Geology of the Hawaiian Islands
GG 103 Section 2

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Geology of the Hawaiian Islands

Course Objectives
- Learn about physical features of Hawaiian Islands, their origin and how human activities affect them
- Learn about the field of Environmental Geology

Course Goals
- To present knowledge that will be useful for life, whether forming opinions on environmental issues, selecting a home site or other property, evaluating a business, or appreciating and understanding your surroundings.
- To prepare you to consider many environmental issues facing society, such as resource utilization, water use and conservation, and land-use planning.

Course Structure
- Lecture, Reading, Discussion
  - Please read the text before class
  - Lecture notes available before class on our web site
  - Time for questions at the beginning of class

Field Trips
- Two short trips on/near campus
- Big Island trip
- SE O`ahu trip

Field Trips
- Two short trips on/near campus
  - During scheduled class times
  - Don’t skip them – there will be questions on the exams about what we see on these trips

Field Trips
- Big Island Field Trip
  - Leave Friday afternoon March 5th
  - Return Sunday afternoon March 7th
  - Cost ~$200
  - Covers airfare, lodging and transportation on Big Island
  - Will need $125 deposit by February 5th (non-refundable)

Text: Geology and the environment
Web: http://www.soest.hawaii.edu/moore/gg103
Will use for Homework, Lecture notes
visit the web site and fill out “GG103 Student Information Form”
<table>
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<tr>
<th>Field Trips</th>
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| • Big Island Field Trip  
  • Plan to visit Kilauea  
  • Watch lava flow into the ocean  
  • Hike Mauna Ulu | • S.E. O‘ahu Field Trip -- No Cost  
  • Saturday, April 3rd, 9am to 4 pm (Tentative date)  
  • Visit Diamond Head  
  • Koko Head/Hanauma Bay  
  • Makapu‘u Point  
  • Castle Junction | • Homework 25%  
  • Due at Beginning of Class  
  • Late Homework will NOT be accepted |

### GG 103 Grading

- **Homework** 25%
- 3 Exams 25% each
  - Not cumulative
  - Will each cover about 1/3 of the course

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### Any Questions?

- Let me know ASAP if you are going to miss an exam or homework due date
- No make-up exams will use average of other 2 exams

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### Geology

Geology is the study of the Earth  
Geology is a science... just like chemistry and physics!  
...but geologists face the special challenge of not being able to do experiments in the sense that chemists and physicists do.

### TIME

- The big difference between geology and other sciences (Not much happens geologically in a human lifetime!)
- Rates of geologic processes: ~ cm/year
- Big earthquakes may displace the ground several meters in a few seconds, but they occur only every 500 years or so.

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### What is Geology?

Geology is the study of the Earth

### The problem of experiments

Since geologists are interested in systems that are very big (hundreds of km) and that have evolved over long periods of time (millions of years), they cannot conduct controlled experiments. They must observe the results of nature's experiments that are already complete.
The rates of geologic processes are almost always slower than the rates of human effects on the environment.

Geologists use millions of years as the standard unit of time:
- $Ma = \text{million years ago}$
- $m.y. = \text{an interval of time (million years)}$

Some geologic features take millions of years to form. Others take seconds!

Scientific principles
The universe is sensible and governed by unchangeable rules.

The scientific method
1) Make an observation about the sensible world.
2) Develop an explanation (hypothesis) that predicts the outcome of other observations or experiments.

The scientific method (cont.)
3a) Make new experiments.
3b) Make new observations.

Hypothesis - Theory - Law
- A hypothesis is an explanation initially offered for a set of observations.
- When a hypothesis withstands many tests it may be called a theory.
- A theory for which there seem to be no sensible reasons to challenge is called a law.

What are the data used in Geology?
Observational:
- maps
- rock types, distributions, structures
- microscopic investigations
Experimental:
- chemical
- geophysical
Uniformitarianism

The present is the key to the past
— James Hutton

Natural laws do not change — however, rates and intensity of processes may.

Geology of the Hawaiian Islands

- Intro to Environmental Geology as applied to the Hawaiian Islands
- Concentrate on volcanic geology
- Plenty of terminology, but we need it to communicate

What is Environmental Geology?

- Geology of ‘today’s’ Earth
- Tries to understand human interaction with the Earth's processes

What is Environmental Geology?

Geology applied to solving environmental issues
- Land use issues
- Where to locate landfills
- Where to locate new subdivisions, highways, etc.
- Natural hazards
- Volcanoes
- Landslides
- Earthquakes
- Tsunamis
- Floods

Environmental Geology uses all fields of Earth Science

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What is environmental Geology?

Geology applied to solving environmental issues
- Human impacts on the environment
  - Groundwater
  - Waste disposal
  - Extractive industries (mining, petroleum production, etc.)

What is environmental Geology?

Geology applied to solving environmental issues
- Global environmental issues
- Climate change — are human activities causing global warming?

Geology in the News

- Earthquake in Iran
- Mud slides in California
- Rain on O‘ahu
- Mudslides
- Sewage spills
- Runoff

Any Questions?
Thursday

- Plate Tectonics
- Please Read in text book:
  - Chapter 1: all
  - Chapter 2: p. 22-26
  - Chapter 3: all
- Log onto GG 103 Web Site and fill out "Student Information Form"