Chapter 3

# Geography: Its Nature and Perspectives

## Introduction

Driving through Nashville, Tennessee, the country music capital of the world, you would expect to pass numerous tourist attractions and shops devoted to that music genre, but you would likely be surprised to see a large Hindu temple built on the city's west side. The study of human geography is related to such an observation. A human geographer would be interested in studying how Hinduism spread to the United States and why this temple was built in a southern city.

Or perhaps you are strolling down a crowded city street in Beijing, China, and come across a Kentucky Fried Chicken restaurant. Human geographers would be interested in analyzing the spread of KFC to China and its impact on local culture.

What is particularly interesting about human geography is its approach to studying the world by looking at the interaction between humans and the lands they inhabit. While

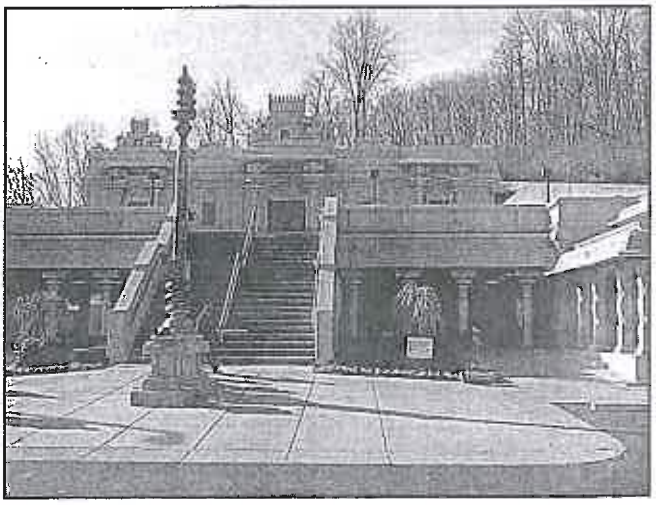


**Figure 3.1. Sri Ganesh Hindu Temple, Nashville, Tennessee**


**Figure 3.2. Kentucky Fried Chicken restaurant in Beijing, China**

most *world* geography classes teach students about the earth from a regional perspective—for instance, starting with North America and moving towards Asia—*human* geography takes a *thematic* approach, looking at the earth and its many different peoples in the context of many different patterns. That is the essence of human geography: defining and explaining patterns in human interactions with the earth.

## Key Questions

- What is human geography, and how is it related to the geographic perspective?
- How is geography a field of inquiry?
- How is spatial analysis embedded in the geographic perspective?
- How are humans and their landscapes related?
- What is geographic scale, and how does it affect geographic inquiry?
- What is regionalization, and how is it related to human geography?
- What effect do globalization and spatial interconnection have on people and places?
- How are various map forms and spatial data used?
- How does technology impact our understanding of geographic patterns and processes?

PART 1

# Geographical Concepts, the Geographical Perspective, and Key Skills

## Geography as a Field of Inquiry

Geography is an exciting field of investigation that focuses on understanding the world and its patterns. One geographer compared geography to a quest for the answer to a strange question: "Why of where?" Yes, geographers study the patterns that appear on a map of the earth when they chart the locations of rivers, mountains, poverty, religions, and other aspects of life. But geographers are also fundamentally concerned with trying to find the *reasons* for the patterns. For example, not only do geographers design maps that show large concentrations of Hindus in India, but they also search to understand *why* most Hindus congregate in India.

Just as an archeologist digs into the earth, geographers search through the layers of patterns in the earth's physical and human landscapes to "write about earth" (which is what *geography* means when translated literally from its Greek roots).

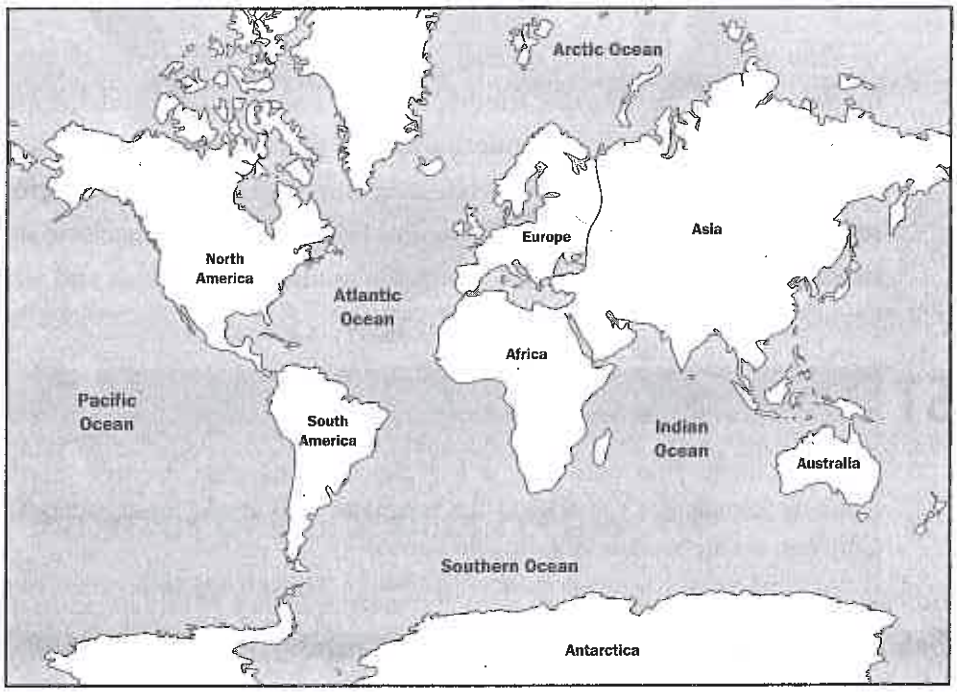



Figure 3.3. The world's continents and oceans

## The Spatial Perspective

At the very base of the geographer's craft is an obsession with space. No, not just outer space but space in general: rooms, countries, parks, continents, cyberspace, rivers—all types of space. Geographers have a special eye for looking into space and investigating the patterns within it. For example, a geographer might look at the space of your bedroom and ask several questions: How are things distributed? What movements are occurring? What processes operate in that space? How does this space relate to other nearby spaces?

Such a way of identifying, explaining, and predicting the human and physical patterns in space and the interconnectedness of various spaces is known to geographers as the **spatial perspective.**

Often geographers create and use **geographic models** to explain and predict spatial patterns in the earth's human and physical landscapes. Geographic models are simplified versions of what exists on the earth and what might exist in the future. Models help geographers search for answers to why patterns exist the way they do—why, for example, India's population growth rate is different from South Africa's. One geographer created a model to explain rural land use patterns in his town. Then other geographers could use that model to explain and predict the patterns of farmland they saw in their towns.

You will study several models in human geography—the demographic transition model, the concentric zone model, and the von Thünen model, to name just a few—and each one will help you understand why patterns exist as they do on the earth. Each model will also give a sense of what the future might look like in terms of a spatial pattern. However, as you study each model, consider the drawbacks to applying it to every situation. Be sure to take into account the model's assumptions and where it was created.

### TEST TIP

If you change your answer to a multiple-choice question, be sure to erase your original answer completely. Otherwise, the machines that grade these sections may count your answer wrong because of a double-bubble.

## Physical Versus Human Geography

Although all geographers are obsessed with the spatial perspective, the particular type of space they focus on varies. **Physical geography** is concerned with spatial analysis of the structures, processes, and locations of the earth's natural phenomena, like soil, climate, plants, and topography. **Human geography**, on the other hand, is primarily concerned with analyzing the structures, processes, and locations of the earth's human creations and their interactions. In essence, both fields of geography analyze the central "why of where" question, but each field approaches the question from a different focus.

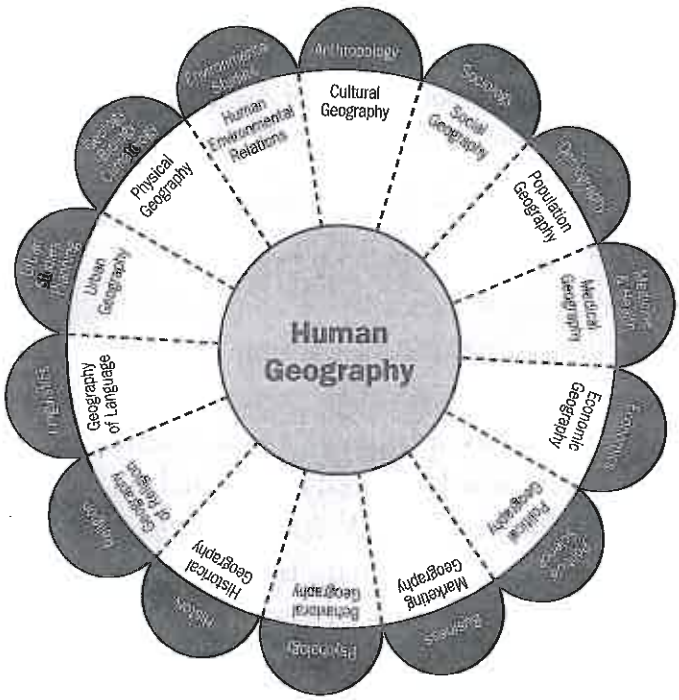



**Figure 3.4. Fields of human geography**

## The Five Themes of the Spatial Perspective

To understand the spatial perspective even more precisely, we must look into its five central themes: location, human–environment interaction, region, place, and movement. The five themes of geography are like five lenses through which geographers look at a space, each lens giving the geographer a different sense of the patterns in that space.

## Location

The theme of location is concerned with analyzing where something is on the earth and the effects that position has on human life. A location can be either absolute or relative.

### Absolute Location

**Absolute location** refers to a position on the global grid. Technically, a location is absolute when it has only one possible reference point. That is why latitude and longitude work; only one place is 85 degrees north, 37 degrees west on the planet. Your home address is another absolute location. There is only one 28 North Main Street in Williamsport, Pennsylvania.


The U.S. Postal Service is the second-largest employer in the United States and processes more than 8,000 pieces of mail each second.

The global grid is an invisible map of latitude and longitude lines. **Lines of latitude** are measured in degrees north and south from the equator, which is 0 degrees latitude. The North Pole is 90 degrees north latitude, while the South Pole is 90 degrees south latitude. Interestingly, lines of latitude never intersect, so geographers often call lines of latitude *parallels*. Because lines of latitude encircle the earth and never intersect, the circumferences of lines of latitude decrease as they move away from the equator in both directions. Therefore, the equator has the largest circumference of all the lines of latitude.

**Lines of longitude** are measured in degrees east and west of one line of longitude known as the prime meridian, which runs through Greenwich, England, and is located at 0 degrees longitude. The line of longitude on the opposite side of the prime meridian is known as the international date line. The international date line is aligned with the 180-degree longitude line for some latitudes but not for others. This reflects the political influence on time zones. For example, the international date line was moved to put all of Russia ahead of Greenwich mean time (which is discussed later in this section).

Interestingly, the prime meridian was selected by a group of politicians and geographers, but any line of longitude could technically be named prime if the world wanted to change it. In fact, some geographers argue that the current prime meridian is **Anglocentric**, meaning that it orients the global grid around English (western European) culture. Critics

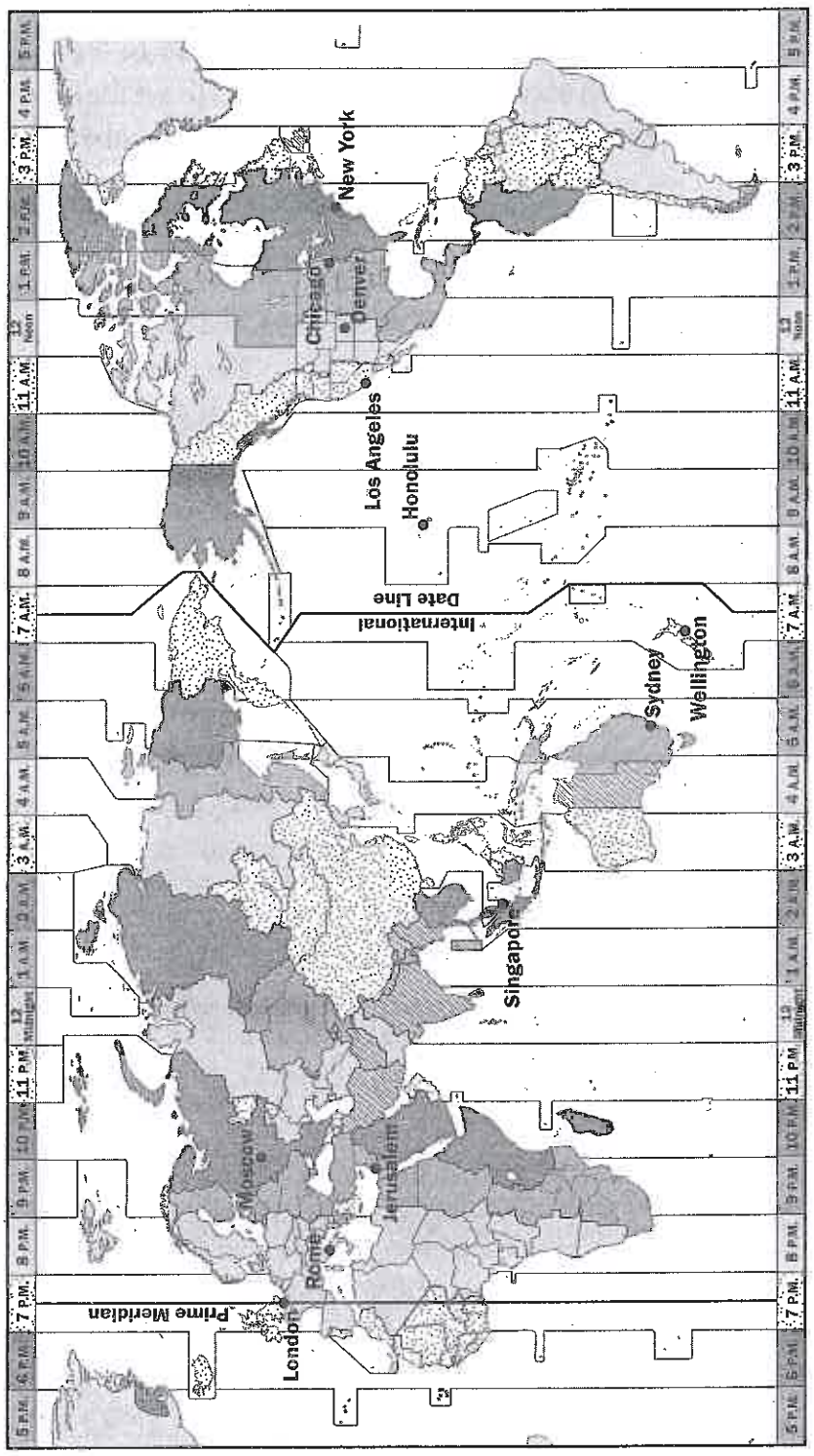



Figure 3.5. World's 24 time zones, each representing 15 degrees of longitude

ask why a line of longitude that runs through Asia, for example, was not selected as the prime meridian.

Thus, the absolute location of anything on the global grid—be it a city, person, boat, or Coke machine—is given as its latitude and longitude. To get more precise readings, each line of latitude and longitude can be broken down into minutes and seconds. There are 60 minutes (′) per degree (°) and 60 seconds (″) per minute.

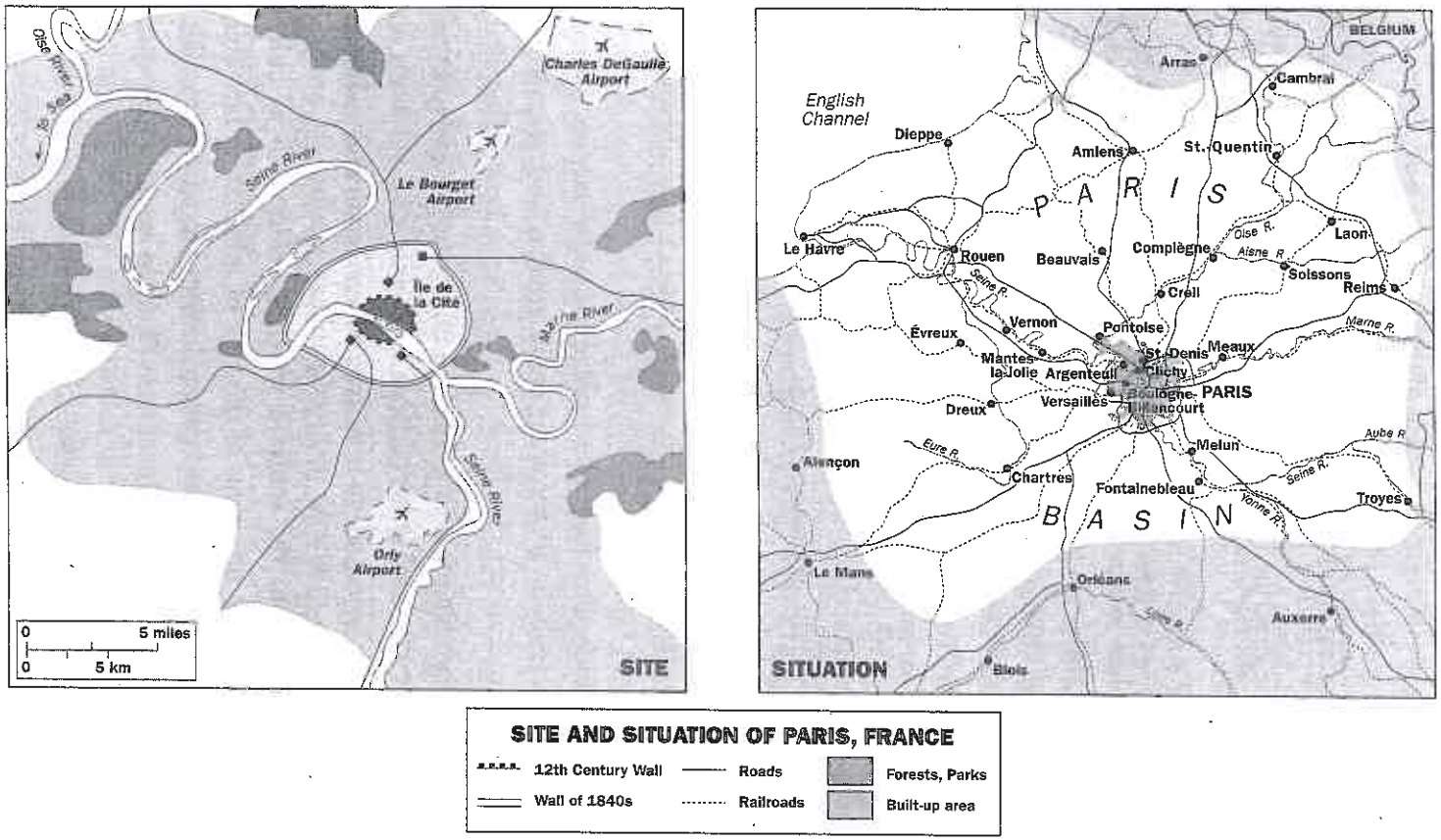
For instance, a coordinate might be written as 75°45′32″ E, which would be a line of longitude read as "75 degrees, 45 minutes, and 32 seconds east (of the prime meridian)." Locations can be pinpointed within inches on the global grid. A degree of latitude is nearly 69 miles; a minute, nearly 1.1 miles; and a second, about 100 feet. Because lines of longitude all meet at the North and South poles, lines of longitude get closer and closer together moving toward the poles.


The earth's equatorial diameter is longer than its polar diameter, making the earth slightly "fatter" than it is tall.

Time zones revolve around the prime meridian, which establishes **Greenwich mean time (GMT)**, or **Universal time**, as the baseline for time throughout the world. The sun "rises in the east and sets in the west" because the earth rotates about its axis in an eastward direction. Taiwan, for example, is nearly 12 hours ahead of Louisville, Kentucky. When it is 6 p.m. on Monday in Louisville, it is 6 a.m. on Tuesday in Taiwan.

Earth's time is divided into 24 standard time zones. With each 15-degree-longitude move you make away from the prime meridian (or GMT), you go ahead or fall back by one hour and one standard time zone. For example, if you move 15 degrees east of the prime meridian, you go one hour ahead of GMT. So when it is 6 p.m. in London (GMT), it is 7 p.m. in countries 15 degrees of longitude east, and it is 8 p.m. in countries 30 degrees of longitude east. The reverse is true if you move in a westward direction from GMT. Interestingly, politics influence time zones, too. China, for example, has instituted one time zone for its entire country, even though its provinces fall into nearly three different standard time zones. The Chinese government believed that one time zone would help unify its vast country.

Related to latitude and longitude are **great circles**, which are circles formed on the earth's surface by a plane that passes through the center of the earth. The equator and every line of longitude paired with its twin on the opposite side of the earth form great




**SITE AND SITUATION OF PARIS, FRANCE**

12th Century Wall — Roads — Forests, Parks

Wall of 1840s — Railroads — Built-up area

Figure 3.6. Site (left) and situation (right) of Paris, France

circles. Any arc of a great circle shows the shortest distance between two points on the earth's surface; thus, airplanes often fly great-circle routes to save gas.

### Relative Location

In addition to absolute location, anything can have a **relative location**, or its location as described in relation to places around it. The relative location of Nashville, Tennessee, could be described as being "south of Louisville, Kentucky," for example. "Hillsboro High School is located 9 miles southwest of McGavock High School" is another example of a relative location.

While the absolute location of a place remains the same (as long as the place does not move on the global grid), a description of a place's relative location can change if the place's surroundings change. For example, Kroger Grocery's relative location of being 2 miles south of Jane's Deli might change if Jane's Deli relocates to another location or goes out of business. Therefore, relative location is contextual and subject to change.

*Site* and *situation* are two more terms that describe a place's location. **Site** refers to a place's *internal* physical and cultural characteristics, such as its terrain and dominant religions. For example, the site of Sarasota, Florida, contains sandy beaches, Catholic churches, and humid equatorial climates, among other internal characteristics. On the other hand, **situation** refers to the location (or context) of a place relative to the physical and cultural characteristics around it. The more interconnected a place is to other powerful places, the better is its situation. A strong situation implies a place having a high degree of connectivity and accessibility, which allow for higher levels of spatial interaction. Moreover, modes of connectivity and accessibility are becoming multilayered as land, sea, and air access points increase and communication technologies like the Internet become increasingly complex.

## Human–Environment Interaction

The second major theme in the geographer's toolbox is analyzing **human–environment interaction**, the study of which is referred to as **cultural ecology**. Geographers analyze both directions of this type of interaction: how human activities affect their environment and how environmental changes impact human life. Geographers also analyze the positive and negative effects of human–environment interaction.

## Region

The third geographic theme is the region, a way of classifying information about places. Just as historians classify their content by epochs and centuries, geographers

classify their information by **regions**, which are spatial units that share some similar characteristics.

Geographers create regions to help them classify and understand the complexity of the earth. Every region consists of an area and a location and is contained by boundaries, which are sometimes not evident. There are three types of regions: formal, functional, and perceptual. However, each region links places together that share something. The physical and cultural character of an area and people's interconnections in that area allow geographers to create and define it as a region.

## Formal Regions

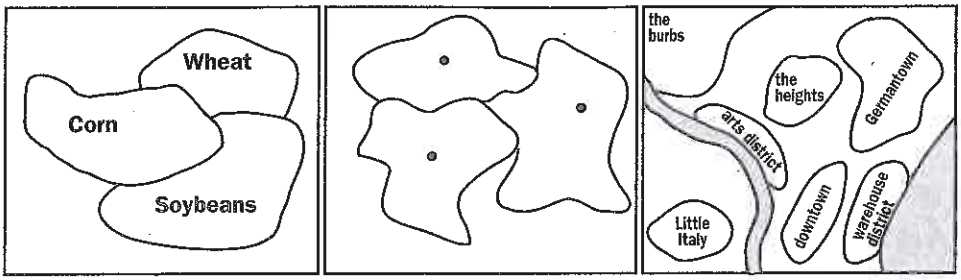
**Formal regions** (sometimes referred to as uniform regions) are areas that have common (or uniform) cultural or physical features. A country is a formal region, or an area of places linked by a shared government. A climate region is a formal region because it links places that share a climate. A map showing where Christianity is practiced is showing a formal region, or a group of places sharing that religion.

## Functional Regions

A **functional region** (sometimes referred to as a nodal region) is a group of places linked together by some function's influence on them. Often the influencing function diffused, or spread, from a central **node**, or originating point. Functional regions are created through the movement of some phenomenon, like a disease, or a perceived interaction among places, like pizza delivery routes. For example, a functional region might appear on a map of Delta Airlines' flights from Atlanta, Georgia. A mapmaker would plot all the places to which Delta travels from its hub in Atlanta—the node. Then the mapmaker would draw a boundary enclosing all those places into one functional region. The area affected by the spread of a flu epidemic is a functional region. A functional region could even show the transmission of a rumor from its source to all the people who hear it. Remember, functional regions are defined by the places affected by the movement of some phenomenon from its source (or node) to other places.

## Perceptual Regions

The third type of region is a **perceptual (or vernacular) region**. The boundaries of a perceptual region are determined by people's beliefs, not a scientifically measurable process. For example, the space in which the "cool kids" sit at lunch would be a perceptual region because its boundaries are totally determined by the region maker's perception of who is cool and who is not—something that could be debated by any other person in the room. Another example of a perceptual region is the South in the United States. People differ in their perceptions of which places are considered part of the South.




Formal regions based on dominant crop types.

Functional regions tied to a central node. These could be banks serving their branches, dairy farms providing milk to suppliers, etc.

Perceptual regions of a city.

**Figure 3.7. Three types of regions: formal regions based on crop types, functional regions linked to a central node, and perceptual regions in a city**

## Place

The fourth geographic theme is **place**, which is a unique combination of physical and cultural attributes that give each location on the earth its individual "stamp." Human components of place include religion, language, politics, and artwork, whereas the physical attributes include climate, terrain, and natural resources. The combination of these two parts of place, the human and physical, are what differentiate each location from another, almost like fingerprints.

Humans also develop a **sense of place**, which is a person's perception of the human and physical attributes of a location that give it a unique identity in our minds. For example, you probably remember a set of smells, sounds, and images from your ninth-grade English classroom. Think of how that sense of place differs from the total set of memories you have of your childhood bedroom or a favorite vacation spot. People can even develop a sense of place for a location they have never visited—through movies, television, and interactions with others who have traveled or heard of the places. You probably have never been to Siberia, but I bet you think it is a place you never want to visit because of its harsh climate!

## Movement

The fifth theme is that of **movement**. Geographers analyze the movement occurring in a space—movement of information, people, goods, and other phenomena. Geographers also evaluate how places interact through movement, a process known as **spatial interaction**. Although everything is theoretically linked to everything else, nearer things are usually

related more to each other than to faraway things. Thus, the extent of spatial interaction often depends on distance.

In evaluating movement and spatial interaction, geographers often evaluate the **friction of distance**, which is the degree to which distance interferes with some interaction. For example, the friction of distance for a working-class Ohio man wanting to visit a dentist in Ethiopia is quite high, meaning that the distance gets in the way of this interaction occurring. However, the friction of distance has been reduced in many aspects of life with improved transportation and communication infrastructures.

Today, the friction of distance is not as much of a problem for a business in Kentucky to sell something to a business in Taiwan, for example. Businesses can now communicate over the Internet, buying and selling their goods in transactions that would have taken months to complete just 30 years ago. This increasing sense of accessibility and connectivity seems to bring humans in distant places closer together, a phenomenon known as **space–time compression**. Note that space–time compression is reducing perceived distance, which is the friction of distance thought by humans, not the actual distance on the land.

Related to space–time compression is the effect of **distance decay**, in which the interaction between two places declines as the distance between the two places increases. Imagine putting a magnet on your desk and putting an iron nail on it. The farther you pull the iron nail away from the magnet, the less of a pull effect the magnet has on the nail, right? It is the same with distance decay; as the distance between two entities increases, the effect of their interaction decreases.

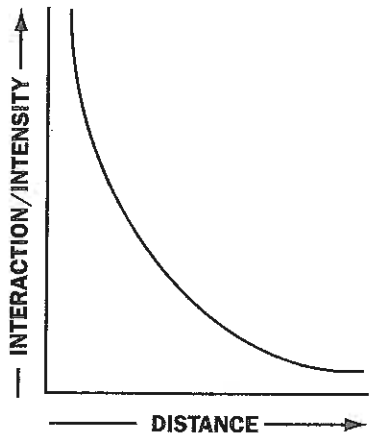



Figure 3.8. Distance decay curve showing that as distance increases, the level of interaction decreases

However, improved transportation and communication technologies have reduced the effect of distance decay on most human interactions. In 1850 on any given day, a person living in Atlanta probably never interacted with someone from 30 miles outside the city. Now a person in Atlanta can interact with people from all over the world via the Internet and improved transportation.

# Mapmaking

A **map** is a two-dimensional model of the earth or a portion of its surface. The process of mapmaking is called **cartography**. All maps include a somewhat simplified view of the earth's surface. **Simplification** is when a cartographer gets rid of unnecessary details and focuses on the information needing to be displayed on the map. When designing a map of Europe for high school students to use to help them memorize the names of countries and capitals, a mapmaker would present a simplified map of Europe's political states and boundaries, eliminating details such as vegetation or climate. Another example of simplification involves a cartographer designing a map of London's underground subway for tourists. Such a cartographer might eliminate unnecessary details such as unrelated buildings and streets from their maps because tourists do not need these details to understand London's subway tracks. Tourists are simply interested in getting on and off the correct subway stops.

## Distortion and Map Properties

It is impossible to take the earth's round surface and put it onto a flat surface without some form of **distortion**, or error, resulting from the "flattening" process. Think of distortion as caused by a process similar to trying to flatten an orange peel. Sorry to inform you of this, but all the maps you have memorized are wrong. As it is often said, "All maps lie flat, and all flat maps lie." Yes, that's right; every map is, in some way, wrong. The globe is the most accurate representation of the earth.

Each map has **four main map properties**: shape, size (area), distance, and direction. *Shape* refers to the geometric shapes of the objects on the map. *Size* (area) refers to the relative amount of space taken up on the map by the landforms or objects on the map. *Distance* refers to the represented distance between objects on the map. *Direction* refers to the degree of accuracy representing the **cardinal directions**—north, south, east, and west—and their **intermediate directions**—northwest, northeast, southwest, and southeast. Less accurate are the **relative directions** that people commonly use to describe a location, such as *right, left, up,* and *down,* among many others.

All four properties cannot be accurately represented, so a cartographer must choose which of the properties to distort. Cartographers make this decision by considering the map's purpose. When designing a map for navigational purposes, the cartographer would keep direction and distance accurate; size (area) and shape are not as important.

**TEST TIP**

Beginning in May 2011, the AP Exam stopped penalizing test takers for incorrect responses to multiple-choice questions. Entering a response for every question—even a wild guess—may help improve your score.

## The Process of Mapmaking: Projection

In making a flat map of the round earth, geographers use geometric shapes. They can choose a cylinder, cone, or flat plane to touch to the earth and construct a map. To visualize this process, imagine that the globe has a light in it and is in a dark room. When the chosen geometric shape, such as a flat plane, is placed on the globe, the globe reflects onto this geometric shape, forming a flat image, or projection, of the round earth. The resulting projection reflects the geometric surface used in constructing it.

The projection is distorted in some way, however, depending on the geometric shape used to make the map. Geographers have different labels for maps that reflect the different properties distorted by the maps:

- **Equal-area (or equivalent) projections:** maps that maintain area but distort other properties
- **Conformal (or orthomorphic) projections:** maps that maintain shape but distort other properties (it is impossible to have a projection that is both conformal and equal area)
- **Azimuthal projections: maps** that maintain direction but distort other properties
- **Equidistant projections: maps** that maintain distance but distort other properties

The Mercator projection, described in more detail in the next section, is a conformal projection created using a cylindrical surface, and the Albers projection was created using a conic surface. Azimuthal projections are flat-plane-constructed maps of each hemisphere. Great-circle routes are apparent on azimuthal projections.

## Uses of Projections

Consider the different maps you have seen in your lifetime. You probably have used a **Robinson projection** in your social studies class to memorize points on the world map because the Robinson projection shows the world according to slight distortion of all four properties, rather than getting just one correct and drastically distorting others. Before the Robinson projection was invented, social studies teachers often used the **Mercator projection.** Though the Mercator projection shows the shapes of the continents and landforms accurately, it drastically distorts the size (area) of the continents. For example, Greenland is almost as large as Africa on the Mercator. Moreover, schools in the former Soviet Union used the Mercator projection to teach its children because the map made the USSR look larger than its enemies. A geographer created the **Peter projection** to show relative sizes of the earth's continents accurately (equal area), but because it distorts shape, it is not conformal.

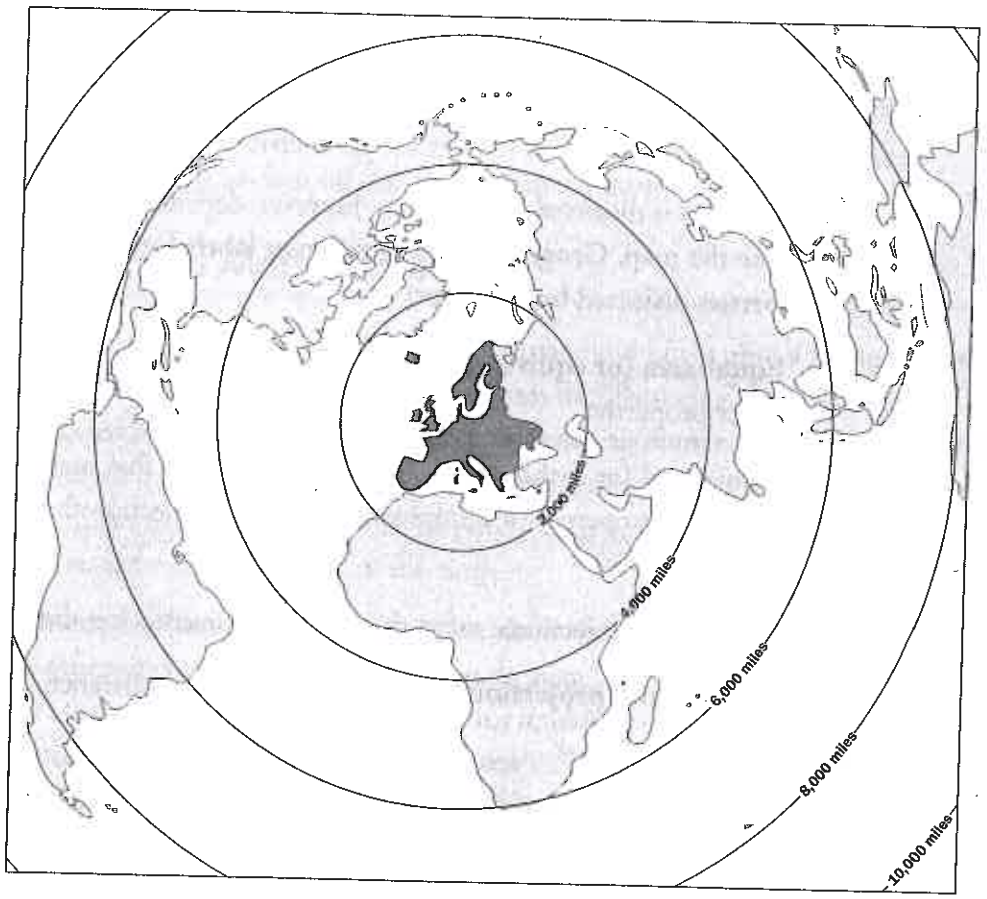



Figure 3.9. Azimuthal projection centered on Hamburg, Germany

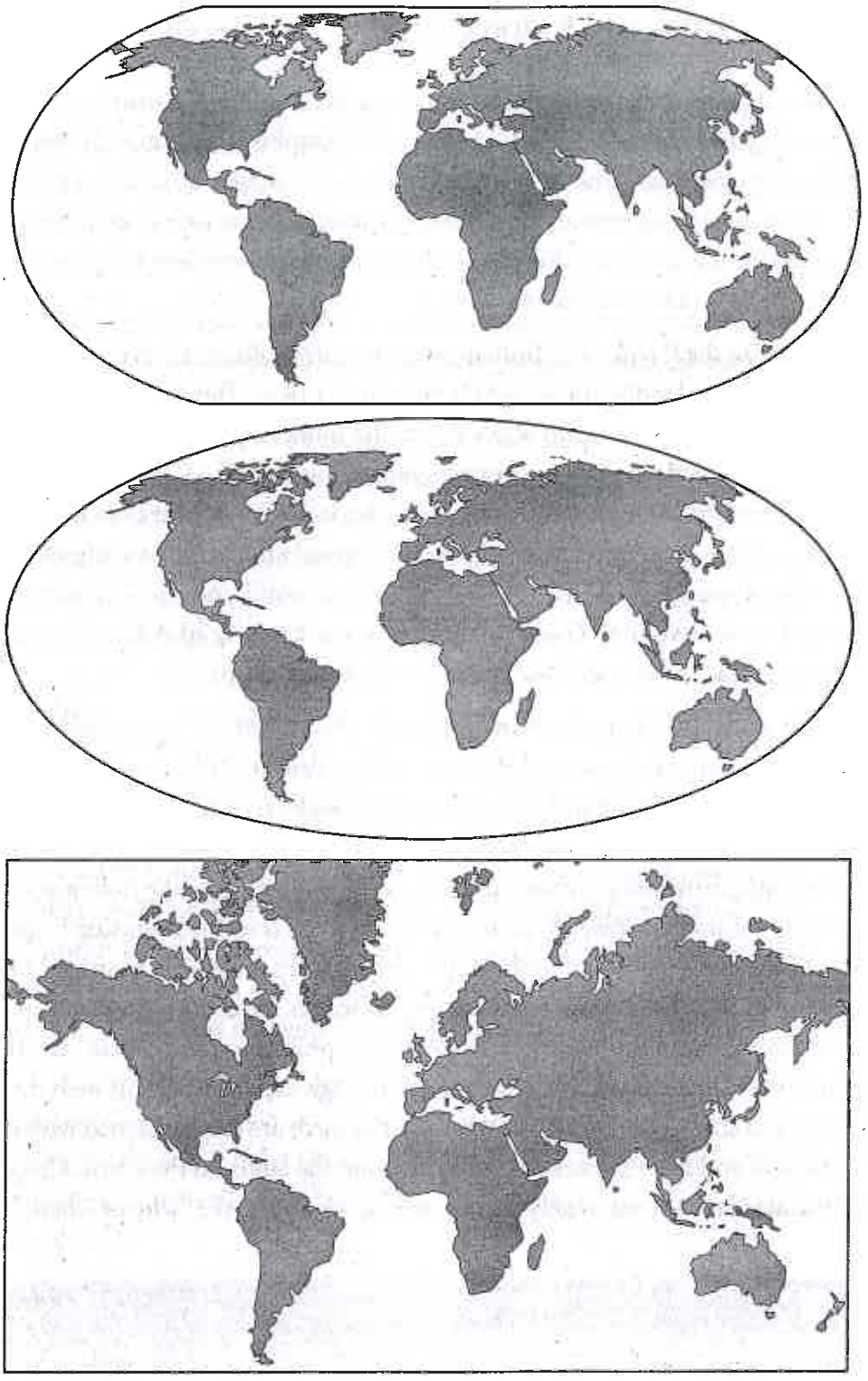


Figure 3.10. Three common projections: the Robinson, Mollweide, and Mercator

## A Brief History of Mapmaking

Just as a painting is a reflection of the artist holding the brush, a map reflects the biases, experiences, and objectives of the cartographer who creates it. An evaluation of Inuit maps of Alaska shows extreme detail in the shapes of inland waterways because the Inuit people navigated those passageways every day to fish and travel to different villages. Before the Greco-Roman civilizations, maps were largely cognitive and created for spiritual and immediate travel needs.

Because the Greeks and Romans were empire builders, scholars developed an interest in mapping landholdings and charting new places. Thus, during the height of those empires, from 1000 BCE to 500 CE, the discipline of geography was born. The Greeks and Romans had great interest in geographic inquiry. The Greek philosopher Aristotle was the first to show that the earth was spherical. Eratosthenes calculated the circumference of the earth and coined the word *geography* to mean "to write about the earth." He also created one of the earliest maps of the world and its climatic zones. Ptolemy wrote his eight-volume *Guide to Geography*, the first text to define the basic principles of geographic study and show examples of detailed maps.

After the fall of the Roman Empire in about 500 CE, maps were often oriented around religious and spiritual themes and less developed for exploration and scientific inquiry. Many medieval European maps were products of religious propaganda, chartered by the Catholic Church and oriented around Jerusalem for religious purposes. In the same way, Islamic maps often used Mecca (in Saudi Arabia, the holiest site to Muslims) as the focal point. However, cartographic progress continued outside Europe, in places like China and Southwest Asia. In the 15th century, as feudalism started to decline and western European empires were starting to search for colonies, interest in mapmaking and geographic inquiry grew. The Mercator projection, created in the 16th century, shows the influence of knowledge gained through exploration in its high degree of directional and shape accuracy. Today maps of the earth are less concerned with charting new territories and more concerned with analyzing the lands on the maps. Geographic focus has shifted away from merely asking "where" to asking the "why of where."

**TEST TIP**

Remember that the multiple-choice section of the AP Exam gives you 60 minutes to answer 75 questions. Plan to spend about 45 seconds on each question. Pacing yourself in this way will help ensure that you have enough time to comfortably respond to every item.

## Cognitive Maps

**Cognitive (or mental) maps** are drawn from memory. A geographer can peer into the human mind by evaluating a cognitive map because it provides a glance into environmental perception. Children often draw maps with a gigantic United States surrounded by tiny neighboring countries, or all by itself. This shows children's view that their home is the center of the world.

The emphasis of a cognitive map is also useful to a geographer trying to understand a culture. While early water-based cultures produced mental maps that often emphasized fishing streams, the map your father drew on a napkin to show you how to get to the maritime museum in a nearby city probably emphasized streets and key landmarks that have been important to him (and others in the community) in navigating your region. In studying cognitive maps, it is essential to evaluate not only what you can see but also what you cannot see. The items left out of a cognitive map are a geographer's clues to both the purpose of the map and the focus (and degree of knowledge) of the individual who drew it.

## Scale

**Scale**, another prominent feature in geographic analysis, can refer to the scope of geographic inquiry or discussion—that is, whether you are studying or discussing a topic affecting the entire world or just a village. In cartography (mapmaking), scale refers to the relationship between a distance on the map and the actual measurement in the real world. In other words, **map (or cartographic) scale** is the degree to which a map "zooms in" on the area it is representing. Scale tells you to what extent the portion of the earth represented on the map has been reduced from its original size to fit on the map.

For example, 1 inch on a map may equal 10 miles in the real world (on the portion of the earth being represented in the map). That scale might be written as "1 inch = 10 miles." Sometimes, the scale is indicated as a fraction, known as a representative fraction. For example, a scale written as "1/40 miles" (or "1:40 miles") means 1 inch on the map equals 40 miles in the real world.

One counterintuitive part of mapping is describing map scale as "large" or "small." Think of it this way: *the larger the area of space being represented on the map, the smaller its scale.* For example, a map of Africa would have a smaller scale than a map of just one country in Africa. A map of the world has a smaller scale than the map of a village. A map of a street has a larger scale than a map of its city. That is, the more "zoomed in" the map is on an area,

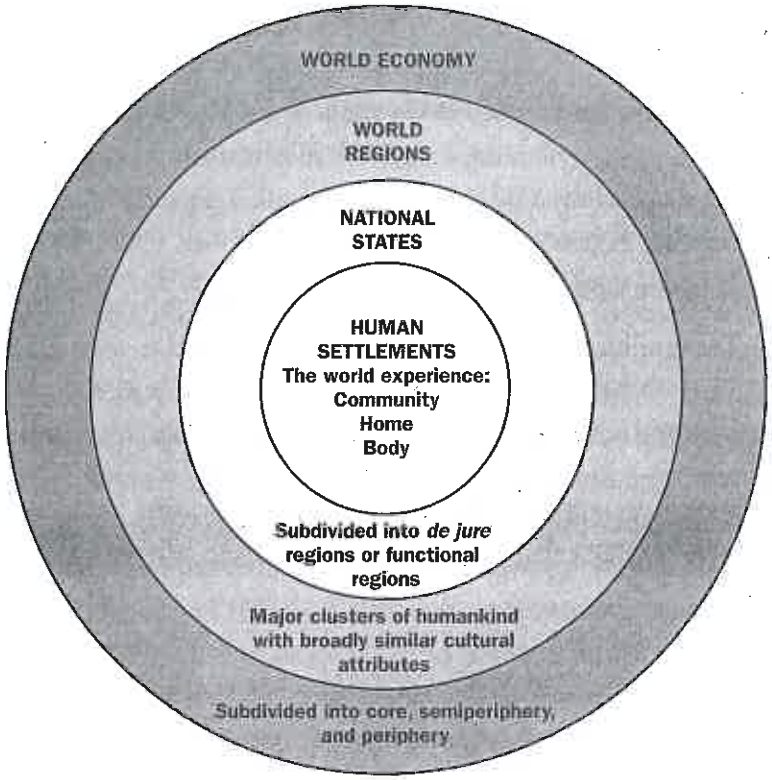



Figure 3.11. Diagram of scales commonly used in geographic research.

the larger is its map scale. A large-scale map depicts a smaller area with more detail than does a small-scale map, which represents a larger area with less detail. A small-scale map is less "zoomed in."

## Categories of Maps

Like a graphic designer choosing the best way to represent an image, geographers can choose from many different types of maps to use in representing different spaces. **Reference maps** show common features such as boundaries, roads, highways, mountains, and cities. A **thematic map**, however, zeroes in on one feature, such as climate, city size, or number of alligators.

Thematic maps come in various forms. **Isoline thematic maps** display the lines that connect points of equal value, as in showing elevation levels. A **choropleth thematic map** shows a pattern of some variable, such as population density or voting patterns, by using various colors or degrees of shading. A now-famous example of a choropleth thematic map is the one displaying the 2004 election results by shading conservative-voting states in red and liberal-voting states in blue. A **proportional-symbol thematic**

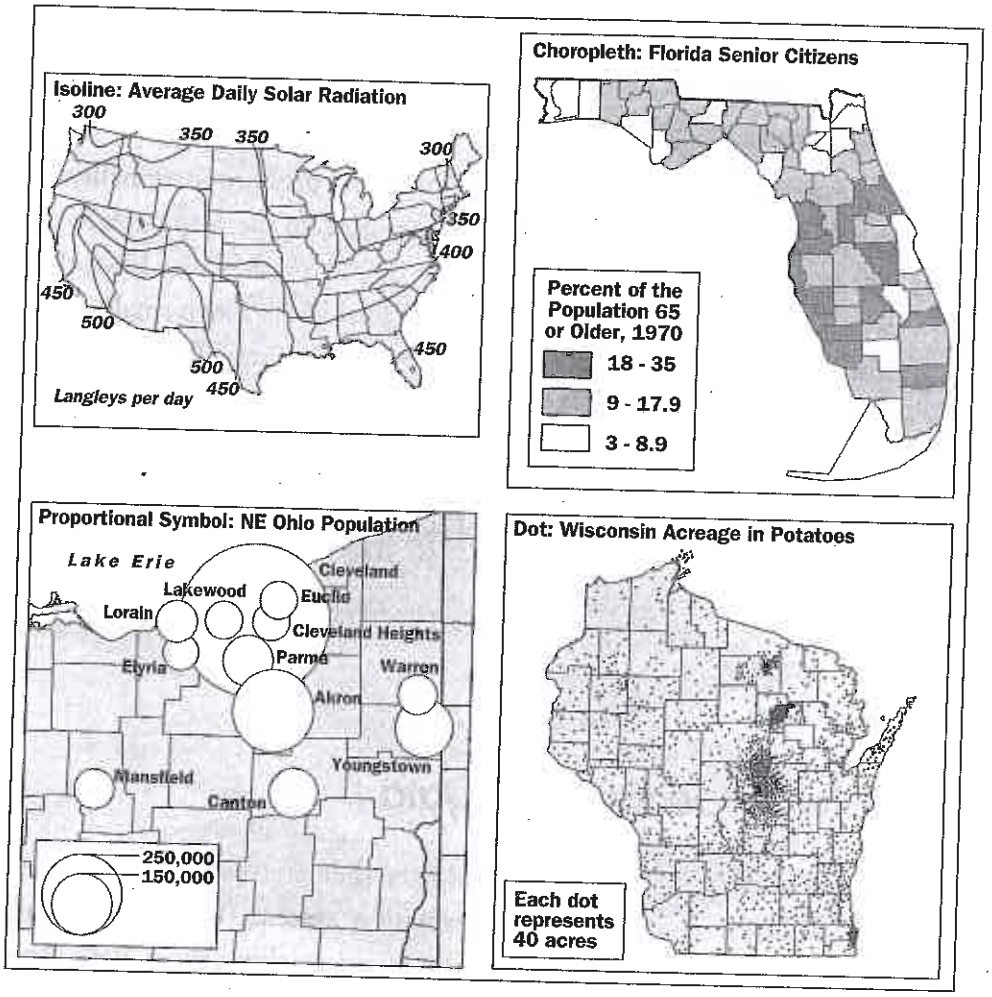



Figure 3.12. Four types of thematic maps

**map** uses some symbol (whether it is a circle, star, triangle, or even Mickey Mouse ears) to display the frequency of a variable. The larger the symbol on the map, the higher is the frequency of the variable found in that region. For example, a proportional symbol of population density in the United States would have larger circles in New York City than in Bagdad, Kentucky (which really exists). **Dot density maps** are thematic maps that simply use dots to represent the frequency of a variable in a given area, such as

**TEST TIP**

A map question will never simply ask you to locate a certain place on a map. Instead, you will need to apply what you have learned about the characteristics of different places or select places to serve as examples of concepts.

the number of college graduates living in counties within a state. A dot density map specifies what each dot represents. In the college graduates map, for example, each dot might equal 100 graduates.

A **cartogram** is another type of map that uses proportionality to show a particular variable. In other words, cartograms use space on the map to show a particular variable. For example, a cartogram showing the frequency of factory labor throughout the world would show a large space taken up by China and a much smaller space taken up by the United States. Cartograms manage to maintain some degree of geographic accuracy in the relative positions of geographic entities.

PART 2

# New Geographical Technologies and Geographical Data

## Obtaining Geographic Data

Mapmakers use data to construct thematic maps. They obtain data from various sources. A **geographic information system (GIS)** is a computer program that stores geographic data and produces maps to show those data. The city government of Nashville, Tennessee, has an entire department devoted to geographic information collection. Geographers in that department collect and manage geographic data and generate maps for the government using a GIS. For example, the city's GIS can produce a map showing property values throughout Nashville. Then it can layer another spatial characteristic such as population density on top of property values to show the relationship between the two variables.

Often geographic data are collected using **remote sensing**, which is the collection of information from satellites and distant collection systems. In other words, remote sensing is the technique of obtaining information about objects through the study of data collected by special instruments that are not in physical contact with the objects being analyzed. **A global positioning system (GPS)** uses satellites to determine exact locations on the global grid. Data directly collected by the geographer making the map or conducting the study are called **primary data**. On the other hand, **secondary data** are collected by a source that previously conducted a study and made data available for future use. For

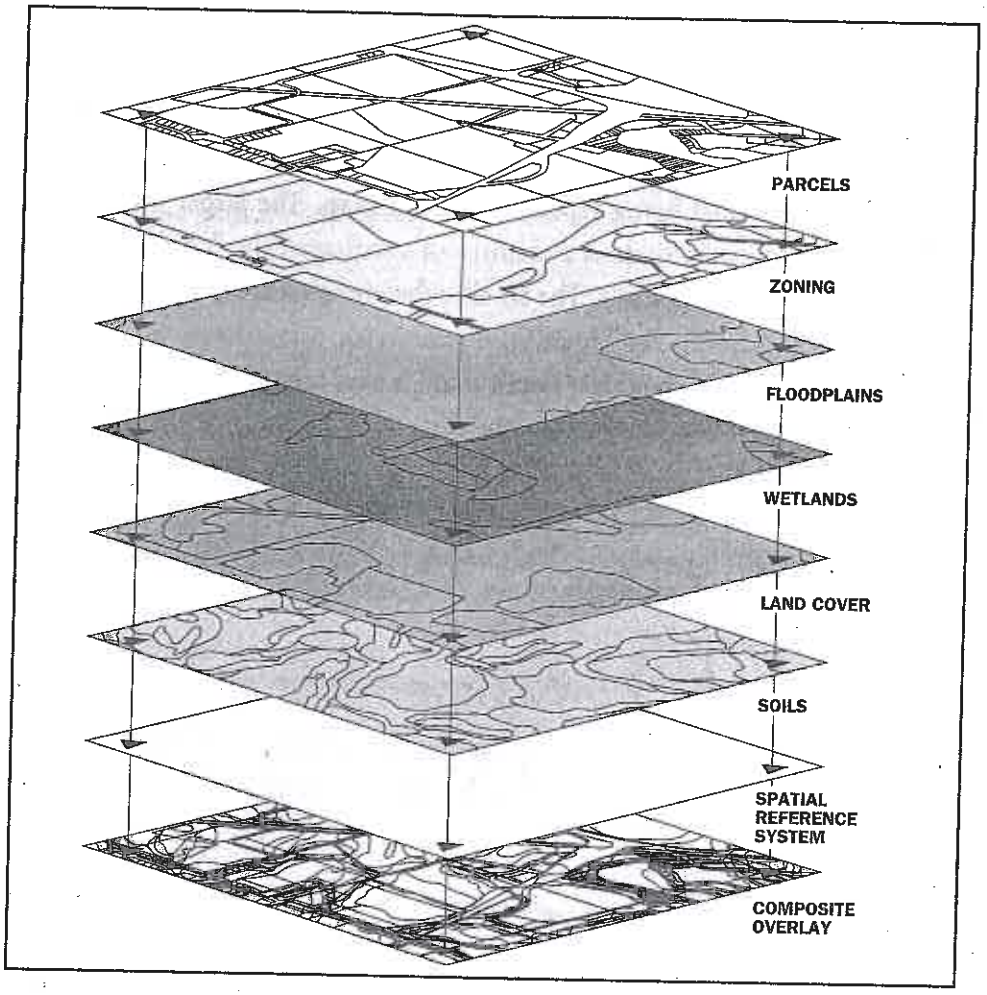


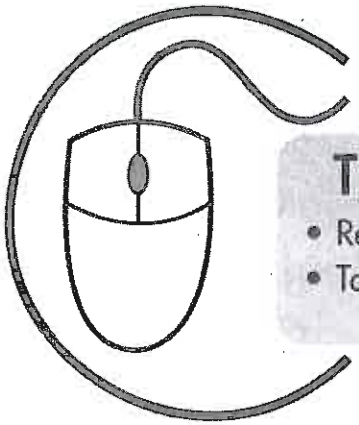

**Figure 3.13.** Layers of data compiled in a geographic information system

example, to make maps of the frequency of people aged 65 years and older in various cities, cartographers can use the U.S. Census Bureau's website to gather the necessary data. In doing so, the mapmakers would be using secondary data, which saves them time and eliminates the hassle of conducting their own count. However, in using secondary data, cartographers must carefully evaluate sources that gathered the data to ensure the accuracy and authenticity of the information. Be careful of what you find on the Web!


Today, GIS is a powerful tool used by many businesses, schools, and government organizations. Over 150 colleges and universities in the United States offer degree programs that help students learn to use GIS programs (ESRI, http://edcommunity.esri.com).

## Data Aggregation

Another issue in cartography is the level of **data aggregation**, which is the size of geographic units being represented on a map. The larger the area that is being represented in a study, such as a country or continent, the "coarser" is the study's (or map's) level of data aggregation. The smaller the area that is being represented, such as a county or neighborhood, the "finer" the study's (or map's) level of data aggregation. That is, "coarser" studies show less detail than "finer" studies.



**Time for a quiz**

- Review strategies in Chapter 2
- Take Quiz 1 at the REA Study Center
  *(www.rea.com/studycenter)*