· THE EARTH ·

A Physical and Human Geography 3/e

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A Physical and Human Geography 3/E

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To my father
Hendrik de Blij
on the occasion of
his 80th birthday
October 3, 1987

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PREFACE

This is the third edition of a book that has undergone changes in title as well as in contents. First published as *Man Shapes the Earth* (1977), it has grown in scope as well as dimension. The original objective still stands: to provide an overview of basic substance and theory in geography, physical as well as human, systematic as well as regional.

The present edition differs from its predecessors in several ways, and many of the changes result from suggestions made by readers. One of these concerns the book's title; that of the second edition (*The Earth: A Topical Geography*) was interpreted by some to mean a physical geography. The changed title better reflects the book's broad contents.

The major structural changes involve the addition of nine color plates, the deletion of the final chapter dealing with world realms, and the addition of a concluding essay that encourages students to consider a scholastic career in geography, with some practical information on how to proceed. The crucial material of the deleted regional chapter, dealing with regional concepts and constructs, has been incorporated into an expanded Chapter 7 (Culture Worlds). Readers who are familiar with the earlier editions will note that additional heads and subheads have been used to enhance clarity.

Individual chapters have received careful and detailed attention, and once again I have benefited enormously from the constructive criticisms made by colleagues and students. The introductory chapter has been expanded and brought up to date, although it retains its emphasis on several of the historic figures who propelled the discipline in earlier years and who ensured its place among the sciences. In our enthusiasm for "new" geographies, we sometimes lose track of our sources, and this is perilous. Let us engender again an appreciation for the work of those who, in another era, moved our field forward.

Many readers who made suggestions for the improvement of the physical chapters will see their recommendations implemented. New opening segments now link the physical and human themes more effectively, and historic events (such as Santorini's eruption) and modern phenomena (such as the El Niño problem) strengthen the connection. Spatial and environmental topics anchor these introductory chapters. New material on geographic implications of crustal plate movement, ocean floor topography, and karst landforms augments Chapter 2. The chapter on the geography of soils and vegetation (the biospheres) has a new introduction and a conclusion that addresses biogeography more comprehensively. Chapter 5 focuses on resources and has been much modified. The soil, studied in the previous chapter as a part of the biosphere, now is treated as a renewable, but not inexhaustible resource. Natural vegetation is accorded similar treatment. Energy resources are considered with a new and stronger focus on North America, and with attention to the attractions and risks of nuclear power. A rewritten conclusion draws attention to the interconnectedness of our world.

The second half of the book retains its basic structure (but without the concluding regional chapter); topics range from demographic to political and from cultural to economic. Significant changes include (1) the addition of a segment on realms, regions, and the regional concept; (2) the addition of new material on urban centers; (3) the restructuring of major parts of the chapter on political geography; (4) the condensation of material on international boundaries on land; (5) the revision of the segments on colonialism; and

(6) the updating and recasting of material on international boundaries at sea.

All the chapter-ending bibliographical sections were rewritten and updated, and attention has been given to several of the major journals in the discipline that deal with topics covered in individual chapters of this book. The glossary has been considerably expanded, but it would have been impractical to include in the glossary every term that is printed in boldface in the text. Terms defined and discussed in considerable detail in the text may not be defined again in the glossary.

ACKNOWLEDGMENTS

My editor, Katie Vignery, urged me to revise *The Earth* and kept the project on schedule; without her assistance in many areas, the book would not have been produced. I am deeply grateful to her. My friend, colleague, and co-author Peter Muller discussed aspects of this project with me over a period of about three years, much to my benefit; he also permitted me to use material from our joint publications, for which I am indebted to him. I could not have written Chapter 1 without having read virtually everything written by our leading biographer and commentator on the geographic scene, Professor Geoffrey J. Martin of Southern Connecticut State University. I also have had the opportunity to incorporate suggestions made by Professor Thomas Giambelluca of the University of Hawaii (Manoa). I further acknowledge with gratitude the detailed comments made by Professor Anthony F. Grande of Hunter College, New York; Professor W. C. Jameson of the University of Central Arkansas; Professor D. Knudsen of Indiana University, Bloomington; Professor R. Marionneaux of Eastern Kentucky University; and Professor Hubert B. Stroud of Arkansas State University.

At John Wiley & Sons, I benefited from the work of Ellen Brown, who directed this project; Joshua Spieler, who supervised the editing; Carolyn Joseph, who designed the book; Gigi Ghriskey and Lisa Heard, who solved many difficult problems of cartography; and Sara Lampert, who was in charge of photographs. I deeply appreciate their work and I am grateful for their commitment to this project.

H. J. de Blij

Coconut Grove, Florida
February 1987

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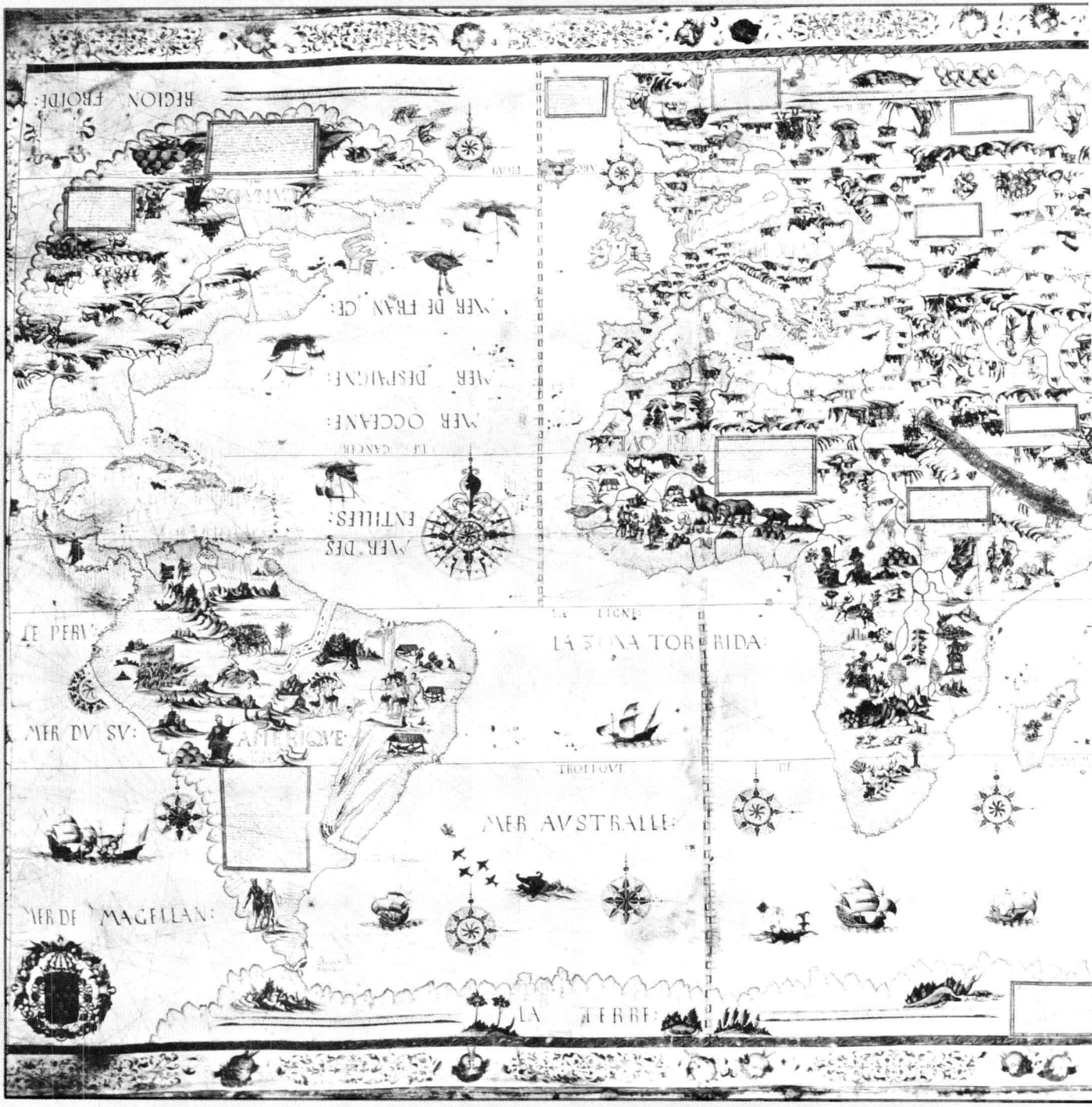
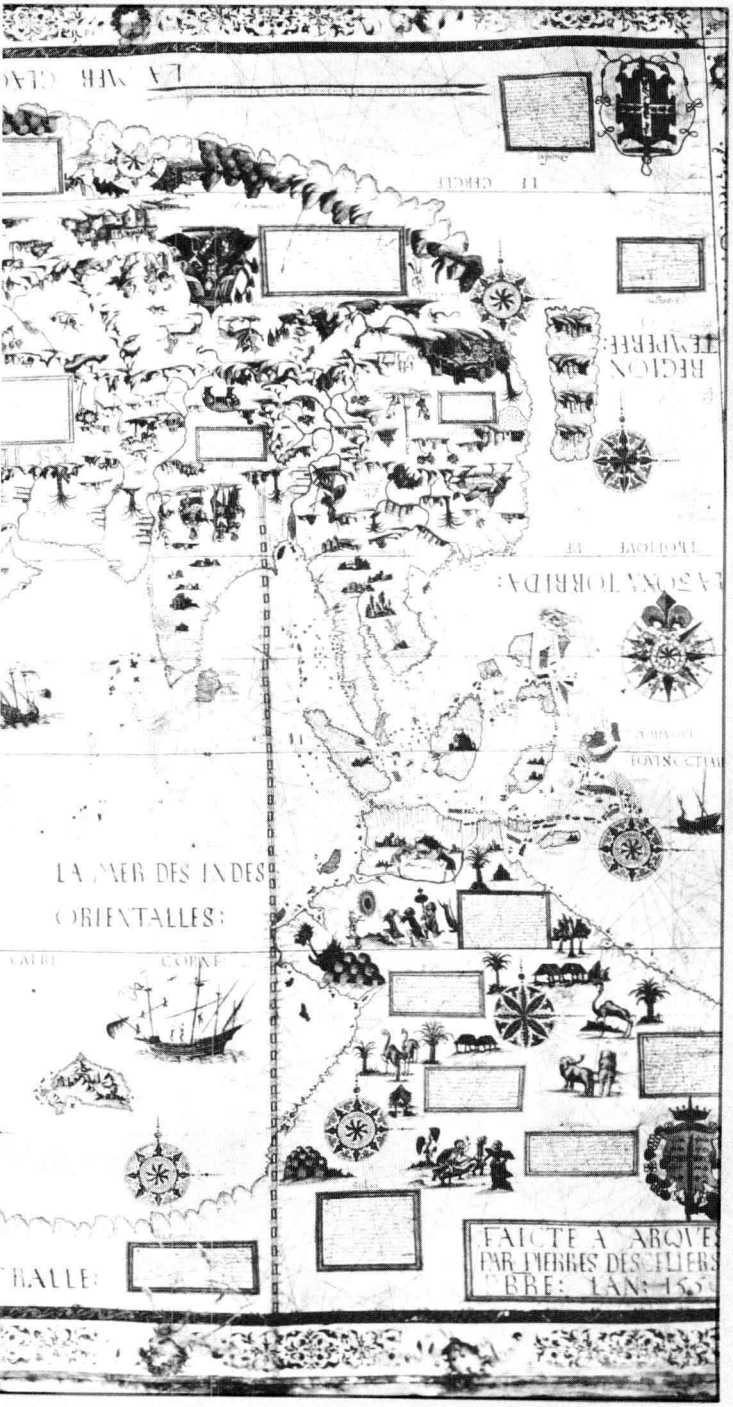




Geography!

For years I have been asking people about their favorite place in the world. Where is it? What is there about it that makes this so special? To a geographer, the answers are always interesting. A student talks longingly of that comfortable, spacious house in the suburb where she grew up. "I couldn't wait to leave for college, and now I can't wait for vacation so I can go back to spend some time in my old room." A businessman loves his condominium on a high floor: "You should see the view over the city," he says. "Even after all these years, I never tire of watching all that activity, day and night." To one of my friends, her favorite place is a beach house in Florida. One time a young African villager took me on a long walk through the bush. Suddenly, we came to the top of a scarp, and the view was magnificent. He pointed to some rocks worn smooth by many hours of sitting. There was no need to explain.

All of us carry such images. Some will fade over time (that favorite room may be soon forgotten), and others will take their place. These new ones may be more significant. Imagine that you were asked to decide in which state (of the United States) you would prefer to live. That question has been asked so many times that the responses, say, of your geography class this term is quite predictable. Many will rank the state where they grew up at the top of the list (there, again, is that comfortable familiarity). California and Florida also rank high. People feel that they *know* such places. Isn't the weather good? The scenery nice? Aren't the cities exciting? But what if a new employer, an international corporation, gave you a choice of countries for your first appointment: Senegal, Ecuador, Sri Lanka, or Somalia. What would you decide? On what basis?

As you will soon discover, the study of geography is an excellent way to learn to make informed decisions of this kind. Ours is an infinitely complex world, but there are ways to decide what information is important, and there are means of organizing such information. Once we have these global frameworks in mind, we can begin to fill in some of the details that interest us especially. That is, we begin to *specialize*. You will find that geographers specialize in all kinds of topics: climate and weather, soils and slopes, the layout of cities, the roles of political boundaries. Geographers have even concentrated their attention on such subjects as tourism, sports, and . . . wine!

Thus the scope of geography ranges far and wide. No body of facts or data belongs exclusively to the field of geography, but geographers often combine information from various other fields for their studies and research. When you read a professional or popular journal in geography, you will note that geographers share an interest in spatial relationships on and near the surface of the earth. The term **spatial** (also sometimes spelled *spacial*) comes, of course, from the noun *space*—not the space of the solar system and beyond, but the space on the surface of our earth. Where are places located, and why? How far is that capital city from the country's international border? Such questions have to do with the location of people, places, and things *relative to each other*, and this is a central theme of geographic study and research. Geographers have devised methods to analyze and solve many problems involving some aspect of *relative location*.

Places, small and large, also are studied for their own sake, and this can be a very rewarding aspect of geography. What is a West African village like? How do people there make a living from the surrounding countryside? Why is Paris so much larger than any other French city? When we try to answer questions of this kind, it soon becomes clear that geographers are interested in the relationships between human societies and natural environments. Those African villagers have learned to use the soils of their farmlands to the best advantage given their farming equipment (or technology), and they know that the seasonal rains are the key to good crops and harvests. Paris, like other places in France, started as a small village, but this village had geographic advantage: a favored spot along the Seine River. Natural and human factors combined to make Paris what it is—a beneficiary of geography. So, when we answer the question "What is it like?" the geographic answer is a blend of natural (physical) and human (social) characteristics.

This brings us to another dimension we geographers must consider when doing our study and research: *scale*. When we describe that West African village, it is possible to go into much more detail than when we generalize geographically about the advan-

tages enjoyed by the growing city of Paris. On a map, detail translates to scale. The map of an entire country cannot show much detail; whole cities are mere dots on such a map. Therefore, the scale is small and is represented by a fraction (say, 1:1,000,000) that confirms this arithmetically. A map of Paris alone shows much more detail; it is therefore on a larger scale and represented by a larger fraction (1:100,000). A map of a village may have a scale of 1:10,000, a scale that is large enough to show individual houses and yards. We will look into the development of mapmaking (cartography) later, but we should realize that scale is not just a matter of maps: it also enters into our descriptions of places. A mental scale enters into the picture when we generalize about countries and places. Let us return for a moment to that question the prospective employer asked about four possible countries of employment. To live in any one of those countries can mean a variety of choices. In Senegal, living in the capital, Dakar, would be an experience quite different from an assignment in a town in the interior. In Ecuador, life in the coastal city of Guayaquil contrasts considerably vis-à-vis Quito in the Andes Mountains. So, we can generalize to some degree (e.g., French would be needed in Senegal, Spanish in Ecuador), but we would need a larger-scale mental map for other decisions.

Maps are among geographers' favorite means of communication. Sometimes they pose questions: Why do these crops yield so much better in this area than in another? Sometimes they provide answers, for example, by showing patterns that appear to be related in some way, thus pointing the need for further research. It has been said that a picture is worth a thousand words; if that is true, then a map is worth a million. Maps can convey complicated information with great efficiency. Imagine a weather reporter on television's nightly news trying to explain the approaching weather systems *without* that background map and enhanced satellite image!

In this book (as in other geography books and journals), there are many references to maps. This is not just because maps convey information so efficiently; there are other reasons. Maps can demonstrate that vital rule of geography referred to earlier: places on the earth's surface have their own distinctive properties that, taken together, give each of these places its own character. No place is exactly identical to any other, and the map is the best way to prove this.

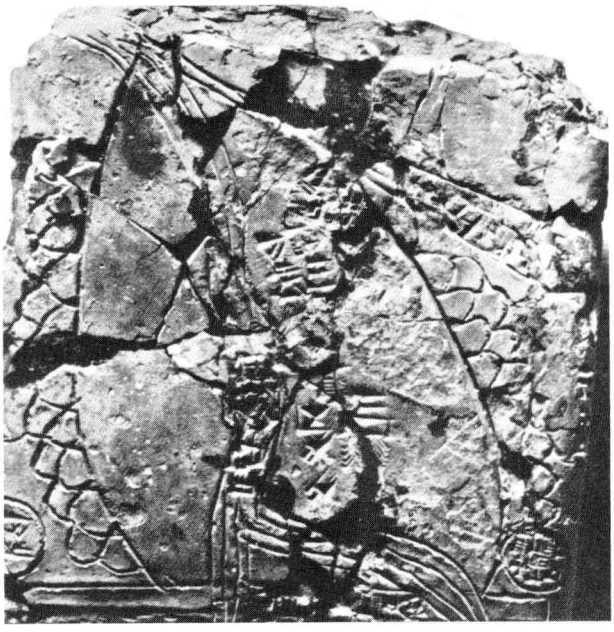
Maps constitute one aspect of communication in geography. Although there is no body of facts that is exclusively geographic, there certainly is a vocabulary of geography. You find certain terms used frequently. These will become familiar as our study progresses because they reflect geography's focus on matters spatial. For example, geographers focus on such questions as the effect of *distance* on migration patterns, the influence of wind *direction* on the expansion of a desert, the relationship between the rate of *diffusion* (***spreading***) of a new idea and the *density* of the population through which it spreads, the impact of low *accessibility* on the development of a frontier farming area. In one way or another, aspects of relative location dominate the language of geography: region, pattern, proximity, isolation, distribution, remoteness, concentration, core, periphery, shape, clustering, and so on.

Such terminology might suggest that geography is exclusively a social science, but this is not the case. Many geographers apply their locational interest to physical phenomena, seeking to learn more about the earth's surface itself or about the climate and weather that affect it. Physical geographers, too, often are attracted by especially interesting patterns and clusters, forms, and shapes. Why does a regional river system fail to conform to the structures of the rocks below? Why does a corner of West Africa experience a monsoon-type deluge of rain every year when other stretches of the coast do not?

Virtually all geographic research and study contribute to our understanding of the earth as humanity's habitat. There were several million years of gradual evolution, then, during the past ten thousand years, human communities experienced revolutionary changes that witnessed the domestication of plants and animals; the development of villages, towns, and cities; the growth of transport networks; and the unprecedented exploitation of the earth's resources. During the last two hundred years, these changes have accelerated almost unimaginably, fueled by the Industrial Revolution and its aftermath and accompanied by explosive population increases. In the pro-

cess, the earth has been—and continues to be—transformed, reshaped by its human occupants. Plains are plowed and planted, rivers are diked and dammed, hills are topped and terraced. The expanding asphalt jungle claims ever more of the countryside. By studying the earth's surface, its natural environments, and its populations in geographic perspective, geographers (physical as well as human) contribute to the comprehension of the interactions between societies and the lands on which they depend.

Geography, then, is a physical (natural) science as well as a social science. Some would argue that it is also a very lively art. Indeed, geography's bibliography includes some memorable literature, ranging from vibrant regional descriptions and exciting accounts of early and modern explorations to impressionistic discussions of geographic dimensions in art and music. Geography's many lineages have produced a field with few limits and countless opportunities.



Cartography is more than five thousand years old: this map of rivers and fields in northern Mesopotamia was drawn in clay about 3800 B.C.

Origins

Geography is a modern science, but its traditions extend to the dawn of scholarly inquiry and research. More than five thousand years ago, Mesopotamian cartographers drew maps of rivers, farm fields, and towns in soft clay; when the clay hardened in the sun, the heat-baked tablet could be lifted up and moved indoors. Some of those ancient maps have survived, and we can pause at a museum display to wonder at the observational skills of the pioneer cartographers of the Middle East. They were the first to use symbols on maps: one symbol for farm fields, another for streams, still another for paths and streets. They were, evidently, the first also to cope with the problem of scale: How much of the real world can be represented on a limited drawing surface? Sitting there, on a hillslope overlooking the valley being mapped, those early cartographers began an alliance with geography that continues to this day.

Actually, nobody was calling this science geography in those days. Certainly there were practitioners of the field in Mesopotamia, in ancient Egypt, and later in Crete and Greece. Homer wrote beautifully and incisively in his *Odyssey* about the character of distant places and areas. Plato and Aristotle wrote treatises, which can only be described as geographic, that raised questions about the relationships between human communities and physical environments.

The works of Aristotle are of special interest because they reveal the nature of early geographic thought and debate. Aristotle (born in 384 B.C.) studied at the school Plato had founded near the city of Athens. But Aristotle was less mathematically inclined than Plato; he was more interested in purposes and ideals. Geographers who study the development of their field often refer to Aristotle's essay *The Ideal State* as one of the earliest geographic treatises ever written. In this essay, Aristotle outlines the geography of what he viewed as a well-functioning country. He uses some terminology that was to become standard in geography: the definition of a national territory by boundaries and its protection by inaccessibility from beyond, for example. He also touches on a matter that still causes debate (e.g., in the modern United Nations): the appropriate size of the population of a state.

Such a population, he argued, should be neither too small—and thus weak—nor too large—and thus ungovernable. Aristotle, in addition, correctly characterizes cities as market centers with external trade connections (all that is missing is the term *hinterland*, but modern German had not yet been invented!). He mentions a factor that we will discuss in detail later, something that has much to do with the prosperity or the decline of cities, their *situation* (a good definition of relative location). As noted earlier, Aristotle also speculated about the effect of natural environment on the behavior of people, an issue that still interests social scientists today.

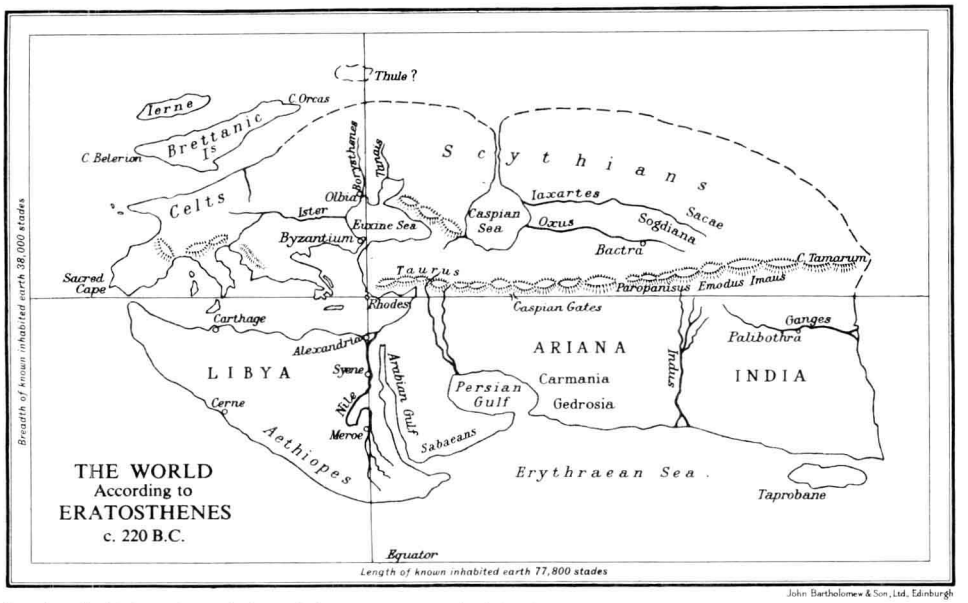
Still, geography was not known as such. The ancient philosophers, Aristotle among them, established lines of scientific and scholarly enquiry that created foundations for many sciences that would emerge centuries later. One of the first of these sciences to acquire a name was geography, and it happened not too long after Aristotle's lifetime.

The scholar who is credited with the naming of *geo* (earth) *graphy* (description) was a Greek philosopher, Eratosthenes. He was born about 276 B.C. in what is today Libya. Eratosthenes had many scholarly interests: he was a scientist, poet, librarian, explorer, mathematician, and cartographer. A follower of Aristotle, he developed many of Aristotle's notions further in a book about the geography of the known earth. But his most important work, and the calculations for which he is most remembered, had to do with the circumference of the earth. This was quite an innovation; first, not everyone believed that the earth was a sphere. But Eratosthenes drew the correct conclusions from what he could observe of the relationship between sun and earth, the behavior of the sun through the seasons, and the changing sun angle with latitude. A round earth, Eratosthenes reasoned, would have an extremely hot equatorial zone, two very cold polar zones, and between these opposites, two temperate zones of which the known inhabited world was one. He even proposed latitudinal limits for these environmental zones, which was a major step forward.

The measurement for which Eratosthenes would become permanently known was made in Egypt. He observed that at noon on about June 21 of a given year the bottom of a deep well in the city of Syene was completely lit by the sun. Thus the sun's ray was exactly perpendicular to the surface of the earth at that place on that date. The next year, on the same date, Eratosthenes measured the noon sun angle at Alexandria, where he worked in the library. The sun was not quite perpendicular, but 7.2° off the vertical. Thus the distance between Syene and Alexandria made a 7.2° difference, or one-fiftieth of the 360° of a complete circle. All Eratosthenes needed now was the surface distance between Syene and Alexandria; by multiplying this figure by 50, he would have the circumference of his round earth. But now he faced a problem: that distance was not easily established. In those days, distances were estimated from the time it took for travelers to go from one place to another and were given in *stadia* (the plural of stadium, the measured length of a sports arena). It is not certain what stadium Eratosthenes used, but he estimated the Syene–Alexandria distance to be 5000 stadia. Some prominent stadiums in Greece had a length of slightly more than 600 ft (185 m). If he used that figure, the result of his calculation would be 26,700 miles (43,000 km) for the circumference of the earth. The actual circumference is now known to be about 25,000 miles (40,000 km). Eratosthenes may have been even closer, a remarkable achievement and one for which he is justly remembered by geographers.

Eratosthenes did more than measure and calculate, however. He was a skilled cartographer, and one of his maps of the known world (about 220 B.C.) is especially interesting. Note that this map shows the outlines of the Mediterranean Sea quite well; Greece, Italy, the Iberian Peninsula, and North Africa ("Libya") are in their approximate positions. Perhaps more remarkable is the shape of Britain and Ireland and the way they are shown. It looks as though Eratosthenes knows their actual outline, but the projection he uses (in his mind, not on the map by latitude and longitude lines) compels him to distort it. Also on the map are "Aethiopes" for Africa south of Egypt, a good representation of the actual course of the Nile River, and "India" toward the eastern edge of the known world. Even the Euxine (Black) and Caspian seas are on the map. Eratosthenes had a remarkable capacity for synthesis as well as mathematics.

The exact circumference of the earth may be known much better today than it was in Eratosthenes' time, but there are still other calculations and mea-



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Eratosthenes' map of the known world, constructed about 220 B.C.

surements to be made. The exact heights of mountains (above mean sea level) and the exact distances between places require ever more precise measurement. Today we are able to measure these so exactly that a remarkable fact has come to light: those distances actually *change*, as do the heights of some mountains! Of course, we know much more now about the fragile crust of our earth than Eratosthenes could have known. But the branch of geography that involves such measurements as he made—*geodesy*—still is an active and important science.

Many other contributions made to geography by ancient Greek philosophers have unfortunately been lost. The works of one, Strabo, are an exception: they survive in almost complete form. To Strabo, who was born about 63 B.C. in present-day Turkey, geography was no mere sideline. He must have been one of the world's first professional geographers, determined as he was to write a compendium of the field that would set down everything that had been achieved as well as establish new directions. He traveled to Rome, studied in the library where Eratosthenes had worked centuries earlier in Alexandria, and read everything geographic that had been written. Based on this research, he wrote a 17-volume *Geography*, a monumental work that still constitutes a guide to the field in ancient times. Ironically, Strabo's great effort attracted rather little attention when it first appeared; it was to become a classic, but not until centuries later. Today it remains a window to the geography of ancient Greece.

ROMAN CONTRIBUTIONS

Compared to the ancient Greeks, Roman scholars did not prove nearly as diligent or successful as geographers. There were exceptions, of course, and one Roman scholar with geographic inclinations was Pliny the Elder (born A.D. 23), who single-handedly assembled and wrote the world's first encyclopedia. Pliny studied in Rome, then entered the army, and followed his service with a period of law study. But he was attracted to research in science and history and eventually produced a giant, 37-book *Natural History* (numerous other writings were lost). Part of this encyclopedic work consists of a compendium of current geographic knowledge (Books III through VI), including valuable descriptions of ancient cities that have since withered or been destroyed.