

Augmented Reality Enhances the Reading Experience, Bringing the Textbook to Life

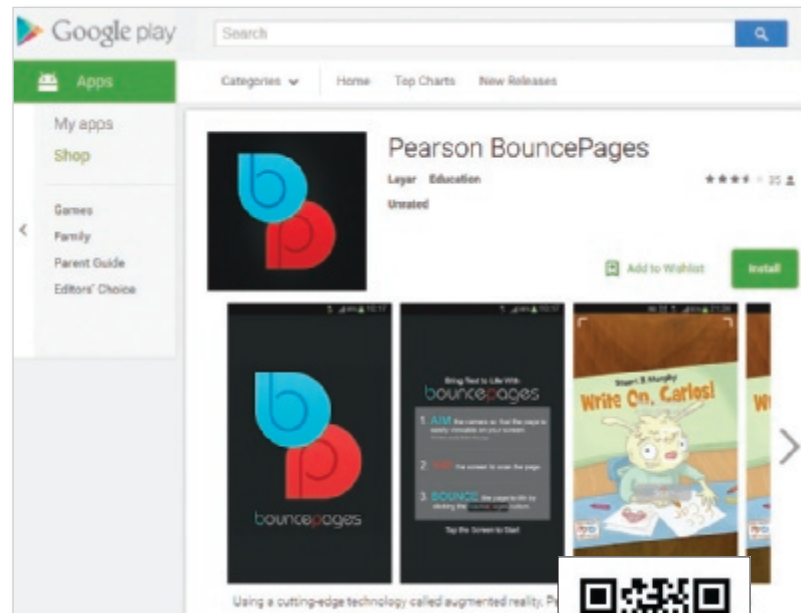


Using a cutting-edge technology called augmented reality, Pearson's BouncePages app launches

engaging, interactive videos and animations that bring textbook pages to life. Use your mobile device to scan a SmartFigure identified by the BouncePages icon, and an animation or video illustrating the SmartFigure's concept launches immediately. No slow websites or hard-to-remember logins required.

BouncePages' augmented reality technology transforms textbooks into convenient digital platforms, breathes life into your learning experience, and helps you grasp difficult academic concepts. Learning geology from a textbook will never be the same.

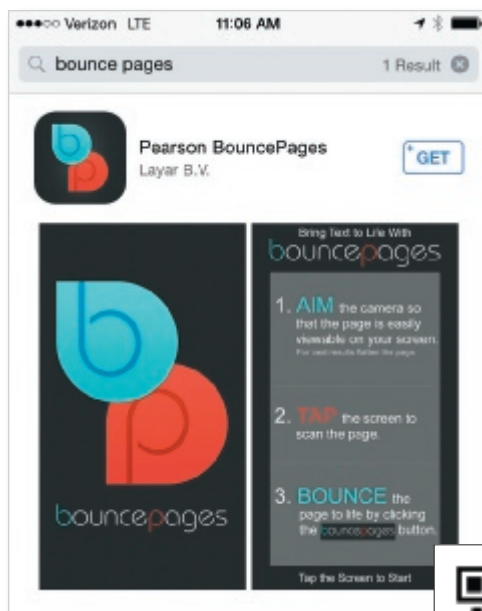
Download the FREE BP App for Android



<https://play.google.com/store/apps/details?id=com.layar.bouncepages&hl=en>



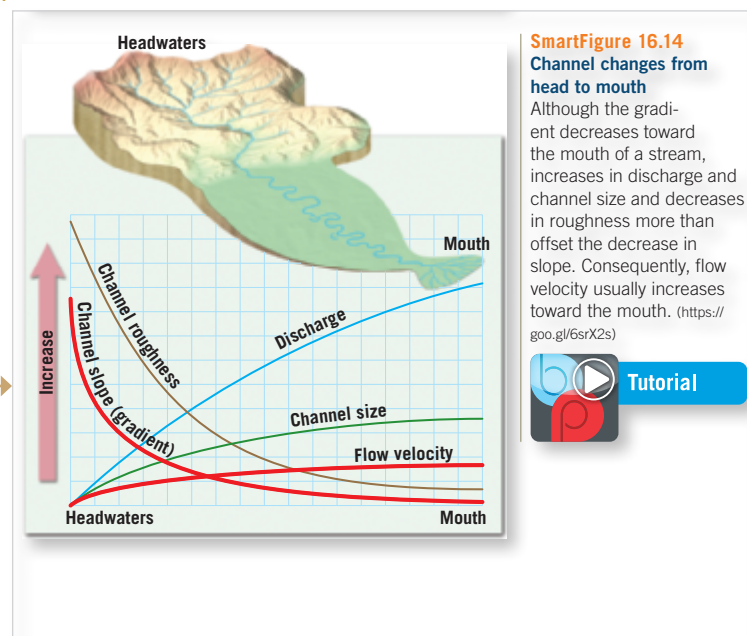
Download the FREE BP App for iOS



<https://itunes.apple.com/us/app/pearson-bouncepages/id659370955?mt=8>



By scanning figures associated with the BouncePages icon, students will be immediately connected to the digital world and will deepen their learning experience with the printed text.



Bring the Field to YOUR Teaching and Learning Experience



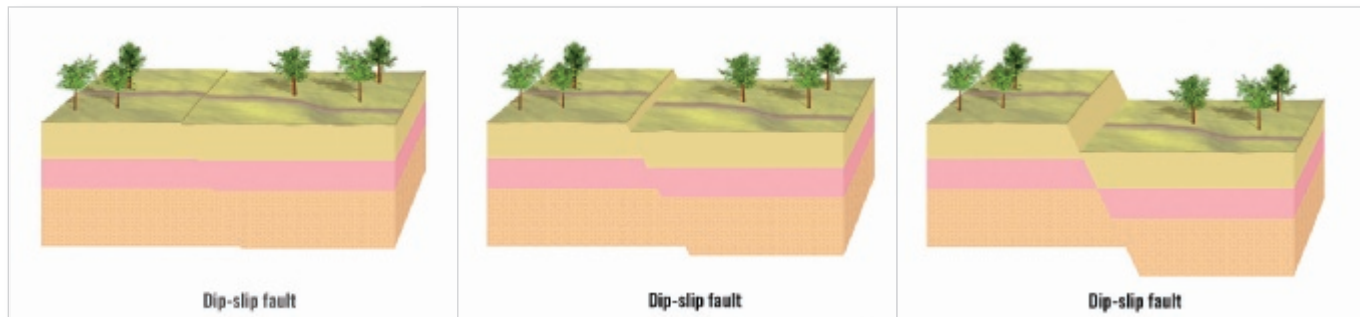
NEW! SmartFigure: Condor Videos. Bringing Physical Geology to life for GenEd students, three geologists, using a quadcopter with a GoPro camera mounted to it, have ventured out into the field to film 10 key geologic locations. These process-oriented videos, accessed through BouncePages technology, are designed to bring the field to the classroom or dorm room and enhance the learning experience in our texts.



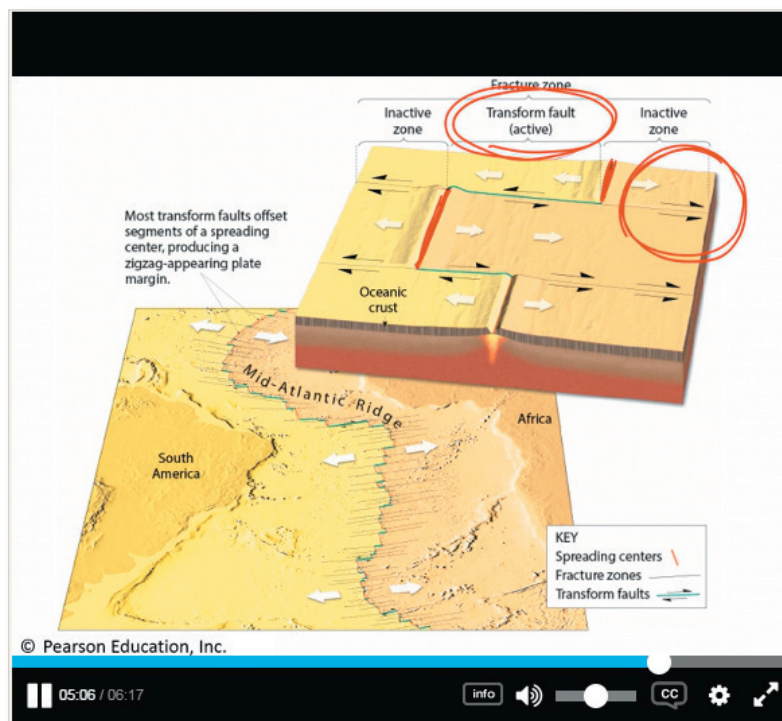
NEW! SmartFigure: Mobile Field Trips. Scattered throughout this new edition of Earth are **24 video field trips**. On each trip, you will accompany geologist-pilot-photographer Michael Collier in the air and on the ground to see and learn about iconic landscapes that relate to discussions in the chapter. These extraordinary field trips are accessed by using the BouncePages app to scan the figure in the chapter—usually one of Michael's outstanding photos.



Visualize Processes and Tough Topics



NEW! SmartFigure: Animations are brief videos, many created by text illustrator Dennis Tasa, that animate a process or concept depicted in the textbook's figures. This technology allows students to view moving figures rather than static art to depict how a geologic process actually changes through time. The videos can be accessed using Pearson's BouncePages app for use on mobile devices, and will also be available via MasteringGeology.



Callan Bentley, SmartFigure Tutorial author, is a Chancellor's Commonwealth Professor of Geology at Northern Virginia Community College (NOVA) in Annandale, Virginia. Trained as a structural geologist, Callan teaches introductory level geology at NOVA, including field-based and hybrid courses. Callan writes a popular geology blog called *Mountain Beltway*, contributes cartoons, travel articles, and book reviews to *EARTH* magazine, and is a digital education leader in the two-year college geoscience community.



SmartFigure: Tutorials bring key chapter illustrations to life! Found throughout the book, these Tutorials are sophisticated, annotated illustrations that are also narrated videos. They are accessible on mobile devices via scannable BouncePages printed in the text and through the Study Area in MasteringGeology.



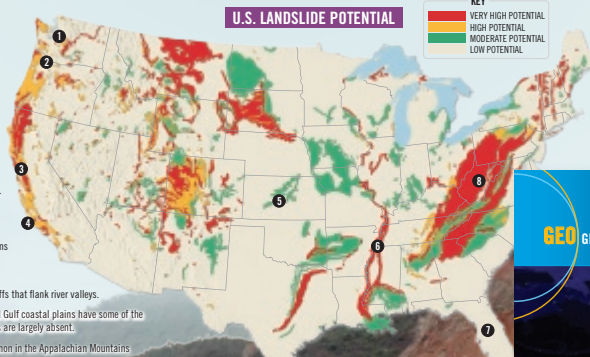
Improved Geospatial and Data Visualizations

GEO GRAPHICS 15.2

Landslide Risks: United States and Worldwide

According to the U. S. Geological Survey, each year in the United States, landslides cost nearly \$4 billion (2010 dollars) in damage repair and cause between 25 and 50 deaths. All states experience rapid mass-wasting processes, but not all areas have the same landslide potential. What's the risk where you live?

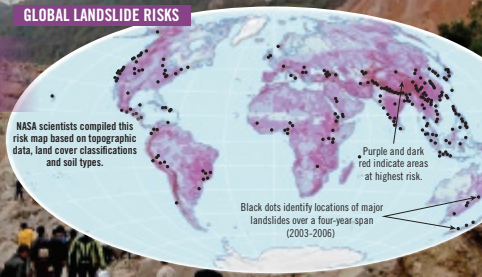
- 1 In parts of the Seattle area, volcanic mudflows called lahars are a potential threat.
- 2 In the mountainous parts of the Pacific Northwest, heavy rains and melting snow often trigger rapid forms of mass wasting.
- 3 Coastal California's steep slopes have a high landslide potential often triggered by winter storms or ground shaking associated with earthquakes.
- 4 Strong wave activity undercuts and oversteepens coastal cliffs.
- 5 In the center of the country, the plains states are relatively flat, so landslide potential is mostly low-to-moderate.
- 6 High potential occurs along steep bluffs that flank river valleys.
- 7 Florida and the adjacent Atlantic and Gulf coastal plains have some of the lowest potential because steep slopes are largely absent.
- 8 In the East, landslides are most common in the Appalachian Mountains.



GLOBAL LANDSLIDE RISKS

Question: What do areas with the highest landslide potential have in common?

NASA scientists compiled this risk map based on topographic data, land cover classifications and soil types.



Black dots identify locations of major landslides over a four-year span (2003-2006)

GEOgraphics use contemporary, compelling visual representations to illustrate complex concepts, enhancing students' ability to synthesize and recall information and important data.

GEO GRAPHICS 1.1

World Population Passes 7 Billion

Complicating all environmental issues is rapid world population growth and everyone's aspiration to a better standard of living. There is a ballooning demand for resources and a growing pressure for people to live in environments having significant geologic hazards.

WORLD'S 10 LARGEST METRO AREAS IN 2010
MILLIONS OF CITIZENS

NEW YORK, USA
18,450,000

MEXICO CITY, MEXICO
18,400,000

SAO PAULO, BRAZIL
20,200,000

This composite satellite image of Earth's city lights helps us appreciate the intensity of human occupation in many parts of the world. In the year 1000, only about 3 percent of the world's people were urban. Today about 51 percent are classified as urban.

Eye on Earth features engage students in active learning, asking them to perform critical thinking and visual analysis tasks to evaluate data and make predictions.

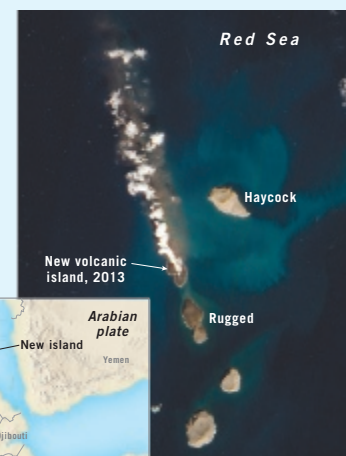
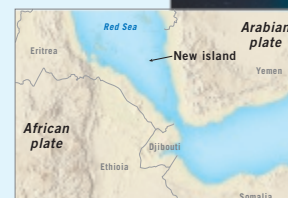
EYE ON EARTH 2.1

In December 2011 a new volcanic island formed near the southern end of the Red Sea. Less than 2 years later, in late October 2013, another volcanic island emerged in the same area. These volcanic islands are part of several small islands in the Zubair Group located off the west coast of Yemen, along the Red Sea Rift.

QUESTION 1 What type of plate boundary produced these new volcanic islands?

QUESTION 2 What two plates border the Red Sea Rift?

QUESTION 3 Are these two plates moving *toward* or *away* from each other?



Modular Approach Driven by Learning Objectives

The new edition is designed to support a four-part learning path, an innovative structure which facilitates active learning and allows students to focus on important ideas as they pause to assess their progress at frequent intervals.

The chapter-opening **Focus on Concepts** lists the learning objectives for each chapter. Each section of the chapter is tied to a specific learning objective, providing students with a clear learning path to the chapter content.

10 Crustal Deformation



Wynning's Grand Tetons are the result of crustal deformation created by tectonic forces that operate in Earth's interior (image courtesy).

FOCUS ON CONCEPTS

Each statement represents the primary **LEARNING OBJECTIVE** for the corresponding major heading within the chapter. After you complete the chapter you should be able to:

- 10.1 Describe the three types of differential stress and name the type of plate boundary most commonly associated with each.
- 10.2 Compare and contrast brittle and ductile deformation.
- 10.3 List and describe five common folded structures.
- 10.4 Sketch and briefly describe the relative motion of rock bodies located on opposite sides of normal, reverse, and thrust faults as well as both types of strike-slip faults.
- 10.5 Explain how strike and dip are measured and how these measurements help geologists about the orientations of rock structures located mainly below Earth's surface.

Concepts in Review, a fresh approach to the typical end-of-chapter material, provides students with a structured and highly visual review of each chapter. Consistent with the Focus on Concepts and Concept Checks, the **Concepts in Review** is structured around the section title and the corresponding learning objective for each section.

Each chapter section concludes with **Concept Checks**, a feature that lists questions tied to the section's learning objective, allowing students to monitor their grasp of significant facts and ideas.

10.5 Concept Checks

1. Distinguish between the two measurements used to establish the orientation of deformed strata.
2. Briefly describe the method geologists use to infer the orientation of rock structures that lie mainly below Earth's surface.

10 Concepts in Review Crustal Deformation

10.1 What Causes Rock to Deform?

Describe the three types of differential stress and name the type of plate boundary most commonly associated with each.

KEY TERMS deformation, rock structure (geologic structure), stress, confining pressure, differential stress, compressional stress, tensional stress, shear stress, strain

- Rock structures are generated when rocks are deformed by bending or breaking due to differential stress. Crustal deformation produces geologic structures that include folds, faults, joints, foliation, and rock cleavage.

- Stress is the force that drives rock deformation. When stress has the same magnitude in every direction, it is called confining pressure. Alternatively, when the amount of stress coming from one direction is greater in magnitude than the stress coming from another direction, we call it differential stress. There are three main types of differential stress: compressional, tensional, and shear stress.
- Strain is the change in the shape of a rock body caused by stress.

- Classify the following everyday situations as illustrating confining pressure, compressional stress, tensional stress, or shear stress: (a) a watermelon being run over by a steamroller, (b) a person diving to the bottom of the deep end of a swimming pool, (c) playing a game of tug-of-war, (d) kneading bread dough, and (e) stepping on a banana peel.

10.2 How Do Rocks Deform?

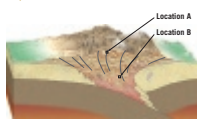
Compare and contrast brittle and ductile deformation.

KEY TERMS elastic deformation, brittle deformation, ductile deformation, outcrop

- There are several types of deformation. Elastic deformation is a temporary stretching of the chemical bonds in a rock. When the stress is released, the bonds snap back to their original lengths. When stress is greater than the strength of the bonds, the rock deforms in either a brittle or ductile fashion. Brittle deformation occurs when rocks break into smaller pieces, whereas ductile deformation is a solid-state flow that allows a rock to bend without fracturing.
- The type of deformation (brittle or ductile) that occurs depends mainly on temperature, confining pressure, rock type, and time. In Earth's upper crust where temperatures and pressure are low, rocks tend to exhibit brittle behavior and break or fracture. At depth rocks tend to deform by flowing or bending.
- Igneous rocks tend to be strong and are more likely to deform in a brittle fashion, whereas sedimentary rocks are weaker and usually deform in a ductile fashion.

- The rate at which differential stress is applied also affects how rocks deform. Silly Putty provides a good analogy. If pulled apart quickly, Silly Putty tends to break, whereas if pulled apart slowly, it tends to stretch (ductile flow) without breaking.

- Examine the accompanying illustration of a collision between two tectonic plates. At which location (A or B) would brittle deformation be more prevalent than ductile deformation?



- The shape of a fold does not necessarily correlate to the shape of the landscape above it. Baller's surface topography usually reflects patterns of differential weathering.

- A fold is said to plunge when its axis penetrates the ground at an angle. This results in a V-shaped outcrop pattern of the folded layers. Domes and basins are large folds that produce nearly circular-shaped outcrop patterns. The overall shape of a dome or basin is like a saucer or a bowl, either right-side-up (basin) or inverted (dome).
- Monoclines are large step-like folds in otherwise horizontal strata that result from subsurface faulting. Imagine a carpet draped over a short staircase to envision how the strata can go from horizontal to tilted and back to horizontal again.

KEY TERMS fault, reverse fault, thrust fault, Klippe, strike-slip fault, transform fault, oblique-slip fault, megathrust fault, fault scarp, slickenside, joint

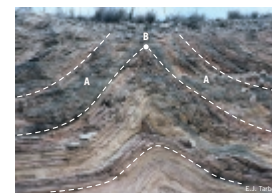
- Faults are fractures along which one rock body slides past another. The direction of offset on a fault may be determined by comparing the blocks of rock on either side of the fault surface. Faults in which movement is primarily parallel to the dip of the fault surface are called dip-slip faults. Dip-slip faults are classified as normal faults if the hanging wall moves down relative to the footwall and as reverse faults if the hanging wall moves up relative to the footwall. Large

Give It Some Thought

1. Is granite or mica schist more likely to fold or flow rather than fracture when subjected to differential stress? Explain.
2. What type of deformation is illustrated by a coin that was run over by a passing train?
 - a. Name the type of fold shown.
 - b. Would you describe this fold as symmetrical or asymmetrical?
3. Refer to the accompanying photo to answer the following questions:
 - a. Name the type of fold shown.
 - b. Would you describe this fold as symmetrical or asymmetrical?



Anthony Pissaklary



- c. What name is given to the part of the fold labeled A?
- d. Is the white dot labeled B located along the fold line, hinge line, or dip line of this particular fold?
4. Refer to the accompanying diagrams to answer the following:
 - a. What type of dip-slip fault is shown in Diagram 1? Were the dominant forces during faulting tensional, compressional, or shear?

Give It Some Thought (GIST) is found at the end of each chapter and consists of questions and problems asking students to analyze, synthesize, and think critically about Geology. GIST questions relate back to the chapter's learning objectives, and can easily be assigned using MasteringGeology.

Continuous Learning Before, During, and After Class with **MasteringGeology**TM

MasteringGeology delivers engaging, dynamic learning opportunities—focusing on course objectives responsive to each student’s progress—that are proven to help students learn geology course material and understand challenging concepts.

Before Class

Dynamic Study Modules and eText 2.0 provide students with a preview of what's to come.

The screenshot shows a 'LEARN' section with a question: 'What type of faults are the products of horizontally directed, extensional stresses?'. The answer is 'Normal faults', which is marked as 'THE CORRECT ANSWER'. Other options include 'Strike-slip faults', 'Reverse faults', 'Thrust faults', and 'I DON'T KNOW YET'. Below the question is a 'WHAT YOU NEED TO KNOW' section with definitions for Normal faults, Reverse faults, Thrust faults, and Strike-slip faults.

Dynamic Study Modules enable students to study effectively on their own in an adaptive format. Students receive an initial set of questions with a unique answer format asking them to indicate their confidence.

Once completed, Dynamic Study Modules include explanations using material taken directly from the text.

The screenshot shows a chapter titled 'Movement of Water Through the Atmosphere'. It includes a text paragraph about the hydrologic cycle and a 'SmartFigure 4.1 Earth's hydrologic cycle' diagram. The diagram shows the water cycle with various processes and their percentages: Total evaporation (2.26%), Surface water evaporation (1.13%), Surface water and other evaporation (0.22%), Transpiration (0.44%), Precipitation on land (56,000 km³), and Precipitation over the ocean (118,000 km³). Below the diagram is a video player titled 'Hydrologic Cycle'.

NEW! Interactive eText 2.0 complete with embedded media. eText 2.0 is mobile friendly and ADA accessible.

- Now available on smartphones and tablets.
- Seamlessly integrated videos and other rich media.
- Accessible (screen-reader ready).
- Configurable reading settings, including resizable type and night reading mode.
- Instructor and student note-taking, highlighting, bookmarking, and search.

During Class

Engage Students with Learning Catalytics

Learning Catalytics, a “bring your own device” student engagement, assessment, and classroom intelligence system, allows students to use their smartphone, tablet, or laptop to respond to questions in class.

The screenshot shows a 'learning catalytics' interface with a question: 'What metamorphic conditions represent regional metamorphism?'. The question is accompanied by a P-T diagram showing different metamorphic zones. The interface also displays 'Historical Performance' (53 students, 64% correct) and the 'Answer' (a P-T diagram). Tags include 'metamorphic rocks', 'learning objective 8.5', 'metamorphism', and 'regional metamorphism'.

After Class

Easy-to-Assign, Customizable, and Automatically Graded Assignments

19 Crustal Deformation and Mountain B... Condor Videos: Monoclines of the Colorado Plateau

Item Type: Coaching Activities | Difficulty: 2 | Time: 5m

Condor Videos: Monoclines of the Colorado Plateau

Watch the video on monoclines

After you have finished, answer the questions.

Part D - Structure of a monocline

A cross-section of a monocline is shown below. Use what you learned in the video to label the parts of the monocline and the directional forces that created it.

Drag the appropriate labels to their respective targets. Not all labels will be used.

uplifted sedimentary rocks

downlifted sedimentary rocks

Submit My Answers Give Up Review Part

Incorrect; Try Again

You labeled 1 of 4 targets incorrectly. Think about where the basement rocks would be located relative to the sedimentary layer.

Part B - The San Rafael Swell

NEW! Project Condor Videos capture stunning footage of the Mountain West region with a quadcopter and a GoPro camera. A series of videos have been created with annotations, sketching, and narration to improve the way students learn about faults and folds, streams, volcanoes, and so much more. In Mastering, these videos are accompanied by questions designed to assess students on the main takeaways from each video.

NEW! 24 Mobile Field Trips take students to classic geologic locations as they accompany geologist-pilot-photographer-author Michael Collier in the air and on the ground to see and learn about landscapes that relate to concepts in the chapter. In Mastering, these videos will be accompanied by auto-gradable assessments that will track what students have learned.

2011 Geology Demo Assignment Mobile Field Trip Video Quiz - The San Andreas Fault

Item Type: Coaching Activities | Difficulty: 2 | Time: 3m | Learning Outcomes | Contact the Publisher

Manage this Item Standard View

Mobile Field Trip Video Quiz - The San Andreas Fault

Watch the Mobile Field Trip Video

Part A

Earth's outer layer is composed of seven dominant plates. What is the name of this rigid outer layer?

hydrosphere

asthenosphere

mantle

mesosphere

lithosphere

Submit My Answers Give Up Review Part

Part B

What type of plate interaction produces the San Andreas Fault?

Diverging plates

converging plates

plates sliding past one another

Submit My Answers Give Up Review Part

Part C

The landslides along with in the town of Hollister, California are a result of _____

extensive tectonic activity whereby magma rises towards the surface causing structural damage

a large earthquake that caused major loss of life and property damage

Part B - Materials associated with each type of mass movement

The various types of mass movements are different in terms of the materials they contribute, and this difference results in a unique mark on the landscape for each type.

You will label the five types of mass wasting in terms of the materials they carry.

Drag the appropriate labels to their respective targets.

Slump

Material: Unconsolidated sediments along a curved surface

Slide

Material: Layered sediments gradually & irregularly downhill

Flow

Material: Sometimes ash

Creep

Material: Blocks of bedrock broken loose and sliding downhill

Fall

Material: Builds on a rocky cliff

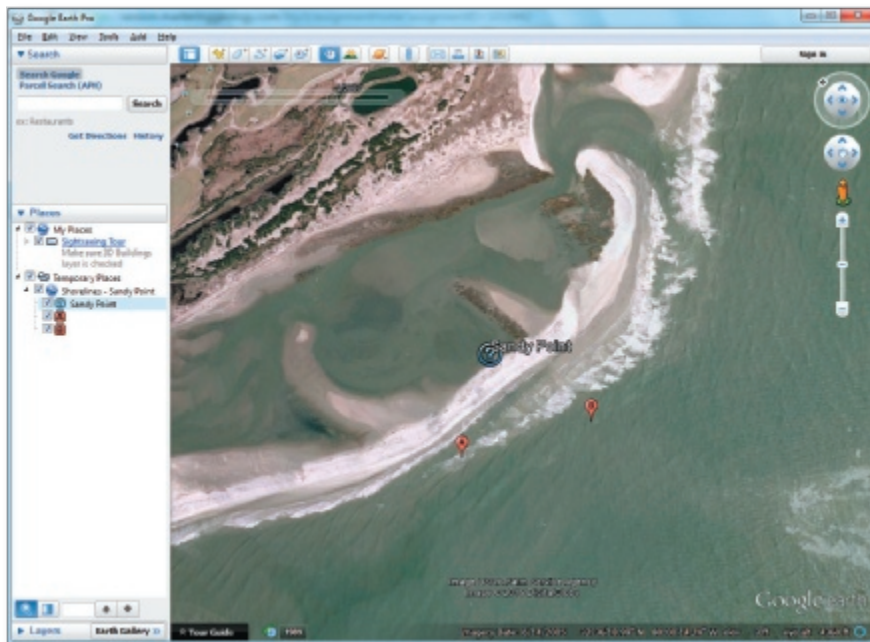
Submit My Answers Give Up Review Part

Incorrect; Try Again

You labeled 2 of 5 targets incorrectly. Which type of mass movement involves the movement of consolidated blocks of detached bedrock and has a distinct zone of weakness separating the slide material from the more stable underlying material?

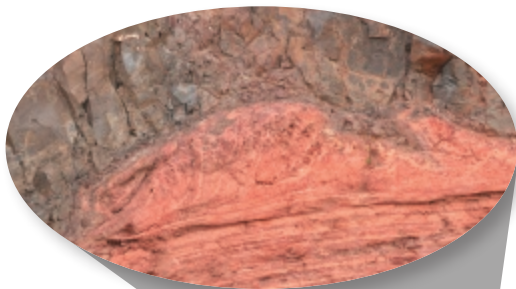
GeoTutor coaching activities help students master important geologic concepts with highly visual, kinesthetic activities focused on critical thinking and application of core geoscience concepts.

MasteringGeology™



Encounter Activities provide rich, interactive explorations of geology and earth science concepts using the dynamic features of Google Earth™ to visualize and explore earth's physical landscape. Dynamic assessment includes questions related to core geology concepts. All explorations include corresponding Google Earth KMZ media files, and questions include hints and specific wrong-answer feedback to help coach students towards mastery of the concepts while improving students' geospatial skills.

NEW! GigaPan Activities allow students to take advantage of a virtual field experience with high-resolution picture technology that has been developed by Carnegie Mellon University in conjunction with NASA.



Part D - Making Observations

After exploring the Gigapan field site, arrange the following observations/inferences by their respective rock unit. These observations/inferences describe the material, appearance and weathering pattern of the respective rock units.

Drag the appropriate items into their respective bins. Each item may be used only once.

Rock Unit 1

- Red and white in color
- Appears to be made up of many thin layers
- Weathered in small irregular shapes
- Weathered in large blocks
- Appears to be massive (no layers)
- Sediments too small to see

Rock Unit 2

- Black and dark gray in color
- Crystals too small to see

[reset](#) [help](#)

[Submit](#) [Hints](#) [My Answers](#) [Give Up](#) [Review Part](#)

Incorrect; Try Again

You sorted 2 out of 8 items incorrectly. Compare the weathering pattern of rock unit #2 to the weathering pattern of rock unit #1. Which rock unit produces large blocks?



Additional MasteringGeology assignments available:

- SmartFigures
- Interactive Animations
- Give It Some Thought Activities
- Reading Quizzes
- MapMaster Interactive Maps