

# INTRODUCTION TO GEOLOGY 2    SPRING 2009    v. 2.1

## Historical Geology and Earth System History

Prof. Stephen J. Mojzsis  
Benson Earth Science Bldg., Rm. 222A  
303-492-5014  
[mojzsis@colorado.edu](mailto:mojzsis@colorado.edu)    <http://isotope.colorado.edu>

**When sending me email, please put “Geology 1020” in the subject header.**

CLASS PERIOD: T,R 12:30-1:45 PM, Benson Earth Sciences 180  
OFFICE HOURS: T 9:30-10:30 AM; R 2:00-3:00PM, or by appointment

REQUIRED TEXTBOOK:  
Steven M. Stanley *Earth System History* (3<sup>rd</sup> edition)

**This book is available in the CU Bookstore on main campus as well as at the Colorado Bookstore (on the hill). You might also want to search around the web for a better price, but we negotiated a reduced rate for this textbook.**

**Welcome to Geology 1020 – a course in geologic history**

We ask ourselves the following question going into this course:

**“How did the Earth arrive at its present physical state?”**

**Purpose:** To introduce you to Earth history. However, I also wish to foster the intellectual stimulation in exploring our environment that geologists experience every day, and for us to have some fun in this inquiry-based course. I will ask you QUESTIONS that require you to raise your hand or use an iClicker.

**Participation:** Class participation is an important component to this course. There is a clear correlation between good attendance and good grades.

**Pre-requisites & Expectations:** Physical Geology (1010), or an equivalent course, is a pre-requisite for attending this course. If you have **not** taken Physical Geology at CU or an equivalent course elsewhere that discusses the material fundamentals to proceed with the topics covered here, please see me immediately after class. You need to have the background material from

Physical Geology to make sense of what we will talk about in this course. In Physical Geology, you will have already been introduced to the origin, structure, composition and dynamics of the Earth, the chemical make-up of the materials that compose the planet and how they operate and interact in different processes (e.g. weathering, denudation, plate tectonics, volcanism, metamorphism, etc.).

**If you have not taken this introductory material, you will not be prepared for this course; see me if you have questions about this.** You will need to recall the three fundamental rock types and the various classifications of the rocks found on Earth. You will have to know their basic origins, although we will briefly review this for each rock type mentioned in class. You will be expected to know the overall structure of the Earth; the theory of plate tectonics; the types of tectonic plate boundaries and the relationships between them and earthquakes, volcanoes and mountain building. Also, you are expected to be familiar with the processes of weathering and erosion, isotopes and the concept of geologic time. Of course, it is useful to be familiar with basic chemistry, physics and mathematics although we will not go into great detail.

**What you will learn:** You will apply knowledge gained from Physical Geology to examine the evolution of the Earth through time in Historical Geology. We will focus on major events in Earth history as recognized in the geological record.

🌍 The physical, chemical and biological “spheres” of planet Earth have interacted over time to induce change, or to respond to change. In fact, geology is unique among the sciences in that there is preserved an interpretable record of “deep time” that can be studied directly from geological materials (rocks, minerals, water, air and so on). Much current research in geology is to apply this knowledge to other solar system bodies such as Mars, the Moon, meteorites, etc. Indeed, much of what we have learned from spacecraft missions to other worlds has been applied back again to the Earth.

🌍 Earth is a dynamic system that is ever changing, including at this very moment! Look outside, the weather is changing, seasons come and go, the day-night cycle, etc. are all in interplay. **This is a theme that you will hear many times from me.** Reinforcing that theme will be our exploration of how the planet came to be, and how the surface regions developed subsequent to life’s emergence. Special emphasis in this course will be placed on the major steps in the biogeochemical history of life and its continual evolution in the context of the changes in the planet itself. To do this, we will explore astronomy, biology, chemistry and physics as applied to the Earth. Geology makes use of many different disciplines in its investigative process.

## **THE IMPORTANT CONCEPT OF EVOLUTION**

Evolution is simply defined as **change over time of a system** (whether biological, chemical or societal). The concept of biological evolution is central to

understanding the history of the Earth, its rock record and how it reached its present form. What is a “Theory”? In Science, it is a well-substantiated explanation of some aspect of the natural world that can incorporate facts, laws, inferences, and tested hypotheses (U.S. National Academy of Sciences). We will examine how geologists read the rock record, how they know the age of the Earth and solar system and the scientific methods of investigation used to arrive at these conclusions. We conclude the course by taking a look back at what we have learned and where we might be going, from the perspective of evolution.

As you might have heard some place or another, there are those who advocate one-or-another “creation” or “intelligent design” ideas based on un-testable supernatural causes. It is important for you to understand that these concepts masquerade as science and have been used by some to challenge the concept of evolution or science as a whole. We therefore consider it important for you to understand the basis of modern evolutionary thought no matter what your major. **If you have ever ridden in an automobile or an airplane, or talked on a cell phone, it is because science has revealed the physics and chemistry of the natural world; your iPod might be cool, but it ain't magic.**

There is a difference between understanding something and believing in something. The focus of science is to try to understand.

## **FORMAT OF THE COURSE**

This is organized as a 3 credit hour, semester-long lecture course, but I wish to foster discussion by asking questions of you. I encourage all students to motivate discussion by asking questions during lecture (*through the usual means, i.e. raising your hand*). Our textbook by Stanley will act as our guide to the progress and outline of material covered in the course, but it should not be considered the do-all and end-all source of knowledge. Come to lecture. Office hours are listed on the syllabus, take advantage of them.

**Reading:** Regular reading exercises will be assigned to you from the textbook that will supplement and build on the lecture notes. You will be expected to have read certain portions of the book before each class period and during lecture, I will be asking you questions about the reading in lecture (I have a tendency to call on people and the iClicker means that I will call on everyone). Reading, taking proper notes and listening will help you with the homework assignments, the quizzes and the exams that determine your grade.

**Attendance:** I highly recommend that you come to every class. Why? This is because the book should be looked on as supplementary information to the lecture notes, not an end-all source of information. Lecture notes are important to your success in this course, as well as the reading.

**Lecture summaries:** At the beginning of each lecture, I will summarize the highlights of what will be covered that day as well as putting in perspective what was previously covered. The balance of each class period will then be spent exploring the details in the assigned reading. I will use the iClicker system to ask you questions about the reading. Stay on top of this!

**Quizzes:** We will have the opportunity now and then to stray from the textbook and explore related subjects. The tests and quizzes will be a combination of short answer rather than all multiple-choice so that we may really use our knowledge actively rather than passively.

**Asking questions:** You are responsible for the material and should be prepared to ask questions about anything that was not clear to you during lecture and/or during office hours. A lack of questions or comments will be taken to mean everyone understood everything they read and they are ready to be tested on it.

## **GRADING**

Your grade will be based on 11 homework assignments, the lowest score of which will be dropped (10 x 5% each = **50%** total); two class period short (20 min.) open book quizzes (2 x 5% each = **10%** total); iClicker questions (worth a participation grade of **5%**) and 2 closed-book, closed-notes exams; a midterm (**15%**) and a comprehensive final exam (**20%**) that covers 1/3 material from the first (midterm) half of the course and 2/3 materials from the last half of the course. The homework will be in the form of exercises that will allow you to apply the principles and ideas discussed in lecture. There will be opportunities for extra credit now and then. There are no make-ups for iClicker questions. Come to class.

The midterm and quizzes will be given during a regularly scheduled class period. The final exam will be given during the scheduled final exam period. On the exams, questions will be designed to stimulate thinking, apply what you have learned and evaluate your ability to analyze and interpret geological information. Other questions will require you to recall important aspects of Earth history. Separate time will be arranged for answering questions of any nature prior to each exam. According to the Final Exam Schedule of the Registration Handbook & Schedule of Courses, Spring 2009 we have our final exam on Tuesday, May 5 from 4:30 PM – 7:00 PM in BESC 180 (our normal classroom).

## **IMPORTANT\_IMPORTANT\_IMPORTANT\_IMPORTANT**

In the event that you have a legitimate conflict with exam dates (e.g. religious observations; military obligations), arrangements absolutely must be made two weeks in advance for you to take a make-up exam. If you miss an exam due to illness, a signed/stamped doctor's excuse will be required for you to be given a

make-up. Unfortunately, in all other cases, failure to take a regularly scheduled exam will result in a “0” grade for that exam with no exceptions.

**Any student eligible for and needing academic adjustments or accommodations because of a disability is requested to speak with Prof. Mojzsis no later than Tuesday, January 22, 2009 and submit the paperwork.**

**PLEASE NOTE – DO NOT MAKE PLANS TO LEAVE FOR SPRING BREAK ON OR BEFORE MARCH 19, OR FOR THE SUMMER BREAK ON OR BEFORE MAY 5. YOU MUST CHANGE SUCH PLANS NOW. INFORM THOSE WHO MIGHT MAKE SUCH PLANS FOR YOU TO NOT DO THIS.**

### **ACADEMIC HONESTY**

Academic honesty is paramount, please visit [www.colorado.edu/ralphie](http://www.colorado.edu/ralphie) or obtain a copy of the “Guide to Student Life” which discusses cheating, plagiarism (copying other people’s work without acknowledgement, and unauthorized possession or disposition of academic materials). This is an unfortunate (and growing) problem on college campuses; the sanctions for doing these things are rather harsh. Simple advice: Don’t do it; Avoid people who do these things: You will get caught. Respect the CU Honor Code.

### **Science Education Initiative**

This course will participate in the CU-Boulder science education initiative, the aim of which is to improve teaching and learning in science courses at CU. During the course of the semester, you maybe asked to take a survey, complete questionnaires, or offer your opinions on some aspects of the course content, teaching materials (e.g. home works, clicker questions) and logistics. Your participation would be appreciated as the analyses of those opinions will help Prof. Mojzsis in his efforts to establish a better learning experience. Opinions or input that you give will be anonymous to Prof. Mojzsis and will have no impact on your grade. Please contact either Prof. Mojzsis or the SEI liaison (Dr. Jennifer Stempien, [geosci@colorado.edu](mailto:geosci@colorado.edu)) if you have any questions or concerns.