A high-angle aerial photograph of the Grand Canyon, showing its deep, layered rock walls and the Colorado River at the bottom. The colors range from deep reds and browns to lighter yellows and greens, illustrating geological stratification.

Geology 104: Earth Science

Spring 2025 (1 section)

3 February through 2 June
(16 weeks)

Miramar
San Diego Miramar College

Revised 27 January 2025

Phil Farquharson

“Mostly“ retired Geology professor...

philfarq@gmail.com

<https://geology104online.geology-guy.com>

[https://sdccd.instructure.com \(Canvas\)](https://sdccd.instructure.com)

Phone/text: (don't like it – please use E-mail)

Course Syllabus:

The latest is always on the “unofficial” web site, and in Canvas

Office Hours:

“Office” Hours: Monday evenings, 6-7 PM, (or by request) using Zoom... ***(send me an email – if I'm not busy, I'd be glad to help, any time!)***

Teaching Philosophy

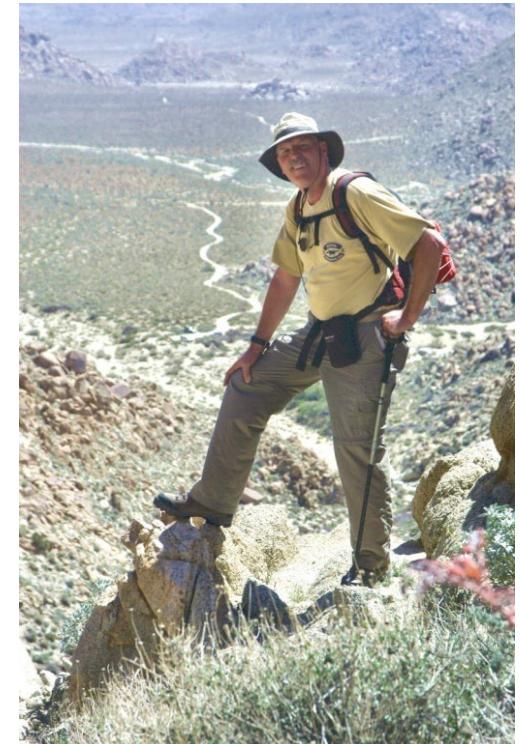
I don't consider myself a teacher. I can't **teach** you anything. My goal is to encourage you to **learn**. Think of me as a cheerleader...

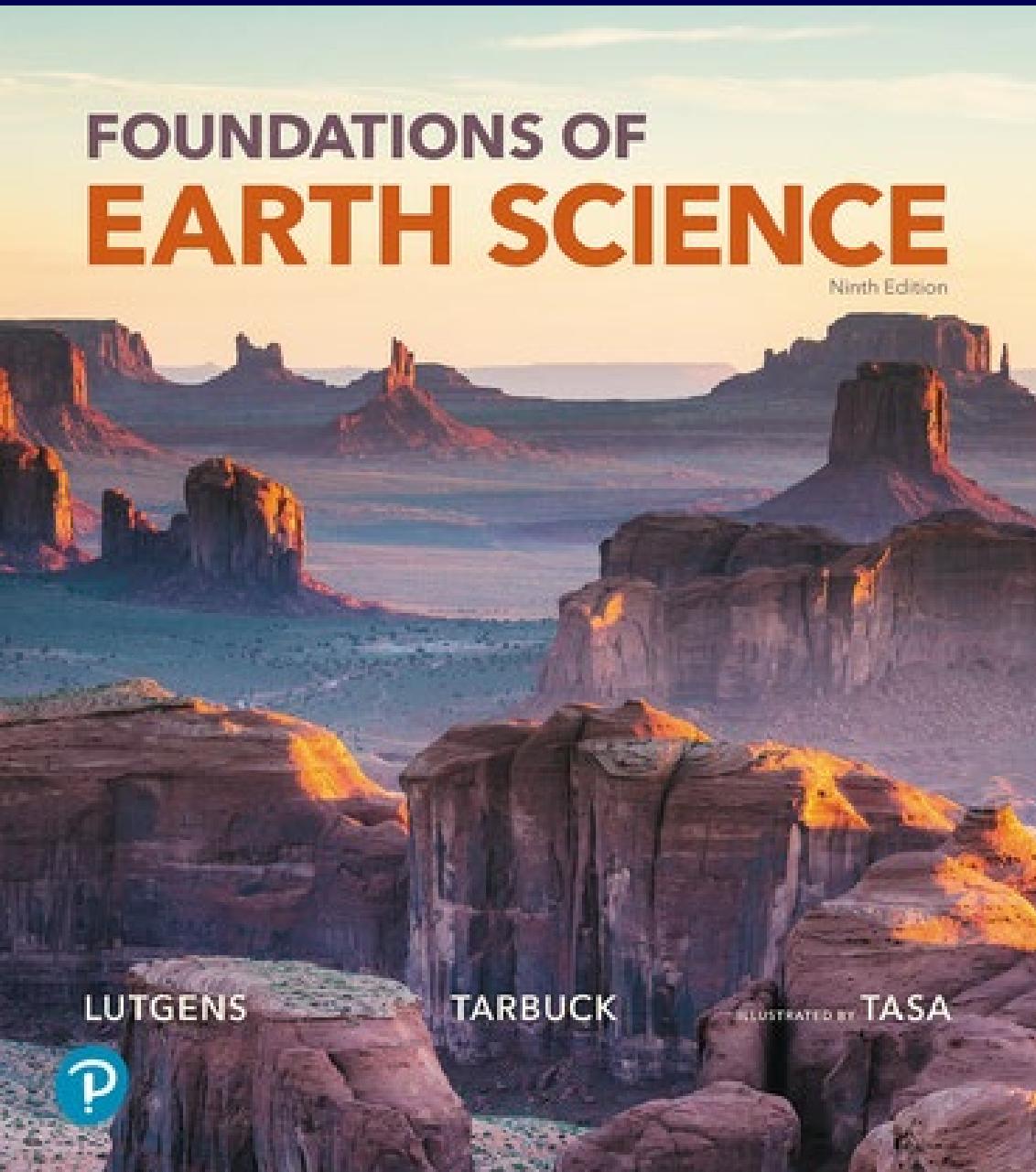
I don't **give** grades. I just **keep score**. **You** are responsible for your success.

Note that geology is a highly interdisciplinary field of study.

Lesson 1:

Earth - it's all one thing!





Required E-text

book:

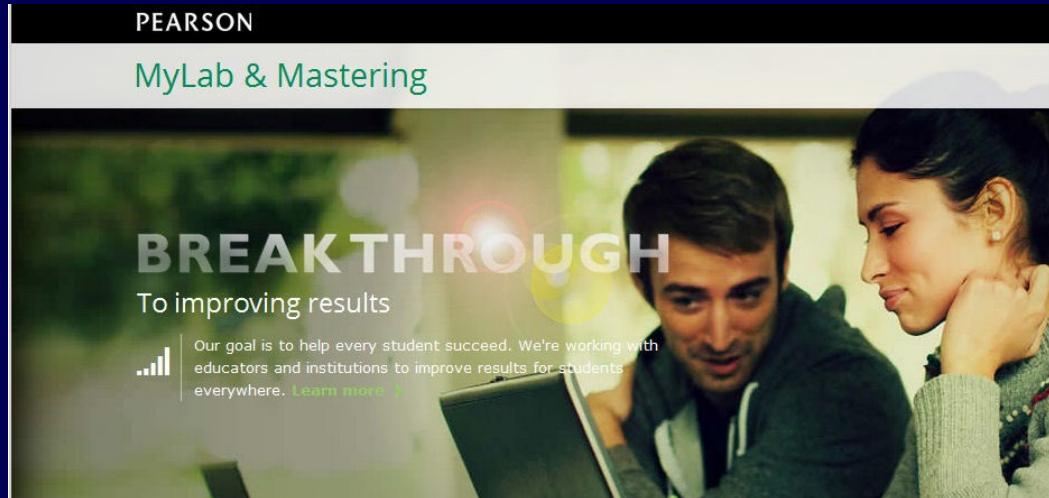
*“Foundations of
Earth Science”
(9th edition)*

by Lutgens,
Tarbuck & Tasa

available in
Miramar College
Bookstore, cost:
\$58.82

(7th or 8th editions of
paper text OK)

Required Canvas Plug-in:



“Modified Mastering Geology”

**Only available in Miramar College
Bookstore included in cost of e-text
for \$58.82 (NOT through Canvas)**

**See instructions (including
PowerPoints/Videos/PDF's) for
more info**

THE RISE AND FALL OF SAN DIEGO

*Experience first-hand the unique
geologic history of our region.*

— Tom Deméré
Curator of Paleontology
San Diego Natural History Museum

150 MILLION YEARS OF HISTORY
RECORDED IN SEDIMENTARY ROCKS

PATRICK L. ABBOTT

Optional Book:

(“nice to have”)

“Rise and Fall”
by Pat Abbott

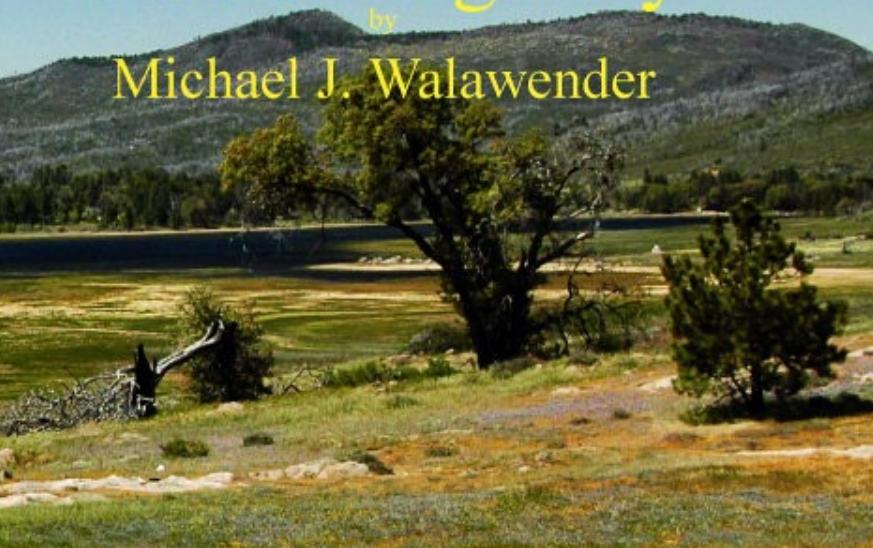
available in
finer bookstores
everywhere,
Online

Sedimentary Rocks
along San Diego Coast

Roadside Geology
along
Sunrise Highway

by

Michael J. Walawender



San Diego Association of Geologists

Optional Book:

("nice to have")

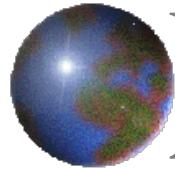
*“Roadside Geology
Along Sunrise
Highway”*

by **Mike Walawender**

Igneous &
Metamorphic rocks
in
S.D. back country

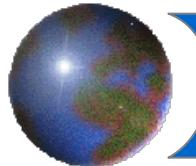


Unlikely Field Trips:
Tourmaline Beach, among others



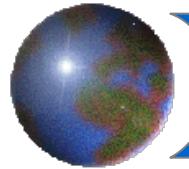
Student Learning Outcomes “SLO’s”

- Students will be able to:
 - ☒ summarize the defining characteristics of a mineral; differentiate among igneous, sedimentary, and metamorphic rocks in terms of the rock cycle.



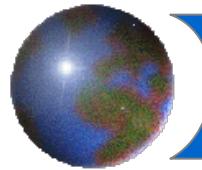
What Will I Learn?

- what Earth Science is and what such scientists do.
- an appreciation of the immensity of geologic time
 - ☒ punctuated by instantaneous catastrophic events such as earthquakes, tsunamis, floods, landslides **and** volcanic eruptions (plus rocks from outer space)
- an understanding of how a variety of minerals and rocks are produced in the earth's crust.
- the geologic origins of important mineral resources and the distribution of these resources on the earth.
- an appreciation of how much we have learned about Earth processes since I began my geological studies fifty-nine (59!!!) years ago.
- In addition to physical geology, we'll cover Oceanography, Meteorology (weather), Climatology (climate), & Astronomy (mainly Solar System)



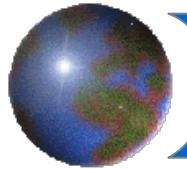
What Will I Learn? (continued)

- Mountain-building and opening of ocean basins
- Bizarre sea creatures that live at underwater volcanic vents
- Waves and coastal hazards
- Earthquakes in some surprising places...
- Supervolcanoes capable of rapid climate change
- How to use Internet resources to keep up to date on Earth changes
- Global climate changes through time
- ... and more!



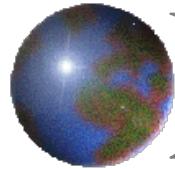
SoCal Regional Geology

- One of the best places in the nation to study Geology
 - ✗ **San Andreas Fault ZONE**
- Living laboratories:
 - ✗ Rose Canyon fault (and others)
 - ◆ Mission Bay, S.D. Bay, Mount Soledad
 - ✗ Santiago Peak volcanics
 - ✗ Marine sediments exposed in sea cliffs
 - ✗ Peninsular Ranges Batholith
 - ✗ Anza Borrego Desert State Park
 - ✗ Salton Buttes
 - ◆ Live volcanoes at our doorstep!



Syllabus Summary

- PowerPoint presentations are only outlines
- You paid big bucks for the book – use it!
 - End-of-chapter materials are useful (summaries, review questions, key terms)
 - Within chapters, additional items are added:
 - ◆ End of chapter:
 - “Concepts in Review”
 - “Give it some thought”
 - ◆ “Eye on Earth” boxes
 - ◆ “Concept Check” boxes
 - ◆ Graphics/videos in general – visualization is fundamental

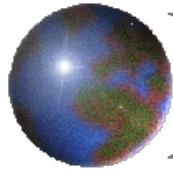


Online: benefits vs. drawbacks

● **Big benefit: freedom!**

● **BUT...**

- You are your own boss...
- Self-discipline required
- Attention to details
- Keeping up with the schedule
- Reading comprehension
- Writing skills



Canvas (Blackboard replacement)



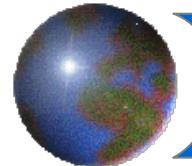
This will be my tenth or so class using this new software. Be patient with the OLD man (born in 1945, do the math...)

I used to be a software engineer. My mantra was “if it ain’t intuitive, it’s broke!”...

Also I’m a guy. General philosophy: if it’s good software, it shouldn’t need any stinkin’ instructions!

</rant>

Canvas seems to be better than Blackboard was – I got to really wring it out during the start of COVID-19!



MasteringGeology Home

(accessed through Canvas → MyLab and Mastering)

Screenshot of a web browser showing the MasteringGeology Course Home page for "Miramar Geology 100 'Intercession' January 2017".

The browser tabs are: MasteringGeology - SPRING ..., Course Home, and Phil Farquharson, Geology Guy.

The URL in the address bar is: openvellum.ecollege.com/course.html?courseId=13477876&OpenVellumHMAC=678ef9e77d7e1d1744e6fb9816a106c3#10001

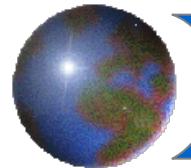
The page title is: Miramar Geology 100 "Intercession" January 2017

The left sidebar menu includes:

- MasteringGeology™
- My Courses
- Manage Course
- Course Home (highlighted)
- Assignments
- Scores
- eText
- Study Area
- User Settings
- Course Tools
- Syllabus
- Instructor Resources
- Instructor Tools

The main content area displays the "Course Calendar" for January 2017. The calendar grid shows dates from 1 to 31, with specific course activities listed for each day:

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|------------------|------------------------------------|------------------|------------------|------------------|------------------|------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | 8 | 9 | 10 | 11 | 12 | 13 |
| Introduction... | Chapter 1 - ... Geography Re... | | Chapter 2 - ... | Math and Che... | Chapter 3 - ... | |
| | | | | | | |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| Chapter 4 - ... | Chapter 5 - ... | Chapters 6 a... | Chapter 8 - ... | Chapter 9 - ... | Chapter 10 - ... | Chapter 11 - ... |
| | | | | | | |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| Chapter 15 - ... | Chapters 16 ... | Chapter 18 - ... | Chapter 19 - ... | Chapter 20 - ... | Chapter 21 - ... | |
| | | | | | | |
| 29 | 30 | 31 | 1 | 2 | 3 | 4 |
| | | | | | | |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |



MasteringGeology Home

MasteringGeology - SPRING ... Course Home Phil Farquharson, Geology Guy +

openvellum.ecollege.com/course.html?courseId=13477876&OpenVellumHMAC=678ef9e77d7e1d1744e6fb9816a106c3#10001

Search

Miramar Geology 100 "Intercession" January 2017

Phil

MasteringGeology™

Course Home

My Courses

Manage Course >

Course Home

Assignments

Scores

eText

Study Area

User Settings

Course Tools >

Syllabus

Instructor Resources

Instructor Tools >

Course Calendar

January 2017

Sunday Monday Tuesday Wednesday Thursday Friday Saturday

1 2 3 4 5 6 7

8 9 10 11 12 13 14

15 16 17 18 19 20 21

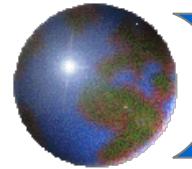
22 23 24 25 26 27 28

29 30 31 1 2 3 4

5 6 7 8 9 10 11

Areas you'll be using the most

Introduction... Chapter 1 - ... Geography Re... Chapter 2 - ... Math and Che... Chapter 3 - ... Chapter 4 - ... Chapter 5 - ... Chapters 6 a... Chapter 8 - ... Chapter 9 - ... Chapter 10 - ... Chapter 11 - ... Chapter 15 - ... Chapters 16 - ... Chapter 18 - ... Chapter 19 - ... Chapter 20 - ... Chapter 21 - ...



MasteringGeology Study Area

02: Plate Tectonics: A Scientific Revolution Unfolds - Mozilla Firefox
wps.pearsoned.com/esm_tarbuck_earth_12_msa/250/64137/16419178.cw/index.html

TARBUCK LUTGENS Earth An Introduction to Physical Geology
TWELFTH EDITION

Chapter 02: Plate Tectonics: A Scientific Revolution Unfolds

[Student Home](#)

[Pearson eText](#)

[Condor Videos](#)

[Mobile Field Trips](#)

[SmartFigure Tutorials](#)

[Animations](#)

[Videos](#)

[GEODe Earth](#)

[Animation Library](#)

[RSS Feeds](#)

[Key Term Study Tools](#)

[Dire Predictions: Understanding Climate Change 2/e eText](#)

③ Visualize

Project Condor Videos

[Continental Rifting in the Southwestern United States](#)

Mobile Field Trips

[Fire and Ice Land](#)

[The San Andreas Fault](#)

SmartFigure Tutorials

[Pangaea](#)

[Crust vs. lithosphere](#)

[Divergent boundaries](#)

[Convergent boundaries](#)

[Transform boundaries](#)

[Magnetic reversals](#)

Animations

[The Breakup of Pangaea](#)

[Collision of India and Eurasia NEW!](#)

[Sea Floor Spreading and Magnetization](#)

[Sea Floor Spreading and Plate Boundaries](#)

[Plate Boundary Features](#)

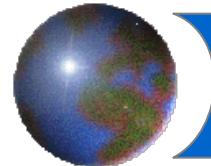
[Motion at Plate Boundaries](#)

[Transform Faults](#)

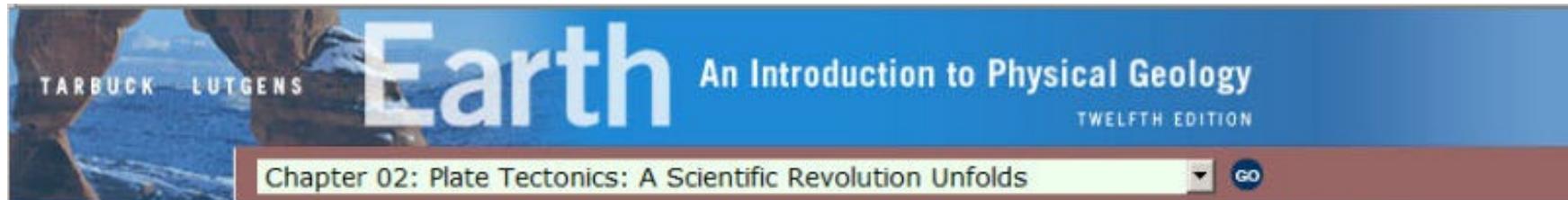
[Hot Spot Volcano Tracks](#)

[Convection and Tectonics](#)

[Magnetic Reversals NEW!](#)



Focus On Concepts



Student Home

Pearson eText

Condor Videos

Mobile Field Trips

SmartFigure
Tutorials

Animations

Videos

GEODe Earth

Animation Library

RSS Feeds

Key Term Study Tools

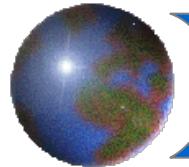
Dire Predictions: Understanding Climate Change 2/e eText

Chapter 02: Plate Tectonics: A Scientific Revolution Unfolds

GO

Home > Chapter 02: Plate Tectonics: A Scientific Revolution Unfolds > Student Home > **Focus on Concepts**

- Discuss the view that most geologists held prior to the 1960s regarding the geographic positions of the ocean basins and continents.
- List and explain the evidence presented by Wegener to support his continental drift hypothesis.
- Discuss the two main objections to the continental drift hypothesis.
- Identify Earth's major plates on a map and list and describe the three types of plate boundaries.
- Sketch and describe the movement along a divergent plate boundary that results in the formation of new oceanic lithosphere.
- Compare and contrast the three types of convergent plate boundaries and name a location where each type can be found.
- Describe the relative motion along a transform fault boundary and be able to locate several examples on a plate boundary map.
- Summarize the evidence used to support the plate tectonics theory.
- Describe two methods researchers use to measure relative plate motion.
- Discuss what is meant by plate–mantle convection and explain two of the primary driving forces for plate motion.



Visualize:

TARBUCK LUTGENS

Earth

An Introduction to Physical Geology

TWELFTH EDITION

Chapter 02: Plate Tectonics: A Scientific Revolution Unfolds



Student Home

Pearson eText

Condor Videos

Mobile Field Trips

SmartFigure
Tutorials

Animations

Videos

GEODe Earth

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Key Term Study
Tools

Dire Predictions:
Understanding
Climate Change 2/e
eText

③ Visualize

Project Condor Videos

[Continental Rifting in the Southwestern United States](#)

Mobile Field Trips

[Fire and Ice Land](#)

[The San Andreas Fault](#)

SmartFigure Tutorials

[Pangaea](#)

[Crust vs. lithosphere](#)

[Divergent boundaries](#)

[Convergent boundaries](#)

[Transform boundaries](#)

[Magnetic reversals](#)

Animations

[The Breakup of Pangea](#)

[Collision of India and Eurasia](#) NEW!

[Sea Floor Spreading and Magnetization](#)

[Sea Floor Spreading and Plate Boundaries](#)

[Plate Boundary Features](#)

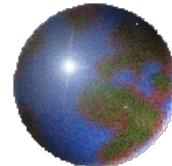
[Motion at Plate Boundaries](#)

[Transform Faults](#)

[Hot Spot Volcano Tracks](#)

[Convection and Tectonics](#)

[Magnetic Reversals](#) NEW!



Read (e-text – if you opt in...)

Animations

GEODe

RSS Feed

Key Term Study
Tools

② Read

 [Chapter 01: An Introduction to Geology](#)

③ Visualize

SmartFigures

[Geologic Time](#)

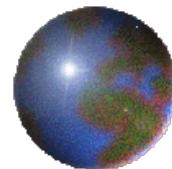
[The Nebular Theory](#)

[Earth's Layers](#)

[The Rock Cycle](#)

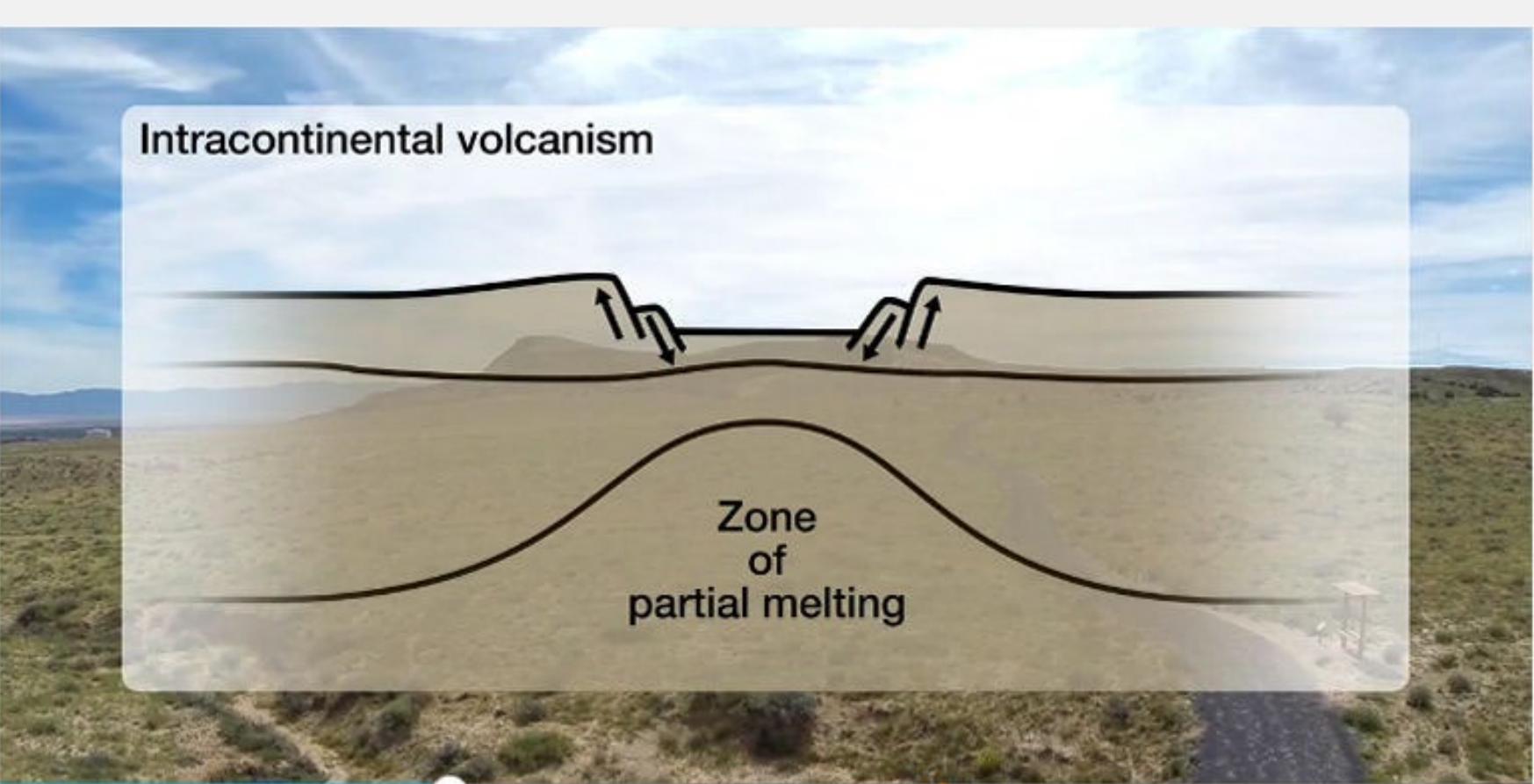
[Shields, platforms, and mountain belts](#)

GEODe Earth



Visualize: Project Condor Videos

Intracontinental volcanism



Zone
of
partial melting

01:29 / 05:17

info

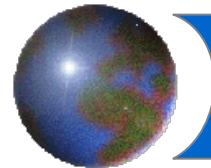


Speed
-

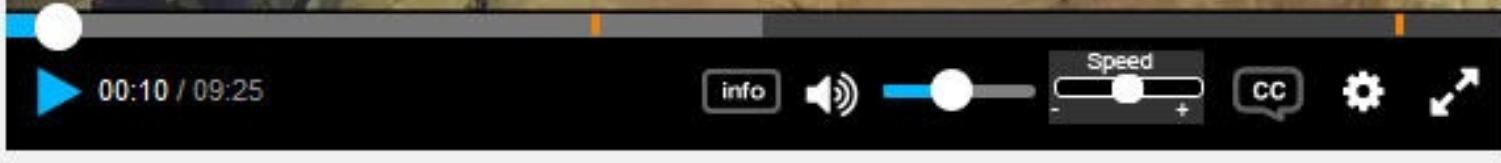
+

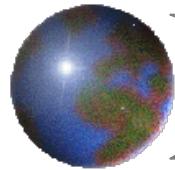
cc





Mobile Field Trips





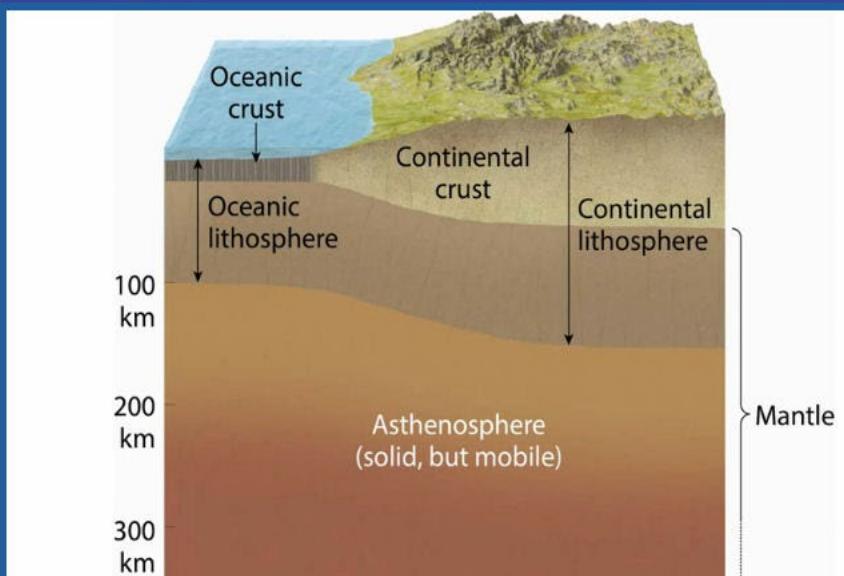
Visualize: “SmartFigures”

Pearson Science - Smart Figures - Mozilla Firefox

media.pearsoncmg.com/bc/bc_0media_geo/smartfigure/sf-CrustVsLithosphere.html

SmartFigures are posted for the exclusive use of students and instructors using the 11th Edition of Earth: An Introduction to Physical Geology, by Tarbuck, Lutgens, and Tasa, and the 7th Edition of Foundations of Earth Science, by Lutgens, Tarbuck, and Tasa. All art Copyright 2014 Dennis Tasa.

PEARSON **ALWAYS LEARNING**



Oceanic crust

Oceanic lithosphere

100 km

200 km

300 km

Continental crust

Continental lithosphere

Asthenosphere (solid, but mobile)

2900 km

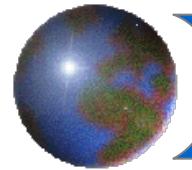
© 2014 Pearson Education, Inc.

02:19

04:19

playback trouble?

Copyright © Pearson Education, Inc. or its affiliate(s). All Rights Reserved.



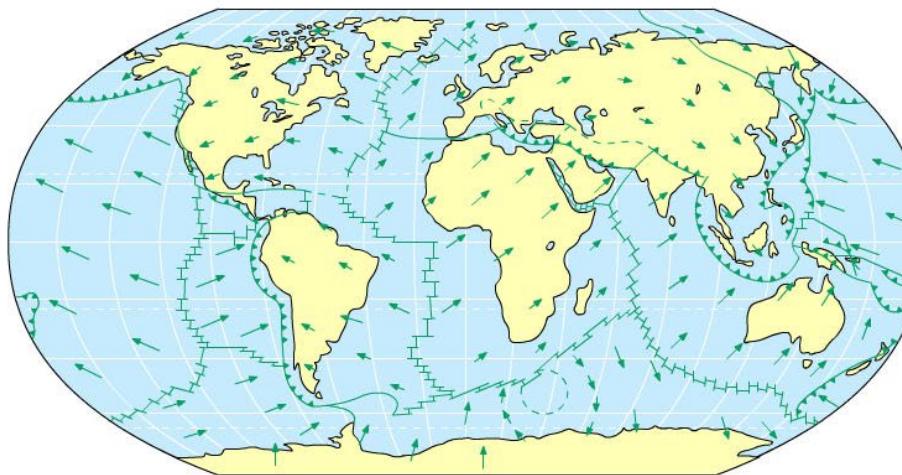
Visualize: Animations

The Breakup of Pangaea - Mozilla Firefox

media.pearsoncmg.com/bc/bc_0media_geo/interactiveanimations/noqzs/064_Pangaea_TR_GO_Ins.html

The Breakup of Pangaea

Introduction Profile View of the South Atlantic The Breakup of Pangaea HIDE TEXT



The Breakup of Pangaea

The animation begins with a world map that shows Earth's current distribution of continents and plates of the lithosphere. Notice that most plates contain a whole continent or a portion of one as well as a large region of sea floor. As a result, most plates include both continental and oceanic lithosphere. Also notice that most plate boundaries (shown by green lines) do not follow the edges of continents. Green arrows indicate the general direction of the plate movement. Plates are moving away from each other at mid-ocean ridge spreading

Labels Off

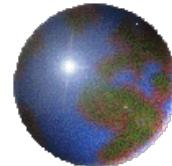
00:04 02:55

PAUSE

Previous | Next

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PEARSON



Chapter Quizzes (practice only)

Chapter 01: An Introduction to Geology

GO

[Home](#) > [Chapter 01: An Introduction to Geology](#) > [Student Home](#) > [Chapter Quiz](#)

This activity contains 20 questions.

1.

Which of the following are accurate definitions of *physical geology* and *historical geology*?

[Hint]

- Physical geology examines the materials composing Earth and seeks to understand the many processes that operate beneath and upon its surface. Historical geology documents the major discoveries, scientists, and development of geologic thought.
- Physical geology examines only the physics of Earth materials. Historical geology seeks to understand the origin of Earth and its development through time.
- Physical geology examines the materials composing Earth and seeks to understand the many processes that operate beneath and upon its surface. Historical geology examines the geologic period that covers human history.
- Physical geology examines the materials composing Earth and seeks to understand the many processes that operate beneath and upon its surface. Historical geology seeks to understand the origin of Earth and its development through time.

2.

According to the textbook, understanding Earth is challenging because our planet is a body with many interacting parts and a complex history

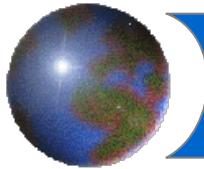
[Hint]

3.

A natural hazard is a natural process that endangers humans.

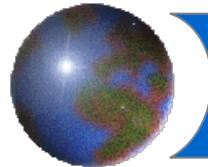
[Hint]

- True



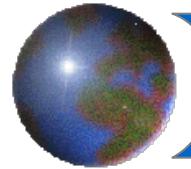
Summary

- **Keep up to date!**
 - check 'Announcements' section in Canvas
- **Canvas and the unofficial web site have links to other resources**
 - Videos
 - PowerPoints
 - Web-links
 - And more!
- **Be curious!**



Summary

- Most of the learning will occur in MasteringGeology
 - ☒ For each chapter, there will be a:
 - ◆ Homework assignment (~15 to 45 points)
 - ☒ Use the Study Area for more information
- Things that will be submitted into Canvas:
 - ◆ Writing Assignments (400 points)
 - ◆ Rocks and minerals SLO exercise,
 - ◆ SLO Test (end of semester, 10 points)



Weighted Percentage

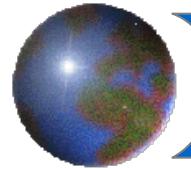
A (superior effort): 90 – 100%

B (better than average): 80 – 89%

C (average): 68 – 79%

D (below average): 55 – 67%

F (failing): < 54%



Tentative Grades

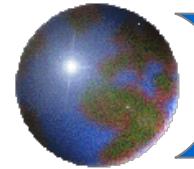
Mastering homework: 779 points

Writing assignments (3): 400

Syllabus Quiz: 10

SLO (minerals/rocks) Quiz: 10

Total: 1,199 points

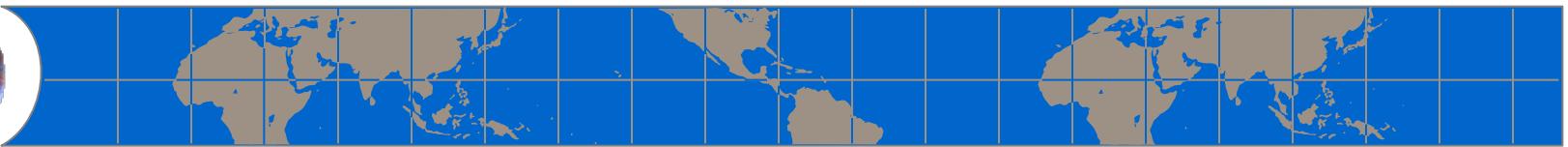
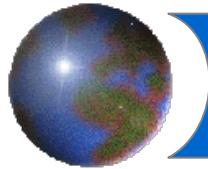


On a negative note...

● PLAGIARISM

- Ugly word, even uglier deed!
- Look it up – it's stealing...
- It's easy to copy and paste from various sources, which makes it easy to detect!
- “cheaters never prosper”

● ‘nuff said...



If you don't understand, please ask!

(in a timely fashion)

philfarq@gmail.com

(best way to contact me)

philfarq@gmail.com
(if you have questions)

the end?