

**GEOL 204 Dinosaurs, Early Humans, Ancestors & Evolution:
The Fossil Record of Vanished Worlds of the Prehistoric Past**
Spring Semester 2016

Lectures: CHE 2110, TuTh 9:30-10:45 am

Discussion Sections:

0101 PLS 1158, M 3-3:50 pm
0102 PLS 1158, M 4-4:50 pm
0103 PLS 1158, M 5-5:50 pm

0104 PLS 1168, M 3-3:50 pm
0105 PLS 1168, M 4-4:50 pm
0106 PLS 1168, M 5-5:50 pm

Instructor:

Dr. Thomas R. Holtz, Jr.

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NOTE: It is your responsibility as a student to completely read through and understand this syllabus. If you have questions about it, please contact Dr. Holtz. You will be held responsible for following all requirements of this syllabus.

Course Description: Where did we, and the other living things on Earth, come from? What lived here before us? How do we know? The questions of the origins of humanity and of the other inhabitants of our world have intrigued cultures throughout history. During the last several centuries scientists have developed many techniques in the natural historical sciences-geology, paleontology, biology, archaeology-which allow us to answer those questions. "The Fossil Record" will consider the many different types of evidence from used to reconstruct events in the history of life by looking at particular case studies of the fossil record. In discussion sections students will be introduced to reading the scientific literature and interpreting examples of data sets, plots, and charts used to interpret the fossil world. Additionally, we will discuss some of the various reasons that otherwise-knowledgeable people reject the scientifically incontrovertible evidence for an ancient Earth and the evolution of life and humanity. We will also examine how the fossil record informs our understanding of (and possible response to) the recent and near-future impact of human technology and activity on the Earth systems and planetary biosphere.

What this course isn't: This is NOT my course on dinosaur paleontology! Please note that there are many words in the title of this course after "Dinosaurs"... In fact, the short name for this course is "The Fossil Record". If you want a course mostly about dinosaurs, try my Fall semester class GEOL 104 Dinosaurs: A Natural History. (Don't worry, though: we do cover some dinosaur paleontology in this class!) This is also neither an overview of the History of Life (that's GEOL 102 Historical Geology) nor a course that gives you the main techniques and methods you need to identify and interpret fossils (that's GEOL 331 Principles of Paleontology).

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.

A 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.

Texts: No single textbook is planned for this course. Selections of short book chapters & peer-reviewed technical and review papers will be made available on ELMS; these must be read by the discussion day they are listed. Also, please keep current with the online lecture notes. 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 Organization: 2 lectures per week (Tuesday, Thursday), 1 section per week (Monday).

Grade: Mid-Term Exam I:	17.5%	Quizzes:	12%
Mid-Term Exam II:	17.5%	Platform Presentation:	10%
Final Exam:	20%	Platform Presentation Peer Grading:	2%
Discussion Participation		News Reports:	5%
& Homework:	15%	I-Series Survey	1%
		EXTRA CREDIT POINTS for Course Evaluation	

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.

Midterm Exams (17.5% each): Two pen-and-paper exams on February 25 and April 5, 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.umd.edu/catalog/index.cfm/show/content.section/c/27/ss/1584/s/1540>. Only those students excused for these causes will be eligible for a make-up exam.

Final Exam (20%): 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 13, 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: see <http://www.umd.edu/catalog/index.cfm/show/content.section/c/27/ss/1584/s/1540>.

Quizzes (12%): 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.

Team Platform Project "Notes from the Fossil Record" (10% total): As a term project for the course you will have a small group (normally 4 students) team which will research a set of research papers on a particular subject, which will be presented as an in-Discussion section platform presentation (PowerPoint or Prezi). More details about the logistics of the project, the types of subjects, grading rubric, etc., will be made available later this semester. The breakdown of the different elements of this project are:

- 1% Teams lists and Contracts – Due Feb. 22
- 1% Topic Proposal – Due February 29
- 1% Annotated Bibliography – Due March 7
- 7% Presentation Itself – Presented on March 28, April 4, 11, 18, or 25

Peer Grading of Presentations (2%): It is also your responsibility to watch and evaluate the presentations of other teams. Rubrics and rules for this will be provided later.

News Reports (5% total): New discoveries are being made all the time in paleontology and related sciences. In order to keep up with new information, each student will read and report on recent news items related to the study of the prehistoric past. These brief reports will be posted as a graded item on ELMS, and also discussed in Discussion Section. Each student will do two such reports between weeks 3 and 12; this means four students will be doing a news report each week in each section. A particular prompt will be given for each week concerning the general topics to be covered. Unless otherwise noted, they must be done prior to 3 pm the following Monday (that is, the time of the first discussion sections each week).

Discussion Participation & Homework (15%): 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 aspect of the "Discussion Participation & Homework" 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 able and willing to discuss the lectures, readings, and homework assignments in an informed manner
- Be a productive and constructive participant in the discussions

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.

Additionally, throughout 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. Homework grades are incorporated into the division of the Discussion Participation in which they are due.

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:

- A. It is not the date of their Team Project Presentation.
- B. They inform their TA by email (cc:ing Dr. Holtz in the email) before hand (if at all possible), or certainly by the end of that same day that they will be absent and the reason for that absence.
- C. 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.
- D. They turn in any assignments due at the TA's office or mailbox in Geology the next working day.
- E. 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 Team Project 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).

I-Series Survey (1%): To support the I-Series of courses, it is critical that we have feedback from student participants in the course. You must take the online I-Series Survey prior to the time of the Final Exam to receive this credit.

EXTRA CREDIT Course Evaluation: Separate from the I-Series Survey is the standard <http://www.CourseEvalUM.umd.edu> course evaluation. CourseEvalUM will be open for students to complete their evaluations for Spring 2016 courses at the end of the semester. Students can go directly to the website (www.courseevalum.umd.edu) 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 at the IRPA course evaluation website:

<https://www.irpa.umd.edu/Assessment/CourseEval/StuFastFacts.html>

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

In order to reward good citizenship, the class as a total will receive +1 if at least 70% of the students do the CourseEvaluation and +2 if 90% or more!

Otherwise, no separate extra credit assignments as such planned for this course, although individual exams, quizzes, and homework assignments may have extra credit questions that add up in the final course grade.

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.

Websites: <http://www.geol.umd.edu/~tholtz/G204/>

Website includes copies of the syllabus, handouts, lecture notes, etc. This site will be built up throughout the semester as each lecture page, etc., is added.

<http://elms.umd.edu/>

The ELMS Canvas site will include required online exams; readings; announcements concerning the class; copies of the handouts; Team Project wikis; and so forth. If you have not already done so, make sure that you get access to ELMS.

Other Policies: **Academic integrity:** All work on tests, homeworks, etc. must be your own. Although group study can be very useful, make sure that all your work you turn in is your own. The University of

Maryland has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://shc.umd.edu/SHC/Default.aspx>

The University of Maryland is one of a small number of universities with a student-administered Honors Code and an Honors Pledge, available on the web at <http://shc.umd.edu/SHC/HonorPledgeInformation.aspx>. The code prohibits students from cheating on exams, plagiarizing papers, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents, and forging signatures. The University Senate encourages instructors to ask students to write the following signed statement on each examination or assignment: "I pledge on my honor that I have not given or received any unauthorized assistance on this examination (or assignment)."

Thus, in GEOL204, work submitted under your name, even for extra credit, must **unambiguously** be exclusively your own. Any evidence of dishonesty on any graded assignment will result in a referral to the [Office of Student Conduct](#). **Note that Geology regards the unauthorized distribution of any course materials as constituting facilitation of academic dishonesty and will report this to the OSC.**

Academic Accommodations: If you have a documented disability, you should contact Disability Support Services 0106 Shoemaker Hall. Each semester students with documented disabilities should apply to DSS for accommodation request forms which you can provide to your professors as proof of your eligibility for accommodations. The rules for eligibility and the types of accommodations a student may request can be reviewed on the DSS web site at <http://counseling.umd.edu/DSS/registration.php>

Religious Observances: The University System of Maryland policy provides that students should not be penalized because of observances of their religious beliefs, students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is the responsibility of the student to inform the instructor of any intended absences for religious observances in advance. **Notice should be provided as soon as possible but no later than the end of the schedule adjustment period (February 5).** Faculty should further remind students that prior notification is especially important in connection with final exams, since failure to reschedule a final exam before the conclusion of the final examination period may result in loss of credits during the semester. The problem is especially likely to arise when final exams are scheduled on Saturdays.

Laptop/Tablet/Smartphone 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.

Because of this, and because of past bad experience, smartphones, tablets, laptops, and all other modes of electronic communication must be **turned off** and **stowed away** during class and discussion 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. 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.

(**NOTE:** if you have a reason for using laptops for note taking approved by the Disability Support Service, please bring that to the attention of both Dr. Holtz and the TAs prior to using them in class, and please make a copy of a DSS note to that affect available for our records.)

Miscellaneous: Much of the information presented is not available in the readings; it is essential that students attend all lectures and take their own notes. If you cannot make a certain lecture, try and find another student who might lend your their notes. (In fact, establishing a study group early in the course has proven useful for many students in the past).

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. Almost certainly lectures cancelled due to University closure will be posted on ELMS using Panopto.

Keep up with the required readings! Although the format of the lectures and the readings do not always match, the readings are important as well. Some of the material to be tested is covered in more detail in the readings than in class.

Readings should be done **prior** to the classtime they are listed.

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MAIN SCHEDULE

Week	Topic	Lecture Question
I	Jan. 25 Discussion: Introductions; Policy Review; Syllabus handed out	
	Jan. 26 Lecture “Into the Darkness of Prehistory: Our Long Quest for Origins”	How did people discover the prehistoric past?
	Jan. 28 Lecture “Bringing Fossils to Life: Paleobiology and the Methods of Science”	What is the “Scientific Method”? How do we use the fossil record to understand the biology and evolution of extinct organisms?
II	Feb. 1 Quiz 1 ; Discussion: Paleo CSI; Understanding Scientific Papers HW assigned	
	Feb. 2 Lecture “Bones in the Stones & Shells in the Shales: Fossils and Fossilization”	What are fossils, and how do they form?
	Feb. 4 Lecture “Clocks in the Rocks: Geologic Time”	How do we determine the age of fossils?
III	Feb. 8 Quiz 2 ; Discussion: Measurements & Uncertainty; Geologic Time HW assigned	
	Feb. 9 Lecture “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?
	Feb. 11 Lecture “On the Origin of Species by Means of Natural Selection”	What is evolution, and how does it work?
IV	Feb. 15 Quiz 3 ; Discussion: Evolution; Overview of Team Projects; Paleoclimate & Evolution HW assigned	
	Feb. 16 Lecture “Ancestors, ‘Missing Links’, and Transitions: The Fossil Record of Speciation and Macroevolution”	How do new species form, and how quickly do these changes take place? What is macroevolution, and what do fossils say about patterns above the species level?
	Feb. 18 Lecture “The Tree of Life: Reconstructing the Pattern of Evolution”	How do we determine the relationships between organisms? How do we reconstruct ancestral states?
V	Feb. 22 Quiz 4 ; Discussion: Phylogenetics; Exam Review; Phylogenetics HW assigned; Teams and Contract due	
	Feb. 23 Lecture “Earth and Life Through Time: A (Very Brief!) Overview of the History of Life on Earth”	What is the broadest scale picture of Earth History?
	Feb. 25 MID-TERM EXAM I	

VI	Feb. 29 Discussion: Research Strategies & Geologic Timelines Demonstration; Paper topics due	
	Mar. 1 Lecture “The End of All Things: Reconstructing Mass Extinctions”	What is a mass extinction, and how do we recognize one?
	Mar. 3 Lecture “Death From Above: The Cretaceous/Paleogene Extinction”	What caused the Cretaceous/Paleogene mass extinction?
VII	Mar. 7 Quiz 5 ; Discussion: Mass Extinctions; Extinction HW assigned; Annotated Bibliography due	
	Mar. 8 Lecture “Death From Below: The Permo-Triassic Extinction”	What caused the Permo-Triassic mass extinction?
	Mar 10 Lecture “First Impressions: The Riddle of the Ediacarans”	What do the Ediacaran fossils represent?
	SPRING BREAK Mar. 14-18	
VIII	Mar. 21 Quiz 6 ; Discussion: Presentation Logistics and Skills	
	Mar. 22 Lecture “Shell Games: The Long Fuse of the Cambrian Explosion”	What caused the Cambrian Explosion?
	Mar 24 Lecture “Reign of the Dinosaurs: What’s the Big Deal?”	How did (some) dinosaurs get so big?
IX	Mar. 28 Quiz 7 ; Team Presentation 1	
	Mar. 29 Lecture “The Hot-Blooded Dinosaurs: Reconstructing Dinosaur Physiology”	Were dinosaurs warm-blooded?
	Mar. 31 Lecture “Feathered Dragons: The Origins of Birds & of Avian Flight”	How did birds evolve from (other) dinosaurs, and how did bird flight evolve?
X	Apr. 4 Quiz 8 ; Team Presentation 2	
	Apr. 5 MID-TERM EXAM II	
	Apr. 7 Lecture “Drawing Out Leviathan: The Origin of Whales”	What does the fossil record tell us about the origin of whales?
XI	Apr. 11 Team Presentation 3	
	Apr. 12 Lecture “Wild and Woolly: Origins of the Quaternary Ice Age and Its Fauna”	How did the Quaternary Ice Age form? From where did its characteristic biota come?
	Apr. 14 Lecture “Scatterlings of Africa: The Origins of Humanity”	Where, and from what, did humans evolve? What were proto-humans like?

XII	Apr. 18 Quiz 9 ; Team Presentation 4	
	Apr. 19 Lecture “Last Man Standing: The Rise of <i>Homo sapiens</i> ”	What makes our species unique, and what happened to our closest kin?
	Apr. 21 Lecture “Out of Eden: The Spread of <i>Homo sapiens</i> ”	How did humanity spread around the world?
XIII	Apr. 25 Quiz 10 ; Team Presentation 5; Human Origins HW assigned	
	Apr. 26 Lecture “The Call of Distant Mammoths: The Pleistocene Megafaunal Extinctions”	What happened to the Pleistocene megafauna?
	Apr. 28 Lecture “Denying the Fossil Record: Evolution Denial and U.S. Science Education”	Why do so many Americans reject the reality of evolution?
XIV	May 2 Quiz 11 ; Discussion: Evolution Denial	
	May 3 Lecture “The Sixth Extinction: The Holocene Extinctions & Modern Defaunations”	How does the fossil record inform us about the on-going modern extinctions?
	May 5 Lecture “Reversing the Tide? Conservation Paleontology, Rewilding, and De-extinction”	How can the paleontological perspective be used in service of endangered species and threatened ecosystems?
XV	May 9 Quiz 12 ; Discussion: Commercial sales of fossils: pros & cons; Final Review	
	May 10 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?

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

FINAL EXAM (NOTE: subject to change: to be confirmed later toward the end of the semester):

May 13 (**FRIDAY**): 8:00-10:00 am, CHE 2110