Term Information

Effective Term	Autumn 2025

General Information

Course Bulletin Listing/Subject Area	Earth Sciences
Fiscal Unit/Academic Org	School of Earth Sciences - D0656
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	2207
Course Title	Dead Ends and Dinosaurs: A History of Earth and Life
Transcript Abbreviation	History Earth Life
Course Description	Mass extinctions and their causes throughout Earth history. Links between climate and evolution of life over geologic time.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week, 8 Week, 7 Week, 6 Week, 4 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	Yes
Is any section of the course offered	100% at a distance
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites	None
Exclusions	None
Electronically Enforced	Yes

Cross-Listings

Cross-Listings	None

Subject/CIP Code

Subject/CIP Code	40.0601
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore, Junior, Senior

Requirement/Elective Designation

Origins and Evolution

Course Details

Course goals or learning objectives/outcomes

- Articulate difficulty of literal reading of fossil record and recognize the biases that exist because of incompleteness of record
- Explain how Big Five mass extinctions are defined
- Compare and contrast causal mechanisms proposed for each of Big 5 mass extinctions
- Identify extinction mechanisms that may relate to extraterrestrial versus Earth-bound causes, including impacts and volcanism

Content Topic List

- Mass Extinctions
- Volcanoes
- Dinosaurs
- Fossils
- Extraterrestrial Impacts
- Evolution

Sought Concurrence

Yes

Attachments

- Concurrence EEOB.pdf: Concurrence-EEOB

  (Concurrence. Owner: Sawyer,Derek)
- DLCoverSheet_EarthSciences_2207_DeadEndsandDinosaurs.pdf: DL-Cover

  (Other Supporting Documentation. Owner: Sawyer,Derek)
- Earth Sci 2207 Theme paperwork.pdf: GE Paperwork

  (Other Supporting Documentation. Owner: Sawyer,Derek)
- Cover letter for 2207 revisions.pdf: Response_Cover_letter_Dec_17_2024

  (Cover Letter. Owner: Sawyer,Derek)
- EarthSc 2207 clean version IN PERSON Dead Ends and Dinosaurs.pdf: Syllabus-IN-PERSON-CLEAN

  (Syllabus. Owner: Sawyer,Derek)
- EarthSc 2207 track changes IN PERSON Dead Ends and Dinosaurs.pdf: Syllabus-In-PERSON-TRACK_CHANGES

  (Syllabus. Owner: Sawyer,Derek)
- EarthSc 2207 clean version ONLINE Dead Ends and Dinosaurs.pdf: Syllabus-ONLINE-CLEAN

  (Syllabus. Owner: Sawyer,Derek)
- EarthSc 2207 track changes ONLINE Dead Ends and Dinosaurs.pdf: Syllabus-ONLINE-TRACK-CHANGES

  (Syllabus. Owner: Sawyer,Derek)

Comments

- Please see Subcommittee feedback email sent 11/8/24. *(by Neff,Jennifer on 11/08/2024 09:01 AM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Sawyer,Derek	10/17/2024 01:56 PM	Submitted for Approval
Approved	Sawyer,Derek	10/17/2024 01:57 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	10/20/2024 09:29 PM	College Approval
Revision Requested	Neff,Jennifer	11/08/2024 09:01 AM	ASCCAO Approval
Submitted	Sawyer,Derek	12/17/2024 11:16 AM	Submitted for Approval
Approved	Sawyer,Derek	12/17/2024 11:16 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	01/15/2025 04:43 AM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Neff,Jennifer Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	01/15/2025 04:43 AM	ASCCAO Approval

Dear NMS Curriculum Committee,

Thank you for the constructive feedback on the 2207 course 'Dead Ends and Dinosaurs…' submitted by the School of Earth Sciences. The following is a point-by-point response to the Subcommittee feedback to go along with the revised syllabus. The most significant changes were to the online syllabus where the Subcommittee requests the course involve more opportunities for discussion and more varied writing assignments. *Note: Red bulleted text below is Committee feedback, black text is our response.*

- For the online syllabus, the Subcommittee asks that the course involve more opportunities for discussion by **requiring** students to engage in meaningful dialogue, facilitating the process of assimilating diverse perspectives. For example, **increasing the focus of interactive discussions could elevate the value of the student presentations**. The Subcommittee also notes that writing opportunities in the course are minimal and limited to the exams. They request that the School of Earth Sciences **incorporate more varied writing assignments throughout the course**.

We have changed the online syllabus so that it is now clear that the Discussion board posts are *required* and must involve meaningful dialogue in order to get full credit. This will allow for diverse perspectives to be heard. Specifically, there are now 3 required substantial contributions that involve writing opportunities in the Discussion board. These additions are on page 13 of the *online* syllabus – Discussion Board/writing. The contributions are interactive to facilitate learning, and students will gain insight from each other's writings about the nature of scientific inquiry into the causes and consequence of mass extinctions. The 3 contributions are included here below and in the syllabus (p.13).

1. Students must first write a question and testable hypothesis about a topic in the lectures and readings. For example, a question may be: "what is the evidence that the extinction of the dinosaurs at the Cretaceous-Paleogene boundary 65 million years ago was a result of an extraterrestrial impact?". They must also include a hypothesis, for example: "in order to test this hypothesis, the evidence should point to a global change in Earth's climate coincident with the evidence for an extraterrestrial impact." To receive full credit, a student must write a question and develop the hypothesis in such a way that ties in the reading with the lecture content. As part of the proposed hypothesis, students will articulate the uncertainty about the cause of a mass extinction event.

2. Students must answer a question written by another student (in part 1 above) and address whether the student has demonstrated that their proposed hypothesis is testable. This fully referenced writing opportunity will involve integration of ideas from multiple sources, and also provide a series of recommendations for the types of data that might be collected as part of future research endeavors. These research recommendations will highlight the strengths and weaknesses of each approach, including the nature of uncertainty in measurements and their interpretations. Using the example of the extraterrestrial impact hypothesis for the dinosaur extinction, a student would answer this question through researching the evidence necessary to answer the question and test the hypothesis. If there is conflicting evidence supporting or refuting the hypothesis, a student can conclude that the question may not yet be answered.

3. Students must grade the writing of another student's written answers to the question posed about the cause of a mass extinction event and testability of a proposed hypothesis (part 2 above). In order to accomplish this writing exercise and appropriately grade each other, students will be provided with

a rubric. This rubric will include an evaluation of the stated question/hypothesis, nature of the data to be collected, clarity of writing, and completeness of multiple and relevant sources.

The above writing assignments are designed to be interactive, varied, and meaningful in development of peer-to-peer evaluation. With the rise of generative-AI, it is in everyone's best interest (instructor and student) to construct the writing assignments in such a way that students will feel empowered to develop ideas and testable hypotheses which can be understood by their peers. We have developed these 3 writing assignments to engage students in the scientific method and enable them to participate in both hypothesis generation and testing, as well as exposing them to the primary scientific literature at a level that cannot be simply accomplished using generative-AI.

Note that the above writing assignments will be included in the *online* version of the course, which can facilitate student interactions through a peer-to-peer system and Discussion board posts. We read the comments from the NMS Panel about adding more and varied writing to apply to the *online* version of the course. However, I wish to note that if the suggestion was to also add these writing assignments to the *in-person* version then I can implement that as well in a revised syllabus.

- The Subcommittee notes that the in-person syllabus indicates that students do not necessarily have to answer the **Top Hat question** in order to receive points for the day. The Subcommittee asks that it be clarified in the syllabus how evaluations will occur for students who do not complete the Top Hat questions. [Syllabus p. 6]

This is a helpful comment and we didn't realize the Top Hat points were unclearly written in the syllabus. Students do need to answer Top Hat questions to get points for the day, and Top Hat points count for 20% of the grade (in person version) or 10% (online). The following text has been added in the syllabus in two places to clarify that students do need to answer the Top Hat questions to receive points.

In the section on Required Technologies (p. 6):

"See below section "Course Assignments, Top-Hat" for details of how Top Hat will be used in grading and assignments. Top Hat points can only be obtained by attending class."

In the section on Course Assignments (p. 7):

Course Assignments
Top-Hat

Top-Hat questions will be delivered during lectures to review material and gauge student comprehension.

"We will have between two and six daily Top Hat questions for both review of the previous lecture material and for participation. The first few questions (presented at start of class so please arrive on time) will be worth 0.5 points for correctness and 0.5 participation points. The remaining questions will be worth 1 participation point. The sum total off all Top Hat points during the course will be worth 15% of the course grade (see 'Grading' and 'Course Assignments' for further details)."

"Students who are not in attendance in the lecture hall are not allowed to take Top Hat quizzes. To ensure that students answering Top Hat quizzes during lecture are attending the lecture, we will take attendance with Top Hat each day using the "Secure Attendance"

feature. Students who answer Top Hat questions but are not in attendance will receive a zero on all Top Hat questions for that day. Answering Top Hat questions while not in class is considered Academic Misconduct (see A1 in the Code of Student Conduct | 3335-23-04 Prohibited conduct)."

- The Subcommittee notes that there are references to labs throughout the syllabi despite the course not involving a lab component and asks that this be resolved. [DL syllabus p. 11; in-person syllabus p. 7, 8]

Thank you for catching this! The reference to a lab component has been removed throughout the revised versions of the DL and in-person syllabi.

- The Subcommittee recommends that the School use the most recent version of the university's recently updated diversity statement if they wish to keep it in the syllabi. The updated statement can be found in an easy to copy/paste format on the Arts and Sciences Curriculum and Assessment Services website. [DL syllabus p. 17-18; in-person syllabus pp. 10-11]

We have added this in the revised versions of the DL and in-person syllabi.

- The Subcommittee recommends that the School use the most recent version of the Student Life Disability Services Statement, which was updated in summer of 2024. The updated statement can be found in an easy to copy/paste format on the Arts and Sciences Curriculum and Assessment Services website. [DL syllabus pp. 18-19; in-person syllabus p. 9]

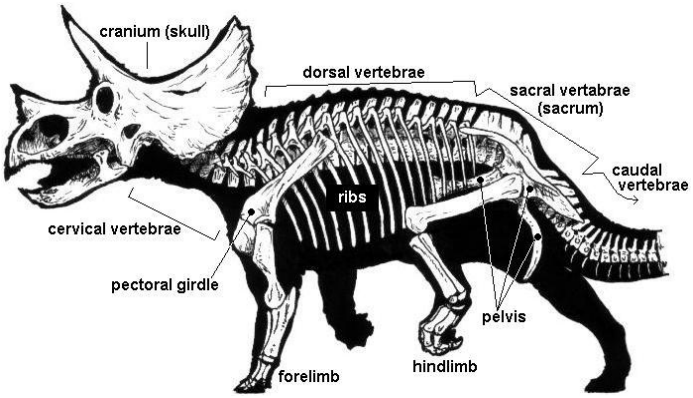
We have added this in the revised versions of the DL and in-person syllabi.

Sincerely,

Matthew Saltzman

Professor, School of Earth Sciences

DEAD ENDS AND DINOSAURS: A HISTORY OF EARTH AND LIFE



EARTHSC 2207

Fall 20xx

3 Credit Hours

Online

Course overview

Instructor

- **Name:** Matthew Saltzman
- **Email:** saltzman.11@osu.edu
- Phone Number: 614-292-0481
- Course Zoom Link
- Office Hours: W, Th, 1:35-2:35 or by appointment
  - Zoom Link https://osu.zoom.us/j/3606799265?pwd=U2ZjZTA5cHE0Sk5uc040aWtHWEdUZz09

Note: My preferred method of contact is email.

- Note: Class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Course Prerequisites

There are no disciplinary or course prerequisites because the basic foundational knowledge needed to succeed in this course will be covered in lectures and readings. As a GE Origins & Evolution Theme course we will integrate Earth science and evolution, which are weaved together in the study of the fossil record of Life through time.

Course description

Throughout the history of Life on Earth, virtually all species go extinct, but how and why it happens differs among groups. For many taxa, diversity follows a boom-and-bust pattern marked by peaks of origination and turnover. This course will focus on the causes of these evolutionary patterns in the fossil record, which may be intertwined with climate change and volcanism or result from an extraterrestrial impact. The course will address whether climatic warming or cooling leads to extinction, and how important the rate of climate change may be. The role of volcanism in triggering severe or rapid climate change and mass extinctions is controversial. The evidence for extraterrestrial impact causing mass extinction, such as the case of the dinosaurs, will be addressed. Not all impacts cause extinction, and not all extinctions are caused by impacts. For example, the principles of plate tectonics are essential to develop and test the hypothesis that mass extinctions could be a consequence of globally increased levels of volcanic activity. The principles of evolution and incompleteness of the fossil record are important concepts that allow for a distinction between 'mass extinction' and 'background extinction' through geologic time.

The course covers three primary topics, which are integrated throughout to enable students to appreciate the origins and evolution of taxonomic groups and factors that have shaped this history.

1) The 'Big 5' mass extinctions have been recognized by geologists and paleontologists for many decades, but the estimated timing and magnitude of these events remains a subject of debate because of the incompleteness of the fossil record. These include the mass extinctions of the Late Ordovician (443 million years ago or myr), Late Devonian (372 myr), Permian-Triassic (251 myr), end-Triassic (200 myr), and end-Cretaceous (65 myr).

2) Environmental ('proxy') evidence for climate change associate with extinction events, including volcanism from chemical indicators such as mercury and strontium isotope records that reveal eruption activity and eruption type (i.e., explosive volcanism versus gradual types). Iridium records are used to fingerprint evidence for extraterrestrial impacts.

3) The consequences of extinction for the diversity of life through time, including which groups were opportunistic in the aftermath of extinctions, and the rise of entirely new groups from speciation events related to the opening up of previously occupied ecological niche space.

Readings from the published scientific literature on mass extinctions will provide the basis for class lectures, discussions, and a group project. For example, the class will read the extraterrestrial impact hypothesis for the mass extinction of the dinosaurs and other groups 65 million years ago published by Alvarez et al. in the journal *Science* in 1980, which is still an important reference for the current debate on extinction causes.

Course expected learning outcomes

By the end of this course, students should successfully be able to:

1. Articulate the difficulty of a literal reading of the fossil record and recognize the biases that exist because of the incompleteness of the record

2. Explain how the Big Five mass extinctions are defined relative to background extinctions

3. Compare and contrast the causal mechanisms proposed for each of the Big 5 mass extinctions

4. Identify challenges in uniquely characterizing an extinction mechanism as it may related to extraterrestrial versus Earth-bound causes, including impacts and volcanism

5. Apply systems thinking when considering the interconnectedness of Earth systems

6. Engage in theoretically grounded discussions regarding the relationship between plate tectonics, biological evolution, and Earth's climate system

General education goals and expected learning outcomes

As part of the Origins & Evolution Theme of the New General Education (GEN) curriculum, this course is designed to prepare students to be able to do the following:

General Theme GOAL 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations.

ELO 1.1 Engage in critical and logical thinking (about the topic or idea of the theme).
ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme.

General Theme GOAL 2: Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.
ELO 2.1 Identify, describe, and synthesize approaches or experiences (as they apply to the theme).
ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.

Origins & Evolution GOAL 3: Successful students will appreciate the time depth of the origins and evolution of natural systems, life, humanity, or human culture, and the factors that have shaped them over time.
ELO 3.1 Illustrate their knowledge of the time depth of the universe, physical systems, life on earth, humanity or human culture by providing examples or models.
ELO 3.2 Explain scientific methods used to reconstruct the history of the universe, physical systems, life on earth, humanity or human culture and specify their domains of validity.
ELO 3.3 Engage with current controversies and problems related to origins and evolution questions.

Origins & Evolution GOAL 4: Successful students will understand the origins and evolution of natural systems, life, humanity, or human culture, and the factors that have shaped them over time.
ELO 4.1 Describe their knowledge of how the universe, physical systems, life on Earth, humanity or human culture have evolved over time.
ELO 4.2 Summarize current theories of the origins and evolution of the universe, physical systems, life on earth, humanity or human culture.

How will these goals and associated ELOs be achieved?

We will achieve these goals and associated ELOs by using critical and logical thinking to grasp the vastness of geologic time and the evolution of Life on Earth. Regarding

Goal 1, all of the readings in this course come from the primary peer-reviewed journal literature, including the most prominent scientific journals such as *Science* and *Nature*. Therefore, students will learn about the topic at a more advanced and in-depth level than the foundations. Furthermore, a group project on a mass extinction event, aiming to address its cause and consequences for Life on Earth, will allow students to engage in an advanced, in-depth, scholarly exploration of the topic. Regarding **Goal 2**, students gain an appreciation of the interdisciplinary nature of the study of mass extinctions, which involves integration of concepts from foundational fields of astronomy, geology, and evolutionary biology, all of which needed to be brought to bear to demonstrate the coincidence of some extinction events with extraterrestrial meteorite impacts. Through the group project, exams and Top Hat quizzes, and reading of the primary academic literature associated with lecture topics, students will synthesize approaches and demonstrate a developing sense of self as a learner. The study of mass extinction and diversity of life through time is a highly active field and each year there are new discoveries with surrounding controversies that we discuss, such as whether extraterrestrial impacts or volcanism are more like to lead to climatic warming or cooling depending on the timescale of study. The Top Hat and Exam questions gauge how opinions and understanding of critical concepts evolve over the course of the semester. Finally, the Group Project involves a deeper analysis of the causes and consequences of a major mass extinction event.

To achieve unique Origins & Evolution **Goal 3**, we explore the time depth of natural Earth and Life systems using both the fossil record of ancient organisms and indirect 'proxy' records of past environment conditions in Earth's atmosphere and oceans. These environmental proxy records have been developed using the scientific method, which students will appreciate through the primary journal literature and then apply to test hypotheses regarding the relationship between climate change and the diversity of Life. Regarding **Goal 4**, we will further learn about how the scientific method is used to not only reconstruct the history of Earth's climate but also assess the incompleteness of the fossil record and how this impacts our understanding of the pace of evolution. We will learn how frequent extraterrestrial impacts are in Earth history and examine examples in which the size of an impact can be related to the magnitude of an extinction event. We will also look at examples of volcanic activity in relation to species extinctions. We will contextualize early scientific controversies such as the extinction of the dinosaurs given knowledge at the time, and discuss the social, political, and religious conditions that influenced discussions regarding origins and evolution over time.

In summary, the evolution over time of the Earth, the origins and evolution of Life on Earth, and the development of human culture and Science are the subject of this entire course. Knowledge of these subjects will be assessed frequently. Each lecture will include Top Hat review questions and discussion questions, and each of the three major sections of the course ends with a midterm that covers all material in that section. And

at the end of the semester each group of 5-6 students presents their research on the cause of a mass extinction event, which requires synthesizing knowledge on how the evolution of Life and Earth's climate are linked. This class is considered an upper-level course in which the expectation is to not only remember and understand reading materials, but also to critically combine and apply basic concepts, such as the theory of evolution or plate tectonics to new problems. In the group project, in particular, creating, evaluating, and analyzing data to come up with an extinction mechanism that supports all existing data for an event is expected.

How this online course works

Mode of delivery

This course is 100% online. There are no required sessions when you must be logged in to Carmen at a scheduled time.

Pace of online activities

This course is divided into weekly modules that are released one week ahead of time and students are expected to keep pace with weekly deadlines but may schedule their efforts freely within that time frame.

At the start of each week I'll post an introductory video check-in with a road map and review of the learning objectives, sharing my thoughts on the week, comments on your collective endeavors, and appreciations of some of the highlights.

Each module will include a summary of the week's activities, recorded video lectures, homework questions to complete in Top Hat, readings to complete, and one or more discussion topic(s) to complete.

You will be working on your weekly modules from Monday through 11:59 Sunday. By Thursday you will need to post your initial contribution(s) to the discussion board(s) and continue the conversation on Friday and Saturday. By Sunday, you will need to have completed the Top Hat quiz for the week.

Credit hours and work expectations

This is a **3-credit-hour course**. According to Ohio State policy (go.osu.edu/credithours), students should expect around 9 hours of engagement with the class each week to receive a grade of (C) average. Actual hours spent will vary by student learning habits and the assignments each week.

Participation requirements

Because this is an online course, your attendance is based on your online activity and participation. The following is a summary of students' expected participation:

> **Participating in online activities** **AT LEAST ONCE PER WEEK** You are expected to log in to the course in Carmen every week. (During most weeks you will probably log in many times.) If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*. These count towards your grade (see 'Assignments' below).

Participating in discussion forums: **2 or more TIMES PER WEEK** As part of your participation, each week you can expect to post at least twice as part of our substantive class discussion on the week's topics. The discussion board posts should be substantive, at least 3-4 sentences that provide an original contribution to the conversation. You are encouraged to post more often, and you can certainly post less substantive responses ("That was really smart. Thanks for that contribution!") as often as wish, but those will not count toward your discussion grade. This is one of the primary ways you will feel connected to your classmates and you should plan to read what they post as part of this activity. Most students feel motivated by ongoing conversations with their classmates. The modules will prompt you on what to discuss in the various forums. These count towards your grade (see 'Assignments' below).

Office hours and live sessions (optional)

All live, scheduled events for the course, including my office hours, are optional. ***Optional Zoom Sessions:*** Over the course of the semester, I may hold optional Zoom sessions to review material in preparation for exams. These optional live zoom sessions will be recorded and made available to all students.

Course communication guidelines

Tone and civility

Students are expected to work together and treat others as they would wish to be treated themselves. Everyone should be respectful of others viewpoints.

Citing your sources

All sources must be properly cited. Ohio State Libraries has excellent guidance on software available. https://guides.osu.edu/citation Choosing and using citations will be emphasized when the primary literature is reviewed at the beginning of the class in the first module. We will use the primary literature for our readings, but additional sources may be included from news organization or online resources.

Protecting and saving your work

Carmen is not immunes to glitches in saving work, either through server issues or student connectivity issues. Students should compose their work in documents or word processing tools outside of Carmen where they can ensure their work will be saved. This provides a backup in case they encounter any issues with browser time-outs, failed submission attempts, or lack of internet connectivity.

Course materials and technologies

Textbooks

There is no required textbook and all required reading associated with weekly lecture content will come from the primary literature/journal articles that are posted to the course Carmen page. We will utilize only highly respected and prominent journals such as *Science* and *Nature* and other broad readership journals aimed primarily at non-specialists. For example, the extraterrestrial impact hypothesis was published in 1980 in Science by Alvarez et al. and is still an important reference today and required reading for this course. The full list of readings is indicated in the Course Schedule and Bibliography at the end of this syllabus. These readings will serve as the starting point for research towards developing a group project on a

mass extinction event to be presented during the Final Exam period. The groups will be assigned during the first week of classes.

Other fees or requirements

None

Course technology

Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at it.osu.edu/help, and support for urgent issues is available 24/7.

- Self-Service and Chat support: it.osu.edu/help
- Phone: 614-688-4357(HELP)
- Email: 8help@osu.edu
- TDD: 614-688-8743

Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)

Required Equipment

- Computer: current Mac (MacOs) or PC (Windows 10) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Required software

- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Full instructions for downloading and installation can be found at go.osu.edu/office365help.

Carmen Access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

Top Hat

- **There is a *requirement*** that you use **Top Hat**
- Sign for a **Top Hat** account at https://app.tophat.com/login (do NOT select the SSO bypass option) using your OSU username/password and there is no cost to you.
- Once you have a Top Hat account, enter join code # XXXXXX (or search for the course "2XXX Spring 2025 Saltzman") to be enrolled.
- It is useful to browse the **student support pages https://success.tophat.com/s/** and if you have questions you are encouraged to call Top Hat or live chat at https://success.tophat.com/s/contact-main.

- Access Top Hat by smartphone or computer web browser

Turnitin

As noted below in the section on academic integrity, we will use Turnitin in this course. You can learn about use of this product here and should be familiar with how it is used by referring here to the student hub of information https://guides.turnitin.com/hc/en-us/categories/21850416398221-Student-hub

Grading and instructor response

How your grade is calculated

Assignment Category	Points and/or Percentage
Exam I	20%
Exam II	20%
Exam III	20%
Top Hat questions	10%
Discussion Board posts/writing	10%
Group Presentations	20%
Total	**100%**

See course schedule below for details and due dates for all of the above.

Description of major course assignments

Exams

- **There are 3 exams taken as Quizzes in Carmen.**

Each exam will cover the material in the modules up to that exam. Questions will include multiple choice and short answer. Quizzes will be available for 24 hours on the day of the exam, and students will have 80 minutes to complete the Quiz in Carmen after opening it.

Academic integrity and collaboration guidelines

Exams will be open notes but no collaboration with other students is allowed.

Top Hat homework

- **Homework questions on Top Hat will be posted at the beginning and end of each module. The questions will include a mixture of: 1) review questions with correct answers that are based on the course content and 2) opinion questions that are for participation points only.**

Discussion Board posts and writing

- **Discussion board posts are required and must involve meaningful dialogue in order to get full credit. This will allow for diverse perspectives to be heard. Specifically, there are now 3 required substantial contributions, outlined below, that involve writing opportunities in the Discussion**

board. The contributions are interactive to facilitate learning, and students will gain insight from each other's writings about the nature of scientific inquiry into the causes and consequence of mass extinctions.

- 1. Students must first write a question and testable hypothesis about a topic in the lectures and readings. For example, a question may be: "what is the evidence that the extinction of the dinosaurs at the Cretaceous-Paleogene boundary 65 million years ago was a result of an extraterrestrial impact?". They must also include a hypothesis, for example: "in order to test this hypothesis, the evidence should point to a global change in Earth's climate coincident with the evidence for an extraterrestrial impact." To receive full credit, a student must write a question and develop the hypothesis in such a way that ties in the reading with the lecture content. As part of the proposed hypothesis, students will articulate the uncertainty about the cause of a mass extinction event.
- 2. Students must answer a question written by another student (in part 1 above) and address whether the student has demonstrated that their proposed hypothesis is testable. This fully referenced writing opportunity will involve integration of ideas from multiple sources, and also provide a series of recommendations for the types of data that might be collected as part of future research endeavors. These research recommendations will highlight the strengths and

weaknesses of each approach, including the nature of uncertainty in measurements and their interpretations. Using the example of the extraterrestrial impact hypothesis for the dinosaur extinction, a student would answer this question through researching the evidence necessary to answer the question and test the hypothesis. If there is conflicting evidence supporting or refuting the hypothesis, a student can conclude that the question may not yet be answered.

- 3. Students must grade the writing of another student's written answers to the question posed about the cause of a mass extinction event and testability of a proposed hypothesis (part 2 above). In order to accomplish this writing exercise and appropriately grade each other, students will be provided with a rubric. This rubric will include an evaluation of the stated question/hypothesis, nature of the data to be collected, clarity of writing, and completeness of multiple and relevant sources.
- The writing assignments are designed to be interactive, varied, and meaningful in development of peer-to-peer evaluation. These 3 writing assignments engage in the scientific method and encourage participation in both hypothesis generation and testing, as well as exposure to the primary scientific literature at an advanced level.
- Discussion Board posts will be evaluated for the quality of your post, how substantive your comments are on the posts of others (posts that don't simply agree or disagree but build on the

ideas in the post or suggest a different angle), and your collegiality—that is, engaging in conversation, by showing, through multiple comments, genuine interest in ideas of others, by asking questions, and answering questions put to you.

Academic integrity and collaboration guidelines

Top Hat questions will be open notes but no collaboration with other students is allowed.

Group Presentations

At the beginning of the semester, groups will be formed that will stay together to research a mass extinction event throughout the semester based on class readings and your own literature search. The final project for this course (as a group) is to create a ten-minute PowerPoint research presentation that synthesizes what you have learned throughout the semester and that explains your mass extinction event in terms of:

Cause: What likely led to the mass extinction? Was it an Earth-bound cause (e.g., warming or cooling, related to volcanism, or was there an extraterrestrial impact?)

Impact: What affect did this have on the long-term diversity of life? Which groups continued and diversified in the aftermath of the extinction, and which groups never recovered?

The groups will be assigned during the first week of classes. Assignments related to the group project include a

prospectus outlining the mass extinction event research plan and literature search in week 3. A literature review is completed in week 6. At the end of week 11, an initial draft of the PowerPoint presentation is posted on Carmen for initial review and feedback. A final draft is due at the end of week 13, giving the students two weeks to practice their presentations to be recorded on Zoom and links to presentations submitted during the Final Exam period (due December 6 of Exam Week).

The group project on a mass extinction event, aiming to address its cause and consequences, will allow students to explore a topic using the *primary literature* provided to students and listed in the course schedule. We will utilize only highly respected and prominent journals such as *Science* and *Nature* and other broad readership journals. The full list of readings is indicated in the Course Schedule and Bibliography at the end of this syllabus. These readings will serve as the starting point for research towards developing a group project on a mass extinction event to be presented during the Final Exam period.

Each group of 5-6 students presents their research on the cause of a mass extinction event, which requires synthesizing knowledge on how the evolution of Life and Earth's climate are linked.

In the group project, creating, evaluating, and analyzing data to come up with an extinction mechanism that supports all existing data for an event is expected.

Academic integrity and collaboration guidelines

The Group Project will be a collaborative effort. Students will need to be citing sources properly and use of generative Artificial Intelligence is not allowed.

Late assignments

Late assignments will not be accepted. Exceptions will be made for those with a formal excuse (i.e., illness with a doctor's note).

Grading Scale

- 93-100: A
- 90-92: A–
- 87-89: B+
- 83-86: B
- 80-82: B–
- 77-79: C+
- 73-76: C
- 70-72: C–
- 67-69: D+
- 60-66: D
- Under 60: E

Instructor feedback and response time

The following outlines my intended availability throughout the course. (Remember that you can call 614-688-4357(HELP) at any time if you have a technical problem.)

• Grading and feedback: You can generally expect feedback within 7 days.

• Email: I will reply to emails within 24 hours on days when class is in session at the university.

• Discussion board: I will check and reply to messages in the discussion boards every 24 hours on school days.

Academic policies

Academic integrity policy

See **Descriptions of major course assignments**, above, for my specific guidelines about collaboration and academic integrity in the context of this online class.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct: http://studentlife.osu.edu/csc/.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

Turnitin use in this course: Students at The Ohio State University are accountable for the integrity of the work they submit. Therefore, you should be familiar with the guidelines provided by the Committee on Academic Misconduct (COAM) and Section A of Ohio State's Code of Student Conduct in order to meet the academic expectations concerning appropriate documentation of sources. In addition, Ohio State has made Turnitin, a learning tool and plagiarism prevention system, available to instructors. For this class, you will submit your papers to Turnitin from Carmen. When grading your work, I will interpret the similarity Report following Section A of Ohio State's Code of Student Conduct as appropriate. For more information about Turnitin, please see the vendor's guide for students. Note that submitted final papers become part of the Ohio State database. The OSU Writing Center: http://cstw.osu.edu provides more information on proper citing of your sources of information.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)

Statement on artificial intelligence and academic integrity:

There has been a significant increase in the popularity and availability of a variety of generative artificial intelligence (AI) tools, including ChatGPT, Sudowrite and others. These tools will help shape the future of work, research and technology — but when used in the wrong way, they can stand in conflict with academic integrity at Ohio State.

The use of generative artificial intelligence (GenAI) tools such as Copilot or ChatGPT are not permitted in this course. Any use of GenAI tools for work in this class may therefore be considered a violation of Ohio State's Academic Integrity policy and Code of Student Conduct because the work is not your own. The use of unauthorized GenAI tools will result in referral to the Committee on Academic Misconduct. If you feel you need to use GenAI for translation, please contact me first. If you have any other questions regarding this course policy, please contact me.

Copyright for instructional materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu

Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity of people and ideas. We believe in creating equitable research opportunities for all students and to providing programs and curricula that allow our students to understand critical societal challenges from diverse perspectives and aspire to use research to promote sustainable solutions for all. We are committed to maintaining an inclusive community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among all members; and encourages each individual to strive to reach their own potential. The Ohio State University does not discriminate on the basis of age, ancestry, color, disability, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, race, religion, sex, gender, sexual orientation, pregnancy, protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. (To learn more about diversity, equity, and inclusion and for opportunities to get involved, please visit: https://odi.osu.edu/ or https://cbsc.osu.edu)

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily

activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Accessibility accommodations for students with disabilities

Requesting accommodations

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request

reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity.

Policy: Religious Holidays, Holy Days and Observances

Course Schedule

Refer to our Carmen course page for up-to-date assignment due dates. ***SEE BILIOGRAPHY FOR PEER REVIEWED JOURNAL ARTICLES**

REFER TO THE CARMEN SITE FOR UP-TO-DATE DUE DATES.

Date	Topic
	Week 1
Aug 20-23	Introduction to the course: questions, structure, and goals
	Topic: Geologic Time
	Week 2
August 26-30	**Topic: Origin of Animals** *Reading*: Smith and Harper, 2013, Causes of the Cambrian Explosion
	Topic: Cambrian Explosion (continue *Reading*: Smith and Harper, 2013) *Assignment*: Group Project selection of mass extinction research project
	Week 3
September 3-6	**Topic: Great Ordovician Biodiversification Event** *Reading*: Stigall, A.L., Edwards, C.T., Freeman, R.L., and Rasmussen, C.M.Ø., 2019, Coordinated biotic and abiotic change during the Great Ordovician Biodiversification Event: Darriwilian assembly of early Paleozoic building blocks
	Topic: Late Ordovician Mass Extinction Event and Oxygen Late Ordovician Mass Extinction and Glaciation *Reading*: Kozik, N.P., Young, S.A., Newby, S.M., Liu, M., Chen, D., Hammarlund, E.U., Bond, D.P.G., Them, T.R., and Owens, J.D., 2022, Rapid marine oxygen variability: Driver of the Late Ordovician mass extinction *Assignment*: Group Project prospectus due
	Week 4

September 9-13	**Topic: Late Ordovician Mass Extinction and Volcanism** (continue *Reading*: Kozik et al., 2022)
	Topic: Late Devonian Mass Extinction *Reading*: Copper, P., 1986, Frasnian/Famennian mass extinction and cold-water oceans *Assignment*: Question and Hypothesis for mass extinction due
	Week 5
September 16-20	**Exam #1 – Section 1 (due at 11:59pm on Sept 20)**
	Topic: Siberian Traps Volcanism and the End-Permian Mass Extinction *Reading*: Renne, P.R., Sprain, C.J., Richards, M.A., Self, S., Vanderkluysen, L., and Pande, K., 2015, State shift in Deccan volcanism at the Cretaceous-Paleogene boundary, possibly induced by impact
	Week 6
September 23-27	**Topic: Permian-Triassic Mass Extinction: 'Mother of All Mass Extinctions' Part I** *Reading*: Benton, M.J., and Twitchett, R.J., 2003, How to kill (almost) all life: the end-Permian extinction event
	Topic: Permian-Triassic Mass Extinction: 'Mother of All Mass Extinctions' Part II (continue *Reading*: Benton, M.J., and Twitchett, R.J., 2003) *Assignment*: Group Project scientific literature bibliography due
	Week 7
October 1	**Topic**: **Microbes and the Aftermath of the End-Triassic Mass Extinction** *Reading*: Looy, C.V. The delayed resurgence of equatorial forests after the Permian-Triassic ecologic crisis
	Topic: End-Triassic Mass Extinction *Reading:* Davies, J.H.F.L., Marzoli, A., Bertrand, H., Youbi, N., Ernesto, M., and Schaltegger, U., 2017, End-Triassic mass extinction started by intrusive CAMP activity *Assignment*: Student (peer) response to Question and Hypothesis for mass extinction due
	Week 8
October 7-9	**Topic: Aftermath of the End-Triassic Mass Extinction** (continue *Reading* Davies et al., 2017)
October 10-11	**Fall Break**
	Week 9
October 14-18	**Exam #2 – Section 2 (due at 11:59pm on October 18)**
	Topic: Dinosaurs Inherit the Earth

	Reading: Brusatte, S.L., Nesbitt, S.J., Irmis, R.B., Butler, R.J., Benton, M.J., and Norell, M.A., 2010, The origin and early radiation of dinosaurs
Week 10	
October 21-25	**Topic: Early Theories for the Dinosaur Extinction** *Reading***:** Alvarez, L.W., Alvarez, W., and Asaro, F., 1980, Extraterrestrial Cause for the Cretaceous-Tertiary Extinction
	Topic: The End-Cretaceous Impact Hypothesis and Iridium Anomaly *Reading*: Vellekoop, J., Sluijs, A., Smit, J., Schouten, S., Weijers, J.W.H., Sinninghe Damsté, J.S., and Brinkhuis, H., 2014, Rapid short-term cooling following the Chicxulub impact at the Cretaceous–Paleogene boundary
Week 11	
October 28-Nov 1	**Topic: The Impact Hypothesis and Iridium Anomaly** (continue *Reading* Alvarez et al., 1980 and Vellekoop et al., 2014)
	Topic: Deccan Volcanism and End-Cretaceous Extinction *Reading***:** Renne, P.R., Sprain, C.J., Richards, M.A., Self, S., Vanderkluysen, L., and Pande, K., 2015, State shift in Deccan volcanism at the Cretaceous-Paleogene boundary, possibly induced by impact *Assignment:* Group Project initial draft due
Week 12	
November 4-8	**Topic: Deccan Volcanism and End-Cretaceous Extinction** (continue *reading* Renne et al., 2015)
	Topic: Chixilub Impact Structure and End-Cretaceous Extinction (continue *reading* Vellekoope et al., 2014)
Week 13	
November 11-15	**Topic: Aftermath of the End-Cretaceous Mass Extinction** (continue *reading* Vellekoope et al., 2014)
	Topic: Mammals Inherit the Earth *Reading:* Evans, A.R. et al., 2012, The maximum rate of mammal evolution *Assignment:* Group Project final draft due
Week 14	
November 18-22	**Topic: Cenozoic Extinctions** *Reading:* Gibbs, S.J., Bown, P.R., Sessa, J.A., Bralower, T.J., and Wilson, P.A., 2006, Nannoplankton Extinction and Origination Across the Paleocene-Eocene Thermal Maximum
	Topic: **Climate and Human Evolution** *Reading***:** Stewart, J.R., and Stringer, C.B., 2012, Human Evolution Out of Africa: The Role of Refugia and Climate Change *Assignment*: Student (peer) grading of student response to Question and Hypothesis for mass extinction due
Week 15	

November 25-26	**Topic: The Sixth Mass Extinction** *Reading:* Barnosky, A.D. et al., 2011, Has the Earth's sixth mass extinction already arrived?
November 27-29	**Thanksgiving break**
Week 16	
December 3	**Exam #3 (due at 11:59pm on Dec 3)**
December 6 (Final Exam Week)	**Group Project Presentations during Final Exam period (these are recorded on Zoom and due at 11:59pm on December 6)**

Bibliography: All readings are peer-reviewed journal articles from the prominent scientific journals aimed at non-specialists (see lecture schedule above for integration with subject matter)

Alvarez, L.W., Alvarez, W., and Asaro, F., 1980, Extraterrestrial Cause for the Cretaceous-Tertiary Extinction: *Science*, v. 208, p. 1095-1108.

Barnosky, A.D. et al., 2011, Has the Earth's sixth mass extinction already arrived? *Nature*, v. 471, p. 51–57, doi:10.1038/nature09678.

Benton, M.J., and Twitchett, R.J., 2003, How to kill (almost) all life: the end-Permian extinction event: *Trends in Ecology & Evolution*, v. 18, p. 358–365, doi:10.1016/S0169-5347(03)00093-4.

Brusatte, S.L., Nesbitt, S.J., Irmis, R.B., Butler, R.J., Benton, M.J., and Norell, M.A., 2010, The origin and early radiation of dinosaurs: *Earth-Science Reviews*, v. 101, p. 68–100, doi:10.1016/j.earscirev.2010.04.001.

Copper, P., 1986, Frasnian/Famennian mass extinction and cold-water oceans: *Geology*, v. 14, p. 835, doi:10.1130/0091-7613(1986)14<835:FMEACO>2.0.CO;2.

Davies, J.H.F.L., Marzoli, A., Bertrand, H., Youbi, N., Ernesto, M., and Schaltegger, U., 2017, End-Triassic mass extinction started by intrusive CAMP activity: *Nature Communications*, v. 8, p. 15596, doi:10.1038/ncomms15596.

Evans, A.R. et al., 2012, The maximum rate of mammal evolution: Proceedings of the National Academy of Sciences, v. 109, p. 4187–4190, doi:10.1073/pnas.1120774109.

Gibbs, S.J., Bown, P.R., Sessa, J.A., Bralower, T.J., and Wilson, P.A., 2006, Nannoplankton Extinction and Origination Across the Paleocene-Eocene Thermal Maximum: *Science*, v. 314, p. 1770–1773, doi:10.1126/science.1133902.

Kozik, N.P., Young, S.A., Newby, S.M., Liu, M., Chen, D., Hammarlund, E.U., Bond, D.P.G., Them, T.R., and Owens, J.D., 2022, Rapid marine oxygen variability: Driver of the Late Ordovician mass extinction: *Science Advances*, v. 8, p. eabn8345, doi:10.1126/sciadv.abn8345.

Looy, C.V. The delayed resurgence of equatorial forests after the Permian-Triassic ecologic crisis: *Proceedings of the National Academy of Sciences*, p. 13857-13862.

Renne, P.R., Sprain, C.J., Richards, M.A., Self, S., Vanderkluysen, L., and Pande, K., 2015, State shift in Deccan volcanism at the Cretaceous-Paleogene boundary, possibly induced by impact: *Science*, v. 350, p. 76–78, doi:10.1126/science.aac7549.

Schulte, P. et al., 2010, The Chicxulub Asteroid Impact and Mass Extinction at the Cretaceous-Paleogene Boundary: *Science*, v. 327, p. 1214–1218, doi:10.1126/science.1177265.

Smith, M.P., and Harper, D.A.T., 2013, Causes of the Cambrian Explosion: *Science*, v. 341, p. 1355–1356, doi:10.1126/science.1239450.

Stewart, J.R., and Stringer, C.B., 2012, Human Evolution Out of Africa: The Role of Refugia and Climate Change: *Science*, v. 335, p. 1317–1321, doi:10.1126/science.1215627.

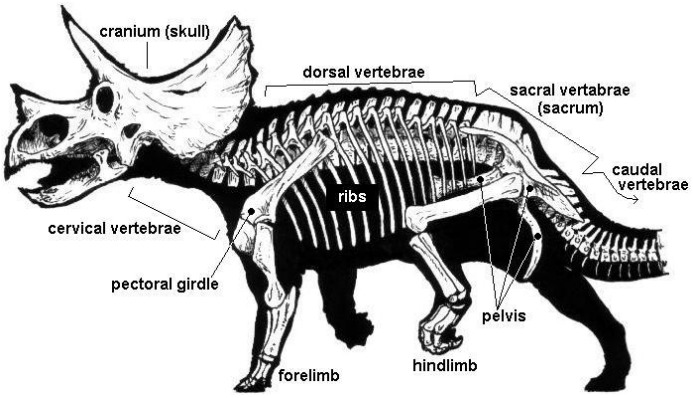
Stigall, A.L., Edwards, C.T., Freeman, R.L., and Rasmussen, C.M.Ø., 2019, Coordinated biotic and abiotic change during the Great Ordovician Biodiversification Event: Darriwilian assembly of early Paleozoic building blocks: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 530, p. 249–270, doi:10.1016/j.palaeo.2019.05.034.

Vellekoop, J., Sluijs, A., Smit, J., Schouten, S., Weijers, J.W.H., Sinninghe Damsté, J.S., and Brinkhuis, H., 2014, Rapid short-term cooling following the Chicxulub impact at the Cretaceous–Paleogene boundary: *Proceedings of the National Academy of Sciences*, v. 111, p. 7537–7541, doi:10.1073/pnas.1319253111

DEAD ENDS AND DINOSAURS: A HISTORY OF EARTH AND LIFE

EARTHSC 2207

Fall Semester 20xx



Course Information

- **Course times and location:**
  - Lectures: Tuesday/Thursday 11:30am-12:50pm; Orton Hall Room 110
- **Credit hours:** 3 credits
- **Mode of delivery:** In person

Instructor

- **Name:** Prof. Matt Saltzman
  - **Email:** Saltzman.11@osu.edu
  - **Office location:** 215 Orton Hall
  - **Office hours:** W 1:35-2:35 in OR 215 or by appointment

Course Prerequisites

There are no disciplinary or course prerequisites because the basic foundational knowledge needed to succeed in this course will be covered in lectures and readings. As a GE Origins & Evolution Theme course we will integrate Earth science and evolution, which are weaved together in the study of the fossil record of Life through time.

Course Description

Throughout the history of Life on Earth, virtually all species go extinct, but how and why it happens differs among groups. For many taxa, diversity follows a boom-and-bust pattern marked by peaks of origination and turnover. This course will focus on the causes of these evolutionary patterns in the fossil record, which may be intertwined with climate change and volcanism or result from an extraterrestrial impact. The course will address whether climatic warming or cooling leads to extinction, and how important the

rate of climate change may be. The role of volcanism in triggering severe or rapid climate change and mass extinctions is controversial. The evidence for extraterrestrial impact causing mass extinction, such as the case of the dinosaurs, will be addressed. Not all impacts cause extinction, and not all extinctions are caused by impacts. For example, the principles of plate tectonics are essential to develop and test the hypothesis that mass extinctions could be a consequence of globally increased levels of volcanic activity. The principles of evolution and incompleteness of the fossil record are important concepts that allow for a distinction between 'mass extinction' and 'background extinction' through geologic time.

The course covers three primary topics, which are integrated throughout to enable students to appreciate the origins and evolution of taxonomic groups and factors that have shaped this history.

1) The 'Big 5' mass extinctions have been recognized by geologists and paleontologists for many decades, but the estimated timing and magnitude of these events remains a subject of debate because of the incompleteness of the fossil record. These include the mass extinctions of the Late Ordovician (443 million years ago or myr), Late Devonian (372 myr), Permian-Triassic (251 myr), end-Triassic (200 myr), and end-Cretaceous (65 myr).

2) Environmental ('proxy') evidence for climate change associate with extinction events, including volcanism from chemical indicators such as mercury and strontium isotope records that reveal eruption activity and eruption type (i.e., explosive volcanism versus gradual types). Iridium records are used to fingerprint evidence for extraterrestrial impacts.

3) The consequences of extinction for the diversity of life through time, including which groups were opportunistic in the aftermath of extinctions, and the rise of entirely new groups from speciation events related to the opening up of previously occupied ecological niche space.

Readings from the published scientific literature on mass extinctions will provide the basis for class lectures, discussions, and a group project. For example, the class will read the extraterrestrial impact hypothesis for the mass extinction of the dinosaurs and other groups 65 million years ago published by Alvarez et al. in the journal *Science* in 1980, which is still an important reference for the current debate on extinction causes.

Course Learning Outcomes

By the end of this course, students should successfully be able to:

1. Articulate the difficulty of a literal reading of the fossil record and recognize the biases that exist because of the incompleteness of the record
2. Explain how the Big Five mass extinctions are defined relative to background extinctions
3. Compare and contrast the causal mechanisms proposed for each of the Big 5 mass extinctions

4. Identify challenges in uniquely characterizing an extinction mechanism as it may related to extraterrestrial versus Earth-bound causes, including impacts and volcanism
5. Apply systems thinking when considering the interconnectedness of Earth systems
6. Engage in theoretically grounded discussions regarding the relationship between plate tectonics, biological evolution, and Earth's climate system

(If approved) This course fulfills a 3-credit course in the Origins & Evolution Theme of the New General Education (GEN) curriculum. Goals and expected learning outcomes with rationale are included in this syllabus below.

General Education Expected Learning Outcomes

Learning Objectives

General Education Learning Goals & Outcomes

For students in the general education (GEN) curriculum, this course is designed to satisfy the Goals and Educational Learning Objectives (ELOs) of the Origins & Evolution Theme.

The following identifies how this course addresses the general Expected Learning Outcomes (ELOs) of any Theme course in the GE, as well as the specific ELOs of the Origins and Evolution Theme.

GE Theme Goals and Expected Learning Outcomes:

As part of the Origins & Evolution Theme of the New General Education (GEN) curriculum, this course is designed to prepare students to be able to do the following:

General Theme GOAL 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations.

ELO 1.1 Engage in critical and logical thinking (about the topic or idea of the theme).
ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme.

General Theme GOAL 2: Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.
ELO 2.1 Identify, describe, and synthesize approaches or experiences (as they apply to the theme).
ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.

Origins & Evolution GOAL 3: Successful students will appreciate the time depth of the origins and evolution of natural systems, life, humanity, or human culture, and the factors that have shaped them over time.
ELO 3.1 Illustrate their knowledge of the time depth of the universe, physical systems, life on earth, humanity or human culture by providing examples or models.

ELO 3.2 Explain scientific methods used to reconstruct the history of the universe, physical systems, life on earth, humanity or human culture and specify their domains of validity.
ELO 3.3 Engage with current controversies and problems related to origins and evolution questions.

Origins & Evolution GOAL 4: Successful students will understand the origins and evolution of natural systems, life, humanity, or human culture, and the factors that have shaped them over time.
ELO 4.1 Describe their knowledge of how the universe, physical systems, life on Earth, humanity or human culture have evolved over time.
ELO 4.2 Summarize current theories of the origins and evolution of the universe, physical systems, life on earth, humanity or human culture.

How will these goals and associated ELOs be achieved?
We will achieve these goals and associated ELOs by using critical and logical thinking to grasp the vastness of geologic time and the evolution of Life on Earth. Regarding **Goal 1**, all of the readings in this course come from the primary peer-reviewed journal literature, including the most prominent scientific journals such as *Science* and *Nature*. Therefore, students will learn about the topic at a more advanced and in-depth level than the foundations. Furthermore, a group project on a mass extinction event, aiming to address its cause and consequences for Life on Earth, will allow students to engage in an advanced, in-depth, scholarly exploration of the topic. Regarding **Goal 2**, students gain an appreciation of the interdisciplinary nature of the study of mass extinctions, which involves integration of concepts from foundational fields of astronomy, geology, and evolutionary biology, all of which needed to be brought to bear to demonstrate the coincidence of some extinction events with extraterrestrial meteorite impacts. Through the group project, exams and Top Hat quizzes, and reading of the primary academic literature associated with lecture topics, students will synthesize approaches and demonstrate a developing sense of self as a learner. The study of mass extinction and diversity of life through time is a highly active field and each year there are new discoveries with surrounding controversies that we discuss, such as whether extraterrestrial impacts or volcanism are more like to lead to climatic warming or cooling depending on the timescale of study. The Top Hat and Exam questions gauge how opinions and understanding of critical concepts evolve over the course of the semester. Finally, the Group Project involves a deeper analysis of the causes and consequences of a major mass extinction event.

To achieve unique Origins & Evolution **Goal 3**, we explore the time depth of natural Earth and Life systems using both the fossil record of ancient organisms and indirect ‘proxy’ records of past environment conditions in Earth’s atmosphere and oceans. These environmental proxy records have been developed using the scientific method, which students will appreciate through the primary journal literature and then apply to test hypotheses regarding the relationship between climate change and the diversity of Life. Regarding **Goal 4**, we will further learn about how the scientific method is used to not only reconstruct the history of Earth’s climate but also assess the incompleteness of the fossil record and how this impacts our understanding of the pace of evolution. We will learn how frequent extraterrestrial impacts are in Earth history and examine examples in which the size of an impact can be related to the magnitude of an extinction event. We will also look at examples of volcanic activity in relation to species extinctions. We will contextualize early scientific controversies such as the extinction of the dinosaurs given knowledge at the time, and discuss the social, political, and religious conditions that influenced discussions regarding origins and evolution over time.

In summary, the evolution over time of the Earth, the origins and evolution of Life on Earth, and the development of human culture and Science are the subject of this entire course. Knowledge of these subjects will be assessed frequently. Each lecture will include Top Hat review questions and discussion questions, and each of the three major sections of the course ends with a midterm that covers all material in that section. And at the end of the semester each group of 5-6 students presents their research on the cause of a mass extinction event, which requires synthesizing knowledge on how the evolution of Life and Earth's climate are linked. This class is considered an upper-level course in which the expectation is to not only remember and understand reading materials, but also to critically combine and apply basic concepts, such as the theory of evolution or plate tectonics to new problems. In the group project, in particular, creating, evaluating, and analyzing data to come up with an extinction mechanism that supports all existing data for an event is expected.

How this course works

Mode of delivery: This course is 100% in person. This course is 3 credit hours with a lecture component.

Readings and Group Project: There is no required textbook and all required reading associated with weekly lecture content will come from the primary literature/journal articles. We will utilize only highly respected and prominent journals such as *Science* and *Nature* and other broad readership journals aimed primarily at non-specialists. For example, the extraterrestrial impact hypothesis was published in 1980 in Science by Alvarez et al. and is still an important reference today and required reading for this course. The full list of readings is indicated in the Course Schedule and Bibliography at the end of this syllabus. These readings will serve as the starting point for research towards developing a group project on a mass extinction event to be presented during the Final Exam period. The groups will be assigned during the first week of classes.

Expectations for Out-of-Class Study: Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 6-9 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc. see go.osu.edu/credithours

Attendance and participation requirements: Research shows regular participation is one of the highest predictors of student success. With that in mind, we have the following expectations for everyone's participation:

> **Lectures**: Although attendance is not taken there will be daily Top Hat quizzes. Students must be in class to answer Top Hat questions (answering Top Hat questions while not in class is considered academic misconduct) but if you miss a class for a valid reason then an alternative assignment will be provided that allows you to get full Top Hat points for that day. *See following section on Required Technologies below for more details on how to log in or sign up for Top Hat at* https://app.tophat.com/login
>
> **Students who are not in attendance in the lecture hall are not allowed to take Top Hat quizzes.** To ensure that students answering Top Hat quizzes during lecture are attending the lecture, we will take attendance with Top Hat each day using the "Secure Attendance" feature. Students who answer Top Hat questions but are not in attendance will receive a zero on all Top Hat questions for that day. Answering Top Hat questions while not in class is

considered Academic Misconduct (see A1 in the Code of Student Conduct | 3335-23-04 Prohibited conduct).

Course Materials, Fees and Technologies

Required Materials and/or Technologies

- There is no required textbook for the course. All readings will come from the primary literature (journal articles) and be uploaded to Carmen. A free online Historical Geology textbook is recommended for those who want additional context for some of the journal readings https://opengeology.org/historicalgeology/
- **There is a requirement** that you use **Top Hat**. Browse the **student support pages https://success.tophat.com/s/**
- Sign for **Top Hat** account at https://app.tophat.com/login (do NOT select the SSO bypass option) using your OSU username/password and there is no cost to you.
- Once you have a Top Hat account, enter join code # **XXXXXX** to be enrolled.

  See below section "Course Assignments, Top-Hat" for details of how Top Hat will be used in grading and assignments. Top Hat points can only be obtained by attending class.

CarmenCanvas Access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you do each of the following:

Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.

Grading

Exams
Exams may consist of multiple-choice, true-false questions, short answers or short essays. The best way to do well on the exam is to attend lectures and take your own notes.

Final grades will be calculated as follows:

Lecture exam I	20% of final grade
Lecture exam II	20% of final grade
Lecture exam III	20% of final grade
Top Hat questions	20% of final grade
Group Presentations	20% of final grade

Grading Scale:
We will use the Ohio State grading scale, which is:
100-93% A; 92.9-90% A-; 89.9-87% B+; 86.9-83% B; 82.9-80% B-; 79.9-77% C+; 76.0-73% C; 72.9-70% C-; 69.9-67 D+; 66.9-60 D; <60 E

Course Assignments
Top-Hat

Top-Hat questions will be delivered during lectures to review material and gauge student comprehension.

- We will have between two and six daily Top Hat questions for both review of the previous lecture material and for participation. The first few questions (presented at start of class so please arrive on time) will be worth 0.5 points for correctness and 0.5 participation points. The remaining questions will be worth 1 participation point. The sum total off all Top Hat points during the course will be worth 15% of the course grade (see 'Grading' and 'Course Assignments' for further details).
- **Students who are not in attendance in the lecture hall are not allowed to take Top Hat quizzes.** To ensure that students answering Top Hat quizzes during lecture are attending the lecture, we will take attendance with Top Hat each day using the "Secure Attendance" feature. Students who answer Top Hat questions but are not in attendance will receive a zero on all Top Hat questions for that day. Answering Top Hat questions while not in class is considered Academic Misconduct (see A1 in the Code of Student Conduct | 3335-23-04 Prohibited conduct).

Exams

There will be 3 in-class exams covering lecture material throughout the semester. Exams will primarily focus on material covered in the associated sections of the course and readings; some key material will be cumulative. Exams will include a combination of multiple choice and short answer questions. If you are unable to take the exam on the

assigned day, you will need to make alternative arrangements **at least two days before the exam date**.

Group project

At the beginning of the semester, groups will be formed that will stay together to research a mass extinction event throughout the semester based on class readings and your own literature search. The final project for this course (as a group) is to create a ten-minute PowerPoint research presentation that synthesizes what you have learned throughout the semester and that explains your mass extinction event in terms of:

1. **Cause**: What likely led to the mass extinction? Was it an Earth-bound cause (e.g., warming or cooling, related to volcanism, or was there an extraterrestrial impact?)
2. **Impact**: What affect did this have on the long-term diversity of life? Which groups continued and diversified in the aftermath of the extinction, and which groups never recovered?

Assignments related to the group project include a prospectus outlining the mass extinction event research plan and literature search in week 3. A literature review is completed in week 6. At the end of week 11, an initial draft of the PowerPoint presentation is posted on Carmen for initial review and feedback. A final draft is due at the end of week 13, giving the students two weeks to practice their presentations to be given to the class during the Final Exam period.

Attendance

The lectures will be conducted in person. If you have a valid excuse (medical, COVID19-related, or compassionate reasons only) please contact us promptly. Attendance is required to answer Top Hat questions.

Statement on Plagiarism and Academic Misconduct:

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute Academic Misconduct.

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: Any activity that tends to compromise the academic integrity of the University or subvert the educational process. Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never

considered an excuse for academic misconduct, so I recommend that you review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct. We will use Turnitin in this course. You can learn about use of this product here and should be familiar with how it is used by referring here to the student hub of information https://guides.turnitin.com/hc/en-us/categories/21850416398221-Student-hub

If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

Statement on artificial intelligence and academic integrity:

There has been a significant increase in the popularity and availability of a variety of generative artificial intelligence (AI) tools, including ChatGPT, Sudowrite and others. These tools will help shape the future of work, research and technology — but when used in the wrong way, they can stand in conflict with academic integrity at Ohio State.

The use of generative artificial intelligence (GenAI) tools such as Copilot or ChatGPT are not permitted in this course. Any use of GenAI tools for work in this class may therefore be considered a violation of Ohio State's Academic Integrity policy and Code of Student Conduct because the work is not your own. The use of unauthorized GenAI tools will result in referral to the Committee on Academic Misconduct. If you feel you need to use GenAI for translation, please contact me first. If you have any other questions regarding this course policy, please contact me.

Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious accommodations:

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable

accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity.
https://oaa.osu.edu/religious-holidays-holy-days-and-observances

Copyright for Instructional Materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

Online reporting form at equity.osu.edu,
Call 614-247-5838 or TTY 614-688-8605,
Or Email equity@osu.edu

Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity of people and ideas. We believe in creating equitable research opportunities for all students and to providing programs and curricula that allow our students to understand critical societal challenges from diverse perspectives and aspire to use research to promote sustainable solutions for all. We are committed to maintaining an inclusive community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among all members; and encourages each individual to strive to reach their own potential. The Ohio State University does not discriminate on the basis of age, ancestry, color, disability, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, race, religion, sex, gender, sexual orientation, pregnancy, protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. (To learn more about diversity, equity, and inclusion and for opportunities to get involved, please visit: https://odi.osu.edu/ or https://cbsc.osu.edu)

Your Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing.

If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th floor of the Younkin Success Center and 10th floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at 614-292-5766 and 24-hour emergency help is also available through the 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Course Schedule

***SEE BILIOGRAPHY FOR PEER REVIEWED JOURNAL ARTICLES**
REFER TO THE CARMEN SITE FOR UP-TO-DATE DUE DATES.

Date	Topic
	Week 1
August 20	Introduction to the course: questions, structure, and goals
August 22	**Topic: Geologic Time**
	Week 2
August 27	**Topic: Origin of Animals** *Reading*: Smith and Harper, 2013, Causes of the Cambrian Explosion
August 29	**Topic: Cambrian Explosion** (continue *Reading*: Smith and Harper, 2013) *Assignment*: Group Project selection of mass extinction research project
	Week 3
September 3	**Topic: Great Ordovician Biodiversification Event** *Reading*: Stigall, A.L., Edwards, C.T., Freeman, R.L., and Rasmussen, C.M.Ø., 2019, Coordinated biotic and abiotic change during the Great Ordovician Biodiversification Event: Darriwilian assembly of early Paleozoic building blocks
September 5	**Topic: Late Ordovician Mass Extinction Event and Oxygen** Late Ordovician Mass Extinction and Glaciation *Reading*: Kozik, N.P., Young, S.A., Newby, S.M., Liu, M., Chen, D., Hammarlund, E.U., Bond, D.P.G., Them, T.R., and Owens, J.D., 2022, Rapid marine oxygen variability: Driver of the Late Ordovician mass extinction *Assignment*: Group Project prospectus due
	Week 4
September 10	**Topic: Late Ordovician Mass Extinction and Volcanism** (continue *Reading*: Kozik et al., 2022)
September 12	**Topic: Late Devonian Mass Extinction** *Reading*: Copper, P., 1986, Frasnian/Famennian mass extinction and cold-water oceans
	Week 5
September 17	**Exam #1 – Section 1**
September 19	**Topic: Siberian Traps Volcanism and the End-Permian Mass Extinction** *Reading*: Renne, P.R., Sprain, C.J., Richards, M.A., Self, S., Vanderkluysen, L., and Pande, K., 2015, State shift in Deccan volcanism at the Cretaceous-Paleogene boundary, possibly induced by impact
	Week 6
September 24	**Topic: Permian-Triassic Mass Extinction: 'Mother of All Mass Extinctions' Part I** *Reading*: Benton, M.J., and Twitchett, R.J., 2003, How to kill (almost) all life: the end-Permian extinction event

September 26	**Topic: Permian-Triassic Mass Extinction: 'Mother of All Mass Extinctions' Part II** (continue *Reading*: Benton, M.J., and Twitchett, R.J., 2003) *Assignment*: Group Project scientific literature bibliography due
Week 7	
October 1	**Topic**: **Microbes and the Aftermath of the End-Triassic Mass Extinction** *Reading*: Looy, C.V. The delayed resurgence of equatorial forests after the Permian-Triassic ecologic crisis
October 3	**Topic: End-Triassic Mass Extinction** *Reading:* Davies, J.H.F.L., Marzoli, A., Bertrand, H., Youbi, N., Ernesto, M., and Schaltegger, U., 2017, End-Triassic mass extinction started by intrusive CAMP activity
Week 8	
October 8	**Topic: Aftermath of the End-Triassic Mass Extinction** (continue *Reading* Davies et al., 2017)
October 10	**NO CLASS – Fall Break**
Week 9	
October 15	**Exam #2 – Section 2**
October 17	**Topic: Dinosaurs Inherit the Earth** *Reading*: Brusatte, S.L., Nesbitt, S.J., Irmis, R.B., Butler, R.J., Benton, M.J., and Norell, M.A., 2010, The origin and early radiation of dinosaurs
Week 10	
October 22	**Topic: Early Theories for the Dinosaur Extinction** *Reading***:** Alvarez, L.W., Alvarez, W., and Asaro, F., 1980, Extraterrestrial Cause for the Cretaceous-Tertiary Extinction
October 24	**Topic: The End-Cretaceous Impact Hypothesis and Iridium Anomaly** *Reading*: Vellekoop, J., Sluijs, A., Smit, J., Schouten, S., Weijers, J.W.H., Sinninghe Damsté, J.S., and Brinkhuis, H., 2014, Rapid short-term cooling following the Chicxulub impact at the Cretaceous–Paleogene boundary
Week 11	
October 29	**Topic: The Impact Hypothesis and Iridium Anomaly** (continue *Reading* Alvarez et al., 1980 and Vellekoop et al., 2014)
October 31	**Topic: Deccan Volcanism and End-Cretaceous Extinction** *Reading***:** Renne, P.R., Sprain, C.J., Richards, M.A., Self, S., Vanderkluysen, L., and Pande, K., 2015, State shift in Deccan volcanism at the Cretaceous-Paleogene boundary, possibly induced by impact *Assignment:* Group Project initial draft due
Week 12	
November 5	**Topic: Deccan Volcanism and End-Cretaceous Extinction** (continue *reading* Renne et al., 2015)
November 7	**Topic: Chixilub Impact Structure and End-Cretaceous Extinction** (continue *reading* Vellekoope et al., 2014)
Week 13	

November 12	**Topic: Aftermath of the End-Cretaceous Mass Extinction** (continue *reading* Vellekoope et al., 2014)
November 14	**Topic: Mammals Inherit the Earth** *Reading:* Evans, A.R. et al., 2012, The maximum rate of mammal evolution *Assignment:* Group Project final draft due
Week 14	
November 19	**Topic: Cenozoic Extinctions** *Reading:* Gibbs, S.J., Bown, P.R., Sessa, J.A., Bralower, T.J., and Wilson, P.A., 2006, Nannoplankton Extinction and Origination Across the Paleocene-Eocene Thermal Maximum
November 21	**Topic**: **Climate and Human Evolution** *Reading***:** Stewart, J.R., and Stringer, C.B., 2012, Human Evolution Out of Africa: The Role of Refugia and Climate Change
Week 15	
November 26	**Topic: The Sixth Mass Extinction** *Reading:* Barnosky, A.D. et al., 2011, Has the Earth's sixth mass extinction already arrived?
November 28	**NO CLASS Thanksgiving break**
Week 16	
December 3	**Exam #3**
December 6 4:00-5:45 PM (Final Exam Time)	**Group Project Presentations during Final Exam period**

Bibliography: All readings are peer-reviewed journal articles from the prominent scientific journals aimed at non-specialists (see lecture schedule above for integration with subject matter)

Alvarez, L.W., Alvarez, W., and Asaro, F., 1980, Extraterrestrial Cause for the Cretaceous-Tertiary Extinction: *Science*, v. 208, p. 1095-1108.

Barnosky, A.D. et al., 2011, Has the Earth's sixth mass extinction already arrived? *Nature*, v. 471, p. 51–57, doi:10.1038/nature09678.

Benton, M.J., and Twitchett, R.J., 2003, How to kill (almost) all life: the end-Permian extinction event: *Trends in Ecology & Evolution*, v. 18, p. 358–365, doi:10.1016/S0169-5347(03)00093-4.

Brusatte, S.L., Nesbitt, S.J., Irmis, R.B., Butler, R.J., Benton, M.J., and Norell, M.A., 2010, The origin and early radiation of dinosaurs: *Earth-Science Reviews*, v. 101, p. 68–100, doi:10.1016/j.earscirev.2010.04.001.

Copper, P., 1986, Frasnian/Famennian mass extinction and cold-water oceans: *Geology*, v. 14, p. 835, doi:10.1130/0091-7613(1986)14<835:FMEACO>2.0.CO;2.

Davies, J.H.F.L., Marzoli, A., Bertrand, H., Youbi, N., Ernesto, M., and Schaltegger, U., 2017, End-Triassic mass extinction started by intrusive CAMP activity: *Nature Communications*, v. 8, p. 15596, doi:10.1038/ncomms15596.

Evans, A.R. et al., 2012, The maximum rate of mammal evolution: Proceedings of the National Academy of Sciences, v. 109, p. 4187–4190, doi:10.1073/pnas.1120774109.

Gibbs, S.J., Bown, P.R., Sessa, J.A., Bralower, T.J., and Wilson, P.A., 2006, Nannoplankton Extinction and Origination Across the Paleocene-Eocene Thermal Maximum: *Science*, v. 314, p. 1770–1773, doi:10.1126/science.1133902.

Kozik, N.P., Young, S.A., Newby, S.M., Liu, M., Chen, D., Hammarlund, E.U., Bond, D.P.G., Them, T.R., and Owens, J.D., 2022, Rapid marine oxygen variability: Driver of the Late Ordovician mass extinction: *Science Advances*, v. 8, p. eabn8345, doi:10.1126/sciadv.abn8345.

Looy, C.V. The delayed resurgence of equatorial forests after the Permian-Triassic ecologic crisis: *Proceedings of the National Academy of Sciences*, p. 13857-13862.

Renne, P.R., Sprain, C.J., Richards, M.A., Self, S., Vanderkluysen, L., and Pande, K., 2015, State shift in Deccan volcanism at the Cretaceous-Paleogene boundary, possibly induced by impact: *Science*, v. 350, p. 76–78, doi:10.1126/science.aac7549.

Schulte, P. et al., 2010, The Chicxulub Asteroid Impact and Mass Extinction at the Cretaceous-Paleogene Boundary: *Science*, v. 327, p. 1214–1218, doi:10.1126/science.1177265.

Smith, M.P., and Harper, D.A.T., 2013, Causes of the Cambrian Explosion: *Science*, v. 341, p. 1355–1356, doi:10.1126/science.1239450.

Stewart, J.R., and Stringer, C.B., 2012, Human Evolution Out of Africa: The Role of Refugia and Climate Change: *Science*, v. 335, p. 1317–1321, doi:10.1126/science.1215627.

Stigall, A.L., Edwards, C.T., Freeman, R.L., and Rasmussen, C.M.Ø., 2019, Coordinated biotic and abiotic change during the Great Ordovician Biodiversification Event: Darriwilian assembly of early Paleozoic building blocks: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 530, p. 249–270, doi:10.1016/j.palaeo.2019.05.034.

Vellekoop, J., Sluijs, A., Smit, J., Schouten, S., Weijers, J.W.H., Sinninghe Damsté, J.S., and Brinkhuis, H., 2014, Rapid short-term cooling following the Chicxulub impact at the Cretaceous–Paleogene boundary: *Proceedings of the National Academy of Sciences*, v. 111, p. 7537–7541, doi:10.1073/pnas.1319253111.

GE Theme course submission worksheet: Origins & Evolution

Overview

Courses in the GE Themes aim to provide students with opportunities to explore big picture ideas and problems within the specific practice and expertise of a discipline or department. Although many Theme courses serve within disciplinary majors or minors, by requesting inclusion in the General Education, programs are committing to the incorporation of the goals of the focal theme and the success and participation of students from outside of their program.

Each category of the GE has specific learning goals and Expected Learning Outcomes (ELOs) that connect to the big picture goals of the program. ELOs describe the knowledge or skills students should have by the end of the course. Courses in the GE Themes must meet the ELOs common for **all** GE Themes and those specific to the Theme, in addition to any ELOs the instructor has developed specific to that course. All courses in the GE must indicate that they are part of the GE and include the Goals and ELOs of their GE category on their syllabus.

The prompts in this form elicit information about how this course meets the expectations of the GE Themes. The form will be reviewed by a group of content experts (the Theme Advisory) and by a group of curriculum experts (the Theme Panel), with the latter having responsibility for the ELOs and Goals common to all themes (those things that make a course appropriate for the GE Themes) and the former having responsibility for the ELOs and Goals specific to the topic of **this** Theme.

Briefly describe how this course connects to or exemplifies the concept of this Theme (Origins & Evolution)

In a sentence or two, explain how this class "fits' within the focal Theme. This will help reviewers understand the intended frame of reference for the course-specific activities described below.

EARTHSC 2207 "Dead Ends and Dinosaurs: A History of Earth and Life" examines the history of Life on Earth and links between biological evolution and climate. The focus is on the 'Big 5' mass extinction events which have been variously attributed to episodes of global warming or cooling, triggered in many cases by volcanic activity, or extraterrestrial impact by a meteorite. As we may currently be in the midst of Earth's 'Sixth Mass Extinction' due to global warming, we see a clear fit with the Origins and Evolution Theme which focusses on students "Having an appreciation of the deep past is important for understanding humanity's place in the universe. The origins and evolution theme puts humans into this larger context and allows us to recognize the fragility of the human condition, how and why humans have survived over time—i.e., our strength as a species-- as well as how and why other closely related human species became extinct. "

Connect this course to the Goals and ELOs shared by *all* Themes

Below are the Goals and ELOs common to all Themes. In the accompanying table, for each ELO, describe the activities (discussions, readings, lectures, assignments) that provide opportunities for students to achieve those outcomes. The answer should be concise and use language accessible to colleagues outside of the submitting department or discipline. The specifics of the activities matter—listing "readings" without a reference to the topic of those readings will not allow the reviewers to understand how the ELO will be met. However, the panel evaluating the fit of the course to the Theme will review this form in conjunction with the syllabus, so if readings, lecture/discussion topics, or other specifics are provided on the syllabus, it is not necessary to reiterate them within this form. The ELOs are expected to vary in their "coverage" in terms of number of activities or emphasis within the course. Examples from successful courses are shared on the next page.

Goal 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations. In this context, "advanced" refers to courses that are e.g., synthetic, rely on research or cutting-edge findings, or deeply engage with the subject matter, among other possibilities.

Goal 2: Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.

ELO 1.1 Engage in critical and logical thinking.	Critical and logical thinking is a main theme of the activities in this course. Students will engage in logical thinking as they weigh the types of geologic evidence that underpin hypotheses for the causes of the largest mass extinction events in Earth history. In lectures, readings of the peer-reviewed literature, and in small-group activities, students will engage in critical thinking. For example, students will read articles that highlight two sides of an ongoing debate over whether the extraterrestrial impact hypothesis for the mass extinction that killed off the dinosaurs and many other groups at the end of the Cretaceous is valid, or whether the preceding volcanic eruptions of the Deccan Traps in India may have been a primary driver. In another example, we will look at the end of the course at whether or not we are in the midst of a sixth great mass extinction event as a result of human-induced global warming. This requires students engage in critical thinking to compare the modern extinction, which is much faster but of lower magnitude in terms of species loss, with the much slower but larger losses of diversity in deep geologic time.

ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or ideas within this theme	Students will read seminal papers in the fields of geology, evolutionary biology and climate change. These include the primary literature form prominent journals that are aimed at non-specialists. This allows for an in-depth scholarly exploration of the topic of mass extinction. Students will work in small groups throughout the semester to apply what they learn in this class to look in detail at one of the Big Five mass extinction events and come up with a consensus view of the cause. As the students grapple with the conflicting evidence that exists in the literature, and debate the degree of uncertainty associated with the evidence from the geologic and fossil records, they will gain an appreciation of the nature of scientific discovery. The exercise also involves literature review, properly citing references, teamwork, constructing effective visual aids, and oral presentation of results to a broad audience.
ELO 2.1 Identify, describe, and synthesize approaches or experiences.	At the start of the course, all students are put in small groups that include students from different backgrounds in terms of their major and class standing, and address interdisciplinary problems with diverse teams. Primary literature will be available on Carmen as a starting point, but student groups will need to expand their research to include additional articles that they will find on their own using tools such as Google Scholar or Web of Science. The group project will involve a debate over the nature of the evidence and the robustness of conclusions regarding extinction mechanisms and severity of biological species loss. Students will incorporate evolutionary biology and geology principles into their thinking, but also address biases in the literature towards certain viewpoints depending on the type of evidence being discussed. Some authors prefer certain types of evidence over others, but this may reflect unconscious bias towards defending their previous hypotheses. Questioning assumptions leads to lively debates, and students can learn to appreciate different view points of their collaborators. In the context of the study of mass extinction in Earth's past, students learn to reflect on the current changes in biological diversity with a warming planet. As is the case with past extinction events, the currently proposed 'Sixth Mass Extinction' event is controversial because of: 1) the ways in which species are defined (i.e., completeness of the records), and 2) extent to which the rate of extinction rises above the 'background' extinction level that is taking place at any given time as species originate and go extinct.

ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.	The development and progression of thought and experience is linked to the group project in which the causes and consequences of a mass extinction event are examined. During each lecture, a portion of the class is devoted to discussion comparing and contrasting each extinction event covered in such a way that students can steadily build up their confidence and ability to dissect arguments made in journal articles we read. For example, in the first exam students use observations of proxy records of volcanic activity and climate to infer the cause of the Late Ordovician mass extinction event; in the second exam, they revisit these same proxies with an increasingly critical eye that allows them to parse out the 'signal' from 'noise' in the proxy records; in the third exam students synthesize past records from deep time and compare them with more recent records, which demonstrates that while there is less noise in the data (i.e., the more recent records are better preserved), the signal is not as strong as some of the older events. As a result of this progression, students reflect on the modern Earth system and biological diversity in the context of past, gaining an appreciation for the different challenges faced throughout geologic time. The final group project serves to tie together these reflections that have taken place during lectures and exams, and allows students to articulate what they have learned.

Goals and ELOs unique to Origins & Evolution

Below are the Goals and ELOs specific to this Theme. As above, in the accompanying Table, for each ELO, describe the activities (discussions, readings, lectures, assignments) that provide opportunities for students to achieve those outcomes. The answer should be concise and use language accessible to colleagues outside of the submitting department or discipline. The ELOs are expected to vary in their "coverage" in terms of number of activities or emphasis within the course. Examples from successful courses are shared on the next page.

GOAL 3: Successful students will appreciate the time depth of the origins and evolution of natural systems, life, humanity, or human culture, and the factors that have shaped them over time.

GOAL 4: Successful students will understand the origins and evolution of natural systems, life, humanity, or human culture, and the factors that have shaped them over time.

ELO 3.1 Illustrate their knowledge of the time depth of the universe, physical systems, life on earth, humanity or human culture by providing examples or models.	To illustrate the time depth of both geologic time and humanity, students work in the group project to compare and contrast the changing dynamics of biological evolution and extinction. Through in depth study of the mechanisms of mass extinction that have been identified in deep time, including the extraterrestrial impact and volcanic winter scenarios, students can articulate the likelihood of a mass extinction caused by humans who are also changing the climate in much the same way a volcanic or extraterrestrial event may. The exams and Top Hat questions build towards an understanding of life on Earth such that students can articulate the different mechanisms for evolution. For example the largest mass extinction event of all time at the end of the Permian period was likely caused by a volcanic eruption, but whether this resulted in extreme warming or cooling over different timescales will be debated throughout the course as similar mechanisms are discussed for successive events. The consequences of warming and cooling scenarios for levels of oxygen in marine environments is of particular significance to theories.

LO 3.2 Explain scientific methods used to reconstruct the history of the universe, physical systems, life on earth, humanity or human culture and specify their domains of validity.	Students learn how Earth scientists and paleontologists are able to reconstruct the history of Life on Earth using observations and biologic and geologic principles. As highlighted in various ways with examples throughout the lectures and journal article readings, this reconstruction relies on the assumption that the underlying mechanisms of plate tectonic theory and evolutionary theory hold steady throughout space and time. The incompleteness of the fossil record and the records of environmental proxies through time both limit the knowledge of deep time processes and make it important to be on the lookout for artifacts that can influence real patterns. For example, we will read articles on the Permian-Triassic mass extinction event by Looy et al. which discuss the likelihood that the gradual nature of the mass extinction assumed in many previous studies involved a literal reading of the fossil record. If confidence intervals on species ranges is calculated statistically, it can be seen that a sudden extinction should be expected to look gradual in the fossil record. This is an example of the scientific method, and is powerful in the sense that many extinction events were later interpreted to be artifacts of the incompleteness of the fossil record.
ELO 3.3 Engage with current controversies and problems related to origins and evolution questions.	Students are first taught to recognize early scientific controversies over the causes of mass extinction events such the one at the end of the Cretaceous period that involved dinosaurs. Importantly, we also discuss the social, political, and religious conditions that influenced discussions regarding origins and evolution over time, and specifically whether 'catastrophism' or 'gradualism' was the proper way to understand past Life on Earth. The notion of catastrophism was often shunned, but with the recognition of an extraterrestrial impact causing loss of species, this idea became accepted. Students further appreciate the limitations of Darwin's theory of evolution in the context of mass extinction. We read primary scientific literature which asks the question of what 'rules' apply during mass extinctions that may not apply during natural selection. Prevailing views on speciation mechanisms, sometimes involving geographic isolation of populations by physical separation related to plate tectonics, are contrasted with the nearly instantaneous affects of events such as meteorite impacts. This notion challenges students understanding of evolutionary theory and over what spatial and temporal scales it may apply. In particular the article in *Science* by Alvarez et al., 1980 on the extraterrestrial impact hypothesis is anticipated to generate significant discussion among students.

ELO 4.1 Describe their knowledge of how the universe, physical systems, life on Earth, humanity or human culture have evolved over time.	The evolution over time of Earth, the origins and evolution of life on Earth, and the links to humanity are the subject of this course. Students' knowledge of these subjects is assessed extensively. Each week has Top Hat quiz questions to assess knowledge. Each of the sections of the course ends with an exam that covers all material in that section. And the group project allows students to present their understanding of the causes and consequences of one of Earth's great mass extinctions, which requires students to creatively synthesize their knowledge on how species evolution occurs and what perspective this can offer on the current anthropogenic warming and Sixth Mass Extinction event. More generally, the evolutionary history of Life on Earth is a constant theme of the lectures and readings, and students explore it further through the group project.
ELO 4.2 Summarize current theories of the origins and evolution of the universe, physical systems, life on earth, humanity or human culture.	Through lectures, exams and the group project, students will understand that the theory of evolution can be viewed in different contexts when it comes to mass extinction events. First, there is the 'Darwinian' understanding of evolution as it relates to natural selection whereby species produce more offspring than can survive, and variability in offspring allows selection of certain traits to take place. In times of mass extinction, the idea of natural selection may no longer apply because an extraterrestrial impact may produce circumstances that don't allow for certain traits to matter. If a population is in the path of a meteorite or volcanic eruption then none will survive regardless of the ways in which natural selection normally produce change through time. Exam questions based on lectures focus on theses differences between 'background' and 'mass' extinctions, as well as the ways in which they can be similar or differ depending on the 'kill mechanism'. The group project also emphasizes comparing and contrasting how these mechanisms of evolution may be changing in the current global warming episode related to human activity.

Distance Approval Cover Sheet

For Permanent DL/DH Approval | College of Arts and Sciences
(Updated 2-1-24)

Course Number and Title: EARTHSC 2XXX Dead Ends and Dinosaurs: A History of Earth and LIFE

Carmen Use

When building your course, we recommend using the ASC Distance Learning Course Template for CarmenCanvas. See Carmen: Common Sense Best Practices and Carmen Fast Facts for Instructors for more on using CarmenCanvas

[X] A Carmen site will be created for the course, including a syllabus and gradebook at minimum.

If no, why not?

Syllabus

[X] Proposed syllabus uses the ASC distance learning syllabus template, includes boilerplate language where required, as well as a clear description of the technical and academic support services offered, and how learners can obtain them.

[X] Syllabus is consistent and is easy to understand from the student perspective.

[X] Syllabus includes a schedule with dates and/or a description of what constitutes the beginning and end of a week or module.

[X] If there are required synchronous sessions, the syllabus clearly states when they will happen and how to access them.

Additional comments (optional).

Instructor Presence

For more on instructor presence: About Online Instructor Presence.
For more on Regular and Substantive Interaction: Regular Substantive Interaction (RSI) Guidance

Students should have opportunities for regular and substantive academic interactions with the course instructor. Some ways to achieve this objective:

[X] Instructor monitors and engages with student learning experiences on a regular and substantive cadence.

Explain your plan for understanding student experiences of the course and how the instructor will be responsive to those experiences (required).

[X] Regular instructor communications with the class via announcements or weekly check-ins.

[X] Instructional content, such as video, audio, or interactive lessons, that is visibly created or mediated by the instructor.

[X] Regular participation in class discussion, such as in Carmen discussions or synchronous sessions.

[X] Regular opportunities for students to receive personal instructor feedback on assignments.

Please comment on this dimension of the proposed course (or select/explain methods above).

I have weekly check in videos with announcements and a look back at the students' past week's content and assignments. I also discuss the reading and material to be covered in the week ahead. I will make lecture videos of myself to be uploaded with each weekly section of the course. I will make comments on the discussion forums to give students opportunities to interact with me and gain feedback on all major assignments.

Delivery Well-Suited to DL/DH Environment

Technology questions adapted from the Quality Matters rubric. For information about Ohio State learning technologies: Toolsets.

- [X] The tools used in the course support the learning outcomes and competencies.
- [X] Course tools promote learner engagement and active learning.
- [X] Technologies required in the course have been vetted for accessibility, security, privacy and legality by the appropriate offices and are readily and reasonably obtainable.
- [X] Links are provided to privacy policies for all external tools required in the course.

Additional technology comments:

Which components of this course are planned for synchronous delivery and which for asynchronous delivery (required)? (For DH, address what is planned for in-person meetings as well)

This is an asynchronous course

If you believe further explanation would be helpful, please comment on how course activities have been adjusted for distance learning:

Workload Estimation

For more information about estimating student workload, see Workload Estimation.

[X] Course credit hours align with estimated average weekly time to complete the course successfully.

[X] Course includes regular substantive interaction well-suited to the learning environment at a frequency and engagement level appropriate to the course.

Provide a brief outline of a typical course week, categorizing course activities and estimating the approximate time to complete them or participate (required):

Week 2 is a typical week. Students read Smith and Harper, Causes of the Cambrian Explosion (3 hours), work through the lecture content (weekly roadmap, look back at previous week, plus 2 lecture videos; 3 hours), join Discussion board on Carmen/Canvas with option to interact (1 hr), work with group on group assignment planning (2 hours)
Direct instruction: 3 hours; Indirection Instruction: 6 hours

[ ] In the case of course delivery change requests, the course demonstrates comparable rigor in meeting course learning outcomes.

Accessibility

See Creating an Accessible Course for more information. For tools and training on accessibility: Digital Accessibility Services.

[X] Instructor(s) teaching the course will have taken Digital Accessibility training (starting in 2022) and will ensure all course materials and activities meet requirements for diverse learners, including alternate means of accessing course materials when appropriate.

[X] Information is provided about the accessibility of all technologies required in the course. All third-party tools (tools without campus-wide license agreements) have their accessibility statements included.

Description of any anticipated accommodation requests and how they have been/will be addressed.

All videos are appropriately captioned; Carmen and pdfs are examined for accessibility and addressed

Additional comments (optional):

Academic Integrity

For more information: Promoting Academic Integrity.

[X] The course syllabus includes online-specific policies about academic integrity, including specific parameters for each major assignment:

[X] Assignments are designed to deter cheating and plagiarism and/or course technologies such as online proctoring or plagiarism check or other strategies are in place to deter cheating.

Additional comments (optional):

I use turnitin for major assignments

Frequent, Varied Assignments/Assessments

For more information: *Designing Assessments for Students*.

Student success in online courses is maximized when there are frequent, varied learning activities. Possible approaches:

[X] Opportunities for students to receive course information through a variety of different sources, including indirect sources, such as textbooks and lectures, and direct sources, such as scholarly resources and field observation.

[X] Variety of assignment formats to provide students with multiple means of demonstrating learning.

[X] Opportunities for students to apply course knowledge and skills to authentic, real-world tasks in assignments.

Comment briefly on the frequency and variety of assignment types and assessment approaches used in this course or select methods above (required):

I will assign primary journal articles for discussion, and group presentations for team assignments, as well as discussion posts related to lecture content

Community Building

For more information: Student Interaction Online and Creating Community on Your Online Course

Students engage more fully in courses when they have an opportunity to interact with their peers and feel they are part of a community of learners. Possible approaches:

- [X] Opportunities for students to interact academically with classmates through regular class discussion or group assignments.
- [X] Opportunities for students to interact socially with classmates, such as through video conference sessions or a course Q&A forum.
- [X] Attention is paid to other ways to minimize transactional distance (psychological and communicative gaps between students and their peers, instructor, course content, and institution).

Please comment on this dimension of the proposed course (or select methods above)

My lecture videos include my personal stories of doing research on course content, and I will work with students to check in on their group project and presentation assignment. I will join discussions on Carmen/Canvas throughout the semester and students will get to know me and each other. Students have can comment on weekly videos and ask follow-up questions.

Transparency and Metacognitive Explanations

For more information: Increasing Transparency and Metacognition

Students have successful, meaningful experiences when they understand how the components of a course connect together, when they have guidance on how to study, and when they are encouraged to take ownership of their learning. Possible approaches:

- [X] Instructor explanations about the learning goals and overall design or organization of the course.
- [X] Context or rationale to explain the purpose and relevance of major tasks and assignments.

[X] Guidance or resources for ancillary skills necessary to complete assignments, such as conducting library research or using technology tools.

[X] Opportunities for students to take ownership or leadership in their learning, such as by choosing topics of interest for an assignment or leading a group discussion or meeting.

[X] Opportunities for students to reflect on their learning process, including their goals, study strategies, and progress.

[X] Opportunities for students to provide feedback on the course.

Please comment on this dimension of the proposed course (or select methods above):

My introduction videos with a roadmap for each week will review the expected learning outcomes and course goals. The assignments will have rubrics that point back towards the course learning outcomes and course objectives. Students work in teams to generate discussion about course content and work towards their group presentation. I will ask seek input from student using Top Hat participation questions on their learning and discuss the feedback with the students.

Additional Considerations

Comment on any other aspects of the online delivery not addressed above (optional):

Syllabus and cover sheet reviewed by *Bob Mick* on *10/11/24*

Reviewer Comments:

My comments and suggestions regarding the distance education syllabus are listed below:

1) Under the section of "How This Online Course Works" it would be helpful to include additional information about what students are expected to complete each week. For example, include information about the weekly recorded lectures students must watch, the weekly introduction videos and road map with learning outcomes mentioned in the cover sheet, the weekly check-in videos with announcements mentioned in the cover sheet, the homework questions in Top Hat, in addition to the readings and weekly discussion board postings. Guidance on which assignment to complete first or a process to follow will be helpful too.

Here is an example:

Every week I'll post an introductory video check-in with a road map and review of the learning objectives, sharing my thoughts on the week, comments on your collective endeavors, appreciations of some of the highlights, and so forth.

Each module will include a summary of the week's activities, recorded video lectures, homework questions to complete in Top Hat, readings to complete, and one or more discussion topic(s) to complete.

You will be working on your weekly modules from Monday through 11:59 Sunday. By Thursday you will need to post your initial contribution(s) to the discussion board(s) and continue the conversation on Friday and Saturday. By Sunday, you will need to have completed the Top Hat quiz for the week.

2) The syllabus states students are required to participate in the discussion boards on a weekly basis, but this isn't included as part of their grade for the course. I recommend making the discussion board posts part of their course grade in the event students don't participate or do so very poorly. It will also be helpful to include additional information about your expectations regarding the quality of the posts to the discussion boards. For example, would simply saying "I agree" be an acceptable post? And do you want to require that they provide substantive comments to other student posts?

Here is example information you might adopt:

Each discussion will be worth 3 points: 1 point for the quality of your initial post; 1 point for two substantive comments on the posts of others made on Friday/Saturday (posts that don't simply agree or disagree but build on the ideas in the post or suggest a different angle); a third point for being a colleague—that is, actually engaging in conversation, by showing, through multiple comments, a genuine interest in the ideas of others, by asking questions, and by answering questions that are put to you.

Or this:

The discussion board posts should be substantive, at least 3-4 sentences and should not boil down to "I agree" or "I disagree" with no original contribution to the conversation. You are encouraged to post more often, and you can certainly post less substantive responses ("That was really smart. Thanks for that contribution!") as often as wish, but those will not count toward your discussion grade. This is one of the primary ways you will feel connected to your classmates and you should plan to read what they post as part of this activity. Most students feel motivated by ongoing conversations with their classmates. The modules will prompt you on what to discuss in the various forums.

3) Will the optional live sessions be recorded for those students who can't attend? If these will be recorded it will be helpful for students to have this information in the syllabus.

4) The syllabus states that student group presentations will be given to the class during the final exam period. Will these presentations be made via live zoom sessions? This should be explained in the syllabus.

5) The syllabus states that Top Hat will be used in the course and the cover sheet states that Turnitin will be used. Both of these technologies should be included in the syllabus under Course Technology. A short explanation should be included for the students to understand how each will be used.

When using Turnitin, an additional statement should be included in the syllabus:

https://teaching.resources.osu.edu/toolsets/carmencanvas/guides/turnitin/turnitin-best-practices

Additional resources and examples can be found on ASC's Office of Distance Education website.

Outlook

RE: Concurrence request Earth Sciences "Dead Ends and Dinosaurs: A History of Earth and Life"

From Freudenstein, John <freudenstein.1@osu.edu>
Date Fri 10/11/2024 10:25 AM
To Sawyer, Derek <sawyer.144@osu.edu>; Vaessin, Harald <vaessin.1@osu.edu>
Cc Saltzman, Matthew <saltzman.11@osu.edu>; Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>

Dear Derek:

I compared the content of your proposed course with that of our “Dynamics of Dinosaurs” (EEOB 2250) and there is minimal overlap, so I see no reason for concern with the proposal and wish you success with this course.

Best wishes,

John Freudenstein

THE OHIO STATE UNIVERSITY

John V. Freudenstein, PhD
Professor
Vice Chair for Undergraduate Studies
Director of the Herbarium (OS)
Dept. of Evolution, Ecology and Organismal Biology
1315 Kinnear Road
Columbus, OH 43212
614-688-0363
freudenstein.1@osu.edu eeob.osu.edu

From: Sawyer, Derek <sawyer.144@osu.edu>
Sent: Thursday, October 10, 2024 2:50 PM
To: Vaessin, Harald <vaessin.1@osu.edu>; Freudenstein, John <freudenstein.1@osu.edu>
Cc: Saltzman, Matthew <saltzman.11@osu.edu>; Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>
Subject: Concurrence request Earth Sciences "Dead Ends and Dinosaurs: A History of Earth and Life"

Dear Professors Vaessin and Freudenstein,

Please find attached a syllabus for a proposed new course in Earth Sciences "Dead Ends and Dinosaurs: A History of Life.” This course would be offered at the 2000 level by Prof. Matthew Saltzman.

The School of Earth Sciences is requesting concurrence for the proposed new course.

*Responses are kindly asked for within 2 weeks by **Friday, October 25, 2024***. Concurrence will be assumed if no response is received by then.

Please email your responses/concurrences to me (sawyer.144@osu.edu).

Please let me know if you have any questions.

Many thanks,
Derek

Dr. Derek E. Sawyer
Associate Professor
Associate Director of Administration
School of Earth Sciences
Affiliated Faculty, Sustainability Institute
The Ohio State University
275 Mendenhall Laboratory
Columbus, OH 43210sawyer.144@osu.edu
614-292-7243
https://u.osu.edu/basins/
LinkedIn | Google Scholar