GEOL204 Dinosaurs, Early Humans, Ancestors & Evolution: The Fossil Record of Vanished Worlds of the Prehistoric Past

Spring 2019

Instructor

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Teaching Assistants

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Classrooms

Lecture	SHM 2102	9:30-10:45 am	TuTh
0101	PLS1158	3-3:50 pm	M
0102	PLS1158	4-4:50 pm	M
0103	PLS1158	5-5:50 pm	M
0104	PLS1168	3-3:50 pm	M
0105	PLS1168	4-4:50 pm	M
0106	PLS1168	5-5:50 pm	M

Course Organization

2 lectures per week (Tuesday, Thursday), 1 discussion section per week (Monday). **NOTE**: You must attend the particular discussion section for which you are registered.

Lectures lost due to University late openings or cancellations or instructor absence will be made up as Panopto video recordings on the ELMS page. Discussion sections missed due to early closings or cancellations will be handled on a case-by-case basis: expect an announcement on ELMS for these.

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 & Homework	10%
Homework	5%
Quizzes	10%
Platform Presentations	12.5%
Museum Poster Presentation	12.5%
Lecture Summaries	5%

Midterm Exams (15% each): Two pen-and-paper exams on February 28 and April 11, respectively. Absence from the exams will not be excused except for those causes approved by University policy in the University of Maryland Undergraduate Catalog see http://www.ugst.umd.edu/courserelatedpolicies.html, under "Attendance, Absences, or Missed Assignments"). Only those students excused for these causes will be eligible for a make-up exam.

Final Exam (15%): A pen-and-paper final exam during the regularly scheduled exam season. It is cumulative for the entire course. Format is similar to the mid-term exams. The preliminary date is ***FRIDAY MAY 17, 8-10 am*** (to be confirmed mid-semester): please plan your end-of-semester travel accordingly!! (It that means informing your parents about this now, please do so!) Again, absence from the final will not be excused except for those causes approved by University policy in the University of Maryland Undergraduate Catalog.

Quizzes (10%): These will be held during the Discussion section but represent their own graded item. These are short answer (typically true/false, multiple choice, or matching questions) referring to material from the previous week's lectures. They will normally be held at the beginning of the Discussion section, so please be on time. The lowest quiz grade is automatically dropped. Only quizzes missed for excused absences can be made up; quizzes missed due to unexcused absences are simply graded as "0". (The first such missed quiz becomes your automatically dropped quiz grade.) Quizzes missed for excused absences ***MUST*** be made up before the next Discussion week, barring extraordinary circumstances: they are normally made up during the TA's office hours.

Individual Platform Presentations "Notes from the Fossil Record" (12.5% 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.

Team Poster Presentations "Museum of the Fossil Record" (12.5% total): As a term project for the later part of the semester, you will construct a poster (using PowerPoint) in the form of a museum exhibit,

explaining some particular concept in paleontology. Your team will consist of 4 people from your section, and your posters will be presented in the last day of class and will be mounted on the website for the course. More details about the logistics of the project, choosing your topic, grading rubric, etc., will be made available later this semester. Your grade is mostly based on the poster itself, but also from within-teem peer evaluations.

Lecture Summary (5% total): In order to keep current with the course, to help prepare for quizzes and exams, and to help focus your thinking, every student will turn in a brief summary of the previous week's lectures by the time of the discussion section. You will turn them in via ELMS. These summaries should be short: only a brief paragraph of a few sentences per lecture. They should restate the key concepts of the lectures. One approach might be to state the key question for the lecture, then (in your ***own words***) the answer to that question.

NOTE: in each Discussion section meeting a student will be called upon to give their summary 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***.

Discussion 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 occasionally some logistical items (for example, planning small group projects). In some situations, there will be interactive activities.

In order to get the complete Participation grade you must:

- Attend every discussion section (the TA will keep a record of the presence and absence of students in their section, normally by using the quizzes)
- Be prepared to (when called upon) provide your summary 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, 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.)
- Put away smart phones, laptops, tablets, etc., except where required for some class activity. (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: While the expectation is that students attend ***EVERY*** lecture and ***EVERY*** discussion section, 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 Poster 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.
- They turn in any assignments due at the TA's office or mailbox in Geology the next working day.
- They are responsible for picking up any newly handed out homework assignment handed out in section.

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 or other extraordinary circumstance that does require missing ***more than 1*** discussion section meeting—or missing the date of the Platform or Poster Presentation—the student must provide written 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 (5% total): Throughout the course (and particularly towards the beginning of the course) there will be short homework projects handed out in the discussion section to be turned in the following week. These packets 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.

LATE ITEM POLICY: Late Homework Assignments and will be docked 25% of the total grade if not turned in on time but turned in (at the TA's mailbox in the Geology Building or at their office) prior to the next day or docked 50% if handed 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 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
- 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 lecture is expected. The PowerPoints will not be provided to students, although there are detailed lecture notes online. If you cannot make a certain lecture, try and find another student who might lend you their notes. (In fact, establishing a study group early in the course has proven useful for many students in the past). Attendance in discussion sections is ***required***: see the grade items for "Discussion Participation & Homework" above for details.

NOTE: Attendance means more than mere presence: it means "paying attention". Please take out your ear buds and refrain from texting/web-browsing/doing homework/etc. in class and in lab.

Communication

Communication in this course will primarily be by means of the ELMS Inbox email system. In cases of 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 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 Dr. Holtz (in class, after class, 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

Recent studies have shown that:

- People who take notes using pen/pencil and paper more effectively process and master the material, especially with regards to their ability to answer conceptual questions. (Also, taking notes by hand allows easier doodling, which has been shown to promote focus and memory).
- More importantly, people using laptops are likely to start multitasking (pulling up social media; watching videos; playing games; doing work for other classes; etc.) and that such multitasking is detrimental to the both the student doing it and all students within view of that screen.

Towards this end, I **very strongly encourage** you to take notes via pencil/pen and paper. It is in your academic benefit to do this.

If you choose to take notes using a computer, you are agreeing to the following conditions:

- Computer use is limited to following along with lecture notes, taking notes yourself, or searching for additional information (via Wikipedia, journal articles, and similar sites) concerning the lecture matter.
- You will refrain from using your computer from any or all of the following during classtime: doing class assignments for this or other classes; using social media, texting, email, or other electronic modes of communication; viewing any websites or apps other than those listed in the first bullet point (i.e., no checking news, entertainment, sports, shopping, etc., sites).
- Failure to restrict your computer use will mean that laptop & smartphone use by **all students** in class will be prohibited for the rest of the semester. Apologies to those students who prefer to use this method to take notes, but this is the only effective way of dealing with the bad actors.

When not in use, smartphones, tablets, laptops, and all other modes of electronic communication must be **turned off** and **stowed away** during class time. (**NOTE**: using your smartphone between your legs underneath the desk is NOT "stowed away", and you aren't and have never fooled a teacher or instructor when you try that…) If you are using the device for recording lectures, please activate them then leave them untouched for the remainder of the lecture.

That said, there may be some group activities in which we will use individual laptops/tablets/smartphones in class. Dr. Holtz will make every effort to inform you about this in advance. However, in those situations you may only use these devices for the task at hand.

As noted above, smartphones must be stowed away during Discussion sections.

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.

Students who complete evaluations for all of their courses in the previous semester (excluding summer), can access the posted results via Testudo's CourseEvalUM Reporting link for any course on campus that has at least a 70% response rate. You can find more information, including periodic updates, at the IRPA course evaluation website:

https://www.irpa.umd.edu/Assessment/CourseEval/fac_faq.shtml

The expectation is that all students will complete these. This is YOUR chance to anonymously evaluate this class: please use this opportunity!

Lecture Schedule

Week	Date	Topic	Question
I	Jan. 28	**Discussion:** Introductions; Policy Review	
	Jan. 29	"Into the Darkness of Prehistory": Our Long Quest for Origins **[LECTURE ON PANOPTO VIDEO: Do Not Meet for Lecture]**	How did people discover the prehistoric past?
	Jan. 31	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?
II	Feb. 4	**Discussion: Quiz 1;** Rocks & Geotime; HW on Scale of Geologic Time	
	Feb. 5	Bones in the Stones & Shells in the Shales: Fossils and Fossilization	What are fossils, and how do they form?
	Feb. 7	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?
III	Feb. 11	**Discussion: Quiz 2**; Scientific Papers; HW on Understanding Scientific Papers	
	Feb. 12	"What is It?": Identifying Fossils and the Nature of Species	How do we identify fossils? What are species?
	Feb. 14	Descent with Modification: Evolution & the Tree of Life	What is evolution?
IV	Feb. 18	**Discussion: Quiz 3**; Presentations overview; Guide to making PowerPoints; HW on PaleoCSI	
	Feb. 19	Tempo & Mode: Species Origins & the Fossil Record	How do new species form?
	Feb. 21	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?
V	Feb. 25	**Discussion: Quiz 4**; Phylogenetic Inference; Midterm Review; HW on Tree of Life	
	Feb. 26	Earth & Life Through Time: The Broad Pattern of the History of Life	What is the broad pattern of the history of Life?
	Feb. 28	**Midterm Exam I**	
VI	March 4	**Discussion:** Presentations 1-3; HW on Paleoclimate	
	March 5	Hot Times in the Old Town Tonight: The PETM and the Anthropocene Contrasted	What do ancient events show about the effects of climate change on the living world?
	March 7	Awful Changes: Mass Extinctions	What are extinctions and mass extinctions?
VII	March 11	**Discussion: Quiz 5;** Presentations 4-6; HW on Mass Extinctions	

	March 12	Death from Above/Death from Below: The Era-Ending Mass Extinctions Compared	How do the Cretaceous-Paleogene and Permo-Triassic mass extinctions compare?
	March 14	A Tale of Two Dynasties: The Rise and Fall of Trilobites and Ammonoids	How do the histories of trilobites and ammonoids compare?
	March 18-22	**SPRING BREAK**	
VIII	March 25	**Discussion: Quiz 6;** Presentations 7-9	
	March 26	Landward, Ho! The Conquest of Land	What changes allowed animals and plants to colonize land?
	March 28	"Fearfully Great Lizards": What's the Big Deal with Dinosaurs?	How did (some) dinosaurs get so big?
IX	April 1	**Discussion: Quiz 7**; Presentations 10-12; Overview of Museum Project	
	April 2	The Hot-Blooded Dinosaurs: Reconstructing Dinosaur Physiology	Were dinosaurs warm-blooded?
	April 4	Feathered Dragons: Dinosaurs and the Origin of Birds	How did birds evolve from (other) dinosaurs, and how did they learn to fly?
X	April 8	**Discussion: Quiz 8**; Presentations 13-15; Midterm Review	
	April 9	Life in Fur: The Rise and Success of Mammals	Where did mammals come from, and why were they so successful?
	April 11	**Midterm Exam II**	
XI	April 15	**Discussion:** Poster Design overview; Presentations 16-18	
	April 16	Wild and Wooly: Origins of the Ice Age and Its Fauna	How did the Quaternary Ice Ages form? From where did its characteristic biota come?
	April 18	The Scatterlings of Africa: The Origins of Humanity	Where, and from what, did humans evolve? What were proto-humans like?
XII	April 22	**Discussion: Quiz 9**; Presentations 19-20; HW on Human Origins	
	April 23	Last Man Standing: The Rise of *Homo sapiens*	What makes our species unique, and what happened to our closest kin?
	April 25	Out of Eden: The Spread of *Homo sapiens*	How did humanity spread around the world?
XIII	April 29	**Discussion: Quiz 10**; Workshop Posters	
	April 30	The Call of Distant Mammoths: The Pleistocene Mass Extinctions	What happened to the Pleistocene megafauna?
	May 2	The Sixth Extinction: The Holocene Extinctions & Modern Defaunations	How does the fossil record inform us about the on-going modern extinctions?
XIV	May 6	**Discussion: Quiz 11**; Workshop Posters	
	May 7	Reversing the Tide? Conservation Paleontology, Rewilding & De-Extinction	How can the paleontological perspective be used in service of endangered species and threatened ecosystems?

	May 9	Misrepresenting the Fossil Record: Creationism, Hoaxes & Pseudoscience	How do people misinterpret the fossil record, and why?
XV	May 13	**Discussion: Quiz 12**; Team Project Presentations	
	May 14	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 17	**FINAL EXAM 8-10 am**	

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