Essentials of
GEOLOGY
13e
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The thirteenth edition of *Essentials of Geology*, like its predecessors, is a college-level text that is intended to be a meaningful, nontechnical survey for students taking their first course in geology. In addition to being informative and up-to-date, a major goal of this book is to meet the need of students for a readable and user-friendly text that is a valuable tool for learning the basic principles and concepts of geology.

Although many topical issues are treated in the 13th edition of *Essentials*, it should be emphasized that the main focus of this new edition remains the same as the focus of each of its predecessors: to promote student understanding of basic principles. As much as possible, we have attempted to provide the reader with a sense of the observational techniques and reasoning processes that constitute the science of geology.

**New & Important Features**

This 13th edition is an extensive and thorough revision of *Essentials of Geology* that integrates improved textbook resources with new online features to enhance the learning experience:

- **Significant updating and revision of content.** A basic function of a college science textbook is to provide clear, understandable presentations that are accurate, engaging, and up-to-date. In the long history of this textbook, our number-one goal has always been to keep *Essentials of Geology* current, relevant, and highly readable for beginning students. With this goal as a priority, every part of this text has been examined carefully. The following are a few examples. In Chapter 9, the text for Section 9.3, “Locating the Source of an Earthquake,” are substantially revised, and a discussion of the USGS Community Internet Intensity Map project is added. In Chapter 11, the treatment of stress, strain, and rock deformation is substantially revised, as is the final section on isostatic balance. In Chapter 12, the mechanism responsible for long-runout landslides is updated, with reference to the occurrence of such landslides on Mars, and the 2015 Nepal earthquake is used as a landslide-triggering event. In Chapter 13, a section on the loss of wetlands in coastal Louisiana is added, and the treatment of flood control is updated and tightened. Many discussions, case studies, examples, and illustrations have been updated and revised.

- **SmartFigures make this 13th edition much more than a traditional textbook.** Through its many editions, an important strength of *Essentials* has always been clear, logically organized, and well-illustrated explanations. Now complementing and reinforcing this strength are a series of SmartFigures. Simply by scanning the Quick Response (QR) code next to a SmartFigure with a mobile device, students can link to hundreds of unique and innovative digital learning opportunities that will increase their understanding of important ideas. Each SmartFigure also displays a short URL for students who may lack a smartphone. SmartFigures are truly media that teach! The more than 200 SmartFigures in the 13th edition of *Essentials of Geology* are of five types:

1. **SmartFigure Tutorials.** Each of these 2- to 4-minute tutorials, prepared and narrated by Professor Callan Bentley, is a mini-lesson that examines and explains the concepts illustrated by the figure.

2. **SmartFigure Mobile Field Trips.** Scattered throughout this new edition are 24 video field trips that explore classic geologic sites from Iceland to Hawaii. On each trip you will accompany geologist/pilot/photographer Michael Collier in the air and on the ground to see and learn about landscapes that relate to discussions in the chapter.

3. **SmartFigures Condor.** The 10 Project Condor videos take you to sites in the American Mountain West. By coupling videos acquired by a quadcopter aircraft with ground-level views, effective narrative, and helpful animations, these videos will engage you in real-life case studies.

4. **SmartFigure Animations.** These animations bring the art to life, illustrating and explaining difficult-to-visualize topics more effectively than static art alone.

5. **SmartFigure Videos.** Rather than providing a single image to illustrate an idea, these figures include short video clips that help illustrate such diverse subjects as mineral properties and the structure of ice sheets.

- **Objective-driven active learning path.** Each chapter in this 13th edition begins with Focus on Concepts: a set of learning objectives that correspond to the chapter’s major sections. By identifying key knowledge and skills, these objectives help students prioritize the material. Each major section concludes with Concept Checks so that students can check their learning. Two end-of-chapter features complete the learning path. Concepts in Review is coordinated with the Focus on Concepts at the beginning of the chapter and with the numbered sections within the chapter. It is a readable and concise overview of key ideas, with photos, diagrams, and questions. Finally, the questions and problems in Give It Some Thought challenge learners by requiring higher-order thinking skills to analyze, synthesize, and apply the material.

- **An unparalleled visual program.** In addition to more than 100 new high-quality photos and satellite images, dozens of figures are new or have been redrawn by the gifted and highly respected geoscience illustrator Dennis Tasa. Maps and diagrams are frequently paired with photographs for greater effectiveness. Further, many new and revised figures have additional labels that narrate the process being illustrated and guide students as they examine the figures, resulting in a visual program that is clear and easy to understand.

**Digital & Print Resources**

**MasteringGeology™**

MasteringGeology® is the most effective and powerful online tutorial, homework, and assessment system available, proven to improve results by helping students master concepts quickly. Interactive,
self-paced coaching activities provide individualized coaching to help students stay on track. With a wide range of activities available, students learn actively and master challenging course concepts. See the MasteringGeology visual walkthrough section for more in-depth details.

Upon textbook purchase, students and teachers are granted access to MasteringGeology in one of the following ways:

- **Preview Access**: Teachers can request preview access online by visiting www.PearsonSchool.com/Access_Request. Select Science, choose Initial Access, and complete the form under Option 2. Preview Access information will be sent to the teacher via e-mail.

- **Adoption Access**: With the purchase of this program, a Pearson Adoption Access Card with Instructor Manual will be delivered with your textbook purchase. (ISBN: 978-0-13-353986-8)


- **OR**

- **Visit PearsonSchool.com/Access_Request, select Science, choose initial Access, and complete the form under Option 3—MyLab/ Mastering Class Adoption Access. Adoption access information will be sent to the teacher via e-mail.**

**Students, ask your teacher for access.**

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**For Instructors**

*Essentials of Geology, 13th Edition* provides an integrated teaching and learning package of support material for students and instructors.

Most of the teacher supplements and resources for this text are available electronically to qualified adopters within Mastering and on the Instructor Resource Center (IRC). Upon adoption or to preview, please go to www.pearsonschool.com/access_request and select Instructor Resource Center. You will be required to complete a brief one-time registration subject to verification of educator status. Upon verification, access information and instructions will be sent to you via email. Once logged into the IRC, enter ISBN 0-13-466349-7 in the “Search our Catalog” box to locate resources. Electronic teacher supplements are also available within the Instructor’s tab of MasteringGeology.

**Instructor Resource Center (Download Only)**

The IRC provides all of your lecture resources in one easy-to-reach place:

- The IRC provides all the line art, tables, and photos from the text in JPEG files.

- PowerPoint™ Presentations: Found in the IRC are three PowerPoint files for each chapter. Cut down on your preparation time, no matter what your lecture needs, by taking advantage of these components of the PowerPoint files:
  - **Exclusive art.** All the photos, art, and tables from the text, in order, have been loaded into PowerPoint slides.
  - **Lecture outline.** This set averages 50 slides per chapter and includes customizable lecture outlines with supporting art.
  - **Classroom Response System (CRS) questions.** Authored for use in conjunction with classroom response systems, these PowerPoint files allow you to electronically poll your class for responses to questions, pop quizzes, attendance, and more.

**Instructor Resource Manual (Download Only)**

The Instructor Resource Manual has been designed to help seasoned and new instructors alike, offering the following sections in each chapter: an introduction to the chapter, outline, learning objectives/focus on concepts; teaching strategies; teacher resources; and answers to Concept Checks and Give It Some Thought questions from the textbook. www.pearsonhighered.com/irc

**TestGen Computerized Test Bank (Download Only)**

TestGen is a computerized test generator that lets instructors view and edit Test Bank questions, transfer questions to tests, and print the test in a variety of customized formats. This Test Bank includes more than 2,000 multiple-choice, matching, and essay questions. Questions are correlated to Bloom’s Taxonomy, each chapter’s learning objectives, the Earth Science Learning Objectives, and the Pearson Science Global Outcomes to help instructors better map the assessments against both broad and specific teaching and learning objectives. The Test Bank is also available in Microsoft Word and can be imported into Blackboard, www.pearsonhighered.com/irc

**For Students**

*The following resources are available for purchase.*

**Laboratory Manual in Physical Geology, 11th Edition** by the American Geological Institute and the National Association of Geoscience Teachers, edited by Vincent Cronin, illustrated by Dennis G. Tasa (0134446607)

This user-friendly, best-selling lab manual examines the basic processes of geology and their applications to everyday life. Featuring contributions from more than 170 highly regarded geologists and geoscience educators, along with an exceptional illustration program by Dennis Tasa, *Laboratory Manual in Physical Geology, 11th edition*, offers an inquiry- and activities-based approach that builds skills and gives students a more complete learning experience in the lab. Pre-lab videos linked from the print labs introduce students to the content, materials, and techniques they will use each lab. These teaching videos help TAs prepare for lab setup and learn new teaching skills. The lab manual is available in MasteringGeology with Pearson eText, allowing teachers to use activity-based exercises to build students’ lab skills.

Periodic reports from the Intergovernmental Panel on Climate Change (IPCC) evaluate the risk of climate change brought on by humans. But the sheer volume of scientific data remains inscrutable to the general public, particularly to those who may still question the validity of climate change. In just over 200 pages, this practical text presents and expands upon the latest climate change data and scientific consensus of the IPCC's Fifth Assessment Report in a visually stunning and undeniably powerful way to the lay reader. Scientific findings that provide validity to the implications of climate change are presented in clear-cut graphic elements, striking images, and understandable analogies. The second edition integrates mobile media links to online media. The text is also available in various eText formats, including an eText upgrade option from MasteringGeology courses.

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- **Michael Collier.** As you read this text, you will see dozens of extraordinary photographs by Michael Collier. Most are aerial shots taken from his nearly 60-year-old Cessna 180. Michael was also responsible for preparing the remarkable Mobile Field Trips that are scattered through the text. Among his many awards is the American Geological Institute Award for Outstanding Contribution to the Public Understanding of Geosciences. We think that Michael’s photographs and field trips are the next best thing to being there. We were very fortunate to have had Michael’s assistance on Essentials of Geology, 13th edition. Thanks, Michael.

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Fred Lutgens
Ed Tarbuck
Use Dynamic Media to Bring Geology to Life
Bring Field Experience to Students’ Fingertips...

NEW! QR Codes link out to SmartFigures
Quick Response (QR) codes link out to over 200 videos and animations, giving readers immediate access to five types of dynamic media: Project Condor Quadcopter Videos, Mobile Field Trips, Tutorials, Animations, and Videos to help visualize physical processes and concepts. SmartFigures extend the print book to bring geology to life.

NEW! SmartFigure: Project Condor Quadcopter Videos
Bringing Physical Geology to life for geology students, three geologists, using a quadcopter-mounted GoPro camera, have ventured into the field to film 10 key geologic locations and processes. These process-oriented videos, accessed through QR codes, are designed to bring the field to the classroom and improve the learning experience within the text.

How to download a QR Code Reader
Using a smartphone, students are encouraged to download a QR Code reader app from Google Play or the Apple App Store. Many are available for free. Once downloaded, students open the app and point the camera to a QR Code. Once scanned, they’re prompted to open the url to immediately be connected to the digital world and deepen their learning experience with the printed text.
NEW! SmartFigure: Mobile Field Trips
On each trip, students 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 QR codes throughout the text. New Mobile Field Trips for the 13th edition include Formation of a Water Gap, Ice Sculpts Yosemite, Fire and Ice Land, Dendrochronology, and Desert Geomorphology.

NEW! SmartFigure: Animations
Brief animations created by text illustrator Dennis Tasa animate a process or concept depicted in the textbook’s figures. With QR codes, students are given a view of moving figures rather than static art to depict how geologic processes move throughout time.

HALLMARK! SmartFigure: Tutorials
These brief tutorial videos present the student with a 3- to 4-minute feature (mini-lesson) narrated and annotated by Professor Callan Bentley. Each lesson examines and explains the concepts illustrated by the figure. With over 100 SmartFigure Tutorials inside the text, students have a multitude of ways to enjoy art that teaches.
The language of this text is straightforward and written to be understood. Clear, readable discussions with a minimum of technical language is the rule. In the 13th edition, we have continued to improve readability with the addition of two new contributing authors, Scott Linnenman and Callan Bentley.

**Scott Linnenman** provided many thoughtful suggestions and idea throughout the text and was responsible for revising Chapter 12: Mass Movement on Slopes: The Work of Gravity. Linnenman is an award-winning Professor of Geology and Science Education and director of the Honors Program at Western Washington University in Bellingham.

**Callan Bentley** is Professor of Geology at Northern Virginia Community College in Annandale, where he has been honored many times as an outstanding teacher. He is a frequent contributor to EARTH magazine and is author of the popular geology blog Mountain Beltway. Bentley assisted with the revision of Chapter 11: Crustal Deformation and Mountain Building and created the SmartFigure Tutorials that appear throughout the text. As students take advantage of these outstanding learning aids, they will hear his voice explaining the ideas.
Most chapters have been designed to be self-contained so that materials may be taught in a different sequence, according to the preference of the instructor or the needs of the laboratory. Thus, an instructor who wishes to discuss erosional processes prior to earthquakes, plate tectonics, and mountain building may do so without difficulty.

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.

**Give It Some Thought** activities challenge learners by requiring higher-order thinking skills to analyze, synthesize, and apply the material.

**Concepts in Review** provides students with a structured review of the chapter. Consistent with the Focus on Concepts and Concept Checks, the Concepts in Review is structured around the learning objective for each section.
BEFORE CLASS

Mobile Media and Reading Assignments Ensure Students Come to Class Prepared

**Updated! Dynamic Study Modules** help students study effectively by continuously assessing student performance and providing practice in areas where students struggle the most. Each Dynamic Study Module, accessed by computer, smartphone, or tablet, promotes fast learning and long-term retention.

**NEW! Interactive eText 2.0** gives students access to the text whenever they can access the internet. eText features include:

- Now available on smartphones and tablets.
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- Accessible (screen-reader ready).
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**Pre-Lecture Reading Quizzes are easy to customize and assign**

Reading Questions ensure that students complete the assigned reading before class and stay on track with reading assignments. Reading Questions are 100% mobile ready and can be completed by students on mobile devices.
DURING CLASS
Engage students with Learning Catalytics

What has teachers and students excited? 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. With Learning Catalytics, you can:

- Assess students in real time using open-ended question formats to uncover student misconceptions and adjust lecture accordingly.
- Automatically create groups for peer instruction based on student response patterns, to optimize discussion productivity.

“My students are so busy and engaged answering Learning Catalytics questions during lecture that they don’t have time for Facebook.”

Declan De Paor, Old Dominion University
AFTER CLASS
Easy to Assign, Customizable, Media-Rich, and Automatically Graded Assignments

NEW! Project Condor Quadcopter Videos
A series of quadcopter videos with annotations, sketching, and narration help improve the way students learn about monoclines, streams and terraces, and so much more. In MasteringGeology™, these videos are accompanied by assessments to test student understanding.

NEW! 24 Mobile Field Trips take students to iconic geological locations with Michael Collier in the air and on the ground to see and learn about geologic locations that relate to concepts in the chapter. In Mastering, these videos are accompanied by auto-gradable assessments that will track what students have learned.

NEW! MapMaster 2.0
GIS-inspired interactive map activities help to enhance students’ data analysis and spatial reasoning skills, and overall geologic literacy.
Encounter Activities
Using Google Earth™ to visualize and explore Earth’s physical landscape, Encounter activities provide rich, interactive explorations of geology and earth science concepts. Dynamic assessments include 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 toward mastery of the concepts.

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

GigaPan Activities allow students to take advantage of a virtual field experience with high-resolution imaging technology developed by Carnegie Mellon University in conjunction with NASA.
Resources for YOU, the Instructor

MasteringGeology™ provides you with everything you need to prep for your course and deliver a dynamic lecture, all in one convenient place. Resources include:

**LECTURE PRESENTATION ASSETS FOR EACH CHAPTER**
- PowerPoint Lecture Outlines
- PowerPoint clicker questions and Jeopardy-style quiz show questions
- All book images and tables in JPEG and PowerPoint formats

**TEST BANK**
- The Test Bank in Microsoft Word formats
- Computerized Test Bank, which includes all the questions from the printed test bank in a format that allows you to easily and intuitively build exams and quizzes.

**TEACHING RESOURCES**
- Instructor Resource Manual in Microsoft Word and PDF formats
- Pearson Community Website (https://communities.pearson.com/northamerica/s/)

Measuring Student Learning Outcomes?
All MasteringGeology assignable content is tagged to learning outcomes from the book and Bloom’s Taxonomy. You also have the ability to add your own learning outcomes, helping you track student performance against your learning outcomes. You can view class performance against the specified learning outcomes and share those results quickly and easily by exporting to a spreadsheet.

Upon textbook purchase, students and teachers are granted access to MasteringGeology. See page xviii for details.
SELECT MAJOR CHANGES IN ESSENTIALS OF GEOLOGY 13E

Global
- QR codes for additional SmartFigures added, including Mobile Field Trips; SmartFigure types indicated in figure captions

Chapter 1
- Subsection “Origin of Planet Earth” substantially revised
- New Did You Know feature added (Section 1.5)
- Two Give It Some Thought questions modified
- Substantively revised figures: 1.13, 1.17, 1.19, 1.20, 1.23, 1.24
- Eleven new photographs

Chapter 2
- Concept Check questions for Section 2.6 revised
- Treatment of whole-mantle convection and plumes substantially rewritten for clarity and currency (Section 2.10)
- One Give It Some Thought question added and one modified
- Substantively revised figures: 2.9, 2.11, 2.17–2.19, 2.29, 2.30, 2.31, 2.35
- Two new photographs

Chapter 3
- Introduction to mineral properties revised (Section 3.4)
- One new Give It Some Thought question added; one modified
- Figure 3.33 now combines illustration and tabular data
- New figures: 3.26, 3.28, 3.33. Figures that have been revised substantively: 3.5 (atomic weight changed to atomic mass), 3.8, 3.9, 3.11, 3.12
- Three new photographs

Chapter 4
- Treatment of magmatic volatiles revised for clarity (Section 4.1)
- Subsection “Compositional Categories” rewritten for clarity; replaces former subsection “Granitic (Felsic) versus Basaltic (Mafic) Compositions” (Section 4.2)
- Terminology “felsic/intermediate/mafic” given priority over “granitic/andesitic/basaltic” (Section 4.4)
- Subsection “Temperature Increase: Melting Crustal Rocks” substantially rewritten for clarity (Section 4.5)
- Improved description of how mineral grains interact with a melt of changing composition
- Footnote added noting complex formation history of Palisades Sill (under “Magmatic Differentiation and Crystal Setting” in Section 4.6)
- Stocks now treated in the section on batholiths (paragraph 4 under “Batholiths” in Section 4.8)
- One Give It Some Thought question modified
- Substantively revised figures: 4.5, 4.12, 4.16, 4.17, 4.33
- Eight new photographs

Chapter 5
- Section 5.2, “The Nature of Volcanic Eruptions,” largely rewritten
- Paragraph added to cover silica-rich pyroclastic intraplate volcanism
- In Section 5.10, volcanism at divergent boundaries now treated before volcanism at divergent boundaries
- Two new Give It Some Thought questions added; one modified
- New figures: 5.3 (replaces 12e Table 5.1), 5.8 (replaces 12e Figure 5.7). Figures that have been revised substantively: 5.5, 5.12, 5.16, 5.19, 5.21, 5.32
- Twelve new photographs

Chapter 6
- New discussion of oxidation as an agent of weathering (“Oxidation” in Section 6.3)
- In the subsection “Controls of Soil Formation,” order of topics changed to put “Time” later (Section 6.5)
- Two new Give It Some Thought questions added
- Substantively revised figures: 6.11, 6.24
- Five new photographs

Chapter 7
- Updated treatment of energy resources, including expanded discussion of emissions from coal combustion and changes in oil and gas production due to fracking (Section 7.8)
- Revised treatment of the slowest limb of the carbon cycle (Section 7.9, including Figure 7.34)
- One new Give It Some Thought question added
- New figure, 7.33. Figure 7.30 substantively expanded
- Five new photographs

Chapter 8
- New contextual paragraph added at start of Section 8.1
- Improved introduction of temperature and pressure as agents of metamorphism at the end of Section 8.1
- Description and figure of a stretched pebble conglomerate added to help students understand the concept of differential stress (subsection “Differential Stress” in Section 8.2)
- In subsection “Other Metamorphic Textures,” improved treatment of nonfoliated metamorphic rocks, including coverage of hornfels (Section 8.3)
- One new Give It Some Thought question
- Four figures added: 8.5, 8.23, 8.27, 8.29. Figures that have been modified substantively: 8.4, 8.6, 8.10, 8.11, 8.24, 8.26
- Eight new photographs

Chapter 9
- Subsection “Faults & Large Earthquakes” substantially rewritten for clarity and conciseness (Section 9.1)
- Section 9.3, “Locating the Source of an Earthquake,” substantially revised, including three figures
- Discussion added for the U.S.G.S. Community Internet Intensity Map project, including a figure (within “Intensity Scales” in Section 9.4)
- Section 9.8 reorganized to put the subsection “Probing Earth’s Interior: ‘Seeing’ Seismic Waves” first; treatment of Earth’s layered structure substantially revised
- Two new Give It Some Thought questions added;
- Two figures added: 9.16, 9.23. Figures that have been modified substantively: 9.10, 9.13–9.15, 9.27 (completely redrawn)
- Two new photographs

Chapter 10
- One Give It Some Thought question replaced with a new one
- One new figure added: 10.4 (two-page global sea-floor map). Figures that have been modified substantively: 10.12, 10.16, 10.21
- Two new photographs

Chapter 11
- Treatment of deformation, stress, and strain in Section 11.1 significantly clarified
- Discussion of the factors that affect how rocks deform significantly clarified (Section 11.1)
- Distinction between faults and joints now covered at the start of Section 11.3
- Description of thrust faulting in the formation of the Himalayas improved (paragraph 4 under “The Himalayas” in Section 11.6)
- Description of isostatic balance and its effects rewritten (Section 11.7)
- One new Give It Some Thought question added

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Select Major changes in Essentials of Geology 13e

- Three figures added: 11.4, 11.5, 11.21. Figures that have been modified substantively: 11.3, 11.6–11.8, 11.10, 11.12, 11.14–11.16, 11.18, 11.19, 11.23, 11.27, 11.29, 11.30
- Six new photographs

Chapter 12
- “Mass movement” introduced in place of older term “mass wasting.”
- Landslides introduced more thoroughly at the start of Section 12.1
- Treatment of mass movements that lack an obvious trigger clarified and moved to the start of section 12.2
- Treatment of mechanism for long-runout landslides updated (subsection “Rate of Movement” in Section 12.3)
- Definition and description of normal faults made clearer (first paragraph of section “Normal Faults” in Section 11.3)
- 2015 Nepal earthquake added as example of a landslide-triggering event (subsection “Examples from Plate Boundaries: California and Nepal” in Section 12.2)
- New Did You Know about 2013 Bingham Canyon Copper Mine landslide added (Section 12.2)
- One new Give It Some Thought question added
- Figure 12.11 modified substantively
- Six new photographs

Chapter 13
- Section 13.1 largely rewritten
- Selected paragraphs of Section 13.2 tightened; headward erosion added as final paragraph in section “Drainage Basins; formation of a water gap added at the end of “Drainage Patterns.”
- Section on the loss of wetlands from the Mississippi delta and coastal Louisiana added (subsection “Vanishing Wetlands” in Section 13.7)
- Treatment of flood control updated and tightened (Section 13.8)
- One new Give It Some Thought question added
- Figure 13.29 added; “Floods & Flood Control” now supported by four new figures 13.31–13.33; Figure 13.24 substantively changed
- Three new photographs

Chapter 14
- Section added on Geothermal Energy (p. 385 in Section 14.5)
- Section added on the impact of prolonged drought on groundwater resources (p. 387 of Section 14.5)
- Three figures added: 14.21, 14.23, 14.29. Figures that have been modified substantively: 14.1, 14.3, 14.22
- Three new photographs

Chapter 15
- Information on Larsen B ice shelf updated (p. 402 in Section 15.1)
- New Give It Some Thought question
- Figures that have been replaced or modified substantively: 15.3, 15.4, 15.6, 15.9, 15.11, 15.22
- Five new photographs

Chapter 16
- New Give It Some Thought question
- Figures that have been modified substantively: 16.2, 16.3, 16.9
- Three new photographs

Chapter 17
- Section 17.1 (“The Shoreline & Ocean Waves”) has been revised to cover both the basic features of shorelines and the behavior of ocean waves. Beaches are now covered along with shoreline processes in Section 17.2 (“Beaches & Shoreline Processes”). Both sections have been tightened to focus more on processes and less on terminology
- Explanation of wave refraction reworded for greater clarity
- Section 17.6 (“Stabilizing the Shore”) moved to later in the chapter than in the preceding edition; it now follows Sections 17.4 (“Contrasting America’s Coasts”) and 17.5 (“Hurricanes: The Ultimate Hazard”)
- Section 17.4 (“Contrasting America’s Coasts”) reorganized to start with the basic classification of coasts as emergent or submergent. This section also now uses cliff retreat at Pacifica, CA as a topical example of erosion on an emergent coast
- Section 17.5 (“Hurricanes: The Ultimate Hazard”) now uses Superstorm Sandy as an example and covers the effects of sea-level rise on vulnerability
- The response of Staten Island to Superstorm Sandy added as an example of a decision to change how coastal land is used (“Changing Land Use” in Section 17.6)
- Four new photographs

Chapter 18
- Section “Correlation within Limited Areas” tightened (in Section 18.3)
- Text and figures for Section 18.4, “Numerical Dating with Nuclear Decay,” substantially revised for better clarity and effectiveness
- Section 18.5, “Determining Numerical Dates for Sedimentary Strata,” moved so that it now immediately follows Section 18.4
- Two Give It Some Thought questions added
- Figures that have been modified substantively: 18.19–18.22, 18.24
- Two new photographs

Chapter 19
- In the section “Oxygen in the Atmosphere,” updated treatment of the effects on land organisms of the apparent high levels of oxygen in the Pennsylvanian (in Section 19.3)
- Acasta Gneiss added to discussion of Earth’s oldest dated rocks (in Section 19.4)
- Section “Supercontinents and Climate” substantially revised (in Section 19.4)
- Figure 19.17 added; illustrating the major provinces of the Appalachian Mountains (in Section 19.5)
- Paragraphs on the origin of prokaryotes, eukaryotes, and photosynthesis substantively revised (“Earth’s First Life: Prokaryotes” in Section 19.6)
- Updated discussion of the origin of tetrapods (“Vertebrates Move to Land” in Section 19.7)
- Updated treatment of the extinction of nonavian dinosaurs (“Demise of the Dinosaurs” in Section 19.7)
- Updated treatment of hominin evolution (“Humans: Mammals with Large Brains & Bipedal Locomotion” in Section 19.9)
- New Give It Some Thought question
- Five new photographs

Chapter 20
- Within Section 20.2 (“Detecting Climate Change”) section “Climates Change” added, including Figures 20.2 and 20.3
- In Section 20.5, context-setting second paragraph added
- Section “Rising CO₂ Levels” updated to include current data, including updated discussion of tropical deforestation
- Section “The Role of Trace Gases” updated to reflect current science, and section “How Aerosols Influence Climate” moved into this section
- Section 20.7, “Climate Feedback Mechanisms,” updated to reflect current science
- Table 20.1, “IPCC Projections for the Late Twenty-First Century,” added to Section 20.8, and section updated to reflect current science
- Section “The Changing Arctic” largely revised
- Section “The Potential for Surprises” updated
- Three new Give It Some Thought questions added