

**EARS 2 Evolution of Earth and Life**  
Winter 2019

**Professor:**

Erich Osterberg, 205 Fairchild Hall, 646-1096, Erich.C.Osterberg@dartmouth.edu

**Teaching Assistants:**

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**Class Meeting Time:**

**Section 1:** Mon Wed Fri 8:50 am - 9:55 pm.

**X-hour:** Thurs. 9:05-9:55 am.

**Section 2:** Mon Wed Fri 11:30 am - 12:35 pm.

**X-hour:** Tues. 12:15-1:05 pm.

**Location:**

**Section 1:** Fairchild 101

**Section 2:** Carson L02

**Office Hours:** Check Canvas for updated office hours and locations

**Class Web Site:** canvas.dartmouth.edu

**Course objectives:**

The presence of life on Earth potentially makes it unique in this solar system. The reasons that life emerged, persisted, and evolved on Earth are tied to Earth's geochemical and geophysical processes, such as the rock cycle and carbon cycle, which have been active on Earth since its formation ~4.54 billion years ago. This course examines how the evolution of the continents, oceans, and atmosphere has strongly influenced the evolution of life, and vice-versa, throughout Earth's history. In this context, we will discuss the origin of the Earth, Moon, oceans, continents, atmosphere, biosphere, and the importance of catastrophic events in the extinction and evolution of different species. We will finish with an exploration of the future of our planet and its inhabitants.

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

- 1) *Synthesize the evolution of the Earth and life on Earth, including the major events in the history of each, and their impact on one another;*
- 2) *Critically evaluate scientific information (e.g., reported in the media) based on knowledge of the scientific method and scientific uncertainty;*
- 3) *Use scientific data to make educated and quantitative estimates of complex systems.*

**Prerequisites:**

There are no prerequisites for this course.

**Texts:**

- 1) *Earth System History, 4th Edition*, by Steven M. Stanley (the 3rd edition is ok but page numbers and some content may differ). This book is on reserve in the Kresge Science Library, 3rd Floor Fairchild Hall.
- 2) *The Sixth Extinction*, by Elizabeth Kolbert. This book is also on reserve in the Kresge Science Library.

**Course Requirements and Grading:**

**Quizzes (15% of grade):** There will be 3 announced quizzes during the term on the reading and lectures. This is to help you prepare for the exams by testing your knowledge and giving you incentive to keep up with the reading. **I will drop the lowest quiz score from your final cumulative grade.**

**Homework Assignments (30% of grade):** There will be six homework assignments throughout the term. You will have ~1 week to complete each assignment.

**First Midterm Exam (15% of grade):** During class on **Wednesday, January 23**; covers material from the beginning of the course up through and including the Monday 1/21 material.

**Second Midterm Exam (15% of grade):** During class on **Friday, February 15**; includes material covered from 1/25 through 2/13, inclusive.

**Final Exam (25% of grade):** 2 hr exam at **a time and place TBD.**

Letter grades will be assigned to your cumulative total points according to the following guide: A  $\geq$  93.00 > A-  $\geq$  90.00 > B+  $\geq$  85.00 > B  $\geq$  80.00 > B-  $\geq$  75.00 > C+  $\geq$  70.00 > C  $\geq$  65.00 etc.

I must adhere to these cutoffs to be fair to all students. A cumulative weighted grade of 89.99% at the end of the term is a B+ grade.

**Grading Questions and Corrections:** The TAs and I take grading very seriously, but errors are possible despite our best efforts. Please review all your homework, quiz, and exam grades for errors and inconsistencies, and ask the TAs or me any questions within **1 week** after each is returned.

**Unexpectedly Missing Quizzes and Exams:** If you need to miss a quiz or exam, **YOU MUST CONTACT ME BEFORE THE QUIZ OR EXAM STARTS** to explain your absence and make plans for taking the exam/quiz at the next available time. Email (erich.c.osterberg@dartmouth.edu) and telephone (603-646-1096) are ways to contact me. If I do not answer the phone, **leave a message!** You may be expected to provide a letter from your doctor, dean, family member (etc.) explaining your absence.

**\*\*\*FAILURE TO CONTACT ME BEFORE THE EXAM/QUIZ OR FAILURE TO PROVIDE A VALID REASON FOR YOUR ABSENCE MAY RESULT IN YOU RECEIVING A 0% ON THE EXAM OR QUIZ\*\*\***

**NO make-up exams/quizzes will be available without a valid reason for absence.**

**Planned Absences during Quizzes or Exams:** If you know ahead of time that you will be absent from a quiz or exam (e.g. for a college-affiliated extra-curricular activity, job interview, etc.), speak with me about it **as soon as you know** so that accommodations can be

made. In general, my policy is to allow students to take exams and quizzes **early** for a planned absence, but not to take it late unless there are special circumstances.

**Late Homework Assignments:** Homework assignments are **due at 5 PM** on the due date. You should turn in your assignments in the EARS 2 drop box on the second floor of Fairchild Hall. 5% will be deducted for each day that an assignment is late, unless you discuss the situation with me **prior** to the original due date. For example, an assignment due on Wednesday would be deducted 5% if turned in between 5 PM Wednesday and 5 PM Thursday, and 10% if turned in between 5 PM Thursday and 5 PM Friday, etc. If you are unable to complete an assignment on time due to illness or other personal reasons, you may be eligible to have this penalty waived. You are encouraged to talk to me **as soon as possible**, and if necessary, meet with your Dean to discuss your situation.

**Disability-Related Accommodations:** Students with disabilities enrolled in this course and who may need disability-related academic adjustments and services are encouraged to see Erich privately as early as possible in the term. Students requiring disability-related academic adjustments and services **MUST** consult the Student Accessibility Services office (301 Collis Student Center, 646-9900, [student.accessibility.services@dartmouth.edu](mailto:student.accessibility.services@dartmouth.edu)). Once SAS has authorized services, students must show the originally signed SAS Services and Consent Form and/or a letter on SAS letterhead to Erich. As a first step, if students have questions about whether they qualify to receive academic adjustments and services, they should contact the SAS office. All inquiries and discussions will remain confidential.

**Religious Observances:** If you have a religious observance that conflicts with your participation in this course, please meet with Erich **as early as possible** to discuss accommodations.

**Academic Honor Principle:** You should be aware of and conform to the Dartmouth Honor Principle as expressed in the ORC. Suspected Honor Principle Violations will be reported to the Dartmouth Committee on Standards (COS).

For this course, specifically be aware of the following:

- **Quizzes and Exams:** All work on quizzes and exams is your own. **Referring to a prior year's corrected quiz or exam is an Honor Principle Violation.**
- **Homeworks:** You are welcome to discuss homework assignments in groups, but what you turn in must be written in your own words. **Referring to a prior year's corrected homework assignment, even if different from this year's assignment, is an Honor Principle Violation.**
- **In-class assignments:** Taking credit for an in-class exercise when not attending that lecture, or posing as another student for an in-class exercise, are both Honor Principle Violations and will be reported to COS.
- **Plagiarism:** Be sure to cite all references in homework assignments.
- If you are unsure, please ask a TA or Erich how the Honor Principle applies to this course.

### Tentative Course Schedule (Updated 12-31-18)

| <b>Date</b> | <b>Lecture Topic</b>   | <b>Reading (S=Stanley; K=Kolbert)</b> |
|-------------|--|---------------------------------------|
| 1/4 (F)     | Intro and Overview of the Course   | S ch 1; K ch 1                        |
| 1/7 (M)     | Rocks and minerals I   | S ch 2; K ch 2                        |
| 1/8 (Tu)    | <b>12:15 pm</b> Optional homework #1 field discussion: meet at Bartlett Tower  |                                       |
| 1/9 (W)     | Rocks and minerals II  | S ch 2; K ch 2                        |
| 1/11 (F)    | Sedimentary environments; <b>HW#1 Due</b>  | S ch 4+5                              |
| 1/14 (M)    | Earth's environments;  | K ch 4                                |
| 1/16 (W)    | Mass Extinctions; <b>Quiz #1</b>   | S ch 3; K ch 5                        |
| 1/18 (F)    | Life and Evolution; <b>HW #2 Due</b>   | S ch 7; K ch 6                        |
| 1/21 (M)    | <b>No Class; MLK Jr. Day</b> – Optional campus glacial geology tour @ 11 am; meet at LSC and wear appropriate clothing for walking through snow for 2 hours. |                                       |
| 1/23 (W)    | <b>MIDTERM EXAM #1 (thru 1/18 material inclusive)</b>  |                                       |
| 1/25 (F)    | Plate Tectonics I  | S ch 8                                |
| 1/28 (M)    | Plate Tectonics II   | S ch 9; K ch 7                        |
| 1/30 (W)    | North American Assembly and Appalachia   | S ch 16; K ch 8                       |
| 2/1 (F)     | Dating the Rock Record; <b>HW #3 Due</b>   | S ch 6                                |
| 2/4 (M)     | Biogeochemical Cycles I  | S ch 10; K ch 10                      |
| 2/6 (W)     | Biogeochemical Cycles II; <b>Quiz #2</b>   | S ch 10; K ch 10                      |
| 2/8 (F)     | The Precambrian: Hadean and Archean; <b>HW #4 due</b>  | S ch 11; K ch 12                      |
| 2/11 (M)    | The Precambrian: Proterozoic   | S ch 12                               |
| 2/13 (W)    | Cambrian Explosion and Ordovician Biodiversification   | S ch 13+14; K ch 13                   |
| 2/15 (F)    | <b>MIDTERM EXAM #2 (thru 2/13 material inclusive)</b>  |                                       |
| 2/18 (M)    | Plants and the Earth System  | S ch 15                               |
| 2/20 (W)    | Dinosaurs, Extinction and Mammals  | S ch 16-18                            |
| 2/22 (F)    | Cenozoic Climate   | S ch 19                               |
| 2/25 (M)    | Human Evolution and Civilization; <b>HW #5 due</b>   | S ch 20                               |
| 2/27 (W)    | Recent and Modern Climate Change; <b>Quiz #3</b>   | S ch 20                               |
| 3/1 (F)     | Modern and Future Climate Change   |                                       |
| 3/4 (M)     | 6th Extinction/Climate discussion; <b>HW #6 due</b>  |                                       |
| 3/6 (W)     | The future of Earth  |                                       |
| Date TBD    | <b>Cumulative FINAL EXAM</b>   |                                       |