and the behavior and function of ancient life

- Recognize how scientists test alternative models of evolutionary events and transitions
- Properly identify the various components of a peer-reviewed research paper, its conclusions, and the evidence used to support those conclusions
- Effectively present and document scientific information by means of by means of PowerPoint presentations

## COURSE THEMES

This course examines how scientists reconstruct events and life forms of the prehistoric past. Over this semester 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
- The role of information from the prehistoric past in understanding climate change and modern biodiversity

## LECTURE THEMES

Each lecture will have one (sometimes more) central question presented towards the beginning, and over the course of the lecture you will see how paleontologists and related scientists answer those questions. It is important that you pay attention to ***HOW*** such questions are answered, and not merely what the answers are.

## NOTE ON CONTENT

Science is demonstrably Humanity's most effective way of assessing reality about the natural world. Many of its discoveries contradict deeply held traditional, religious, political, or personal beliefs. In this particular course, we shall examine what Science has uncovered about the age of the Earth and its inhabitants, the origin and interrelationships of species (including our own), and the reality of climate change (including human contribution to this phenomenon). We will not shy from indicating where the scientific discoveries demonstrate that other beliefs about these aspects of the natural world are in error. If you find it distressing to hear people's beliefs called inaccurate (whether you hold them or not), this may not be the course for you: there are many other courses available at the University which fulfill the same requirement. If, however, you wish to understand not merely what Science has discovered but also ***HOW*** it discovered it—regardless of its implications for traditional, religious, political, or personal beliefs—then we encourage your active participation.

# EXPECTATIONS & POLICIES

## EXPECTATIONS & ATTENDANCE

Attendance in Discussion Section and Review Meetings is required.: see the grade items for “Discussion Participation” above for details. **NOTE:** Attendance means more than mere presence: it means “paying attention”. Please refrain from texting/web-browsing/doing homework/etc. in class.

Viewing the Panopto lectures is also required. Lecture notes are provided online, but they are not the script of the videos. You can be held responsible for any material presented in lecture in terms in quizzes or exams.

## 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. Dr. Holtz will contact students via ELMS in order to inform them concerning how this will affect course organization.

## 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 Dr. Holtz (in Review Meetings, 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>

## COURSE EVALUATIONS

CourseEvalUM will be open for students to complete their evaluations during the last two weeks of the semester. Students can access CourseEvalUM through ELMS to complete their evaluations. You will be alerted about these dates and provided more information closer to that time, and students will be alerted via their official University e-mail account.

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## COURSE SCHEDULE

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Question</b>
<i>I</i>	Jan. 25	<b>Discussion Section:</b> Introductions; Policy Review; Overview of Syllabus	
	Jan. 26	<b>Review Meeting:</b> Overview of the Course & Its Topics	
	Lecture	“Into the Darkness of Prehistory”: Our Long Quest for Origins	How did people discover the prehistoric past?
	Lecture	Clocks in the Rocks: The Geologic Record & Geologic Time	How do rocks form? How do they record past environments? How do we tell geologic time?
<i>II</i>	Feb. 1	<b>Discussion:</b> The Scale of Geologic Time; HW on Geologic Time & Paleoenvironments provided	
	Feb. 2	<b>Review Meeting</b>	
	Lecture	Bones in the Stones & Shells in the Shales: Fossils and Fossilization	What are fossils, and how do they form?
	Lecture	Bringing Fossils to Life: Paleobiology and the Methods of Science	How do we use the fossil record to understand the biology and evolution of extinct organisms?
<i>III</i>	Feb. 5	<b>Quiz 1 due</b>	
	Feb. 8	<b>Discussion:</b> What are Scientific Papers?; Geologic Time HW <b>due</b> ; HW on Understanding Scientific Papers provided	
	Feb. 9	<b>Review Meeting</b>	
	Lecture	“What is It?”: Identifying Fossils and the Nature of Species	How do we identify fossils? What are species?
<i>IV</i>	Lecture	Descent with Modification: Evolution by Natural Selection	What is evolution?
	Feb. 15	<b>Discussion:</b> Platform Presentations overview; Guide to making PowerPoints; Scientific Papers HW <b>due</b> ; HW on PaleoCSI provided	

	Feb. 16	<b>Review Meeting</b>	
	Lecture	Tempo & Mode: The Fossil Record of Speciation and Evolutionary Transformations	How do new species form?
	Lecture	The Tree of Life: Reconstructing the Evolutionary History of Life	How do we reconstruct how species are related to one another? How does the fossil record document the rise of major groups and the origins of new traits?
	Feb. 19	<b>Quiz 2 due</b>	
V	Feb. 22	<b>Discussion:</b> Tree of Life; Midterm Review; Paleo CSI HW <b>due</b> ; Evolution & the Tree of Life HW provided	
	Feb. 23	<b>Review Meeting &amp; Midterm Review</b>	
	Feb. 24-26	<b>Midterm Exam I online</b>	
	Lecture	Earth & Life Through Time: A Brief Dive through Deep Time	What is the broad pattern of the history of Life?
	Lecture	Climate Emergencies Past & Present: The PETM and the Anthropocene Contrasted	What do ancient events show about the effects of climate change on the living world?
VI	March 1	<b>Discussion:</b> Presentations 1-3; Evolution HW <b>due</b> ; HW on Paleoclimate provided; <b>PowerPoints for Presentations due for all students</b>	
	March 2	<b>Review Meeting</b>	
	Lecture	Awful Changes: Mass Extinctions	What are extinctions and mass extinctions?
	Lecture	Death from Above: The Cretaceous/Paleogene Mass Extinction	What caused the Cretaceous/Paleogene mass extinction?
	March 5	<b>Quiz 3</b>	
VII	March 8	<b>Discussion:</b> Presentations 4-6; Paleoclimate HW <b>due</b> ; HW on Mass Extinctions provided	

	March 9	<b>Review Meeting</b>	
	Lecture	Death from Below: The Permo-Triassic Mass Extinction and Mass Extinction Wrap Up	What caused the Permo-Triassic mass extinction?
	Lecture	First Impressions to Shell Games: The Garden of Ediacara and the Cambrian Explosion	What were the first animals like, and why did animals develop shells?
	March 14-18	<b>SPRING BREAK</b>	
VIII	March 22	<b>Discussion:</b> Presentations 7-9	
	March 23	<b>Review Meeting</b>	
	Lecture	A Tale of Two Dynasties: The Rise and Fall of Trilobites and Ammonoids	How do the histories of trilobites and ammonoids compare?
	Lecture	“Fearfully Great Lizards”: The Rise of the Dinosaurs	How did dinosaurs become so successful?
	March 26	<b>Quiz 4</b>	
IX	March 29	<b>Discussion:</b> Presentations 10-12; Midterm Review	
	March 30	<b>Review Meeting</b>	
	Lecture	Feathered Dragons: Dinosaurs and the Origin of Birds	How did birds evolve from (other) dinosaurs, and how did they learn to fly?
	Lecture	The Hot-Blooded Dinosaurs: Reconstructing Dinosaur Physiology	Were dinosaurs warm-blooded?
X	April 5	<b>Discussion:</b> Presentations 13-15; Midterm Review continued	
	April 6	<b>Review Meeting &amp; Midterm Review</b>	
	April 7-9	<b>Midterm Exam II online</b>	
	Lecture	Furry Conquerors: Cenozoic Mammalian Diversification	How did mammals diversify after the K/Pg mass extinction?
	Lecture	Drawing Out Leviathan: The Origins of Whales	What does the fossil record tell us about the origin of whales?

XI	April 12	<b>Discussion:</b> Presentations 16-18	
	April 13	<b>Review Meeting</b>	
	Lecture	Wild and Woolly: Origins of the Ice Age and Its Fauna	How did the Quaternary Ice Ages form? From where did its characteristic biota come?
	Lecture	The Scatterlings of Africa: The Origins of Humanity	Where, and from what, did humans evolve? What were proto-humans like?
	April 16	<b>Quiz 5 due</b>	
XII	April 19	<b>Discussion:</b> Presentations 19-20; HW on Human Origins provided; Fossil Record in Popular Culture project overview	
	April 20	<b>Review Meeting</b>	
	April 21	Last Man Standing: The Rise of <i>Homo sapiens</i>	What makes our species unique, and what happened to our closest kin?
	April 23	Out of Eden: The Spread of <i>Homo sapiens</i>	How did humanity spread around the world?
XIII	April 26	<b>Discussion:</b> Fossil Record in Popular Culture presentations I	
	April 27	<b>Review Meeting</b>	
	Lecture	The Call of Distant Mammoths: The Pleistocene Mass Extinctions	What happened to the Pleistocene megafauna?
	Lecture	The Sixth Extinction: The Holocene Extinctions & Modern Defaunations	How does the fossil record inform us about the on-going modern extinctions?
	April 30	<b>Quiz 6 due</b>	
XIV	May 3	<b>Discussion:</b> Fossil Record in Popular Culture presentations II	
	May 4	<b>Review Meeting</b>	
	Lecture	Reversing the Tide? Conservation Paleontology, Rewilding & De-Extinction	How can the paleontological perspective be used in service of endangered species and threatened ecosystems?

XV

Lecture	The Earth After Us: The Fossil Record of the Anthropocene and Beyond	What will we leave behind in the fossil record?
May 10	<b>Discussion:</b> Final Exam Review	
May 11	<b>Review Meeting &amp; Final Review</b>	
Lecture	What Good is the Fossil Record? Perspectives of the Prehistoric Past	How do we balance public and private interests in fossil specimens? How do scientists get their information out to the public?
May 11	<b>Quiz 7 due</b>	
May 13-15	<b>FINAL EXAM onlines</b>	

Homework projects will be due by the section meeting after they are assigned.