

# HONR 259C “FEARFULLY GREAT LIZARDS”: TOPICS IN DINOSAUR RESEARCH



FALL 2019

*“The combination of such characters, some, as the sacral ones, altogether peculiar among Reptiles, others borrowed, as it were, from groups now distinct from each other, and all manifested by creatures far surpassing in size the largest existing reptiles, will, it be presumed, be deemed sufficient ground for establishing a distinct tribe or sub-order of Saurian Reptiles, for which I would propose the name of Dinosauria.” – R. Owen (1842), British Fossil Reptiles*

## INSTRUCTOR

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

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## CLASSROOM

Lecture

ESJ 1309

TuTh 12:30-1:45 pm

## COURSE DESCRIPTION

Since their discovery in the early 19th Century, dinosaurs have fascinated both the scientific community and the general public. Alternatively the exemplars of power and adaptation or obsolesce and failure, the members of Dinosauria have been the best known of Life's ancient past to the world at large. But how do we know about them? How can we reconstruct their anatomy, their behavior, their evolution, and their extinction? And how can knowledge of these ancient animals help us understand the contemporary world? This Honors Seminar will focus on the nature of that understanding. Students in the program will examine the science behind dinosaur paleontology: how data derived from fossils are used to reveal the life and habits of these animals.

Students in this course will engage with the primary technical literature from scientific journals, as well as general audience sources in a variety of media. Through this they will see how paleontologists attempt to understand the biology of these organisms through a various means of analysis and inference, and will see how (and to what degree) alternatively hypotheses of the same evidence are evaluated. They will see how this information is transmitted from scientists to the general public. As a capstone of the course, each student will create their own example of a popular audience presentation of a scientific discovery about dinosaurs in a medium of their own choice.

**Please note:** one thing this course is NOT is a comprehensive survey of the diversity of dinosaurs, their biology, and their times (that course is GEOL 104 Dinosaurs: A Natural History). Instead, this course will examine a smaller subset of topics in depth and explore the relevant research around that subject.

**Also please note:** This Honors Seminar involves considerably more reading and writing than typical science courses. Nearly every week you will be reading at one or more article or video relevant to the topic. It is your responsibility to have read/screened these in advance and be read to be conversant on the contents.

## COURSE ORGANIZATION

2 meetings per week (Tuesday, Thursday). Tuesdays are typically devoted to lectures; Thursdays to discussions and other group activities.

Lectures lost due to University late openings or cancellations or instructor absence will be made up as Panopto video recordings on the ELMS page. Group discussions and other activities lost due to the same will be made up in a manner to be announced over ELMS.

## FIELD TRIPS

Two field trips are planned for this course. A report on one of these is a graded item for the course. The other trip is available for an extra credit. The field trips are:

- **Sunday September 15:** Deep Time Hall of Fossils and other fossil exhibits at the National Museum of Natural History, Smithsonian Institution, Washington, D.C.
- **Saturday October 12:** Dinosaur Park, Laurel, MD

## TEXTS

There is no textbook for this course. There are online lecture notes provided (<https://www.geol.umd.edu/~tholtz/H259C/H259CLec.html>); these should be read in advance of the appropriate lecture.

There are a substantial number of short readings and screenings required for this course: these include technical papers from the scientific literature; essays for the general public; news reports from the press; YouTube explanatory videos; shorter documentaries; and others. These will be provided as links on the ELMS page. In some cases, every student will read that paper/screen that video; in others, subsets of the class are assigned different viewing/screenings and are responsible for sharing the information from these to the class as a whole.

## 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
Discussion Participation	10%
Quizzes	10%
Individual Papers	30%
Group Discussion Reports	15%

<b>Field Trip Report</b>	5%
<b>Capstone Proposal</b>	2%
<b>Capstone One-Slide Proposal Defense Peer-Review</b>	2%
<b>Capstone Draft</b>	5%
<b>Capstone Draft Peer-Review</b>	2%
<b>Capstone Final</b>	15%
<b>Capstone Final Peer-Review</b>	4%

**Discussion Participation (10%):** As this is an Honors Seminar, all students are expected to attend every course meeting and be an active participant when appropriate. In some classes, there may be interactive activities or discussions. A default grade of 5 will be given for every class a student attends. They may be awarded up to 2 more points as extra credit for particularly helpful or effective participation in the. Students who are present for all discussion sections but are non-participants or are disruptive may be docked up to 2 and 4 points (respectively) at the instructor’s discretion.

While the expectation is that students attend ***EVERY*** class, it is recognized that occasionally conditions (accident, illness, etc.) arise that prevent such. To recognize that, every student is allowed ***two*** (2) absences in class without penalty, so long as they inform Dr. Holtz by email (beforehand if at all possible), or certainly by the end of that same day that they will be/were absent and the reason for that absence. Should you not inform Dr. Holtz in a timely fashion, the students will receive a 0 for the grade for the discussion/participation for that day. Additionally, if there are more than two absences the student will receive a 0 for the grade each additional class time missed. (If there is a medical condition or other extraordinary circumstance that does require missing ***more than 2 class meetings***—or missing the date of an individual in-class presentation of some form—the student must provide written documentation from the appropriate sort of official (health professional; court official; etc.) explaining the absence.)

**Quizzes (10%):** In order to assess the mastery of knowledge within the course, there will be a series of 6 quizzes. These will typically involve true/false, multiple choice, and/or identification questions. The lowest quiz grade is automatically dropped.

**Individual Papers (30%):** Nearly every week there will be some writing assignments. Most of these will be very brief (1-2 pages) and are based on analysis of one or more reading/screening. These papers are to be submitted on ELMS in advance of the Discussion meeting in which they are due: your

responses to the paper prompts will be part of the subject of the discussions and in-class projects of that day.

The grades for these papers (rubrics will be available on ELMS) incorporate both the mechanics of writing (grammar [both English and technical]; spelling; factual accuracy) as well as depth of insight in response to the prompts. Typically, the papers will examine both the results of the research you read as well as questions about the argumentation in those papers. In some cases, you will be asked to write the paper in a particular style or to a particular audience. At least some of the papers are subject to peer grading as well as grading by the instructor.

**Group Discussion/Critical Review Reports (15%):** On several days there will be small group discussions in class rather than lectures. These discussions will focus on readings/screenings and your individual papers. The deliverable graded aspect of these discussions will be short reports turned in at the end of class. This will be a series of questions that you answer based on your collaboration; some of the questions are derived from advanced readings and writing; others from new related material presented in the report packet. All group members present that day receive the same grade on the report.

**Field Trip Report (5%):** A short report from one of the two field trips is required of all students, based on a series of prompts. Students may use a field trip report from the second field trip as an extra credit assignment worth +2% of the course grade. (Students with a documented University excuse for missing both field trips must consult with Dr. Holtz in determining a make up for this assignment.)

**Capstone Project (30% total):** The primary project for the later part of the course is a creative project concerning dinosaurs and dinosaur research which you develop. The possible type of project is very broad: indeed, part of the assignment is coming up with not only the topic but the presentation format you will use. Just to give you a sense of possible project formats, here are some possibilities:

- A mock-up of a possible museum exhibit
- A faux-scientific paper describing an imagined discovery (a new dinosaur species, tracksite, etc.) consistent with current knowledge but revealing information not currently known
- An illustrated children's book
- A short YouTube video
- A card game or other table-top game

The grade for this project is broken down into a series of individual parts, culminating in the presentation of your projects in lieu of a final exam. More specific details will be provided later, but the components are as follows:

- **Capstone Proposal (2% total):** Due Oct. 17, identify both the particular topic of dinosaur research you wish to present, and the medium in which you would present it.
- **Capstone One-Slide Proposal Peer Review (2% total):** You will receive feedback from Dr. Holtz about your initial proposal, asking for clarification or given pointers. On Oct. 29 you will present in class a single PowerPoint slide giving a brief overview of your revised proposal. Your fellow students will evaluate your concept and give you feedback.
- **Capstone Draft (5% total):** On Nov. 14 you will submit a draft version of your project. The details might not be finalized, but it should be well on the way towards a completed version. For instance, your drawings (if any) might be sketches, but you should have sketches rather than a blank space saying “picture to come”.
- **Capstone Draft Peer Review (2% total):** Two randomly-assigned students will provide their own evaluations of your draft independent of the instructor. These are due on Nov. 21.
- **Capstone Final (15% total):** On Monday Dec. 16 instead of a final exam there will be a showcase of presentations of your work. For those with hardcopy products, please make sure to bring them with you. You will be given an 8-minute block in which to show your work, and 2 minutes for questions. The order of presentation will be randomly determined.
- **Capstone Final Peer Review (4% total):** In addition to Dr. Holtz’s grade, each capstone project will have a grade based on the averaged evaluation by the rest of the students.

## COURSE OVERVIEW

### LEARNING OUTCOMES

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

- Properly interpret and extract relevant information from an analytical scientific paper (and recognize the distinction of such a paper from other forms of technical literature)
- Assess claims of inferred dinosaurian biology, behavior, and extinction from fossil evidence
- Effectively present scientific discoveries via a number of media

### COURSE THEMES

This course examines how scientists study the age, environments, evolution, origin, biology, behavior, and extinction of dinosaurs and the other inhabitants of their world. 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 argumentation, and how diverse lines of evidence are used to reconstruct events of the ancient past
- What an understanding of dinosaurian biology, behavior, ecology, and extinction can reveal about modern environmental conditions

## EXPECTATIONS & POLICIES

### EXPECTATIONS & ATTENDANCE

Attendance is required. The Honors Seminars require you to do more than simply master the information; you must be able to intelligently communicate and discuss the ideas and concepts of the course with your instructor and fellow students.

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). If you want to achieve a good grade in the course, the time to start working towards that is from the very beginning! Keep up with the material as it is presented rather than “cramming” to study it right before exams.

**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.

### 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 will be some group activities in which we will use individual laptops/tablets/smartphones in class. The group discussions in particular are opportunities where you will want electronic access (for instance, to read your own papers and the source articles). However, in those situations you may only use these devices for the task at hand.

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## CLASS SCHEDULE

<i>Date</i>	<i>Topic</i>
<i>Aug. 27</i>	"What are dinosaurs, and how do we know about them?" (Introduction to the Course; History of Discoveries)
<i>Aug. 29</i>	"How does Science work?" (Scientific research and argumentation examined; the anatomy of scientific papers)
<i>Sept. 3</i>	"How do we know about dinosaurs?" (Basics of fossils and rocks)
<i>Sept. 5</i>	<b>DISCUSSION:</b> Examining the scientific literature (reverse outline of paper)  <b>Quiz 1</b>
<i>Sept. 10</i>	"How do we find fossils?" (Process of discovery and recovery of fossils; paleoenvironmental interpretation)
<i>Sept. 12</i>	<b>DISCUSSION:</b> Beyond the analytical paper (examining the varieties of scientific literature)
<i>Sept. 15</i> <i>(SUN.)</i>	<b>FIELD TRIP:</b> Deep Time Hall of Fossils, National Museum of Natural History, Smithsonian Institution, Washington, D.C.
<i>Sept. 17</i>	"How do we identify dinosaurs?" (Basics of anatomy; species and taxonomy)
<i>Sept. 19</i>	<b>DISCUSSION:</b> Comparison of media reports & scientific papers  <b>Quiz 2</b>
<i>Sept. 24</i>	"How do we reconstruct the evolutionary history of dinosaurs?" (Phylogenetics and phylogenetic inference)
<i>Sept. 26</i>	<b>DISCUSSION:</b> Dinosaur documentaries: how much is real?
<i>Oct. 1</i>	"Where did dinosaurs come from?" (Interrelationships of vertebrates; dinosaur origins)
<i>Oct. 3</i>	<b>CRITICAL REVIEW:</b> Estimating dinosaur size (reverse outline of paper)  <b>Overview of Capstone Project</b>  <b>Quiz 3</b>
<i>Oct. 8</i>	"What were the major groups of dinosaurs?" Part I (Dinosaur diversity and interrelationships)
<i>Oct. 10</i>	<b>CRITICAL REVIEW:</b> Dinosaur display & combat (assessing argumentation)

<i>Oct. 12</i> <i>(SAT.)</i>	<b>FIELD TRIP:</b> Dinosaur Park, Laurel, MD
<i>Oct. 15</i>	"What were the major groups of dinosaurs?" Part II (Even more dinosaur diversity and interrelationships)
<i>Oct. 17</i>	<b>CRITICAL REVIEW:</b> The awesomeness of tyrannosaurs  <b>Capstone Proposal Due</b>  <b>Quiz 4</b>
<i>Oct. 22</i>	"How did birds evolve from other dinosaurs?" (Origins of birds and avian flight)
<i>Oct. 24</i>	"What was on the outside of dinosaurs?" (Dinosaur feathers, fuzz, color)
<i>Oct. 29</i>	"How did dinosaurs move?" (Dinosaurian locomotion)  <b>Capstone One-slide Proposals</b>
<i>Oct. 31</i>	<b>CRITICAL REVIEW:</b> Dinosaur locomotion and trace fossil analysis  <b>Quiz 5</b>
<i>Nov. 5</i>	"What were baby dinosaurs like?" (Dinosaur reproduction and ontogeny)  <b>Field Trip Report due</b>
<i>Nov. 7</i>	<b>CRITICAL REVIEW:</b> Issues in dinosaur ontogeny, display, and sexual dimorphism
<i>Nov. 12</i>	"Were dinosaurs warm-blooded?" (Physiology)
<i>Nov. 14</i>	<b>DISCUSSION:</b> Dinosaur physiology  <b>Capstone Draft Due</b>  <b>Quiz 6</b>
<i>Nov. 19</i>	"How did the world of the dinosaurs come to an end?" (The Cretaceous/Paleogene mass extinction)
<i>Nov. 21</i>	<b>DISCUSSION:</b> Extinction and recovery  <b>Capstone Draft Peer Reviews Due</b>

<i>Nov. 26</i>	“What does the popular media get wrong about dinosaurs?” (The science in <i>Jurassic Park</i> and beyond)
<i>Nov. 28</i>	<b>THANKSGIVING RECESS: Enjoy your roasted maniraptoran</b>
<i>Dec. 3</i>	“What can we learn from dinosaurs? What do we still need to learn about dinosaurs?”
<i>Dec. 5</i>	<b>CRITICAL REVIEW:</b> Fossil ownership  <b>Quiz 7</b>
<i>Dec. 16</i> <i>(MON.)</i>	<b>CAPSTONE PROJECT SHOWCASE 1:30-3:30 pm</b>