

THE Cultural Landscape

An Introduction to Human Geography

TWELFTH EDITION



**James M.
Rubenstein**

World States

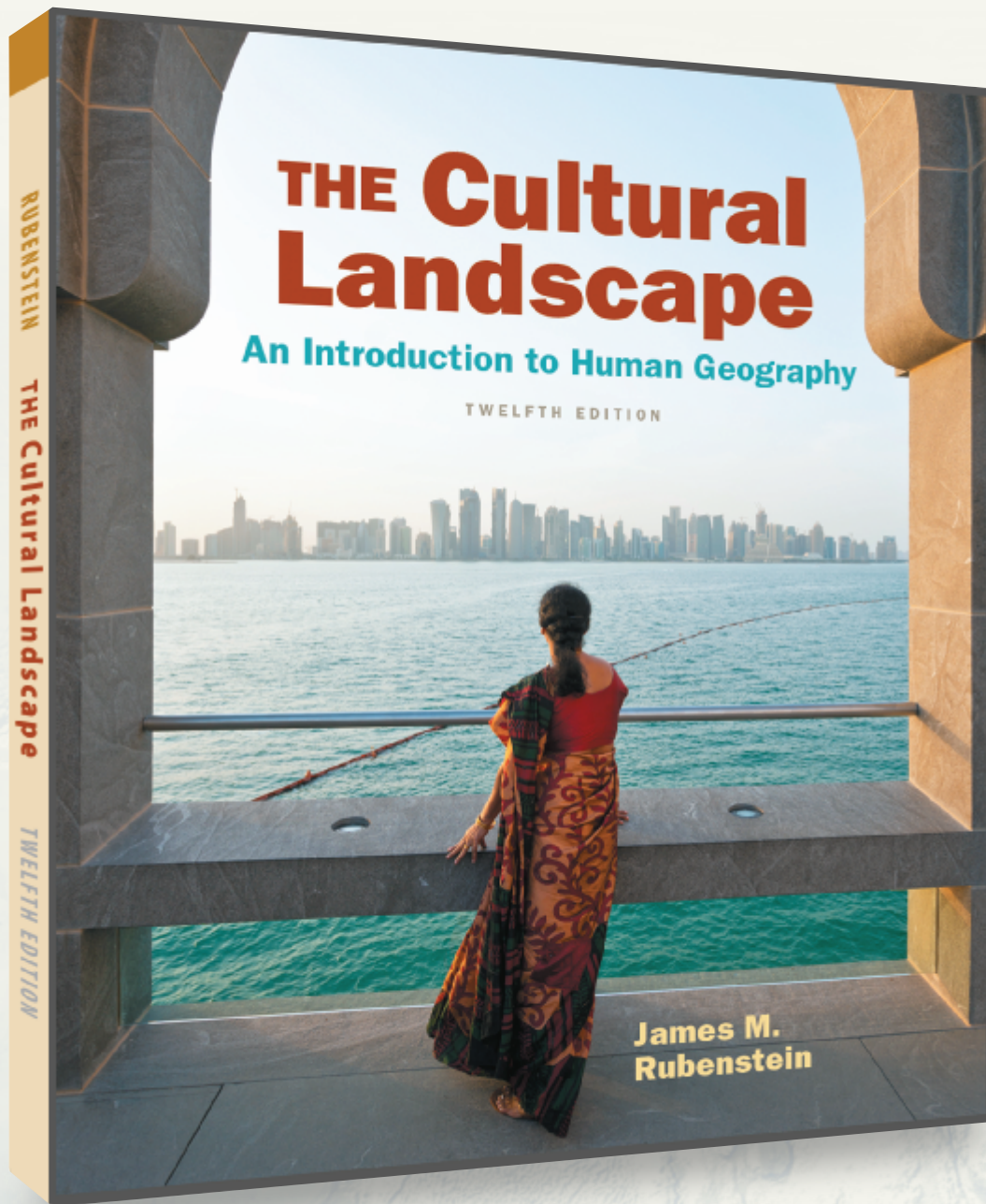




See Europe inset map below



Strengthens Students' Connection to Geography through Active, Discovery-Based Learning



PEARSON

Active, Discovery-Based Learning

DOING GEOGRAPHY California Agriculture and Water

California's extended extreme drought is stressing agriculture, which uses 80 percent of the state's distributed water. Homeowners and businesses in California have been required to make substantial cuts in their water usage. California farmers produce one-third of U.S. vegetables and two-thirds of fruits and nuts. It takes a lot of water to grow these fruits and vegetables. So if you are living in any of the 50 U.S. states, you are consuming California water indirectly through consuming produce. In fact, the average American consumes around 40 gallons of California water per day. Table 9-2 has examples of the amounts of California water that go into growing some fruits and vegetables.

TABLE 9-2 Amount of Water Needed to Grow Selected Fruits and Vegetables in California

Fruits and nuts	Gallons	Your produce consumption	Your water consumption
1 apple, peach, pear, or plum, ¼ melon	7.0		
5 strawberries	3.0		
1 almond	1.0		
1 walnut	5.0		
3 grapes	1.0		
1 lemon, orange, grapefruit, or clementine	20		
1 avocado	40		
Vegetables			
1 broccoli or cauliflower floret	0.5		
Lettuce, cabbage, spinach [salad portion]	1.0		
1 carrot or celery stalk	0.5		
1 slice tomato, onion, or potato	0.5		

NEW! Doing Geography and the accompanying *What's Your Geography* features discuss the geographic tools, techniques, and skills used to address real-world problems, and then ask students to put themselves in the role of geographers by applying these skills and techniques to their real-world experiences and environments, helping students connect the relevance of human geography to their everyday lives.

What's Your Food and Agriculture Geography?

Your California Water Consumption

How much California water did you consume today in your fruits and vegetables?

1. Determine from Table 9-2 the quantities of the listed fruits and vegetables that you have consumed today (or another day specified for your class).
2. What was your total consumption of California water from eating produce?
3. How does your total consumption compare to the national average of 40 gallons?
4. What factors might account for having consumption that is higher or lower than the national average?

DEBATE IT! Immigration reform: Tougher controls or legal status?

Debate over authorized immigration centers on border security and on appropriateness of a path to legal status for unauthorized immigrants in the United States.

NEW! Debate It presents two sides of a complex topic using a two-column pro vs. con format to help engage students in active debate and decision-making. *Debate It* can be used for homework, group work, and discussions.

TIGHTEN SECURITY AND DO NOT OFFER A PATH TO LEGAL STATUS

- **THE WRONG MESSAGE.** People breaking the law by crossing the U.S. border without proper documentation sends the wrong message to people who obey the law.
- **ENCOURAGE OTHERS.** Rewarding people for illegal behavior will encourage others to enter without documents.
- **POOR SECURITY.** The border is not sufficiently secure, especially in small towns and rural areas.



◀ **FIGURE 3-42**
MINIMAL SECURITY AT THE BORDER
Crossing from Palomas, Mexico, to Columbus, New Mexico.

OFFER A PATH TO LEGAL STATUS; SECURITY IS ALREADY TIGHT ENOUGH

- **IMPRACTICAL.** It would be a practical impossibility for law enforcement officials to actually find the 11 million unauthorized immigrants.
- **ECONOMIC IMPACT.** Pulling unauthorized immigrants out of their jobs would cripple the U.S. economy.
- **AGENTS.** The numbers of border agents and deportations of unauthorized immigrants have doubled since 2000.
- **LAW-ABIDING.** Unauthorized immigrants are productive and otherwise law-abiding members of U.S. society.



◀ **FIGURE 3-43**
BORDER AGENTS
Rio Grande near Laredo, Texas.

A Focus on Sustainability

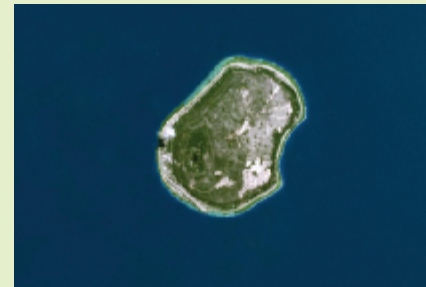
SUSTAINABILITY & OUR ENVIRONMENT

Rising Oceans and the Future of Nauru

The sustainability of the world's smallest island state, Nauru, as well as other island microstates, is in danger due to rising ocean levels. Sea levels rose around 17 centimeters (6.7 inches) during the twentieth century. Scientists working for the United Nations forecast another rise of between 18 and 59 centimeters (between 7 and 23 inches). The rising oceans will submerge a large percentage of the tiny island. Another Pacific Ocean microstate, Kiribati, a collection of approximately 32 small islands, has already witnessed the disappearance of two of its islands under rising oceans.

Nauru, Kiribati, and other Pacific island microstates are atolls—that

is, islands made of coral reefs (Figure 8-16). A coral is a small sedentary marine animal that has a horny or calcareous skeleton. Corals form colonies, and the skeletons build up to form coral reefs. Coral is very fragile. Humans are attracted to coral for its beauty and the diversity of species it supports, but handling coral can kill it. The threat of climate change to the sustainability of coral is especially severe: Coral stays alive in only a narrow range of ocean temperatures, between 23°C and 25°C (between 73°F and 77°F), so global warming threatens the ecology of the portions of the islands that remain above sea level.



▲ FIGURE 8-16 NAURU: WORLD'S SMALLEST ISLAND MICROSTATE Rising sea level because of climate change threatens the future of the island, whose area is only 21 square kilometers (8 square miles).

SUSTAINABILITY & OUR ENVIRONMENT

Remanufacturing

Remanufacturing contributes to a more sustainable environment. The principal challenge is to increase its economic sustainability.

- **Paper.** Most types of paper can be recycled. Newspapers have been recycled profitably for decades, and recycling of other paper, especially computer paper, is growing. Rapid increases in virgin paper pulp prices have stimulated construction of more plants capable of using waste paper. The key to recycling is collecting large quantities of clean, well-sorted, uncontaminated, dry paper.
- **Plastic.** The plastic industry has developed a system of numbers marked inside triangles. Symbols 2 (milk jugs), 4 (shopping bags), and 5 (such as yogurt containers) are considered to be safest for recycling. The plastics in symbols 3 (such as food wrap), 6 (Styrofoam), and 7 (such as iPad cases) may contain carcinogens. Symbol 1 (soda and water bottles) can allow bacteria to accumulate.
- **Aluminum.** The principal source of recycled aluminum is beverage containers. Aluminum cans began to replace glass bottles for beer during the 1950s and for soft drinks during the 1960s. Aluminum scrap is readily accepted for recycling, although other metals are rarely accepted.



▲ FIGURE 11-85 REMANUFACTURING Junked cars await shredding so that the steel can be reused.

- **Glass.** Glass can be used repeatedly with no loss in quality and is 100 percent recyclable. The process of creating new glass from old is extremely efficient, producing virtually no waste or unwanted by-products. Though unbroken clear glass is valuable, mixed-color glass is nearly worthless, and broken glass is hard to sort.

NEW! Sustainability & Our Environment relates the principal topics of human geography to overarching issues of economic, social, and environmental sustainability for our planet.

A Refined Learning Path

KEY ISSUE 2

Why Is Each Point on Earth Unique?

- ▶ **Place: A Unique Location**
- ▶ **Region: A Unique Area**
- ▶ **Culture Regions**

LEARNING OUTCOME 1.2.1

Identify the distinctive features of a place, including toponym, site, and situation.

UPDATED! *Key Issues* highlight the four critical “big questions” around which each chapter is organized.

UPDATED! *Learning Outcomes* emphasize the skills and knowledge students should gain from each section.

PAUSE & REFLECT 1.2.1

What is the origin of the toponym of your hometown?

UPDATED! *Pause & Reflect* questions allow students to check and apply their understanding as they read each section.

CHECK-IN KEY ISSUE 2

Why Is Each Point on Earth Unique?

- ✓ Location is identified through name, site, and situation.
- ✓ Regions can be formal, functional, or vernacular.
- ✓ Culture encompasses what people care about and what people take care of.

UPDATED! *Check Ins* conclude each section, summarizing the main points of each Key Issue.

UPDATED! *Key Issues* are summarized at the end of the chapter, followed by **NEW!** *Thinking Geographically* questions and **NEW!** *Explore* activities using Google Earth.

KEY ISSUE 2

Why is each point on earth unique?

Geographers identify unique places and regions distinguished by distinctive combinations of cultural as well as economic and environmental features. Location is the position something occupies on Earth. A region is an area characterized by a unique combination of features. The distribution of features helps explain why every place and every region is unique.

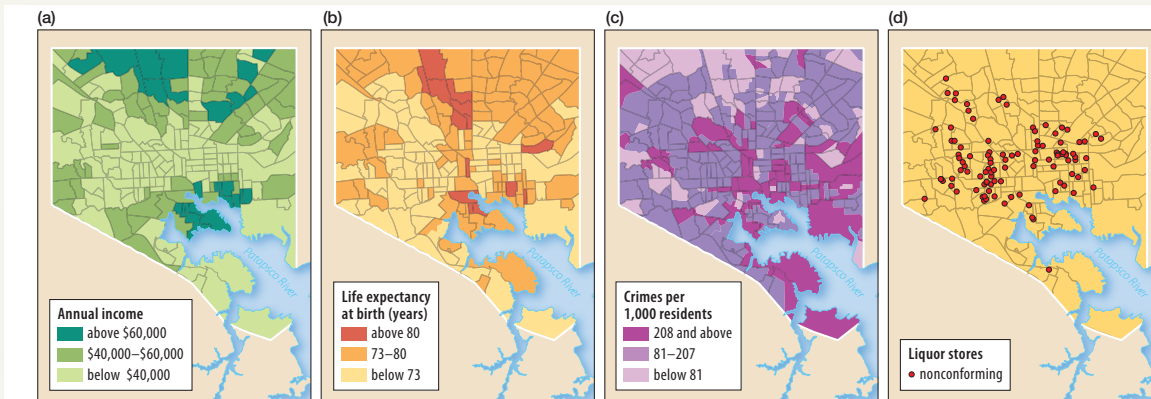
THINKING GEOGRAPHICALLY



3. What are elements of the site and situation of your hometown?
4. Can you name another place to which your hometown has strong connections?
5. What is an example of a feature that connects your town to another?

◀ FIGURE 1-59 SITE AND SITUATION OF BOSTON The site is Boston Harbor and several rivers. Logan Airport is an example of the connections found in Boston to other places.

Visualizing Earth's People & Places

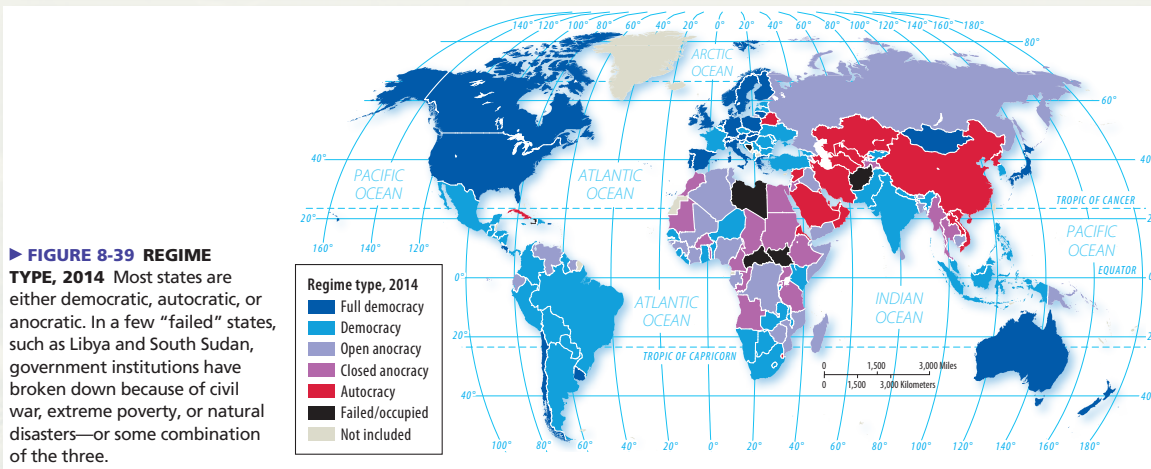


▲ **FIGURE 1-24 SPATIAL ASSOCIATION IN BALTIMORE** (a) Income, (b) life expectancy at birth, (c) crime, (d) nonconforming liquor stores.

NEW & REVISED!

Cartography.

All maps have been thoroughly updated with current data and contemporary cartographic styles, for optimal spatial visualization and analysis.



► **FIGURE 8-39 REGIME TYPE, 2014** Most states are either democratic, autocratic, or anocratic. In a few “failed” states, such as Libya and South Sudan, government institutions have broken down because of civil war, extreme poverty, or natural disasters—or some combination of the three.

▼ **FIGURE 3-46 IMMIGRANTS IN EUROPE** Africans trying to reach Italy are rescued by the Italian navy after their boat sunk trying to cross the Mediterranean Sea.



▲ **FIGURE 10-36 WORLD TRADE ORGANIZATION PROTEST** Protestors outside the Department of Agriculture in the Philippines demonstrate during a speech delivered by the director of the World Trade Organization in 2015.

UPDATED! The latest science, statistics, and associated imagery. Data sources include the 2015 Population Reference Bureau World Population Data and the 2015 United Nations Human Development Report. Recent world political events are covered, including the rise of the Islamic State, Russia's takeover of Crimea, and the Syrian refugee crisis.

Continuous Learning Before, During, and After Class

BEFORE CLASS

Mobile Media and Reading Assignments Ensure Students Come to Class Prepared.



NEW! Dynamic Study Modules personalize each student's learning experience. Created to allow students to acquire knowledge on their own and be better prepared for class discussions and assessments, this mobile app is available for iOS and Android devices.



Pearson eText in MasteringGeography

gives students access to the text whenever and wherever they can access the internet. eText features include:

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

Pre-Lecture Reading Quizzes are easy to customize & assign

NEW! 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.

with MasteringGeography

DURING CLASS

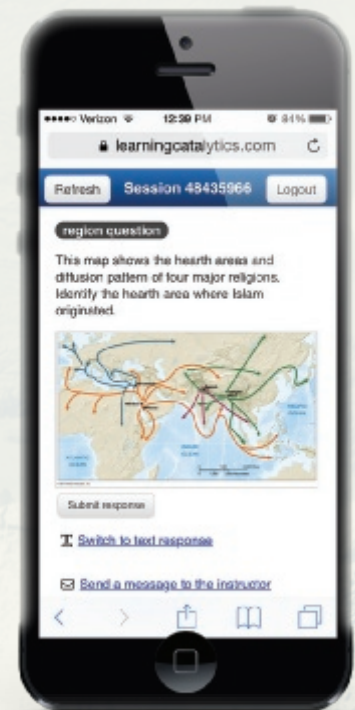
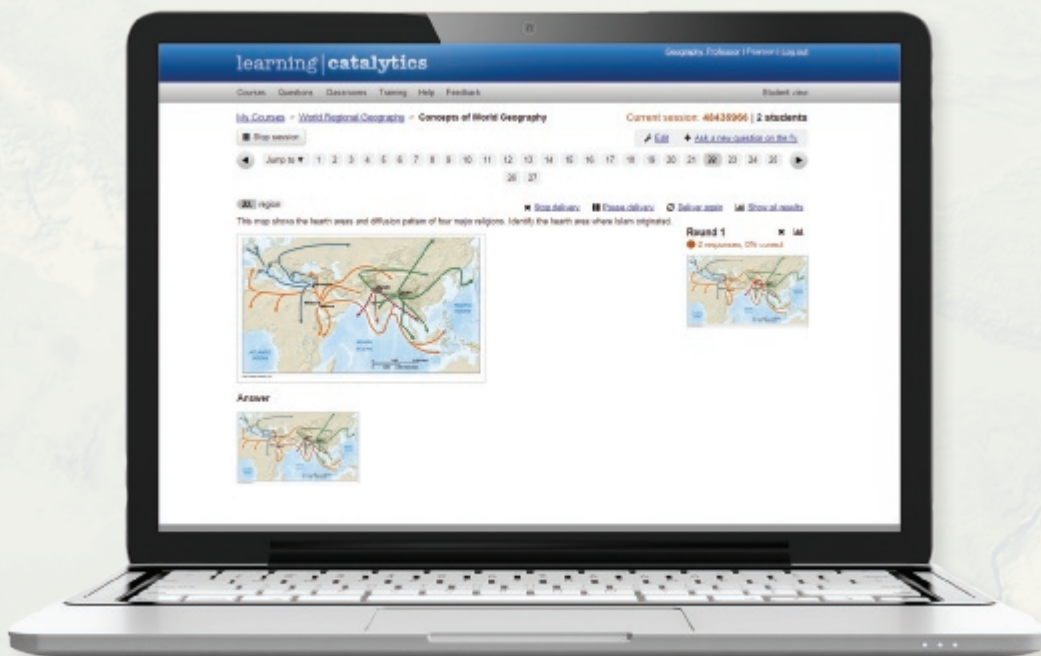
Learning Catalytics and Engaging Media

What has Professors 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



Enrich Lecture with Dynamic Media

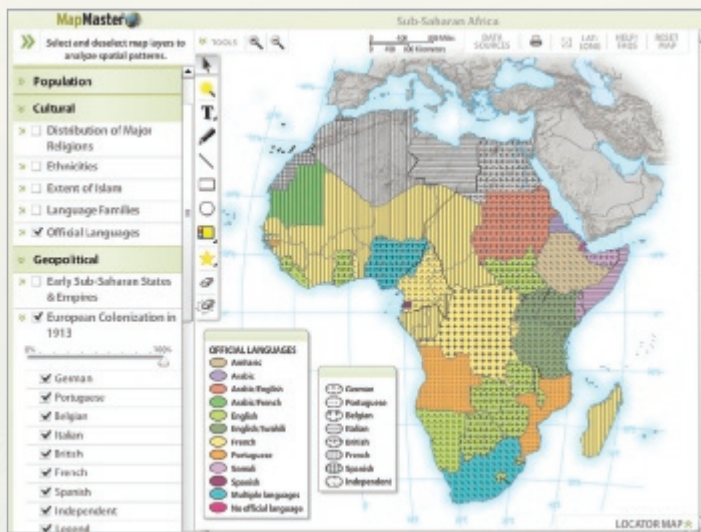
Teachers can incorporate dynamic media into lecture, such as Videos, MapMaster Interactive Maps, and Geoscience Animations.

Mastering Geography™

MasteringGeography delivers engaging, dynamic learning opportunities—focusing on course objectives and responsive to each student’s progress—that are proven to help students absorb human geography course material and understand challenging geography processes and concepts.

AFTER CLASS

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



UPDATED! MapMaster Interactive Map Activities are inspired by GIS, allowing students to layer various thematic maps to analyze spatial patterns and data at regional and global scales. This tool includes zoom and annotation functionality, with hundreds of map layers leveraging recent data from sources such as NOAA, NASA, USGS, United Nations, and the CIA.

NEW! Geography Videos from such sources as the BBC and *The Financial Times* are now included in addition to the videos from Television for the Environment’s Life and Earth Report series in **MasteringGeography**. Approximately 200 video clips for over 25 hours of video are available to students and teachers and **MasteringGeography**.



GeoVideo

Log in to the **MasteringGeography** Study Area to view this video.

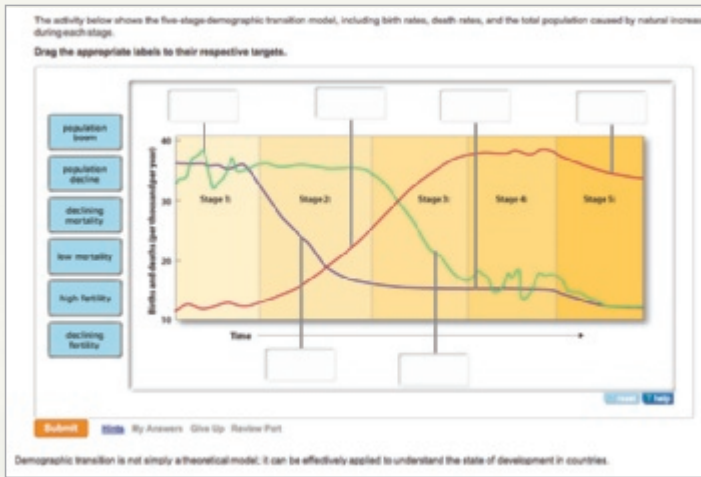
Human Impacts on Water Resources

Humans use water for many purposes, including manufacturing, agriculture, and recreation, as well as direct consumption. Access to fresh clean water is not possible for many people in the world. The poor condition of infrastructure restricts access to fresh clean water for some people. Other people live in arid locations.



1. What are the principal uses of water resources other than direct consumption by people and animals?
2. Given that the world’s total supply of water is constant, how might we increase the world’s supply of water suitable as a resource for use by people?
3. What steps, if any, are being taken in your school or community to conserve water?

NEW! GeoVideo activities integrate BBC videos at the end of chapters, encouraging students to log into **MasteringGeography** to view the videos and answer questions. These video clips can also be assigned for credit.



NEW! GeoTutors. Highly visual coaching items with hints and specific wrong answer feedback help students master the toughest topics in geography.

UPDATED!
Encounter (Google Earth) activities provide rich, interactive explorations of human geography concepts, allowing students to visualize spatial data and tour distant places on the virtual globe.



Map Projections

Map Projection Properties: Exploring Projections

Introduction Earth's Grids Map Projection Properties Map Projection Classes Using Map Projections

Distortion on Projections Equal Area Projections Conformal Projections Compromise Projections Exploring Projections

Exploring Projections

Let's compare the ways different landmasses are depicted on different projections.

Select the highlighted landmasses on the globe and compare the shape and area decisions on the three map projections.

Click the arrows to navigate the globe.

Click CONTINUE to go to the questions.

Map Projections interactive tutorial media helps reinforce and remediate students on the basic yet challenging introductory map projection concepts.





THE CULTURAL LANDSCAPE

AN INTRODUCTION TO HUMAN GEOGRAPHY | TWELFTH EDITION

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PREFACE

Geography is the study of where things are located on Earth's surface and the relationships between people and those locations. The word *geography*, invented by the ancient Greek scholar Eratosthenes, is based on two Greek words. Geo means "Earth," and graph means "to write." According to the National Geography Standards, geographers ask two simple questions: "Where is it?" and "Why is it there?" In other words, where are people and activities located across Earth's surface? Why are they located in particular places? *The Cultural Landscape* seeks to answer these questions as they relate to our contemporary world. The book provides an accessible, in-depth, and up-to-date introduction to human geography for majors and non-majors alike.

New to the 12th Edition

This edition brings substantial changes in both organization and content and, updated data and statistics.

NEW ORGANIZATION

A long-time strength of this book has been its clear, easy-to-use organization and outline. Electronic versions of the books now coexist with traditional paper format, formatted to facilitate reading on tablets and computers without compromising the pedagogic strengths of traditional paper formats. Valuable organizational features established in previous editions have been retained and considerably strengthened for this electronic age through the addition of several new features. The new elements can be grouped into two types:

- New informational features included in each chapter include the following:
 - **Doing Geography** is a new feature that discusses various geographic tools, techniques, and skills used to address real-world problems related to each chapter's concepts.
 - **What's Your Geography**, a feature that accompanies *Doing Geography*, asks students to put themselves in the role of geographers by applying these skills and techniques to their real-world experiences and environments, thereby connecting the global to the local, helping students connect the relevance of human geography to their everyday lives.
 - **Debate It** is a new feature that presents two sides of a complex human geography topic to help engage students in active debate and decision making. Readers may find that they agree with one side of the debate, or they may find merits in both perspectives.

- **Sustainability & Our Environment** is a new feature that relates the principal topics of human geography to overarching issues of economic, social, and environmental sustainability for our planet.
- **Interactive image** is a caption that accompanies an image in each chapter. The caption encourages students to interpret the geographic meaning and significance of the image.
- **GeoVideo** is a new activity at the end of the chapter that integrates a BBC video with the subject of the chapter. Students are encouraged to log into MasteringGeography to view videos that present dynamic applications of chapter topics. Teachers can assign videos for credit.
- **Explore** is a new end-of-chapter activity that uses Google Earth to investigate a chapter concept or application.
- **Thinking Geographically** end-of-chapter questions now include images designed to illuminate chapter concepts or suggest directions for reflection.
- New outlining and arrangement of chapters include the following:
 - Each chapter continues to follow an outline based on four Key Issues, as in previous editions. Following each Key Issue title are several bulleted statements that outline the main topics discussed in that key issue.
 - Every two-page spread now begins with either one of the four Key Issues or one of the main bulleted statements.
 - Each two-page spread is now self-contained. As a result, maps and photos appear next to where they are discussed in the text. No more going through a chapter to find a figure that has been referenced on one page but actually appears on another page.
 - Two features initiated in the previous edition are now extended to all two-page spreads. One is a **Learning Outcome** that appears at the beginning of the spread and summarizes the principal purpose of the spread. And each spread now contains a **Pause and Reflect** feature that is presented as a question. Each question is designed to stimulate further reflection or discussion on the material being presented in the spread.
 - At the end of each section, **Key Issue Check-Ins** confirm for students the main issues and themes they should understand before continuing on in the chapter.

NEW CONTENT

Human geography is a dynamic subject. Topics that were central to the discipline a generation ago have faded in importance, while new ones take their place. Each chapter naturally provides updates of the most recently available data. Below are examples of entirely new material included in each chapter.

Chapter 1 (This Is Geography) has a new title. New topics include electronic mapping, geotagging, Volunteered Geographic Information (VGI), and geographic approaches to cultural identity such as gender and sexual orientation. Geography's five most basic concepts are introduced through the example of Luxembourg. The discussion of sustainability includes new information on the drought in the U.S. West.

Chapter 2 (Population and Health) includes an expanded discussion of health issues in a new Key Issue 3. As the rate of population growth declines from its peak during the second half of the twentieth century, population geography is increasingly concerned with the health of humans, not just their fertility and mortality. A new Key Issue 4 addresses future scenarios for world population and health.

Chapter 3 (Migration) includes recent controversies concerning U.S. borders and the surge of migration into Europe from Africa and Asia. The *What's Your Geography* feature helps students consider their own family's migration stories.

Chapter 4 (Folk and Popular Culture) includes new material about the diffusion of social media, as well as the distribution of various types of limits on Internet freedom. The chapter also has a new *Debate It* feature concerning clothing worn by observant Muslim women.

Chapter 5 (Languages) uses the leading authority Ethnologue's latest 5-point classification of languages as institutional, developing, vigorous, in trouble, and dying. The final Key Issue expands a discussion of new, revived, and growing languages. A new *Sustainability & Our Environment* feature focuses on gender differences in languages.

Chapter 6 (Religions) has been substantially reorganized and rewritten, and includes input from some of the nation's leading authorities on the geography of religions. Religion is especially important to many students. A chapter on the geography of religions can foster understanding of the diversity of religions in the world.

Chapter 7 (Ethnicities) includes new material on ethnic diversity in countries other than the United States, including Brazil. Also included is a new section on urban ethnic enclaves.

Chapter 8 (Political Geography) addresses current conflicts such as islands disputed between China and Japan, Russia's annexation of the Crimea from Ukraine, and the rise of terrorist organizations such as the Islamic State and Boko Haram. The chapter also includes a new *Debate It* feature on gerrymandering.

Chapter 9 (Food and Agriculture) now precedes the chapter on development, in accordance with the order suggested by the Advanced Placement Human Geography course syllabus. Key Issue 4 includes expanded discussions of genetically modified foods and food safety.

Chapter 10 (Development) reflects recent changes in United Nations development indexes. The chapter includes an expanded discussion of inequalities in development both among and within countries. In addition to development challenges faced by developing countries, the inequality discussion also considers Europe's current difficulties in attempting to promote economic growth through austerity.

Chapter 11 (Industry and Energy) has a new title that reflects inclusion of material on energy that had been in the previous edition's Development chapter. New material is included on U.S. transportation networks. Readers are asked to identify the national origin of their t-shirts.

Chapter 12 (Services and Settlements) includes a discussion of the new sharing economy, such as Uber and Airbnb. New *Doing Geography* and *What's Your Geography* features include an interactive study of food deserts.

Chapter 13 (Urban Patterns) includes an expanded discussion of the structure of nonwestern cities today, as well as in the past. A new case study illustrates the CBD of Louisville, Kentucky. Also expanded is a discussion of the relationship between transportation and urban patterns.

MasteringGeography has also evolved since the last edition, now featuring a broad library of BBC video clips, a new next generation of GIS-inspired MapMaster interactive maps, Dynamic Study Modules for Human Geography, a responsive-designed eText 2.0 version of the book, and more.

Geography Matters

The main purpose of this book is to introduce students to the study of human geography as a social science by emphasizing the relevance of geographic concepts to human problems. It is intended for use in college-level introductory human or cultural geography courses, as well as the equivalent advanced placement course in high school. At present, human geography is the fastest-growing course in the AP curriculum.

GEOGRAPHY IN OUR ELECTRONIC AGE

Many speculated that geography would be irrelevant in the twenty-first century. Geography's future was thought to be grim because the diffusion of electronic communications, such as the Internet and social media, would make it easier for human activities to be conducted remotely. If any piece of information could be accessed from any place in the world (at least where electronic devices work), why live, shop, work, or establish a business in a crowded city or a harsh climate?

In reality, geography has become more, not less, important in people's lives and the conduct of business. Here are several ways that location matters more now than in the past, because of—not despite—the diffusion of electronic devices:

1. Smartphones and other electronic devices match specific demand to supply in a particular locality. For example:
 - Restaurant apps match hungry people to empty seats in a locality's restaurants.
 - Real estate apps help people find housing for sale or for rent in a locality.
 - Social apps let people know where their friends in a particular locality are hanging out that night.
 - Transportation apps match vehicles with available seats to people trying to get to specific locations.

These sorts of apps generate data on people's preferences in space, which in turn helps even more

location-based business get started and grow. Instead of looking for restaurants in the Yellow Pages, we find places to eat that are mapped on our device and in our locations. No wonder that geography apps, in the form of maps (including navigation) and travel (including transportation), rank as two of the five most frequently used services on smartphones.

2. Electronic devices are essential to the smooth movement of people and goods. For example:

- Turn-by-turn information can prevent you from getting lost or steer you back if you do get lost.
- Traffic jams on overcrowded roads can be avoided or minimized.
- Vehicles in the future will be driverless, so you can spend driving time working, learning stuff, or social networking.
- Instead of turning on a radio to hear traffic information, we look at the red and green traffic flow patterns on an electronic map.
- Instead of waiting for a TV weather report, we look at storm patterns on our device's map.

Images from Google Earth and others that you see throughout this book will become more detailed and accurate as technologies advance. Mapping is expanding into indoor spaces and into three dimensions.

3. The people who make all of these new location-based apps are themselves highly clustered in a handful of places in the world, such as Silicon Valley.

- Ideas—both brilliant and far-fetched—are still easier to communicate face-to-face than across long distances.
- Living and working in places like Silicon Valley, despite high expenses and choking traffic jams, put people next to other like-minded innovators in the electronic-based geography of the twenty-first century.

4. Electronic devices also impact the changing geography of cultural diversity.

- What if you searched for an available restaurant table in a foreign language? Would you find the same places?
- What if you conducted an Internet search in a foreign country? Would you find the same information?

A central theme in this book explores the tension between two important themes—globalization and cultural diversity. In many respects, we are living in a more unified world economically, culturally, and environmentally. The actions of a particular corporation or country affect people around the world. For example, geographers examine the prospects for an energy crisis by relating the distributions of energy production and consumption. Geographers find that the users of energy are located in places with different social, economic, and political institutions than are the

producers of energy. The United States and Japan consume far more energy than they produce, whereas Russia and Saudi Arabia produce far more energy than they consume.

This book argues that after a period when globalization of the economy and culture has been a paramount concern in geographic analysis, local diversity now demands equal time. People are taking deliberate steps to retain distinctive cultural identities. They are preserving little-used languages, fighting fiercely to protect their religions, and carving out distinctive economic roles. Local diversity even extends to addressing issues, such as climate change, that at first glance are considered global. For example, the “greenest” cars for motorists to drive in Oregon are different than the “greenest” cars for Ohio.

Outline of Main Topics

The book discusses the following main topics:

- What basic concepts do geographers use? Chapter 1 provides an introduction to ways that geographers think about the world. Geographers employ several concepts to describe the distribution of people and activities across Earth, to explain reasons underlying the observed distribution, and to understand the significance of the arrangements.
- Where are people located in the world? Chapters 2 and 3 examine the distribution and growth of the world's population, as well as the movement of people from one place to another. Why do some places on Earth contain large numbers of people or attract newcomers while other places are sparsely inhabited?
- How are different cultural groups distributed? Chapters 4 through 8 analyze the distribution of different cultural traits and beliefs and the problems that result from those spatial patterns. Important cultural traits discussed in Chapter 4 include food, clothing, shelter, and leisure activities. Chapters 5 through 7 examine three main elements of cultural identity: language, religion, and ethnicity. Chapter 8 looks at political problems that arise from cultural diversity. Geographers look for similarities and differences in the cultural features at different places, the reasons for their distribution, and the importance of these differences for world peace.
- How do people earn a living in different parts of the world? Human survival depends on acquiring an adequate food supply. One of the most significant distinctions in the world is whether people produce their food directly from the land or buy it with money earned by performing other types of work. Chapters 9 through 12 look at the three main ways of earning a living: agriculture, manufacturing, and services. Chapter 13 discusses cities, the centers for economic as well as cultural activities.

Divisions within Geography

Because geography is a broad subject, some specialization is inevitable. At the same time, one of geography's strengths is its diversity of approaches. Rather than being forced to adhere rigorously to established disciplinary laws, geographers can combine a variety of methods and approaches. This tradition stimulates innovative thinking, although students who are looking for a series of ironclad laws to memorize may be disappointed.

HUMAN AND PHYSICAL GEOGRAPHY

Geography is both a physical science and a social science. When geography concentrates on the distribution of physical features, such as climate, soil, and vegetation, it is a physical science. When it studies cultural features, such as language, industries, and cities, geography is a social science. This division is reflected in some colleges, where physical geography courses may carry natural science credit while human and cultural geography courses carry social science credit.

While this book is mostly concerned with geography from a social science perspective, one of the distinctive features of geography is its use of natural science concepts to help understand human behavior. The distinction between physical and human geography reflects differences in emphasis, not an absolute separation. The integration of physical and human geography is especially important when studying sustainability issues.

TOPICAL AND REGIONAL APPROACHES

Geographers face a choice between a topical approach and a regional approach. The topical approach, which is used in this book, starts by identifying a set of important cultural issues to be studied, such as population growth, political disputes, and economic restructuring. Geographers using the topical approach examine the location of different aspects of the topic, the reasons for the observed pattern, and the significance of the distribution.

The alternative approach is regional. Regional geographers select a portion of Earth and study the environment, people, and activities within that selected area. The regional geography approach is used in courses on Europe, Africa, Asia, and other areas of the world. Although this book is

organized by topics, geography students should be aware of the location of places in the world. A separate index section lists the book's maps by location. One indispensable aid in the study of regions is an atlas, which can also be used to find unfamiliar places that pop up in the news.

DESCRIPTIVE AND SYSTEMATIC METHODS

Whether using a topical or a regional approach, geographers can select either a descriptive or a systematic method. Again, the distinction is one of emphasis, not an absolute separation. The descriptive method emphasizes the collection of a variety of details about a particular location. This method has been used primarily by regional geographers to illustrate the uniqueness of a particular location on Earth's surface. The systematic method emphasizes the identification of several basic theories or techniques developed by geographers to explain the distribution of activities.

This book uses both the descriptive and systematic methods because total dependence on either approach is unsatisfactory. An entirely descriptive book would contain a large collection of individual examples not organized into a unified structure. A completely systematic approach suffers because some of the theories and techniques are so abstract that they lack meaning for the student. Geographers who depend only on the systematic approach may have difficulty explaining important contemporary issues.

Suggestions for Use

This book can be used in an introductory human or cultural geography course that extends over one semester, one quarter, or two quarters. An instructor in a one-semester course could devote one week to each of the chapters, leaving time for examinations. In a one-quarter course, the instructor might need to omit some of the book's material. A course with more of a cultural orientation could use Chapters 1 through 8. If the course has more of an economic orientation, then the appropriate chapters would be 1 through 3 and 9 through 13. A two-quarter course could be organized around the culturally oriented Chapters 1 through 8 during the first quarter and the more economically oriented Chapters 9 through 13 during the second quarter. Topics of particular interest to the instructor or students could be discussed for more than one week.

Acknowledgments

For a book that has been through many editions to maintain its leadership position, stale and outdated material and methods must be cleared out to make way for the fresh and contemporary. It is all too easy for an author in the twenty-first century to rely on practices that brought success in the twentieth century. Strong proactive leadership is required from the publisher to push an already strong book to loftier aspirations. This leadership is especially critical during a period when the teaching and learning environment is changing much more rapidly than even in the late twentieth century. A major reason for the long-term success of this book has been the quality of leadership in geography at Pearson Education.

Christian Botting, Senior Editor for Geography, Meteorology, and Geospatial Technologies at Pearson Education, has now led the team through six of my book projects. Because Pearson Education is the dominant publisher of college geography textbooks, the person in charge of geography wields considerable influence in shaping the nation's geography curriculum. Christian expertly balances the challenges of leading the market and listening to customers, of pushing ahead with innovations and sticking with what works.

Anton Yakovlev, Program Manager at Pearson Education, has now been involved with me on five book projects. Anton not only keeps impeccable control of what has to be done, he has been more proactive than previous project managers in initiating many great ideas.

Sean Hale, Project Manager at Pearson Education, ably handles day-to-day movement of materials and ideas. This project has a nontraditional flow of work among the principal actors, and I am grateful to Sean for keeping everything moving in a timely and an accurate manner.

I have had the great fortune to work with only three editors for most of my long association with Pearson and its predecessors. Paul F. Corey, who is now president of Science, Business and Technology at Pearson, guided development of the third, fourth, and fifth editions of this book. Dan Kaveney guided development of the sixth, seventh, eighth, and ninth

editions. I will always value the sound judgment, outstanding vision, and friendship of Paul and Dan, and now Christian.

In this age of outsourcing, Pearson works with many independent companies to create books. This edition has been the beneficiary of a top-notch team:

Karen Gulliver, the development editor, has had lots of great ideas. Because the book has been a success for so long, it is a challenging job to make a great product even stronger.

Jeanine Furino, at Cenveo Publisher Services, smoothly managed the flow of copyediting and other production tasks for this project. This is an especially important task because of the unusual flow of work, especially the unique construction of each two-page spread.

Kevin Lear, Senior Project Manager at International Mapping, and his team, produced outstanding maps for this book. Back in the 1980s, when he was getting started as a professional cartographer, Kevin was the first cartographer to figure out how to produce computer-generated full-color maps for the second edition of this book. That was the first time that either GIS or full color had been used in a geography text.

I am grateful for the great work done on a variety of ancillaries.

I would also like to extend a special thanks to all of my colleagues who have, over the years, offered a good deal of feedback and constructive criticism. Colleagues who served as reviewers as we prepared the 12th edition are: Victoria Alapo (Metropolitan Community College), Christiana Asante-Ashong (Grambling State University), Becky Bruce (Southwestern Oklahoma State Univ), Tom Chapman (Old Dominion University), Xueming Chen (Virginia Commonwealth University), Marcia England (Miami University), Steven Graves (California State University Northridge), Chris Hall (Davis School District, Utah), Institute for Curriculum Services, Gordon Newby (Emory University), William Pitts (Baylor University), Benjamin Ravid (Brandeis University), James Saku (Frostburg State University), Debra Sharkey (Columbus River College), Jill Stackhouse (Bemidji State University), John Voll (Georgetown University), Margath Walker (University of Louisville), and Pam Wolfe (Yeshiva of Greater Washington).

DIGITAL & PRINT RESOURCES

For Students and Teachers:

This edition provides a complete human geography program for students and teachers.

Masteringgeography™ with Pearson eText for *The Cultural Landscape*

The Mastering platform is the most widely used and effective online homework, tutorial, and assessment system for the sciences. It delivers self-paced coaching activities that provide individualized coaching, focus on course objectives, and are responsive to each student's progress. The Mastering system helps teachers maximize class time with customizable, easy-to-assign, and automatically graded assessments that motivate students to learn outside of class and arrive prepared for lecture. MasteringGeography offers:

- Assignable activities that include GIS-inspired MapMaster™ interactive maps, *Encounter Human Geography* Google Earth™ Explorations, GeoVideos, GeoTutors, Thinking Spatially & Data Analysis activities, end-of-chapter questions, reading quizzes, Test Bank questions, map labeling activities, and more.
- Student study area with GIS-inspired MapMaster interactive maps, Geoscience Animations, web links, geography videos, glossary flash cards, “In the News” RSS feeds, reference maps, an optional Pearson eText and more. www.masteringgeography.com

For Teachers

Instructor Resource Manual (Download Only) (0134259416) Updated for the twelfth edition, the *Instructor Resource Manual*, is intended as a resource for both new and experienced instructors. It includes lecture outlines, additional source materials, teaching tips, advice about how to integrate online media, and various other ideas for the classroom. <http://www.pearsonhighered.com/irc>.

TestGen® Computerized Test Bank (Download Only) (0134259408) 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 over 1,000 multiple choice and short answer/ essay questions. Questions are correlated to the revised U.S. National Geography Standards and Bloom's Taxonomy to help instructors better map the assessments against both broad and specific teaching and learning objectives. The questions are also tagged to chapter specific learning outcomes. The Test Bank is available in Microsoft Word, and is importable into Blackboard. <http://www.pearsonhighered.com/irc>

Instructor Resource DVD (0134259424) The *Instructor Resource DVD* provides high-quality electronic versions of photos and illustrations from the book in JPEG, pdf, and PowerPoint formats, as well as customizable PowerPoint lecture presentations, Classroom Response System questions in PowerPoint, and the *Instructor Resource Manual* and *Test Bank* in MS. Word and TestGen formats. For easy reference and identification, all resources are organized by chapter.

For Students

Teaching College Geography: A Practical Guide for Graduate Students and Early Career Faculty (0136054471)

This two-part resource provides a starting point for becoming an effective geography teacher from the very first day of class. Divided in two parts, Part One addresses “nuts-and-bolts” teaching issues. Part Two explores being an effective teacher in the field, supporting critical thinking with GIS and mapping technologies, engaging learners in large geography classes, and promoting awareness of international perspectives and geographic issues.

Aspiring Academics: A Resource Book for Graduate Students and Early Career Faculty (0136048919)

Drawing on several years of research, this set of essays is designed to help graduate students and early career faculty start their careers in geography and related social and environmental sciences. *Aspiring Academics* stresses the interdependence of teaching, research, and service—and the importance of achieving a healthy balance of professional and personal life—while doing faculty work. Each chapter provides accessible, forward-looking advice on topics that often cause the most stress in the first years of a college or university appointment.

Practicing Geography: Careers for Enhancing Society and the Environment (0321811151)

This book examines career opportunities for geographers and geospatial professionals in business, government, non-profit, and educational sectors. A diverse group of academic and industry professionals share insights on career planning, networking, transitioning between employment sectors, and balancing work and home life. The book illustrates the value of geographic expertise and technologies through engaging profiles and case studies of geographers at work.

Goode's World Atlas, 23rd Edition (0133864642)

Goode's World Atlas has been the world's premiere educational atlas since 1923, and for good reason. It features over 250 pages of maps, from definitive physical and political maps to important thematic maps that illustrate the spatial aspects of many important topics. The 23rd edition includes digitally produced reference maps, as well as new thematic maps on demography, global climate change, sea level rise, CO₂ emissions, polar ice fluctuations, deforestation, extreme weather events, infectious diseases, water resources, and energy production.

Encounter Human Geography Workbook & Website by Jess C. Porter (0321682203)

For classes that do not use MasteringGeography, *Encounter Human Geography* provides rich, interactive explorations of human geography concepts through Google Earth. Students explore the globe through themes such as population, sexuality and gender, political geography, ethnicity, urban geography, migration, human health, and language. All chapter explorations are available in print format as well as online quizzes, accommodating different classroom needs. All worksheets are accompanied with corresponding Google Earth KMZ media files, available for download for those who do not use MasteringGeography, from <http://www.mygeoscienceplace.com>.

Dire Predictions: Understanding Climate Change, 2nd edition, by Michael Mann and Lee R. Kump (0133909778)

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 essential findings of the IPCC's 5th 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** covers the latest climate change data and scientific consensus from the IPCC Fifth Assessment Report and integrates links to online media. The text is also available in various eText formats, including an upgrade option from MasteringGeography courses.

Television for the Environment Earth Report Geography Videos on DVD (0321662989)

This three-DVD set is designed to help students visualize how human decisions and behavior have affected the environment and how individuals are taking steps toward recovery. With topics ranging from the poor land management promoting the devastation of river systems in Central America to the struggles for electricity in China and Africa, these 13 videos from Television for the Environment's global *Earth Report* series recognize the efforts of individuals around the world to unite and protect the planet.

ABOUT THE AUTHOR



Dr. James M. Rubenstein received his B.A. from the University of Chicago in 1970, M.Sc. from the London School of Economics and Political Science in 1971, and Ph.D. from Johns Hopkins University in 1975. He is Professor of Geography at Miami University, where he teaches urban and human geography. Dr. Rubenstein also conducts research in the automotive industry and has published three books on the subject—*The Changing U.S. Auto Industry: A Geographical Analysis* (Routledge); *Making and Selling Cars: Innovation and Change in the U.S. Auto Industry* (The Johns Hopkins University Press); and *Who Really Made Your Car? Restructuring and Geographic Change in the Auto Industry* (W.E. Upjohn Institute, with Thomas Klier). Dr. Rubenstein is also the author of *Contemporary Human Geography*, as well as Introduction to *Contemporary Geography*. He also writes a weekly column about local food for the *Oxford Press*. Winston, a lab-husky mix with one brown eye and one blue eye, takes Dr. Rubenstein for long walks in the woods every day. *Thanks to Ursula Roma for the photo.*

ABOUT OUR SUSTAINABILITY INITIATIVES

Pearson recognizes the environmental challenges facing this planet, as well as acknowledges our responsibility in making a difference. This book is carefully crafted to minimize environmental impact. The binding, cover, and paper come from facilities that minimize waste, energy consumption, and the use of harmful chemicals. Pearson closes the loop by recycling every out-of-date text returned to our warehouse.

Along with developing and exploring digital solutions to our market's needs, Pearson has a strong commitment to achieving carbon-neutrality. As of 2009, Pearson became the first carbon- and climate-neutral publishing company, having reduced our absolute carbon footprint by 22% since then. Pearson has protected over 1,000 hectares of land in Columbia, Costa Rica, the United States, the UK and Canada.

In 2015, Pearson formally adopted *The Global Goals for Sustainable Development*, sponsoring an event at the United Nations General Assembly and other ongoing initiatives. Pearson sources 100% of the electricity we use from green power and invests in renewable energy resources in multiple cities where we have operations, helping make them more sustainable and limiting our environmental impact for local communities.



PEARSON

The future holds great promise for reducing our impact on Earth's environment, and Pearson is proud to be leading the way. We strive to publish the best books with the most up-to-date and accurate content, and to do so in ways that minimize our impact on Earth. To learn more about our initiatives, please visit www.pearson.com/social-impact/sustainability/environment.html.





THE CULTURAL LANDSCAPE

James M. Rubenstein

DEDICATION

This book is dedicated to Bernadette Unger, Dr. Rubenstein's wife, who has been by his side through many books, as well as to the memory of his father, Bernard W. Rubenstein. Dr. Rubenstein also gratefully thanks the rest of his family for their love and support.

THE CULTURAL LANDSCAPE

1

This Is Geography

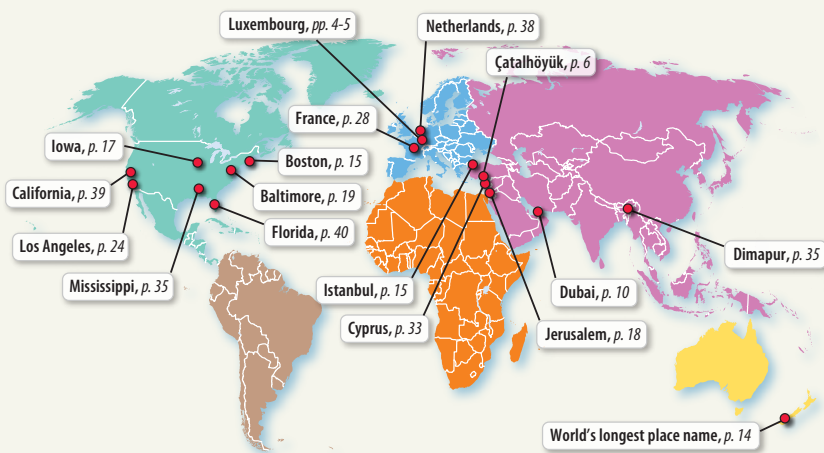
What do you expect from this geography course? You may think that geography involves memorizing lists of countries and capitals. Perhaps you associate geography with photographic essays of exotic places in popular magazines. Contemporary geography is the scientific study of where people and activities are found across Earth's surface and the reasons they are found there.



Luxembourg City, including St. John Church, built in 1606.



LOCATIONS IN THIS CHAPTER



KEY ISSUES

1

Why Is Geography a Science?

Prehistoric humans were the first people to make maps. Contemporary tools enable cartographers—and anyone else who has access to electronic devices—to make precise maps.



2



Why Is Each Point on Earth Unique?

Geographers understand why each *place* on Earth is in some ways unique. Each area or *region* on Earth also possesses a unique combination of features.

3



Why Are Different Places Similar?

Many features are organized in a regular manner across *space*. Some regularities are global in *scale*, whereas others have distinctive local character.

4



Why Are Some Actions Not Sustainable?

Distinctive to geography is the importance given to *connections* between human activities and the physical environment. Some human activities are sustainable, but others are not.

Why Is Geography a Science?

- ▶ **Introducing Geography**
- ▶ **Cartography: The Science of Mapmaking**
- ▶ **Contemporary Geographic Tools**
- ▶ **Interpreting Maps**
- ▶ **The Geographic Grid**

LEARNING OUTCOME 1.1.1

Summarize differences between geography and history.

Thinking geographically is one of the oldest human activities. Perhaps the first geographer was a prehistoric human who crossed a river or climbed a hill, observed what was on the other side, returned home to tell about it, and scratched the route in the dirt. The second geographer may have been a friend or relative who followed the dirt drawing to reach the other side.

The word *geography*, invented by the ancient Greek scholar Eratosthenes, is based on two Greek words. *Geo* means “Earth,” and *graphy* means “to write.” Geography is the study of where things are found on Earth’s surface and the reasons for the locations. Human geographers ask two simple questions: Where are people and activities found on Earth? Why are they found there?

In his framework of all scientific knowledge, the German philosopher Immanuel Kant (1724–1804) compared geography and history:

Geographers . . .	Historians . . .
identify the location of important places and explain why human activities are located beside one another.	identify the dates of important events and explain why human activities follow one another chronologically.
ask <i>where</i> and <i>why</i> .	ask <i>when</i> and <i>why</i> .
organize material spatially.	organize material chronologically.
recognize that an action at one point on Earth can result from actions at another point, which can consequently affect conditions elsewhere.	recognize that an action at one point in time can result from past actions that can in turn affect future ones.

History and geography differ in one especially important manner: A geographer can drive or fly to another place to study Earth’s surface, whereas a historian cannot travel to another time to study other eras firsthand. This ability

to reach other places lends excitement to the discipline of geography—and geographic training raises the understanding of other spaces to a level above that of casual sightseeing.

Introducing Geography

To introduce human geography, we will concentrate on two main features of human behavior: culture and economy. The first half of the book explains why the most important cultural features, such as major languages, religions, and ethnicities, are arranged as they are across Earth. The second half of the book looks at the locations of the most important economic activities, including agriculture, manufacturing, and services.

This chapter introduces basic concepts that geographers employ to address their “where” and “why” questions. To explain where things are, one of geography’s most important tools is a map. Ancient and medieval geographers created maps to describe what they knew about Earth. Today, accurate maps are generated from electronic data.

Geographers employ several basic concepts to explain why every place on Earth is in some ways unique and in other ways related to other locations. Many of these concepts are commonly used English words, but they are given particular meaning by geographers.

To explain why every place is unique, geographers have two basic concepts:

- A **place** is a specific point on Earth, distinguished by a particular characteristic. Every place occupies a unique location, or position, on Earth’s surface.
- A **region** is an area of Earth defined by one or more distinctive characteristics. Geographers divide the world into a number of regions, such as North America and Latin America.

To explain why different places are interrelated, geographers have three basic concepts:

- **Scale** is the relationship between the portion of Earth being studied and Earth as a whole. Geographers study a variety of scales, from local to global. Many processes

▼ **FIGURE 1-1 PLACE** The place of the City of Luxembourg is atop a hill overlooking the Alzette River.





▲ **FIGURE 1-2 REGION** Luxembourg is part of the region of Europe.

that affect humanity's occupation of Earth are global in scale, such as climate change and depletion of energy supplies. At the same time, local-scale processes—such as preservation of distinctive cultural and economic activities—are increasingly important.

- **Space** refers to the physical gap or interval between two objects. Geographers observe that many objects are distributed across space in a regular manner, for discernible reasons.
- **Connection** refers to relationships among people and objects across the barrier of space. Geographers are concerned with the various means by which connections occur.

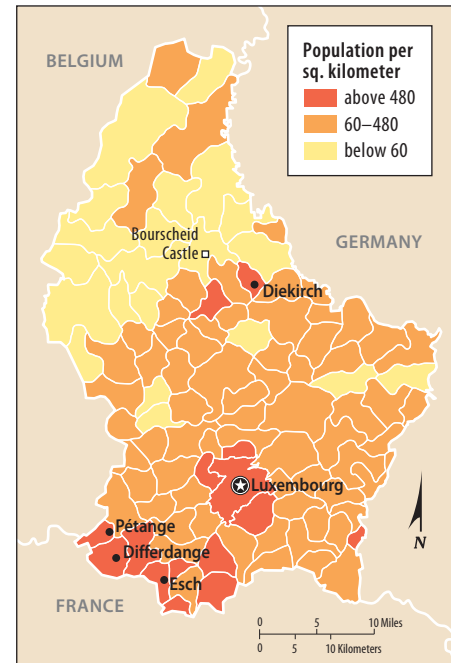
Luxembourg can be used to illustrate the five concepts. The City of Luxembourg is a place located on a hillside perched above the Alzette River (Figure 1-1). The City of Luxembourg is the capital of the country of Luxembourg,

▼ **FIGURE 1-3 SCALE** (a) Regional scale: high-rise buildings in the background house offices of the European Union; (b) Local scale: vendor at farmers' market sells food products made in Luxembourg.

(a)



(b)



▲ **FIGURE 1-4 SPACE** The space occupied by Luxembourgers is primarily houses built close together in cities in the southern half of the country.

located in the world region of Europe (Figure 1-2). Luxembourg plays a major role at a global scale, as one of the principal headquarters of the European Union, which unites 28 countries (Figure 1-3a). At the same time, Luxembourg, like other places, has a distinctive local scale; one example is the availability of distinctive local products not available elsewhere (Figure 1-3b). The space occupied by Luxembourg has distinctive features; for example, most people live in the south of the country, whereas the north is sparsely inhabited (Figure 1-4). Connections between Luxembourg and other places are provided by road, rail, and river (Figure 1-5).

PAUSE & REFLECT 1.1.1

What are the principal connections from your hometown to other places?

▼ **FIGURE 1-5 CONNECTION** Luxembourg is connected to other places in Europe by train. European Union offices are in the background.



Cartography: The Science of Mapmaking

LEARNING OUTCOME 1.1.2

Understand how cartography developed as a science.

Geography's most important tool for thinking spatially about the distribution of features across Earth is a map. A **map** is a two-dimensional or flat-scale model of Earth's surface, or a portion of it. Geography is immediately distinguished from other disciplines by its reliance on maps to display and analyze information.

A map serves two purposes:

- **As a reference tool.** A map helps us to find the shortest route between two places and to avoid getting lost along the way. We consult maps to learn where in the world something is located, especially in relationship to a place we know, such as a town, body of water, or highway. The maps in an atlas or a smart phone app are especially useful for this purpose.
- **As a communications tool.** A map is often the best means for depicting the distribution of human activities or physical features, as well as for thinking about reasons underlying a distribution.

A map is a scale model of the real world, made small enough to work with on a desk or computer. It can be a hasty here's-how-to-get-to-the-party sketch, an elaborate work of art, or a precise computer-generated product. For centuries, geographers have worked to perfect the science of mapmaking, called **cartography**. Contemporary cartographers are assisted by computers and satellite imagery.



▲ **FIGURE 1-6 EARLIEST SURVIVING MAP** This map, dating from 6200 B.C., depicts the town of Çatalhöyük, in present-day Turkey, and the eruption of the Hasan Dağ (Mount Hasan) twin-peaks volcano, which is actually located around 140 km northeast of the town. Archaeological evidence indicates that the volcano did erupt around the time that the map was made. The map is now in the Konya Archaeological Museum.

GEOGRAPHY IN THE ANCIENT WORLD

The science of geography has prehistoric roots. The earliest surviving fully authenticated map, depicting the town of Çatalhöyük, located in present-day Turkey, dates from approximately 6200 B.C. (Figure 1-6). Archaeologists found the map on the wall of a house that was excavated during the 1960s. Major contributors to geographic thought in the ancient eastern Mediterranean included:

- Thales of Miletus (ca. 624–ca. 546 B.C.), who applied principles of geometry to measuring land area.
- Anaximander (610–ca. 546 B.C.), a student of Thales, who made a world map based on information from sailors and argued that the world was shaped like a cylinder.
- Pythagoras (ca. 570–ca. 495 B.C.), who may have been the first to propose a spherical world and argued that the sphere was the most perfect form.
- Hecateus (ca. 550–ca. 476 B.C.), who may have produced the first geography book, called *Ges Periodos* (“Travels Around the Earth”).
- Aristotle (384–322 B.C.), who was the first to demonstrate that Earth was spherical on the basis of evidence.
- Eratosthenes (ca. 276–ca. 195 B.C.), the inventor of the word *geography*, who accepted that Earth was round (as few others did in his day), calculated its circumference within 0.5 percent accuracy, accurately divided Earth into five climatic regions, and described the known world in one of the first geography books.
- Strabo (ca. 63 B.C.–ca. A.D. 24), who described the known world in a 17-volume work titled *Geography*.
- Ptolemy (ca. A.D. 100–ca. 170), who wrote the eight-volume *Guide to Geography*, codified basic principles of mapmaking, and prepared numerous maps that were not improved upon for more than 1,000 years (Figure 1-7).

China was another center of early geographic thought. Ancient Chinese geographic contributions included:

- “Yu Gong” (“Tribute of Yu”), a chapter in a book called *Shu Jing* (“Classic of History”), which was the earliest surviving Chinese geographical writing, by an unknown author from the fifth century B.C., described the economic resources of the country's different provinces.
- Pei Xiu, the “father of Chinese cartography,” who produced an elaborate map of the country in A.D. 267.

GEOGRAPHY'S REVIVAL

After Ptolemy, little progress in mapmaking or geographic thought was made in Europe for several hundred years. Maps became less mathematical and more fanciful, showing



▲ **FIGURE 1-7 WORLD MAP BY PTOLEMY, CA. A.D. 150** The map shows the known world at the height of the Roman Empire, surrounding the Mediterranean Sea and Indian Ocean.

Earth as a flat disk surrounded by fierce animals and monsters. Geographic inquiry continued, though, outside Europe. Contributors outside of Europe included:

- Muhammad al-Idrisi (1100–ca. 1165), a Muslim geographer who prepared a world map and geography text in 1154, building on Ptolemy’s long-neglected work (Figure 1-8).
- Abu Abdullah Muhammad Ibn-Battuta (1304–ca. 1368), a Moroccan scholar, who wrote *Rihla* (“Travels”) based on three decades of journeys covering more than 120,000 kilometers (75,000 miles) through the Muslim world of northern Africa, southern Europe, and much of Asia.

Making maps as reference tools revived during the Age of Exploration and Discovery. Columbus, Magellan, and other explorers who sailed across the oceans in search of trade routes and resources in the fifteenth and sixteenth centuries required accurate maps to reach desired destinations without wrecking their ships. In turn, cartographers used information collected by the explorers to create more accurate maps. Influential European cartographers included:



▲ **FIGURE 1-9 WORLD MAP BY ORTELIUS, 1571** This was one of the first maps to show the considerable extent of the Western Hemisphere, as well as the Antarctic landmass.

- Martin Waldseemüller (ca. 1470–ca. 1521), a German cartographer who was credited with producing the first map to use the label “America”; he wrote on the map (translated from Latin) “from Amerigo the discoverer . . . as if it were the land of Americus, thus America.”
- Abraham Ortelius (1527–1598), a Flemish cartographer, who created the first modern atlas and was the first to hypothesize that the continents were once joined together before drifting apart (Figure 1-9).
- Bernhardus Varenius (1622–1650), who produced *Geographia Generalis*, which stood for more than a century as the standard treatise on systematic geography.

PAUSE & REFLECT 1.1.2

What is one main difference between the world maps of Ptolemy (Figure 1-7) and of Ortelius (Figure 1-9)?



► **FIGURE 1-8 WORLD MAP BY AL-IDRISI, 1154** Al-Idrisi built on Ptolemy’s map, which had been neglected for nearly a millennium.

Contemporary Geographic Tools

LEARNING OUTCOME 1.1.3

Identify geography's contemporary analytic mapping tools.

Maps are not just paper documents in textbooks. They have become an essential tool for contemporary delivery of on-line services through smart phones, tablets, and computers.

PINPOINTING LOCATIONS: GPS

Our smart phones, tablets, and computers are equipped with **Global Positioning System (GPS)**, which is a system that determines the precise position of something on Earth. The GPS in use in the United States includes three elements:

- Satellites placed in predetermined orbits by the U.S. military (24 in operation and 3 in reserve).

- Tracking stations to monitor and control the satellites.
- A receiver that can locate at least 4 satellites, figure out the distance to each, and use this information to pinpoint its own location.

GPS is most commonly used for navigation. Pilots of aircraft and ships stay on course with GPS. On land, GPS detects a vehicle's current position, the motorist programs the desired destination into a GPS device, and the device provides instructions on how to reach the destination. GPS can also be used to find the precise location of a vehicle, enabling a motorist to summon help in an emergency or a customer to monitor the progress of a delivery truck or position of a bus or train.

Thanks to GPS, our electronic devices provide us with a wealth of information about the specific place on Earth we currently occupy. Cell phones equipped with GPS allow individuals to share their whereabouts with others. Geographers find GPS to be particularly useful in coding the precise location of objects collected in fieldwork.

The locations of all the information we gather and photos we take with our electronic devices are recorded through

DOING GEOGRAPHY Data Collection & Mental Mapping

Most of the maps and other information fed into handheld electronic devices is provided by three companies. Google supplies Android devices, TomTom (formerly Tele Atlas) supplies Apple devices, and Nokia (formerly Navteq, now owned by Microsoft) supplies Microsoft products. These companies get their information from what they call "ground truthing." Hundreds of field researchers drive around, building the database. One person drives, while the other feeds information into a notebook computer (Figure 1-10). Hundreds of attributes are recorded, such as crosswalks, turn restrictions, and name changes. Thus, electronic navigation systems ultimately depend on human observation.



▲ **FIGURE 1-10 GOOGLE STREET MAPPING** Jaraíz de la Vera, Spain.

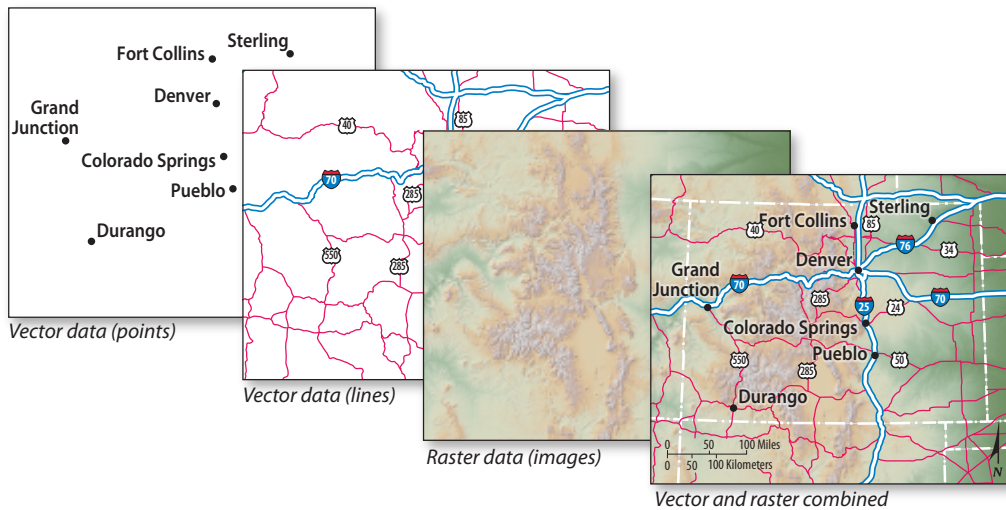
What's Your Geography?

A **mental map** is a personal representation of a portion of Earth's surface. A mental map depicts what an individual knows about a place, and it contains personal impressions of what is in the place and where the place is located.

1. Draw a mental map depicting your route between two familiar places, such as between home and school or dorm room and geography class. Show the paths (roads or walkways) and important landmarks along the route, such as buildings or shops.
2. Compare your mental map to those made by others in your class. How detailed is your depiction of paths and

landmarks compared to those of others? At school, for example, a senior is likely to have a more detailed map than a newcomer.

3. Compare your mental map to a map of the same area from Google Maps. How accurate is your map? Did you forget something important or put something in the wrong place?
4. At OpenStreetMap, see if your route has been mapped. If so, are important landmarks included? If your route has not been mapped, or if important landmarks are not included, you are free to place them on the map by following OpenStreetMap instructions.



▲ **FIGURE 1-11 GIS** Geographic information systems involve two types of data: vector and raster. Vector data consists of points (for example, for cities) and lines (for example, for highways). Raster data consists of images such as landforms.

geotagging, which is identification and storage of a piece of information by its precise latitude and longitude coordinates. Geotagging has led to concerns about privacy.

ANALYZING DATA: GI-SCIENCE

Geographic Information Science (GIScience) is analysis of data about Earth acquired through satellite and other electronic information technologies. A **geographic information system (GIS)** captures, stores, queries, and displays the geographic data. GIS produces maps (including those in this book) that are more accurate and attractive than those drawn by hand. A map is created by retrieving a number of stored objects and combining them to form an image. Each type of information is stored in a layer (Figure 1-11). For example, separate layers could be created for boundaries of countries, bodies of water, roads, and names of places. A simple map might display only a single layer by itself, but most maps combine several layers, and GIS permits construction of much more complex maps than can be drawn by hand.

The acquisition of data about Earth's surface from a satellite orbiting Earth or from other long-distance methods is **remote sensing**. Remote-sensing satellites scan Earth's surface and transmit images in digital form to a receiving station on Earth's surface. At any moment, a satellite sensor records the image of a tiny area called a picture element, or pixel. Scanners detect the radiation being reflected from that tiny area. A map created by remote sensing is essentially a grid containing many rows of pixels. The smallest feature on Earth's surface that can be detected by a sensor depends on the resolution of the scanner. Geographers use remote sensing to map the changing distribution of a wide variety of features, such as agriculture, drought, and sprawl.

GIScience helps geographers create more accurate and complex maps and measure changes over time in the characteristics of places. Layers of information acquired through remote sensing and produced through GIS can be described and analyzed. GIScience enables geographers to calculate whether relationships between objects on a map are significant or merely coincidental. For example, a map showing

where life expectancy is low (such as in Figure 1-24) can be combined with layers showing the location of people with various incomes and the location of crimes.

COLLECTING AND SHARING DATA: VGI

Smart phones, tablets, and computers enable individuals to make maps and share them with others. **Volunteered geographic information (VGI)** is the creation and dissemination of geographic data contributed voluntarily and for free by individuals. VGI is part of the broader trends of **citizen science**, which is scientific research by amateur scientists, and **participatory GIS (PGIS)**, which is community-based mapping. Citizen science and PGIS collect and disseminate local knowledge and information through electronic devices. For example, OpenStreetMap (OSM) is VGI intended to develop a free base map of the world. Individuals can contribute to OSM at OpenStreetMap.org (see Doing Geography and What's Your Geography? feature).

A **mashup** is a map that overlays data from one source on top of a map provided by a mapping service, such as Google Maps or Google Earth. The term *mashup* refers to the practice of overlaying data from one source on top of one of the mapping services; the term comes from the hip-hop practice of mixing two or more songs.

A mashup map can show the locations of nearby pizza restaurants, the locations of commercial airplanes currently in flight, or traffic conditions on highways. Individuals can create mashups on their personal computers because mapping services provide access to the application programming interface (API), which is the language that links a database such as an address list with software such as mapping software. An API for mapping software is available at such sites as developers.google.com/maps.

PAUSE & REFLECT 1.1.3

State a question you have about the area where you live. Describe a mashup that you could create using GIS that would answer your question.