

# Geology 102 — Earth, Life, and Time

University of Tennessee — Fall 2011

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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, the 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 affect on life on Earth — tornados, hurricanes, volcanoes, earthquakes, tsunamis, and the constant threat of global warming. 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 4.5 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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## LECTURES

- Location → MWF 2:30 pm-3:20 pm, Rm. 302
  - Instructor → Dr. Linda C. Kah (Rm. 214, Ph. 974-6399, lckah@utk.edu)
  - Office Hours → F 3:30-5:00 pm, or by e-mail appointment
  - Textbook → Earth System History, by Steven M. Stanley (W.H. Freeman)
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## GRADING AND ASSESSMENT

- Lab Sections → 33%
- Homework Assignments → 3%
- Tests → 16% each (4 exams, to total 64%)
- Extra Credit Opportunities → There will be a minimum of 3 extra credit opportunities

## APPROXIMATE GRADING SCHEME

- Grades denoted by lowest percentage of points achieved; grade scale is subject to change
- A (93); A- (90); B+ (85); B (78); B- (75); C+ (70); C (63); C- (60); D+ (55); D (48); D- (45)

## ADDITIONAL INFORMATION FOR GRADING AND ASSESSMENT

- Laboratory attendance is mandatory
  - Lecture attendance is encouraged. 80% attendance in lecture will allow a student to replace their lowest test grade with a score equivalent to their highest test grade. Documented absences for University-related functions will not count against student attendance.
  - Exams will cover lecture and reading material and will emphasize recent material and its integration with previously learned concepts. Exams will consist of a matching or multiple choice, as well as short answer and essays.
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## FIVE TIPS FOR CLASSROOM SUCCESS

- TAKE ATTENDANCE SERIOUSLY

Lectures do not reiterate laboratory exercises (or *vice versa*). Rather, lectures will give the “big picture” of Earth evolution while labs will provide some “nuts and bolts” experience of doing geology. It is also critical to remember that no textbook is infallible. New observations and interpretations require that scientific ideas constantly evolve. You are likely to receive information in lecture that may be different, or not readily available, from your text.

- BE PREPARED AND COURTEOUS

Come to class on time, with proper equipment, and having read assignments beforehand. Please, turn off all cell phones and pagers prior to entering the classroom.

- TAKE NOTES

Take notes on textbook readings prior to lectures. This practice will give you the luxury of listening attentively to the lectures and taking comprehensive notes, rather than merely struggling to write down all words that you hear and see during class. You might find it helpful to bring several different colors pens to class so that you can highlight terms in your notes, note questions to ask, and make drawings.

- ASK QUESTIONS

Always feel free to ask questions during class. I will try to make a habit of allowing a few minutes at the beginning of class for review and questions regarding the previous lecture.

- REFER TO SYLLABUS

Your syllabus contains a wealth of information, from lecture topics and readings to your instructor’s office hours, phone number, and e-mail. Keep it handy and use it wisely!

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## STATEMENT ON DISABILITIES

Any student who has a disability that might affect their performance in this class should schedule an appointment with the Office of Disability Services (974-6087) to discuss your specific needs. Once you have met with Disability Services, you should make an appointment with me so I can assist in any special accommodation that you may require.

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*Complex events can rarely be reconstructed  
from single lines of evidence,  
even where the record is well preserved.*

Dr. Preston Cloud, Historical Geologist (1983)

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## SYLLABUS OF LECTURE TOPICS — GEOLOGY 102

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### **PART I – THE MODERN EARTH**

- Life and environments on Earth (Chapters 3 and 4)

- W Aug. 17 – overview of course; complexity of Earth ecosystems
- F Aug. 19 – distribution and classification of life on Earth
- M Aug. 22 – limitations to life on Earth
- W Aug. 24 – origin of Earth environments (part 1 – atmospheric circulation)
- F Aug. 26 – origin of Earth environments (part 2 – ocean circulation)

- Marine biogeochemical cycles (Chapter 10)

- M Aug. 29 – the oceanic food web
- W Aug. 31 – nutrients in the ocean
- F Sept. 2 – marine biogeochemical cycles, part 1
- M Sept. 5 – NO CLASS (LABOR DAY HOLIDAY)
- W Sept. 7 – marine biogeochemical cycles, part 2
  
- F Sept. 9 – TEST 1 (ECOSYSTEMS OF THE MODERN EARTH)**

### **PART II – DECIPHERING THE GEOLOGIC PAST**

- The geologic record of a changing Earth (Chapters 1, 2, 5 and 6)

- M Sept. 12 – plate tectonics and the changing face of Earth \*
- W Sept. 14 – the sedimentologic record \*
- F Sept. 16 – stratigraphy and stratigraphic completeness \*

- The fossil record (Chapters 3 and 7)

- M Sept. 19 – the fossil record \*
- W Sept. 21 – taphonomy and the preservation of ancient life
- F Sept. 23 – the action of evolution

- The magnitude of time (Chapter 6)

- M Sept. 26 – deciphering the magnitude of time \*
- W Sept. 28 – determinations of relative time, part 1
- F Sept. 30 – determinations of relative time, part 2
- M Oct. 3 – discovering the age of the Earth

**W Oct. 5 – TEST 2 (DECIPHERING THE ANCIENT EARTH)**

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## SYLLABUS OF LECTURE TOPICS, CONTINUED

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### PART III – EVOLUTION OF EARLY ECOSYSTEMS

- The early Earth (Chapter 11)

- F Oct. 7 – understanding Earth's origins
- M Oct. 10 – clues to the origin of life \*

- Towards a modern ecosystem (Chapter 12 and 13)

- W Oct. 12 – oxygen and Earth evolution (part 1 – evidence) \*
- F Oct. 14 – NO CLASS (FALL BREAK) \*
- M Oct. 17 – oxygen and Earth evolution (part 2 – role of plate tectonics)
- W Oct. 19 – oxygen and Earth evolution (part 3– biological consequences)
- F Oct. 21 – biomineralization and the Cambrian explosion
- M Oct. 24 – Ordovician exploitation of environments
- W Oct. 26 – Ordovician radiation and extinction

**F Oct. 28 – TEST 3 (PRECAMBRIAN & EARLY PALEOZOIC ECOSYSTEMS)**

### PART IV – TOWARDS A MODERN WORLD

- Later Paleozoic life and environments (Chapters 14 and 15)

- M Oct. 31 – from fins to feet
- W Nov. 2 – discovering the land
- F Nov. 4 – reptiles to mammals

- The Mesozoic (Chapters 16 and 17)

- M Nov. 7 – archosaurs
- W Nov. 9 – dinosaur evolution
- F Nov. 11 – a tale of two extinctions

- The paleobotanical record (Chapters 14 and 15)

- M Nov. 14 – origin and evolution of early land plants
- W Nov. 16 – evolution of angiosperms

- Cenozoic evolution of life and climate (Chapters 18, 19, and 20)

- F Nov. 18 – towards a modern plate arrangement
- M Nov. 21 – from tropics to tundra
- W Nov. 23 – from tropics to tundra (part 2) \*
- F Nov. 25 – NO CLASS (THANKSGIVING BREAK)
- M Nov. 28 – Cenozoic mammals and migrations \*

**M Dec. 5 – Final Exam (2:45-4:45, Room 302)**

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