

# Dynamic Earth GG101 - Spring 2012

## POST 723, Lecture MWF 9:30 ~ 10:20am

Dr. Fletcher, POST 802A, 294-0386, [fletcher@soest.hawaii.edu](mailto:fletcher@soest.hawaii.edu) Office hrs: T/Th 1- 3 pm and by appointment  
TEXT *Physical Geology: The Science of Earth*, 2011, Fletcher, C.  
Class Lectures - <http://www.soest.hawaii.edu/coasts/lecture/gg101/index.html>

### Why take a geology class?

1. To understand your home planet
2. To become a better steward of your community
3. To be an informed voter
4. To improve your critical thinking skills

### Do you want an A? You cannot learn without studying.

1. Do EVERY homework (1-2 hrs per week)
2. Come to EVERY class
3. Do ALL the reading (2-3 hrs per week)
4. Participate and ask questions in class, and
5. Prepare for exams (2 hrs per week)

I do not grade on a curve – everyone can get an A.

### Week

### Weekly Topic

Jan. 9	Why Geology? Solar system (Ch. 1, 2)
Jan. 16	<i>MLK Holiday</i> ; Plate tectonics (Ch. 3)
Jan. 23	Plate tectonics, Minerals (Ch. 4)
Jan. 30	Igneous rox, Volcanoes (Ch. 5, 6)
Feb. 6	Weathering, Sedimentary rox (Ch. 7, 8)

**Field Trip to Big Island** Fri Feb 10<sup>th</sup> to Sun 12<sup>th</sup> – buy your own plane ticket to Hilo (arrive by 6:00pm on the 10<sup>th</sup>), \$125 for lodging/food/van rental. Best flights 2/10/12 HA360; 2/12/12 HA181 (\$170)

Feb. 13	Metamorphic rox, Rock cycle (Ch. 9) <b>First Exam on Fri. Feb. 17</b>
Feb. 20	<i>Presidents Holiday</i> ; Mountain building, Earthquakes (Ch. 11, 12)
Feb. 27	Earthquakes, Geologic time (Ch. 13)
Mar. 5	Earth history, Climate change (14, 16)
Mar. 12	Climate change
Mar. 19	Climate change <b>Second Exam on Fri Mar. 23</b>
Mar. 26	<i>Spring Break</i>
Apr. 2	Glaciers, Streams (17, 19)
Apr. 9	Streams, Groundwater (Ch. 20)
Apr. 16	Groundwater, Local issues
Apr. 23	Coastal and Marine Geology (Ch. 22, 23)
Apr. 30	REVIEW <b>Third Exam on Wed May 2, 9:30am</b>

**Grading** - Three exams worth 50% (16.6% each), homework/in-class assignments worth 50%. Extra points awarded for going on the Big Island field trip, class attendance, class participation, extra credit projects. Extra credit projects must be approved by me and turned in to me by April. 13. To get homework assignments and to turn them in, you **MUST** attend class. Unless you email ahead of class, no late assignments will be accepted. All homework must be typed/word processed – not hand written.

The **Department of Geology and Geophysics** has established the following undergraduate student learning objectives. Keep especially objectives 1, 3, and 5 in mind as overarching targets of our curriculum in GG101.

1. Students can explain the relevance of geology and geophysics to human needs, including those appropriate to Hawaii, and be able to discuss issues related to geology and its impact on society and planet Earth.
2. Students can apply technical knowledge of relevant computer applications, laboratory methods, and field methods to solve real-world problems in geology and geophysics.
3. Students use the scientific method to define, critically analyze, and solve a problem in earth science.
4. Students can reconstruct, clearly and ethically, geological knowledge in both oral presentations and written reports.
5. Students can evaluate, interpret, and summarize the basic principles of geology and geophysics, including the fundamental tenets of the sub-disciplines, and their context in relationship to other core sciences, to explain complex phenomena in geology and geophysics.

## Geology and You

This course will provide you with a new view of the world. For the rest of your life you will carry a special perspective that only an understanding of geology can provide. A geology course can make you a better member of your community because you will understand your home planet, you will know how to avoid natural hazards, you will know how to sustain natural resources, you will understand that global warming is real, you will become an informed voter, and you will improve your critical thinking skills.

**Earth is the product of billions of years during which geologic processes have carved the land, mixed the seas and air, and shifted the continents—and continue to do so.**

All life on Earth is the product of natural selection. Preserving biodiversity and natural habitats is critical to the continuation of Earth's natural resources. Natural resources are geologically renewed but humans use resources faster than they can be naturally renewed. Today humans use 1.5 Earths; that is, the resources we use in 1 year, will take 1.5 years to replace. In the U.S. we use 5 Earths. This is not sustainable.

To ensure that heavily used resources are still here for future generations means that we must ultimately find alternative resources, augment the rate of natural renewal, or reduce our rate of consumption (or all the above). This can lead to *sustainability*.

Regardless of your lifework, the science of geology can provide you with a level of awareness that will serve you in your career, your personal life, and your role as a community member of planet Earth. Here are 5 “Enduring Understandings” of geology that serve as semester-long learning goals.

**1. The study of Earth encompasses a vast range of time and space.** Geologists study nature from the length of the Solar System (trillions of kilometers) to the bonding of atoms (0.0000001 centimeters). We stretch our minds to understand the megascopic to the microscopic. Massive planets are constructed of the smallest minerals. Eons of time consist of long periods of slow and gradual change punctuated by short intervals of sudden violent convulsions in nature (i.e., earthquakes, floods, landslides). This immense span of time and space is one of the fundamental characteristics of the geological sciences.

**2. Plate tectonics controls the geology of Earth's surface.** The theory of plate tectonics has far reaching implications for the organization of the planet and its history. As plates move they perpetually change the way our planet looks. Mountain ranges rise when plates collide only to be worn by erosion down to the sea. Ocean basins open and close as continents rift and collide again. Nearly every aspect of geology is related to how plates interact and change through time.

**3. Geologic systems are the product of interactions between solid Earth, oceans, atmosphere, and living organisms.** Earth is organized into overlapping *geologic systems* that influence and react to each other. Geologic systems consist of interdependent materials (such as rocks, sediments, organic compounds, and water) that interact with natural physical and chemical processes. In a broad sense, these interactions occur because solar energy, geothermal energy, and gravitational energy are at work mixing the air, ocean, and solid Earth.

**4. Change is ever present and accumulates over vast time. Humans are powerful agents of change.** You live upon an ancient and restless landscape that is changing under your feet. All forms of life have evolved partially in response to geologic change over time. Today's Earth is the product of both gradual and instantaneous change accumulating over 4.6 billion years. Hence, our planet looked very different in the past and it will look different in the future.

**5. Rocks and sediments are pages in the book of Earth history.** Geologists read the story of Earth history in the crust. Earth history teaches us that Earth is very old, that evolution is responsible for life's incredible diversity, that ever-present change is a characteristic of geologic systems, and that geologic processes operate on an immense stage of time and space.