

# ENVS 222—Evolution of the Earth

## Oxford College of Emory University, Spring 2018

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### COURSE INFO

- Instructor: Dr. Melissa Hage, [melissa.hage@emory.edu](mailto:melissa.hage@emory.edu), Room OSB 224, 770-784-8345
- Lecture Time: Monday, Wednesday and Friday, 10:45 – 11:50 am
- Lecture Location: OSB 223
- Textbook: Earth System History 4<sup>th</sup> Edition, by Stanley and Luczaj (Freeman)
- Lab Time: Thursday 1:40 – 4:40 pm
- Lab Location: OSB 223

### OFFICE HOURS

- Wednesday 2:30 pm – 4:30 pm
- By appointment or chance. I am usually in my office from 8:30 am – 5:00 pm, except for when I am teaching classes or attending meetings.

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### OVERVIEW

We are witness to extraordinary times. At latest count, the Earth has experienced the extinction of nearly 20% of known animal species, and at the same time, debate rages as to the possibility of finding life on Mars or elsewhere in the universe. We have also witnessed incredible instances of nature's power and its effect on life on Earth — tornados, hurricanes, volcanoes, earthquakes, tsunamis, and the constant threat of global climate change. Yet through this, we must keep in mind that the entire evolution of our species represents a mere “blink of the eye” in the nearly 4.6 billion years of Earth's evolutionary history.

The geological record is by no means complete, yet with careful observation it provides us with a means to observe the interactions between life and nature throughout Earth's long history...and we find that the history of life and the physical and chemical evolution of the Earth's environment are inextricably linked. In this course, we will focus on the changing nature of these interactions through Earth history. First, we will consider the complexity of these interactions in the modern world (i.e., what controls the nature and distribution of life on Earth today, and what are the limits to life on Earth?). We will then see how these observations provide the basis for speculation (i.e., the building of testable hypotheses) regarding the nature of similar interactions throughout the geologic past. Finally, we will examine the geologic record to determine the causes and consequences of these changing interactions through Earth history.

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### OVERARCHING STUDENT LEARNING OBJECTIVES

The two **overarching goals** of this course are:

- 1) to peak your curiosity about the Earth they inhabit, gain knowledge about the natural world, and to share that curiosity and knowledge with others. You should be able to observe the world around them, marvel at what they see, and understand the processes at work.
- 2) to impart to you a relevance of scientific knowledge and processes so that you can become more critical thinkers and better decision-makers – economically, politically, socially, and personally.

At the completion of this course, you will be able to:

- Identify common sedimentary rocks and structures, and interpret and describe the depositional environments in which they form
- Describe the sedimentological, paleoclimatic, and orogenic history of the Earth with a focus on North America
- Explain and apply the principles of stratigraphy, paleoecology, and geochronology
- Explain the theory of biological evolution and how it explains the diversity and extinction of organisms
- Identify common fossil organisms and describe their habitat
- Construct and interpret geologic and stratigraphic maps and cross-sections

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## GRADING AND ASSESSMENT

	%
Exam 1	10
Exam 2	10
Exam 3	10
Exam 4	10
Lab	30
In-Class and Homework Assignments	8
Final Paper	8
In-Class Quizzes	8
Participation	6
Total	100

Letter Grade	Percent Equivalent
A	94-100
A-	90-93
B+	87-89
B	84-86

Letter Grade	Percent Equivalent
B-	80-83
C+	77-79
C	74-76
C-	70-73

Letter Grade	Percent Equivalent
D+	67-69
D	60-66
F	0-59

\*Note: I do not curve grades. I also do not *give* grades. **Your final grade in this class will be based on what you have earned. If you do not pass lab, you will fail the course.**

\*\* I am more than happy to discuss your overall grade or a grade you earned on a specific assignment. However, **I will not do so via email.** If you would like to discuss your grade, please come and see me in person during office hours or make an appointment.

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## COURSE POLICIES

**Grading policies:** Grades are assigned on a straight scale (not curved). In the case of grades near the cutoff, good attendance, class participation, and improvement over the course of the semester can have a (+) marginal effect on your final grade. Poor attendance and class participation can likewise have a (-) marginal effect.

**Weekly Readings:** The textbook readings are the primary source of information for this course. Class periods will be spent reviewing, discussing, and illustrating concepts presented in the text, thus *it is essential that you read the assigned materials before class meets on the assigned date.*

**Canvas:** Most of the course materials (syllabus, lecture notes, handouts, readings, videos, assignments, etc.) will be posted on Canvas. Several assignments will be submitted via Canvas. It is imperative that you feel comfortable using this website. If you have questions, please do not hesitate to come and talk to me about navigating Canvas.

**In-Class and Homework Activities:** Class attendance is important and you are expected to show up to class on time, prepared, and ready to participate. You should bring your textbook, calculator, pencil, and more than one color pen to every class. That being said, you are all adults and capable of making the decision about whether you chose to come to class or not. Thus, attendance will not be taken in the traditional way. There will be in-class activities designed to check for preparation and understanding, generate discussion, encourage participation, and deepen comprehension of the course material. For some of these activities, full points will be awarded for completion. For other activities, points will be awarded based on correctness. Some activities will be completed in class; other activities will need to be finished outside of class. There will be no make-ups for missed activities; however, the lowest 3 grades will be dropped at the end of the semester. There are no excused absences for lecture. The dropping of the 3 lowest activities grades act as your missing class freebies and can be used for any reason (illness, studying, travel, athletic event, family emergency, wild monkeys breaking into your dorm, etc.). Any additional missed classes will count as zeros for those days' activities. Missing class regularly will have a detrimental effect on your grade. There will be a handful of homework assignments given throughout the semester, but these assignments will NOT be allowed to be any of the 3 lowest activities grades dropped.

**Class Participation:** You are required to actively participate in class discussions in order to enhance and facilitate student dialogue and learning. You are encouraged to share your experience, perspective, questions, and analysis of text, reading materials and assignments. No one is allowed to be a spectator! Therefore, you must be prepared by reading and having assignments completed prior to class. Please bring the required text, readings, and questions you have to each class!

You will receive up to 6% for attendance and participation in discussions, as follows:

- Little or no attendance – 0 points; Spotty attendance – 1 point; Regular attendance – 2 points
- Rare or uninformed contributions to discussion – 1 point; Occasional useful contributions to discussion – 3 points; Frequent useful contributions to discussion – 4 points.

**In-class quizzes:** Quizzes will be administered throughout the semester to check for content understanding and to ensure you are engaging in distributive studying. These will be cooperative quizzes:

Part 1: You will independently take the quiz

Part 2 (optional): You can re-take the quiz, but will work in a group

Your final quiz score is based upon 75% from Part 1 and 25% from Part 2. If you choose not to complete the group quiz or if your grade on Part 1 is higher than Part 2, only your grade from Part 1 will count. Bottom line: taking the cooperative quiz will not negatively affect your quiz grade. Some quizzes will be announced, others will not, and quizzes cannot be made up. However, I will drop the lowest quiz grade to help offset possible extenuating circumstances such as illness or absence due to an athletic competition. Quizzes are administered at the start of class. Late arrivals will not be given additional time and cannot take Part 1 if Part 2 has already or is about to begin.

**Late Assignments:** All assignments will be due at the start of class, whether the assignment is due in class or on Canvas. If you are late to class on a day an assignment is due, the assignment will be considered late. Assignments will be accepted up to 3 days past the due date. Scores on late assignments will be penalized 10 points each day they are late. So, if an assignment is due in class on a Monday at 1:15 pm and you turn it in between Monday at 1:16 pm and Tuesday at 1:15 pm, you will lose 10 points. If you turn it in between Tuesday at 1:16 pm and Wednesday at 1:15 pm, you will lose 20 points. If you turn it in between Wednesday at 1:16 pm and Thursday at 1:15 pm, you will lose 20 points. You may not turn in the assignment after 1:15 pm on Thursday.

**Exams:** There are 4 exams: 3 in-class exams and a final. The three in-class exams will cover course materials directly preceding them. The final will be partially comprehensive. This means that the majority of the exam will cover the course material directly preceding it, however some of the larger-scale concepts that we keep coming back to throughout the semester will also be on the exam. Ordinarily, exams cannot be made up. If you miss an exam due to an excused absence, you must notify me prior to the time of the exam and schedule a time to take the exam. If the absence is not excused, you will be given a zero for the missed exam. Students are cautioned that any excuse for missing an exam will come under sever scrutiny and the instructor will make the final decision regarding whether or not a missed exam is acceptable. **All exam and due date conflicts must be resolved within the first two weeks of the semester.**

The college sets the final exam schedule. Leaving early for rides or flights, vacations, relatives' or friends' weddings or graduation, jobs, having more than one exam on one day, etc. are NOT considered valid reasons to request an earlier or later exam date/time.

**Final Paper:** Throughout the course of the semester, we will focus on how life has evolved through time. Major evolutionary steps have both been influenced by, and have had an effect on, the physical world. The biosphere and geosphere are intimately connected. For your final paper, you will identify what you think are the 5 major events in the evolution of life on Earth. You will describe these events and discuss why you have chosen these to be the most important events. Additionally, you will discuss what geologic events may have been involved in the onset of these evolutionary moments and/or how these evolutionary events impacted the physical world. As we will only be able to complete a cursory discussion of the major evolutionary events during class, you will need to find at least 5 different primary literature references to help you in your discussion. The final paper should be ~5 pages in length, 1.5-line spacing, 1 inch margins, and a separate title page and reference page that do not count towards the page requirement. In order to help you from leaving this paper until the last minute, there will be checkpoints along the way. As we are working our way through geologic time, some of these deadlines will be before we discuss certain evolutionary events in class. This means you will have to work ahead and do your own research.

**Classroom Conduct:** In order to maintain a good learning environment, rude and/or disruptive behavior will NOT be tolerated. You will be asked to leave the class if your behavior is deemed inappropriate. The following are considered rude and disruptive:

- (1) Consistently arriving late to class
- (2) Private conversations during class
- (3) Lack of attention during class
- (4) Habitually leaving and returning to class in one class period
- (5) Allowing your cell phone to ring/vibrate on numerous occasions
- (6) Paying more attention to your cell phone than to what's going on in class

**Religious Holidays:** Instructors are encouraged, not required, to accommodate students' academic needs related to religious holidays. Please make every effort to negotiate your religious holiday needs within the first two weeks of the semester; waiting longer may compromise your instructor's ability to extend satisfactory arrangements. If you need guidance negotiating your needs related to a religious holiday, the College Chaplain, Rev. Lyn Pace, [ppace@emory.edu](mailto:ppace@emory.edu), Candler Hall 202, is willing and available to help. Rev. Pace is not tasked with excusing students from classes or writing excuses for students to take to their professors. Emory's official list of religious holidays may be found at [http://www.religiouslife.emory.edu/faith\\_traditions/holidays.html](http://www.religiouslife.emory.edu/faith_traditions/holidays.html)

**Cell Phones:** The use of cell phones is not allowed in the classroom and the laboratory, unless you are given specific instructions to use them. Please turn off your phone before you come to class and leave your phone at the front during exams. Cell phones cannot be used as a calculator on any quizzes or exams.

**Personal Computer:** If you would like to take notes on your personal laptop in class you must come and talk to me first. Studies have shown that students retain material better if they manually write, rather than type class notes. Additionally, hand writing notes allow for the use of sketches, which is very important in science, and requires some processing of the information in order to decide what is important to write in your notes. Class PowerPoint Presentations will be provided to you after class via Canvas. Use of laptops to surf the web, login to Facebook, Skype or other networking/chat during class is unprofessional and unacceptable and will result in the loss of the privilege to use a laptop during class.

**Caution:** Students often think that they don't have to come to class because the lecture slides are posted on the web. Those students who skip commonly perform poorly on exams! This is a college level course with a tremendous amount of material that many students have never been exposed to before. Exams require that you do more than just memorize material; exam questions require you to think *and* apply what you have learned to specific problems presented to you. PowerPoint lectures will be posted online so that you can review and write material down after the class, as opposed to trying to **listen** to what is being discussed *and* **write down** what is on the slide *and* **look** at the visual material being presented. While you may be able to do 1 or 2 of the 3 tasks, it is a very rare person who can do all three of them at the same time without missing something!

**Honor Code:** All examinations and all work for credit in this course comes under the regulations of the Honor Code (<http://oxford.emory.edu/catalog/regulations/honor-code.html>). Your signature on your work attests to your upholding the Honor Code. Please read the information on **plagiarism** and always ask if you have any questions how the Honor Code applies to any assignment.

**Policy regarding students with disabilities:** The Office of Accessibility Services (OAS) works with students who have disabilities to provide reasonable accommodations. In order to receive consideration for reasonable accommodations, students must contact OAS and complete the registration process. Faculty may not provide disability accommodations until an accommodation letter has been processed; accommodations are not retroactive. Students registered with OAS who receives a letter outlining specific academic accommodations are strongly encouraged to coordinate a meeting time with their professor to discuss a protocol to implement the accommodations as needed throughout the semester. This meeting should occur as early in the semester as possible. Contact OAS for more information at (770) 784-4690 or [oas\\_oxford@emory.edu](mailto:oas_oxford@emory.edu). Additional information available at: <http://equityandinclusion.emory.edu/access/students/index.html>.

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## LAB SESSIONS

Geology is a field-based observational science, and as such, laboratory sessions provide an excellent opportunity to learn geologic concepts and methods through applied activities. Labs are meant to supplement lecture material – to give opportunities for you apply new knowledge. Please be sure to do the following to prepare for labs so that you can work effectively and get your labs done in the time allotted:

- Labs will be posted on Canvas. You will need to print and read the lab BEFORE coming to lab each week.
- I expect everyone to stay for the full lab period to complete as much of the lab exercise as possible, regardless of the time frame it is due. In some cases, we may work for more than one period on the lab. In others, we may only work during the period, with the lab due at the end of the period. Still other times, the labs won't be due until the next meeting time.
- You are expected to have read the appropriate text assignments as well as the appropriate chapter in the lab manual and reviewed lecture material prior to lab sessions. Labs may not always correspond to lectures, so you may need to review older material in some weeks.
- You are to bring your textbook and all your tools (calculator, colored pencils, etc.), to *every* lab.

**Each lab is worth 20 pts each and, collectively, labs comprise 30 % of your final grade.** Most labs are to be completed within the lab time. Some labs may require additional work outside of lab/class time.

- 10 points (less for sloppy or incomplete work – includes not labeling numbers in math work) will be earned simply by completing the lab in a satisfactory manner and correcting your lab using the available answer key during the lab time. When you correct your labs, make the corrections in a different color. *Do not destroy your original answer.* When you review this material for exams, then, you can see your mistakes and not repeat them. Remember, learn from your mistakes!
- 10 points will be available through a quiz on the lab material at the start of lab the following week. You will use the self-graded lab as a study guide.

You may work independently, but you are encouraged to work with your peers (groups may consist of 2 and not more than 3 students). Sometimes you will be able to pick with whom you'd like to work and other times groups will be assigned randomly so that you get to know others in the class. When you are finished with the lab, you may leave only after 1) correcting your answers using the keys provided (leave your original answer intact, but write in the correct answer nearby, preferably in ink or another color pencil), and 2) "checking out" with me. Do not leave without first watching me write your points down!

**Acceptable Laboratory Absences:** There are no excused absences for lab. However, on rare occasions, illness, family emergencies and certain school-sponsored events may make it necessary for a student to miss a lab session. You must notify me BEFORE the day of the absence in all but the most extreme emergencies. In all cases, I will make the final decision regarding whether or not an absence is acceptable. An unexcused absence from lab results in a 5-point reduction in the final grade. Two unexcused lab absences will result in the failure of the course.

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SYLLABUS OF LECTURE AND LAB TOPICS

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	Date	Lecture/Lab Topic	Textbook	HW/ Class Quizzes
W	Jan. 17	Class Cancelled		
Th	Jan. 18	Lab: Class Overview		
F	Jan. 19	Plate Tectonics I	Ch. 8	
M	Jan. 22	Plate Tectonics II	Ch. 8, 9	HW #1 (Questionnaire)
W	Jan. 24	Plate Tectonics III	Ch. 9	
Th	Jan. 25	Lab: Minerals and Mineral ID	Ch. 2	
F	Jan. 26	Igneous, Metamorphic, and Sedimentary Rocks	Ch. 2	Quiz 1
M	Jan. 29	Igneous, Metamorphic, and Sedimentary Rocks	Ch. 2	
W	Jan. 31	Sedimentary Structures, Environments, Facies	Ch. 5	Quiz 2
Th	Feb. 1	Lab: Igneous and Metamorphic Rocks		
F	Feb. 2	Sedimentary Structures, Environments, Facies	Ch. 5	
M	Feb. 5	Sedimentary Structures, Environments, Facies	Ch. 5	
W	Feb. 7	Review		Quiz 3
Th	Feb. 8	Lab: Sedimentary Rocks		
<b>F</b>	<b>Feb. 9</b>	<b>Exam 1</b>		
M	Feb. 12	Geologic Time I	Ch. 6	
W	Feb. 14	Geologic Time II	Ch. 6	
Th	Feb. 15	Lab: Geologic Time		
F	Feb. 16	Geologic Time III	Ch. 6	HW #2 (Geologic Time)
M	Feb. 19	Evolution and Natural Selection	Ch. 7	Quiz 4
W	Feb. 21	Evolution and Natural Selection	Ch. 7	
Th	Feb. 22	Lab: Evolution and Natural Selection		
F	Feb. 23	Fossil Preservation and the Diversity of Life	Ch. 3	Quiz 5
M	Feb. 26	The Hadean and Archean	Ch. 11	HW #3 (Evolution)
W	Feb. 28	The Hadean and Archean	Ch. 11	
Th	Mar. 1	Lab: Fossilization		
F	Mar. 2	The Proterozoic Eon I	Ch. 12	Quiz 6
M	Mar. 5	The Proterozoic Eon II	Ch. 12	
W	Mar. 7	The Proterozoic Eon III	Ch. 12	HW #4 (Snowball Earth)
<b>Th</b>	<b>Mar. 8</b>	<b>Lab: Exam 2</b>		
F	Mar. 9	TBD		
M	Mar. 12	SPRING BREAK		
W	Mar. 14	SPRING BREAK		
Th	Mar. 15	SPRING BREAK		
F	Mar. 16	SPRING BREAK		
M	Mar. 19	Early Paleozoic I	Ch. 13	
W	Mar. 21	Early Paleozoic II	Ch. 13	
Th	Mar. 22	Lab: Fossil Identification		

F	Mar. 23	Early Paleozoic III	Ch. 13	
M	Mar. 26	Middle Paleozoic I	Ch. 14	Quiz 7
W	Mar. 28	Middle Paleozoic II	Ch. 14	
Th	Mar. 29	<i>Lab: Facies Mapping I</i>		
F	Mar. 30	Late Paleozoic I	Ch. 15	Quiz 8
M	Apr. 2	Late Paleozoic II	Ch. 15	Paper Outline
W	Apr. 4	Late Paleozoic III		
Th	Apr. 5	<i>Lab: Facies Mapping II</i>		Quiz 9
<b>F</b>	<b>Apr. 6</b>	<b>Exam 3</b>		
M	Apr. 9	Early Mesozoic	Ch. 16	
W	Apr. 11	Early Mesozoic	Ch. 16	
Th	Apr. 12	<i>Lab: Physical Correlation</i>		
F	Apr. 13	Early Mesozoic	Ch. 16	
M	Apr. 16	The Cretaceous	Ch. 17	Quiz 10
W	Apr. 18	The Cretaceous	Ch. 17	Paper Draft
Th	Apr. 19	<i>Lab: Dinosaurs</i>		
F	Apr. 20	The Cretaceous	Ch. 17	
M	Apr. 23	The Paleogene	Ch. 18	Quiz 11
W	Apr. 25	The Late Cenozoic	Ch. 19	HW #5 (Order of Events)
Th	Apr. 26	<i>Lab: Human Evolution</i>		
F	Apr. 27	The Holocene	Ch. 20	Quiz 12
M	Apr. 30	The Holocene	Ch. 20	Final Paper
<b>W</b>	<b>May 2</b>	<b>Final Exam – 9:00 – 12:00</b>		

**\*\* This is an ambitious schedule subject to change during the semester.** Updated syllabi will be posted to Canvas and an email will be sent out when changes have been made.

**\*\* Not all homework assignments are listed here.** You may have additional homework assignments given throughout the semester.