Introduction to Physical Geology (GEOL 1)

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SADDLEBACK COLLEGE

What is

Physical Geology?

Having to do with the material world

Γῆλογία

Earth Study

Introduction to Physical Geology

Introduction to the study of the Earth within our material world

Why are you here?

SADDLEBACK
COLLEGE

Why are you here?

Need this class for college credit
(Need a passing grade)

Fits in your schedule

Might be interesting

Might be easy

Isn't something terrifying like
chemistry, biology, or physics

working 2 full time jobs doesnt
keep you busy enough

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Something to do after high
school
Break from the "real" world
Want to get degree
Want to be paid more

Life goal
Like learning
Not offered in high school

AA degree here
UC transfer requirements
CSU transfer requirements

By 2020:

The four most in-demand competencies in the labor market:
Decision-making
Communications
Analysis
Administration

65% of job openings will require postsecondary education.

Source: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0ahUKEwjf6senvtDYAhUS7GMKHYwEBQ8QFgg3MAI&url=https%3A%2F%2Fcew.georgetown.edu%2Fwp-content%2Fuploads%2F2014%2F11%2FRecovery2020.ES_.Web_.pdf&usg=AOvVaw3FGbObdfyUGW1kqe1N48EU

UC transfer

Complete the 7-course pattern: Four transferable college courses chosen from at least two of the following subject areas: A) arts and humanities B) social and behavioral sciences **C) physical and biological sciences**

Earn at least a **2.4 GPA** in UC-transferable courses (2.8 if you're a nonresident).

CSU transfer

* As an aside, I am sorry that the CSU transfer website is so confusing, it really is a shame

Area B — Scientific Inquiry and Quantitative Reasoning:

B1 (science course) B3 (lab section)

...must have achieved a cumulative grade point average of **2.0 or better.**

Why are you here?

SADDLEBACK
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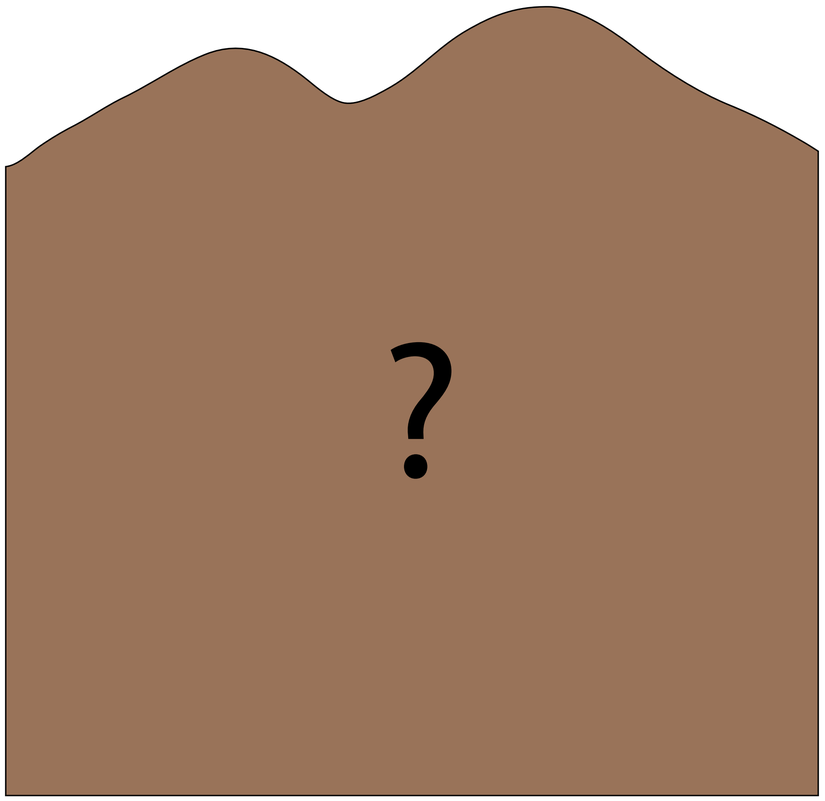
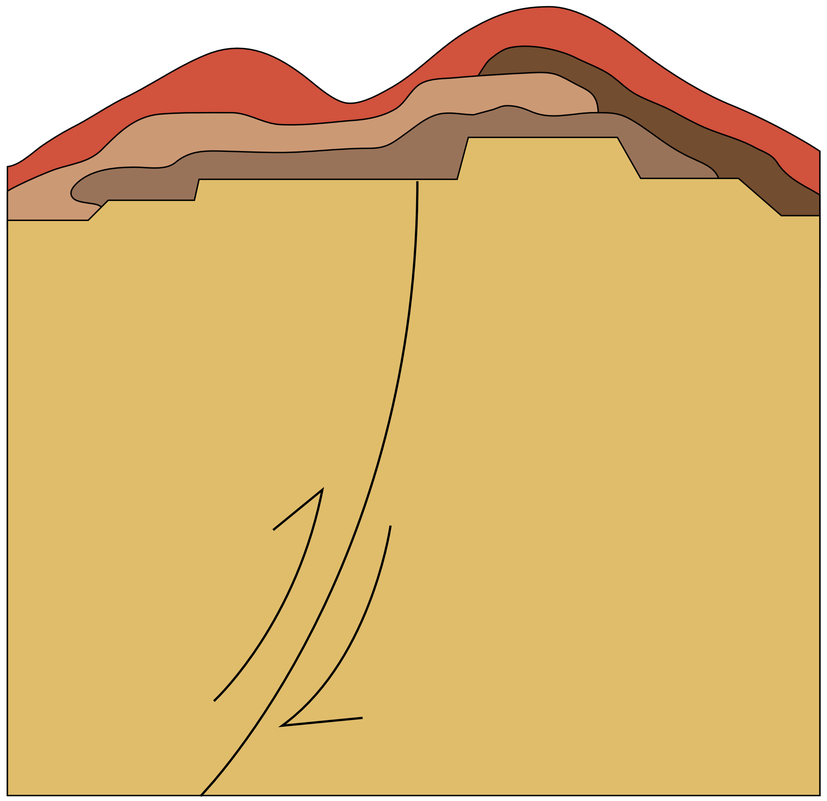
SADDLEBACK COLLEGE



Questions geologists ask:

How did Saddleback form,?
What is it made out of?
How old is it?
Is it safe to build houses on?
Can I mine minerals out of?
Does it have fossils in it?
Does it have oil in it?
Is there water in it?
Is it a safety hazard?
Can I keep hazardous things in it?



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“I hate the outdoors, and I don’t care about the saddleback logo”

“I hate the outdoors, and I don’t care about the saddleback logo”

Photograph by Asmit Kumar Panigrahi

Who has a smart phone?

Who has a smart phone right now in your pocket?

Everything on Earth is made up of atoms (Even cell phones)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 **H** 1.008																	2 **He** 4.0026
3 **Li** 6.94	4 **Be** 9.0122											5 **B** 10.81	6 **C** 12.011	7 **N** 14.007	8 **O** 15.999	9 **F** 18.998	10 **Ne** 20.180
11 **Na** 22.990	12 **Mg** 24.305											13 **Al** 26.982	14 **Si** 28.085	15 **P** 30.974	16 **S** 32.06	17 **Cl** 35.45	18 **Ar** 39.948
19 **K** 39.098	20 **Ca** 40.078	21 **Sc** 44.956	22 **Ti** 47.867	23 **V** 50.942	24 **Cr** 51.996	25 **Mn** 54.938	26 **Fe** 55.845	27 **Co** 58.933	28 **Ni** 58.693	29 **Cu** 63.546	30 **Zn** 65.38	31 **Ga** 69.723	32 **Ge** 72.630	33 **As** 74.922	34 **Se** 78.97	35 **Br** 79.904	36 **Kr** 83.798
37 **Rb** 85.468	38 **Sr** 87.62	39 **Y** 88.906	40 **Zr** 91.224	41 **Nb** 92.906	42 **Mo** 95.95	43 **Tc** (98)	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.76	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.29
55 **Cs** 132.91	56 **Ba** 137.33	57-71 *	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.84	75 **Re** 186.21	76 **Os** 190.23	77 **Ir** 192.22	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.2	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** (226)	89-103 #	104 **Rf** (265)	105 **Db** (268)	106 **Sg** (271)	107 **Bh** (270)	108 **Hs** (277)	109 **Mt** (276)	110 **Ds** (281)	111 **Rg** (280)	112 **Cn** (285)	113 **Nh** (286)	114 **Fl** (289)	115 **Mc** (289)	116 **Lv** (293)	117 **Ts** (294)	118 **Og** (294)

* Lanthanide series	57 **La** 138.91	58 **Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** (145)	62 **Sm** 150.36	63 **Eu** 151.96	64 **Gd** 157.25	65 **Tb** 158.93	66 **Dy** 162.50	67 **Ho** 164.93	68 **Er** 167.26	69 **Tm** 168.93	70 **Yb** 173.05	71 **Lu** 174.97
# Actinide series	89 **Ac** (227)	90 **Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (262)

Everything in our day to day life, came from someplace.

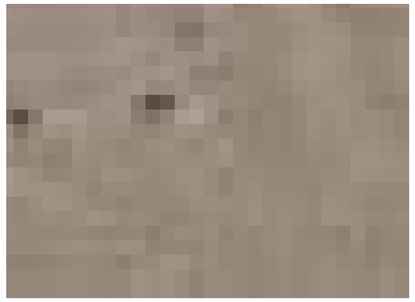
For the most part, the all of these atoms have been on Earth for a very LONG time

Big picture concept of this class:
Earth processes do not change these elements, only mix them around.

Smartphone Chemistry

Plastic
insulators
packaging

C



Si

Na K B Li

Glass,
insulators,
batteries

Al Fe

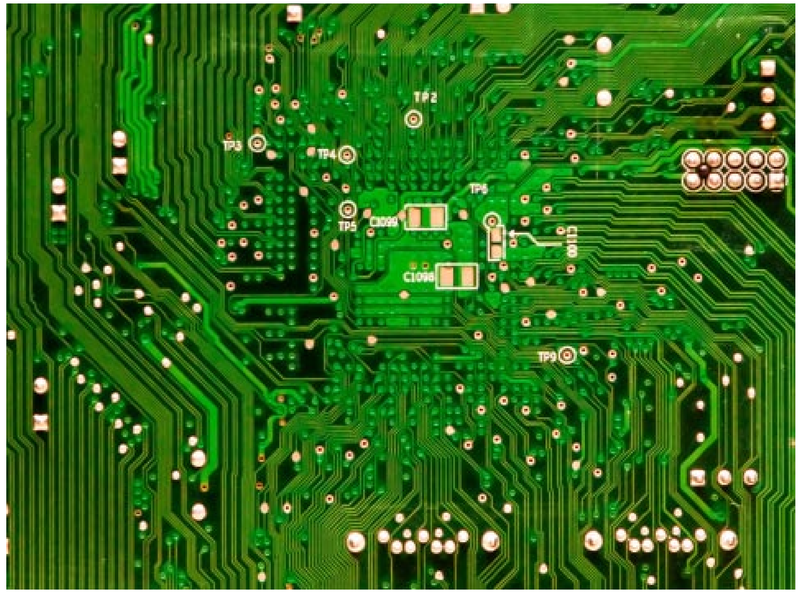
packaging

Smartphone Chemistry

Sn Cu Au

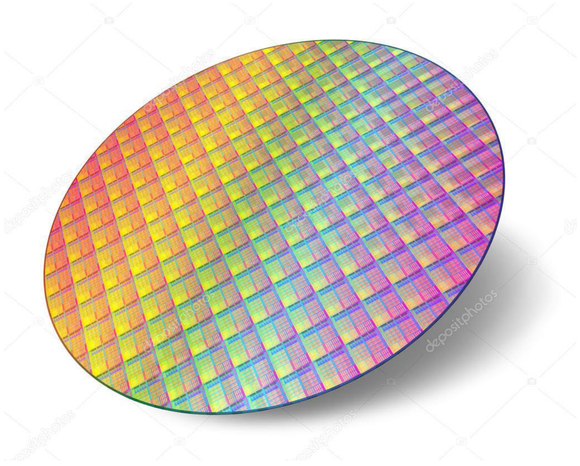
Pb Ni Co

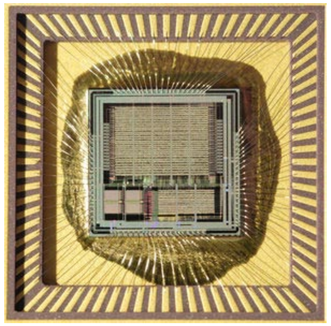
Wires,
electronics
solder, batteries



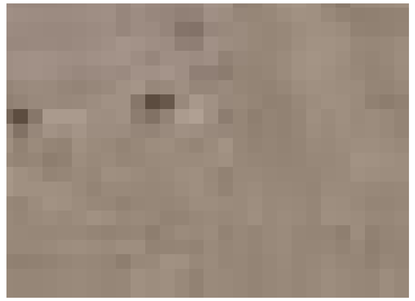
Smartphone Chemistry

Silicon chips
and other
Semi-conductors





Si



Ge

He O N Ar Xe

Ag Au Cu Al Mg

+ more!

Smartphone Chemistry

Colorful screens

Y La Tb Gd Ta

Pr Eu Dy Nd Ce

If cellphones are geology, can I use them in geology class?

If cellphones are geology, can I use them in geology class?

Worded another way:
In your class can we use one of the most revolutionary technologies of our era?

Http://moderngeology.com

1) What email address would you like class emails to go to?

2) What name do you go by?

3) What grade are you going to try to earn in this class?

4) What major are you thinking about studying in college?

How many people live on Earth?

A) 7.442 billion

B) 2.981 million

C) 561.4 million

D) 15.231 billion

How many people live off the earth?

A) 2

B) 6

C) 35

D) 112

http://www.howmanypeopleareinspacerightnow.com/

Why is the sky blue?

A) It reflects the color of the sea

B) Air molecules scatter blue wavelengths

C) Nitrogen gas is slightly blue

What is the most common element on the earth?

A) Si (Silicon)

B) O (Oxygen)

C) Al (Aluminum)

D) C (Carbon)

E) Fe (Iron)

Most of the modern diatomic oxygen in the atmosphere is generated by?
(Diatomic = O_2, the type of oxygen we breathe)

A) Volcanic eruptions

B) The terrestrial biosphere

C) The marine biosphere

The ozone hole over Antartica is related to global warming?

A) True

B) False

Over the past 100 years, which has caused the most sea level rise?

A) Melting of glaciers

B) Increased rainfall on land

C) Warming of ocean waters

Right now the Earth is at one of its hottest periods known

A) True

B) False

C) It is too hard to tell, more science needs to be done

If you forget Valentine 's Day chocolate in your car, and it heats up, when you find it after geology class, is there any possibility that it might have transformed into a slide of pizza?

A) Yes, depending on how hot it gets

B) Yes, depending on how long it stays hot

C) No

I have used Excel or Google sheets to do math calculations before

A) I am excel wizard
B) A am comfortable doing few basic things
C) I have very minimal experience
D) None but I am interested in learning
E) None and I find computers difficult

Click submit or Pass in tests if you did them on paper

Review questions

home lectures lab study homework

Modern Geology

Spring 2018 Geology 1

Class site updates

- Welcome to Saddleback Spring Geology 1

Class schedule
Lecture and Lab schedule
Saddleback class Syllabus
Beginning term exam

We will be using smart phones/computers in class
We will be using pen and paper

Don’t be distracted. Don’t distract your neighbor.

Hydraulic mining

Strip mining

College is supposed to prepare students for successful careers

So....

I think it is helpful to treat our classroom environment like you might experience in the workforce

Just like a real job everything is optional:
You can leave at any time
You can show up at any time

Just like a real job:
You will only be paid for the work you do
(Pay = learning something and or getting college credit)

Can I not show up to work and still get paid?

California employee law states: 1 hr sick leave per ever 30 worked.
6 hrs per week class times, 16 week period. 6 hours/week * 16 weeks = 96 hours
96 hours / 30 hours = 3.2 hours sick leave, which is about 1 Class.
Your not an employee, but I think its fair that
you may miss one class with no repercussions.
(You don't even need to send me an e-mail with an elaborate excuse)

Some classes are more important than others:
If you miss a 60 point midterm you must reschedule the midterm with the professor
or lose 40 points.

I try to focus this class on practical aspects of geology relevant to the modern world.

I try to give assignments, exams, and freedom so that you can learn at your best.

I try not to waste your time.

Don’t waste your time. (treat your time seriously)

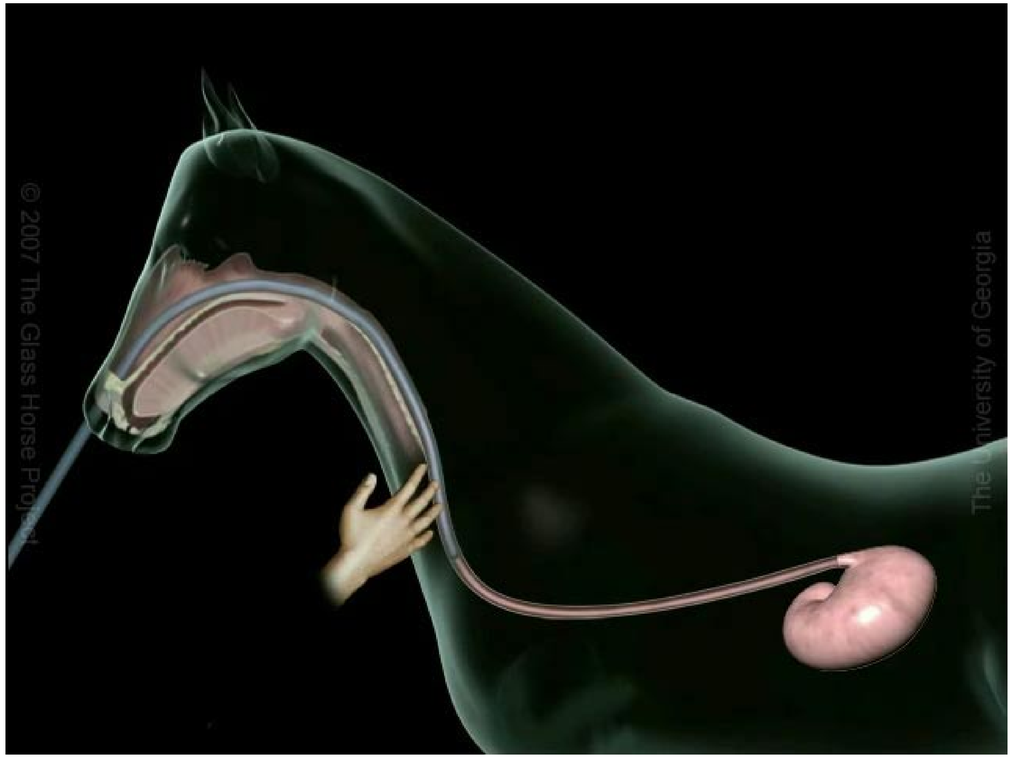
Stay enrolled in this class only if you
want to get a C or higher.

Come to office hours if your not getting the grade you want.

Ask for help learning the material.

You can bring a horse to water but you can’t make it drink

You can bring a horse to water but you can’t make it drink



Important Class Dates:

Last Day to Add with APC*:	Sunday, 2/4/2018
Drop with Refund by:	Sunday, 1/28/2018
Elect Pass/No Pass by:	Wednesday, 2/21/2018
Drop without 'W' Grade by:	Sunday, 2/4/2018
Drop with 'W' Grade by:	Wednesday, 4/11/2018
Last Week of Class Ends:	Wednesday, 5/23/2018

If you need an APC, please see me after class

Stupid question policy?

There are such things stupid questions.
(I know, I've asked many of them)

Stupid questions come from stupid people.

Good answers to questions makes smart people.

Making smart people is the whole reason why universities exists.

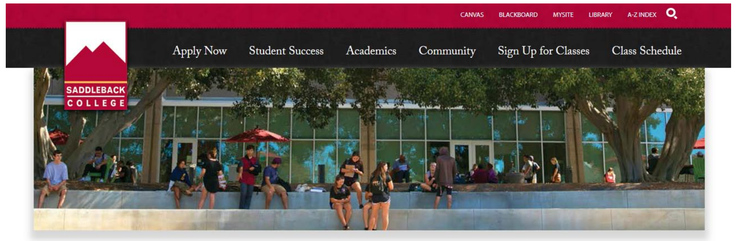
I will do my best to give the best answers I can,
I hope you will do your best to ask
as many questions as you can, (even the stupid ones).

Grades

<u>Laboratory</u>

30% Laboratory portion

2-3 hr field trip locally (TBA)



Spring Final Exam Schedule

Coming Soon

<u>In Class points:</u>

38% Mid term exams

10% End term exam (??)

<u>Homework:</u>

5% Google project (Due March 5th)

10% Most important project (Due April 23rd)

6% Outdoor report (Due May 21st)

Mojave (Jim Schneider) The meetings are Wednesday Feb. 14 (pre-trip) and Wednesday Mar 07 (post-), both from 6:00-7:20 in SCI 123. The trip is Feb. 23-25 (Fri-Sun).

Death Valley (Jim Repka) Thursday Mar 08 (pre-trip) and Thursday Mar 29 (post-), both from 6:00-7:20 in SCI 124. The trip is Mar 16-19 (Fri-Mon, note that it is four days).
Both trips leave early Friday morning and return late afternoon/early evening (we shoot for pre-sunset).

Google project (5%)

The most important project (10%)

Outdoor report (6%)

Office hours

Office hours are on Monday from 5:00PM to 6:00PM

Special Services: Students with verified disabilities (physical and/or learning) may be entitled to appropriate academic accommodations. If you are such a student please contact me and, if you've not done so already, Disabled Students Programs and Services (DSPS) in room SSC 113 or in Village 28-1, 29-1, or 23-1.

This can take a while so start pestering the DSPS folks right away

Honor Code: TLDR: Don't cheat.

Anyone taking a class at Saddleback College should be familiar with the Students' Rights and Responsibilities section of the Student Handbook (pages 39-40), in particular the section on academic dishonesty.

All assignments, tests, papers, or quizzes are expected to be entirely your own work unless I specifically state otherwise.

Enrollment: If you don't want to be in the class, then drop the class.

Learning objectives:

1. Describe what science is and apply the scientific approach to problem solving.

2. Identify common minerals based on their physical properties.

3. Identify common rocks and interpret the tectonic/environmental conditions under which they were formed.

4. Locate and identify basic features on topographic maps.

5. Describe the current model of earth's physical and chemical layering, including evidence that supports this model.6. Describe the theory of plate tectonics, including evidence that supports this theory.

7. Identify the tectonic processes responsible for creating mountain ranges, basins and other features on the earth's surface.

8. Identify the tectonic processes responsible for creating earthquakes and various types

6. Describe the theory of plate tectonics, including evidence that supports this theory.

7. Identify the tectonic processes responsible for creating mountain ranges, basins and other features on the earth's surface.

8. Identify the tectonic processes responsible for creating earthquakes and various types of volcanic activity.

9. Describe the various surface processes responsible for the evolution of the earth's surface.

10. Interpret the geologic history of an area, based upon geologic structure as well as rock types and fossils present in the geologic column.

Student learning outcomes:

1) Students will be able to describe the current model of Earth's physical and chemical layering, including evidence that supports this theory

2) Students will be able to explain the theory of plate tectonics and its relationship to Earth's processes and landforms

3) Students will be able to construct and interpret topographic and geologic maps, profiles, and cross sections

4) Students will be able to identify common minerals and rocks and interpret the conditions under which they formed.

Class description:
Integrated study of the principles of geology
and the use of geologic clues to determine earth history.

Composition of Earth's crust and interior,
plate tectonics,
volcanism,
earthquakes,
mountain building,
surface processes
natural resources such as minerals, fossil fuels, and water.

Topics Covered:

1. The formation of the universe, the solar system and the Earth
2. Earth's internal structure and plate tectonics
3. Atoms, matter, and minerals
4. Volcanism and igneous processes
5. Earthquakes and seismicity
6. Mountain building and continental accretion
7. Weathering and erosion
8. Uniformitarianism and geologic time
9. River processes and groundwater
10. Landslides and mass wasting
11. Glaciers and climate change
12. Wind, deserts, and shoreline processes
13. Energy resources

We have just gone through everything on the syllabus

the full syllabus is online

Now to start thinking like a geologist

What controls the Earth?

(Discuss in groups)

What controls the Earth?

Some ideas from students in class:

Gravity
Humans,
Oceans
Heat
Climate
Atmosphere

Ideas from physicis:

Gravitation
Weak nuclear
Strong nuclear
Electromagnetic

What controls the Earth?

Where is the weak nuclear force?

Physics is right,
but using this physics
tool box is not very
practical when looking
at a large system on
the Earth

One way of thinking that we will refer to in this class often uses the following:

Pressure

Temperature

Chemical composition

This way of thinking is called:

Thermodynamics

Pressure

Temperature

Chemical composition

Thermodynamics

Originally developed to make better engines, thermodynamics gives us a practical way to think about the changes we see in geology.

Composition = Carbon
Temperature = Same

High pressure
(Diamond)

Low pressure
(Graphite)

Geologic time

Geology is unique from most sciences, in that most things geologists think about also include a time component.

The time component in geology ranges from fractions of a second to billions of years, and everything inbetween.

Hypotheses, Theory, Law

Scientific method

Question
Hypothesis
Experiment
Analysis
Conclusions
Share

How can you perform an experiment on the Eartah?

If you cannot, is geology a science?