Geology 10113: Understanding the Earth

"The sea washes the shore,
The majesty of land,
Down it flows
as sand"

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Class Text & Lab

- Tarbuck and Lutgens, *Earth: An Introduction to Physical Geology* (9th edition) is available at the bookstore.
- You will receive lab handouts in lab.

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Syllabus

May	Lecture - 9:00 to 10:50	Lab - 12:00 to 1:50	Chapters in Text
10	Intro - Matter & Minerals	No Lab 1st day	Chs. 1 & 3
11	Igneous Rocks & Volcanos	Minerals	Chs. 4 & 5
12	Weathering & Sedimentary Rocks	Igneous Rocks	Chs. 6 & 7
13	Sedimentary & Metamorphic Rocks	Sedimentary Rocks	Chs. 7 & 8
14	Exam #1	Metamorphic Rocks	
15			
16			
17	Geologic Time	Lab Exam #1	Chs. 9 & 22
18	Mass Wasting & Surface Water	Reading & Making Maps	Chs. 15 & 16
19	Surface & Ground Water	Contour Maps	Chs. 16 & 17
20	Glaciers & Deserts	Planetary Geology	Chs. 18 & 19
21	Exam #2	Fieldtrip	
22			
23			
24	Shorelines and Stress & Strain	Geologic Maps	Chs. 20 & 10
25	Earthquakes & Earth Interior	Sequencing Events	Chs. 11 & 12
26	Continental Drift & Plate Tectonics		Chs. 2 & 22
27	Plate Tectonics & Planetary Geo.	Lab Exam #2	Chs. 2 & 23
28	Exam #3		

- Make sure you read and understand class policies
- Note when exams are held
- Skim through a book chapter before the lecture is given
- Be on time for class

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Class Web Site

- http://geo1.tcu.edu/busbey/geo10113

The class web site contains PDF versions of the presentations. Downloading and studying the presentations is NOT a substitute for taking good notes since there are things I discuss in lecture that are not on the presentations.

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F.Y.I

- If you miss an exam you should bring proof of your 'excusable' absence
- Lab attendance is mandatory
- Be punctual for class and lab
- Cell phones are forbidden! If a cell phone goes off I might give a pop quiz to the whole class! During exams there is a zero tolerance cellphone policy

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Grades

- Each hour exam is worth 25% - so the hour exams are worth a total of 75%.
- The lab is worth 25%.
- Any 'curves' will be made on the final grade.

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Cheating

- If you are found cheating on an exam you will be given a zero for that exam
- This policy holds true for lab and lecture
- Don't cheat

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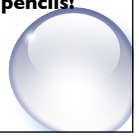
Any Questions?

Ok.. time to get under way
break out the notebooks and pencils!



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Scientific Inquiry

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Scientific Inquiry

- How or why things happen is explained using a:
  - Hypothesis
  - Theory

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Scientific Inquiry

- The Scientific Method
- There is no fixed path that scientists follow that leads to scientific knowledge
- 'Real' science does not begin or end with any 'absolute' and untestable truths.

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Earth Basics

- In this course we will look at the Earth as a unique, self-contained body in the solar system.
- We are the only planet with a lithosphere, hydrosphere, atmosphere and biosphere.
- The earth is unique in that water exists in all three phases on earth and has played a major part in shaping what we see on the surface.
- Unlike any other planet our atmosphere is largely the result of biological processes.

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Earth as a system

- The Earth is a dynamic system with many interacting parts or 'spheres'
- Geology
  - Aims to study Earth as a system composed of numerous interacting parts or subsystems
  - Employs an interdisciplinary approach to understand the earth as a system and to solve global environmental problems

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Earth as a System

- What is a system?
- Feedback mechanisms

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Earth as a system

- The Earth system is powered by
  - Sun (external only)
  - Earth's interior

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Geology

- Physical Geology
- Historical Geology

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Geology & The Environment

- Important relationships exist between people and the natural environment
- Problems and issues addressed by geology include:
  - Natural hazards, world population growth and environmental issues.
  - Mineable, and usually nonrenewable, resources.

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Aspects of Geologic Time

- Geologists deal in "Geologic Time" as opposed to "Human Time"
- Relative dating and the geologic time scale
  - Relative dating means that dates are placed in their proper sequence or order without knowing their age in years
  - As long ago as the late 1700's 'geologists' were setting up a Geologic Time Scale based only on relative time.
- Absolute dating and radioactive decay
  - Starting with the discovery of radioactive decay in the first decade of the 19oos's, absolute dating has used to assign actual years before present to events.

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Aspects of Geologic Time

- The magnitude of geologic time is immense
  - Involves vast times – millions to billions of years
  - An appreciation for the magnitude of geologic time is important because many processes are very gradual

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We will briefly look at the history of the solar system and the gross physical construction of the earth

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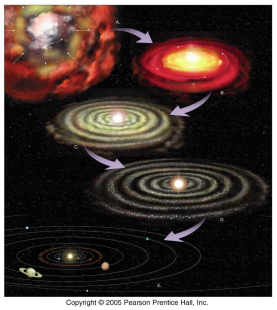

Third Rock From The Sun

- The Solar System is about 5 billion years old.
- The Earth was derived from a cooling - condensing gas cloud.
- The Earth had a solid surface as of about 4.6 billion years ago.
- The first oceans began accumulating about 4 billion years ago.

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Earth Internal Structure

- Layers defined by composition
- Layers defined by physical properties

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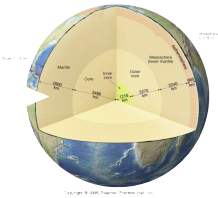
Earth Internal Structure



- Layers defined by composition
  - Crust - Continental (Si+Al) or Oceanic (Si+Fe)
  - Mantle - Fe+Si (Stoney)
  - Core - Fe+Ni (Metallic)

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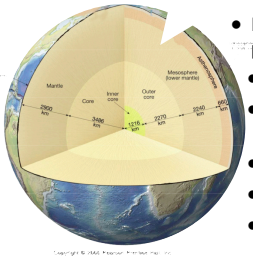
Earth Internal Structure



- Layers defined by physical properties
  - Lithosphere - rigid
  - Asthenosphere - 10% liquid
  - Mesosphere - plastic
  - Outer Core - liquid
  - Inner Core - solid

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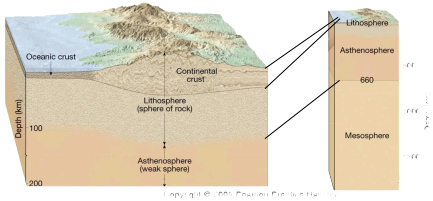
The Crust: Oceanic and Continental



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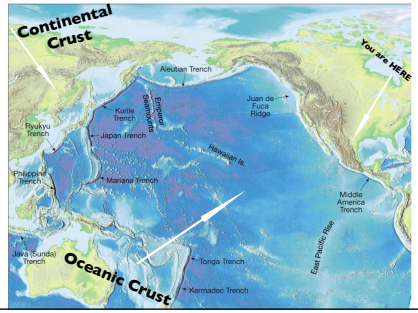

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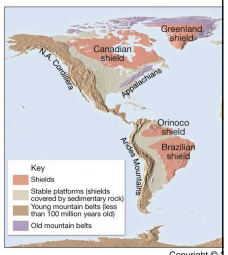
Continental Crust

- Modern continents are made up of slivers and chunks of even older continents.
- Continental crust is 540 million years old or older! Chunks of old crust are called cratons.
- Cratons are made of shields (exposed ancient crust) and platforms (ancient crust buried in younger sediments.)



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Continents

- Many active mountain chains are younger than 600 million years, so they are not a part of any craton.
- They represent where older continents have collided or where volcanic arcs are plastered on an edge.