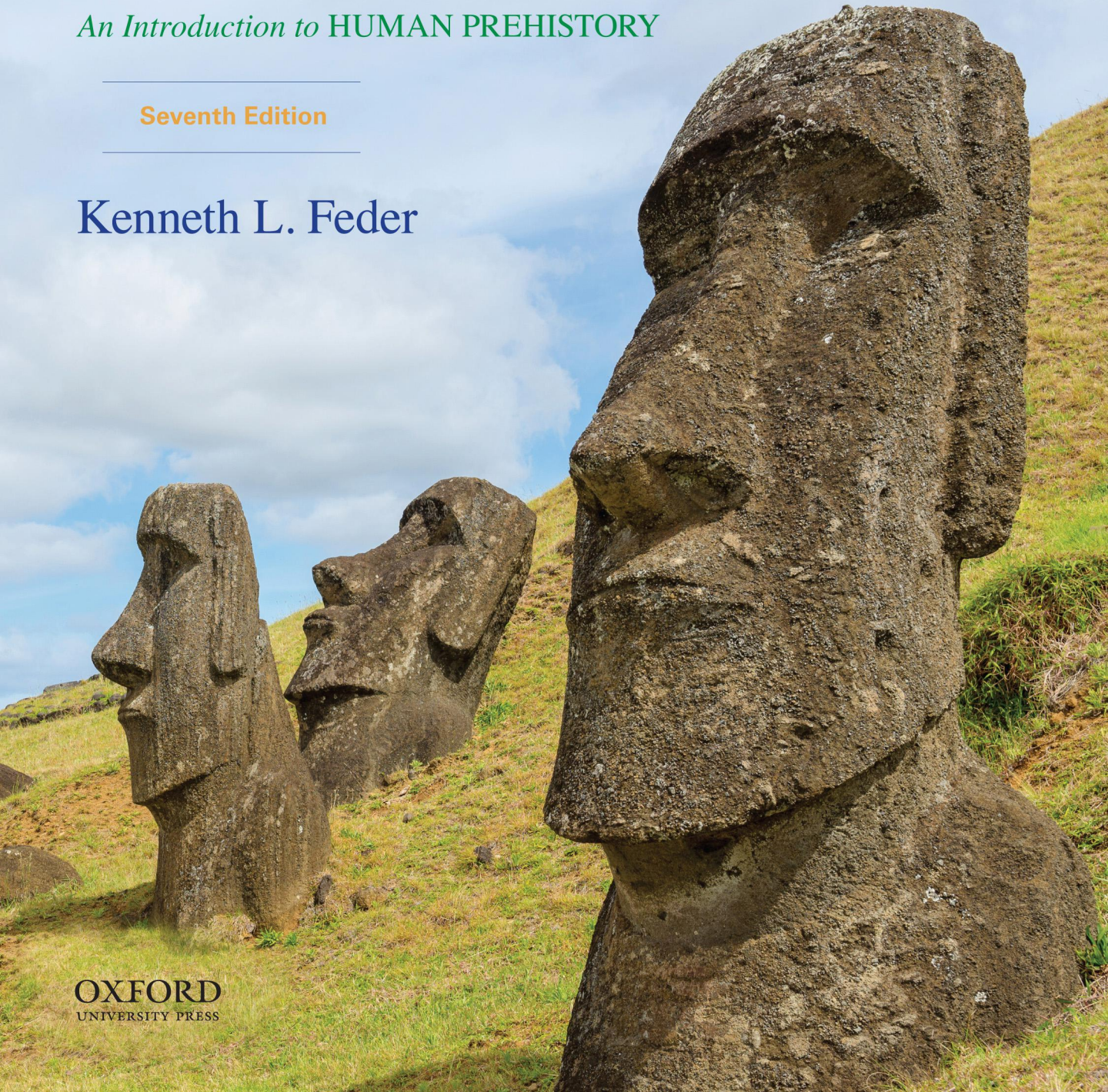
THE PAST IN PERSPECTIVE

An Introduction to HUMAN PREHISTORY

Seventh Edition

Kenneth L. Feder



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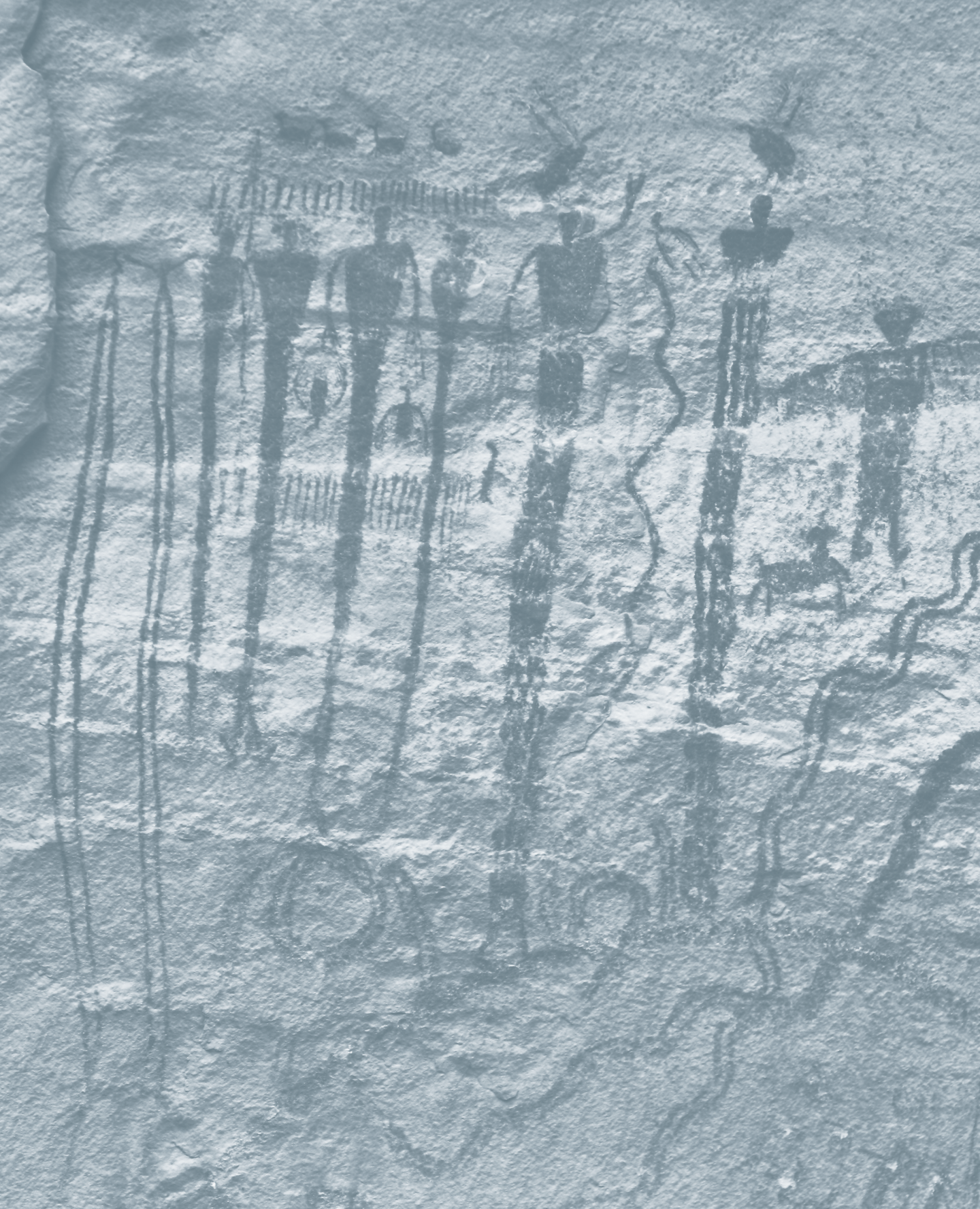

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An Introduction to Human Prehistory

KENNETH L. FEDER
Central Connecticut State University

SEVENTH EDITION

New York Oxford
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for
JOSH and JACOB

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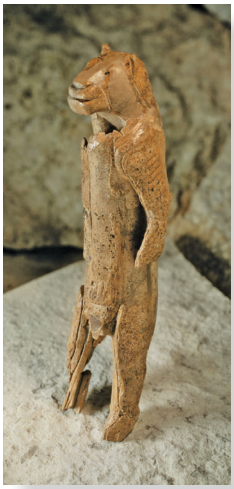
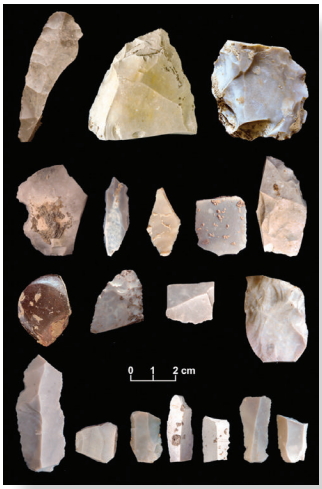




PREFACE

Wait; you're actually reading the Preface? Nobody reads the Preface. I mean, it's not like there's anything in here that's going to be on the test. Well, if you're that interested, proceed.

Mid-twentieth-century British author L. P. Hartley begins his novel *The Go-Between* with the now-iconic phrase: "The past is a foreign country: they do things differently there." Now, in the context of that book, Hartley's reference is to an elderly man inspired to think about the trajectory of his own life while going through some of his old junk. I am not the first person to use Hartley's phrase as a metaphor for the broader pursuit of historians and archaeologists who, through reference to the old junk in the world's attic or basement, think about the trajectory of the broader human story. Indeed, the human past is like a foreign country where things are done differently than they are in the present. In this book we will visit that foreign country. I will be your tour guide. Keep your arms and legs inside the vehicle at all times.

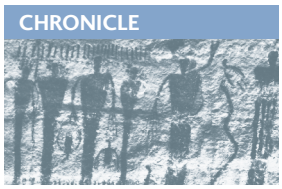
The Past in Perspective: An Introduction to Human Prehistory focuses on the dim echoes of the human past, presenting an accessible chronicle of human physical and cultural evolution. The readers of this text are undergraduates with no previous coursework in archaeology; for many it will be their only academic exposure to our prehistoric past. Rather than overwhelm beginning students with an all-inclusive, detailed, or encyclopedic survey of human antiquity, this text focuses on the major themes of the human evolutionary story. It begins with the evolution of our earliest hominin ancestors, traces the evolution of the modern human species, and follows the various pathways our ancestors took in the development of food-producing societies and complex civilizations. My goal throughout is to instill in readers an appreciation for the long chronicle of humanity and the ongoing processes we use to construct and assess that story.

HOW THE TEXT IS ORGANIZED

Chapters 1 and 2 provide context and background for the discussion of human prehistory. Chapter 1 places the study of the human past in the context of science, specifically the science of anthropology. Chapter 1 also explains how a scientific approach to the study of prehistory developed. Chapter 2 is a brief overview of key methodologies employed by archaeologists and paleoanthropologists in their study of the human past. It represents a brief introduction to archaeology.

Following these introductory chapters, Chapters 3 through 14 go on to present a chronological survey of the human past. Each chapter follows a consistent format with these headings: Prelude, Chronicle, Issues and Debates, Messages From the Past, Case Study Close-up, Summary, and To Learn More. A consistent format provides a pedagogical advantage, and the trajectory of human physical and cultural evolution becomes far more apparent and connected. What we know, what we don't know, and what are still topics of vigorous debate will be clear to the reader.

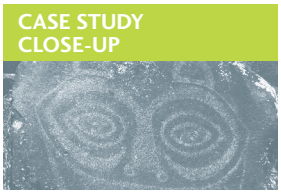
The **PRELUDE** represents a conscious attempt on my part to provide a pedagogical "hook" for each chapter. Personal anecdotes or fascinating historical incidents, for example, immediately engage students in the key issue or issues of the chapter, whether it is upright locomotion, the origins of artistic expression, or the power of ancient civilizations.



The **CHRONICLE** presents in narrative form a consensus view of that part of the human past that is the chapter's focus. It represents the heart of each chapter, providing our current understanding of the time period covered, the hominins discussed, and the cultural evolutionary developments reflected in the time period.

ISSUES AND DEBATES discusses the answers we have been able to provide for key questions about human physical and cultural evolution as well as the unresolved issues that remain and the ongoing debates. These sections provide differing—and sometimes competing—perspectives. Students are thus exposed to the sometimes messy, always exciting, and inevitably human process of science fraught with disagreements, reassessments, shifting paradigms, and only hard-won consensus.

MESSAGES FROM THE PAST is new to this edition and represents my attempt to address a common criticism of archaeology; that while the study of human antiquity might be interesting, it's a pretty esoteric discipline with little relevance in the modern world. Nothing could be further from the truth. Many, most, maybe all of the challenges facing humanity in the modern world—warfare, ethnic violence, environmental degradation—have roots deep in the history of our species. Indeed, there are valuable messages for modern human beings that can be gleaned from archaeology and paleoanthropology.



The CASE STUDY CLOSE-UP is a detailed examination of one or more sites considered diagnostic or emblematic of the time period or primary issue of the chapter.

Each chapter's **Summary** provides a brief recapitulation of the key issues in the chapter.

To Learn More provides suggestions for further reading in professional journals, academic texts, and trade books.

ADDITIONAL FEATURES

In addition to a consistent chapter format, I've included a number of other features that make this text a more useful learning tool.

A timeline opens every chapter and helps place the key events and sites mentioned in the body of the chapter within a global historical context.

To help students better orient themselves on the world stage, I've included abundant maps throughout the book. Each chapter (3–14) presents a map or, in some cases, multiple maps in which each of the sites mentioned in the chapter is located. Chapters 3 through 14 also include a list of sites—broken out by continent, region, or country—that are mentioned in the chapter, along with the page number where they can be found.

A list of Key Terms at the end of each chapter provides an alphabetical listing of important terms that appear in boldfaced type within the chapters and includes page numbers for where they can be found. Definitions can be found in the margins of the page on which the terms first appear and in the end-of-book Glossary.

The text's visual appeal enhances its readability. Full-color photographs are cross-referenced to pertinent text discussions. Detailed, colorful charts and drawings, as well as abundant color photographs, underscore significant points in the text. Captions add information rather than simply label the art.

The Glossary, References, and a comprehensive Index make information readily accessible.

WHAT'S DIFFERENT ABOUT THE SEVENTH EDITION?

I get it: textbooks are crazy expensive. It makes perfect economic sense for you to purchase used copies at a fraction of their original cost and then sell them back to the bookstore at the end of the semester to save some money. I also understand your frustration when you go to purchase your textbooks and find that used copies are not yet available because the publisher has just released a new edition, a fact that also renders worthless older editions of books that you'd like to recycle for some cash. You don't have to be paranoid to suspect that there's a cynical strategy on the part of publishers to release relatively minor updates of textbooks in an attempt to increase their bottom line. Publishers—and, okay, authors—make money on only the first sale of a book, so it makes sense for them to frequently come out with new editions.

I do wonder about updating books on subjects like algebra. I mean, have there been a bunch of great discoveries in algebra since the previous edition of your algebra textbook was published, discoveries sufficient to warrant the release of an updated and more expensive new edition?

I'm not sure about algebra, and perhaps it sounds self-serving, but I think it makes sound pedagogical sense to frequently update texts in paleoanthropology and archaeology. These are fields in which the expansion of knowledge continues at a breathtaking pace. Since the publication of the sixth edition of this book in 2013, there have been absolutely revolutionary discoveries and, in many instances, what we know about the human past has significantly and even dramatically changed. Bottom line: as a result of these remarkable new data, the sixth edition of *The Past in Perspective* is, at least in part, significantly out-of-date and there is ample justification for the existence of this new edition. Here is only a small sample of some of the more significant updates:

- **Chapters 2–14** contain a new section, "Messages from the Past." In these sections, I show how knowledge about the human past gathered through archaeology and paleoanthropology may help inform us about the modern human condition. Archaeological evidence of ancient warfare, examples of economic inequality, and data showing how human beings in antiquity responded to environmental changes and challenges are fundamentally relevant to our understanding of the present. The famous George Santayana aphorism, "Those who cannot remember the past are condemned to repeat it," certainly applies. And, since most of human "history," in the broadest definition of that term, actually happened before there was writing, we can update that phrase to read, "Those who cannot remember prehistory are condemned to repeat it." I'm not sure that this book will save humanity from repeating previous mistakes, but at least with the knowledge revealed through archaeology, we'll recognize those mistakes when we repeat them.
- **Chapter 2:** If you were hoping that this book would let the cat out of the bag concerning ancient aliens, Atlantis, or the Nephilim, sorry. All of those things are nonsense and I've added a discussion of fake archaeology to this chapter.
- **Chapter 3:** It's stunning, actually. Since the last edition of *The Past In Perspective*, researchers have discovered stone tools at the Lomekwi 3 site more than half-a-million years older than those previously deemed the oldest, as well as a vast assemblage of hominin remains (*Homo naledi*) at a cave in southern Africa. Both of these discoveries are game-changing.
- **Chapter 4:** We used to think that the earliest art produced by human beings dated to no more than about 30,000 years ago. Then, evidence of symbolic expression was found in southern Africa dating to more than 70,000 years ago. Now, a new analysis of a shell found at Trinil, on the island of Java, suggests that *Homo erectus* produced a form of art that may date to close to a million years ago.
- **Chapter 5:** The recovery of genetic material from ancient hominin bones has fundamentally altered paleoanthropology, perhaps especially

as the analysis of ancient genetic material has been successfully performed on Neandertal skeletal remains. In truth, the pace of discovery in this form of analysis is so rapid, by the time you read Chapter 5, much more will be known.

- **Chapter 6:** In most art history texts and courses, the art of the European Upper Paleolithic is rightfully highlighted. But Europe is not the only place where ancient cave paintings have been found. Cave art at least as old as the oldest found in Europe has been found in Indonesia.
- **Chapter 7:** The recovery of ancient genetic material and its analysis has also revolutionized the study of human migration to the New World. As an example, the genetic analysis of the Anzick boy from Montana may be the most important application of molecular archaeology performed in the New World. The Anzick remains are compared to the Mal'ta skeleton—found in Siberia—in this chapter.
- **Chapter 8:** I think there are two kinds of people in the world: people who own dogs and people who would like to. There have been significant recent discoveries in terms of the domestication of not only dogs, but rice, and cattle, all of which are discussed here.
- **Chapter 9:** There are lots of new data about Stonehenge and Çatal Höyük, including the discovery of more than 100 large, buried stones at Durrington Walls near Stonehenge.
- **Chapter 10:** The rulers of the great civilizations of antiquity were the original "one-percenters." I put the wealth and power of those rulers in a modern context in this chapter.
- **Chapter 11:** I present here an expanded and updated discussion of societal collapse. What is collapse? How does it occur? What may cause it? And how do people reorganize their societies after a collapse?
- **Chapter 12:** I have updated the discussion of the origins of the Maya, the collapse of their civilization, and the use of isotopic analysis to trace the geographic origins of Maya rulers.
- **Chapter 13:** The Inca practiced human sacrifice. I have updated and expanded the discussion of this practice.
- **Chapter 14:** I have updated the discussion of the mound-building societies of the American Midwest and Southeast, and I have done the same with the cultures of the American Northwest Coast.
- **Epilogue:** This brand-new epilogue is, essentially, an expanded "Messages From the Past" section, focused on the combined, compounded, and cumulative changes to our planet wrought through human technological evolution.

SUPPLEMENTARY MATERIAL FOR STUDENTS AND INSTRUCTORS

A companion website for *The Past in Perspective* is available at www.oup.com/us/feder. On the website, students will find multiple-choice quizzes, chapter summaries, web links, and vocabulary flashcards.

A personal goal of mine in writing this book has been to inspire among its readers a lifelong interest in the past. As a result, I have included a resource in the accompanying website called "Visiting the Past." In it, I provide information about actually visiting some of the sites featured in the text. I have always found it terrifically gratifying when I hear from past students a year, five years, or even longer after taking one of my courses that as a result of interest kindled there, they have visited archaeological sites open to the public—often sites I highlighted in class and of which I showed photos from my own visits. I realize that the vast majority of this book's readers will not go on to careers in archaeology, but I hope that many will be similarly inspired by the material presented here to personally experience some of the significant sites discussed in its pages. Of course, I have an ulterior motive; I hope that students who visit sites like the ones discussed in this book recognize their significance on multiple levels and become citizens committed to their protection and preservation.

For instructors, an Instructor's Manual, Computerized Test Bank, and PowerPoint presentations are available on the Ancillary Resource Center and include multiple-choice and short-answer/essay questions, as well as chapter overviews, lists of key words, and suggested sources for videos and websites. To access these materials, register at www.oup-arc.com.

ACKNOWLEDGMENTS

The Past in Perspective was originally published by Mayfield Publishing, which is now, lamentably, gone. It was Jan Beatty, my developmental editor at Mayfield, who came up with the idea for the book in the first place and encouraged me throughout the writing process. The entire thing was her idea, so if you don't like this book, you should blame her. She is, in many ways, responsible for its existence. In truth, I can't thank her enough for her support.

A million thanks to Sherith Pankratz, Meredith Keffer, and Keith Faivre at Oxford University Press. This book was truly a collaborative effort, and they deserve recognition for all of the work they put into making it look great and, I think, read so well. Writing a book is both a glorious and a terrifying journey. It's great to have an amazing team along with you for the ride. Thanks, guys!

The relationship between an author and a copy editor can be difficult; I mean, after all, why would anyone need to change my already perfect writing? Ha! It has been a genuine pleasure working with Carrie Crompton on the manuscript, and I owe her a debt of gratitude for the many corrections and improvements she has made.

I am also extremely grateful to many colleagues and students, as well as to my late father, who have shared their thoughts, suggestions, and, yes, pointed criticisms of *The Past in Perspective*. Also, I continue to be both grateful for and amazed by the generosity of so many colleagues who have generously provided me with photographs to use in *The Past In Perspective*. In particular, I would like to thank Maxime Aubert, Lee Berger, Jarrod Burks, Nick Conrad, Jenn Davis, Jon Erlandson, Sonja Gray, Sonia Harmand, Jose Joordens, Christopher Kleihege, Chris Lepre, Jason Lewis, Kurt Rademaker, Brian Siegel, Pierre-Jean Texier, Liz

Throop, Paola Villa, and Michael Waters. The photographs and art they supplied are useful, instructive, and beautiful.

A special shout-out and genuine thanks to Jeanette Cooper for her suggestions about improving my discussion of Minoan Crete. I will never—I repeat, never—use the word "temple" again with reference to the monumental structures of that civilization. Also, thanks to Jonathan Kent for helping me tighten up my discussion on the use of slaves in ancient Egyptian construction.

I would also like to thank the reviewers of the seventh edition: Lauren Ann Sullivan, University of Massachusetts at Boston; Ian Lindsay, Purdue University; Jeb J. Card, Miami University; Sean Rafferty, University at Albany-SUNY; Maria Masucci, Drew University; Mark A. Rees, University of Louisiana at Lafayette; Timothy L. Bober, Western Michigan University; and two anonymous reviewers. I took their counsel seriously and am in their debt for the many useful suggestions they made.

In the area of personal thanks, I am grateful to have a colleague and friend like Dr. Michael Alan Park. And yes, it will be "terribly strange to be seventy," but that's still a long way away. For me, anyway.

My sense of excitement about the world around me was kindled by my parents, and I must thank them both. My dad is gone now and sorely missed, but I know that he reveled in the work I did in my research and publications.

Just like life on the planet and human societies, our individual sagas exhibit enormous change through time. Mine has been no different. What never changes is the enjoyment I get from impressing my two now adult and accomplished sons, Josh and Jacob, with the work that I do. At the same time, all of the kitties I have had in my life—Randolph, Harpo, Groucho, Busterella, Aslan, Xander, and now Sedona and Dodger—have shown me that it's important to look away from the computer screen every once in a while to scratch a friend behind the ear, rub an exposed belly, or fill the damn food dish.

And while my love, Jenn Davis, isn't the kind of person to admit it out loud, I think she's kind of impressed by the work that I do. Anyway, she puts up with all the time I devote to this and my other projects, so I guess she's okay with it. But don't tell her I know that. It would annoy her.

THE PAST *in* PERSPECTIVE

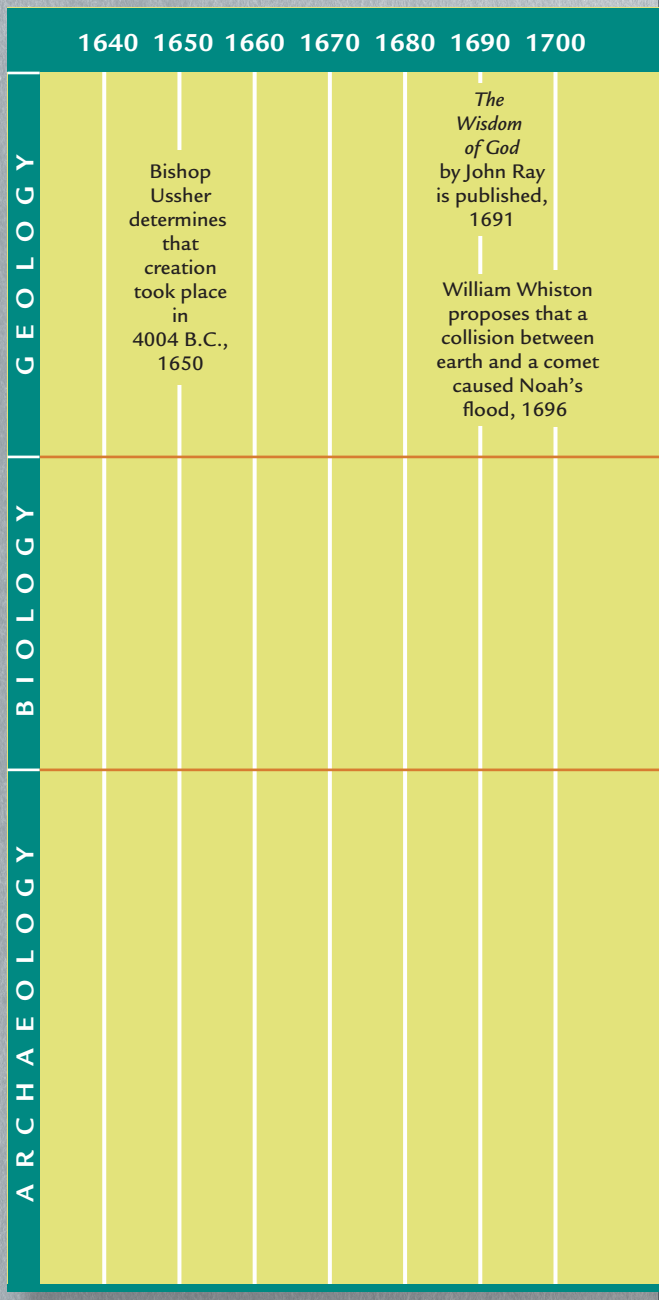
1

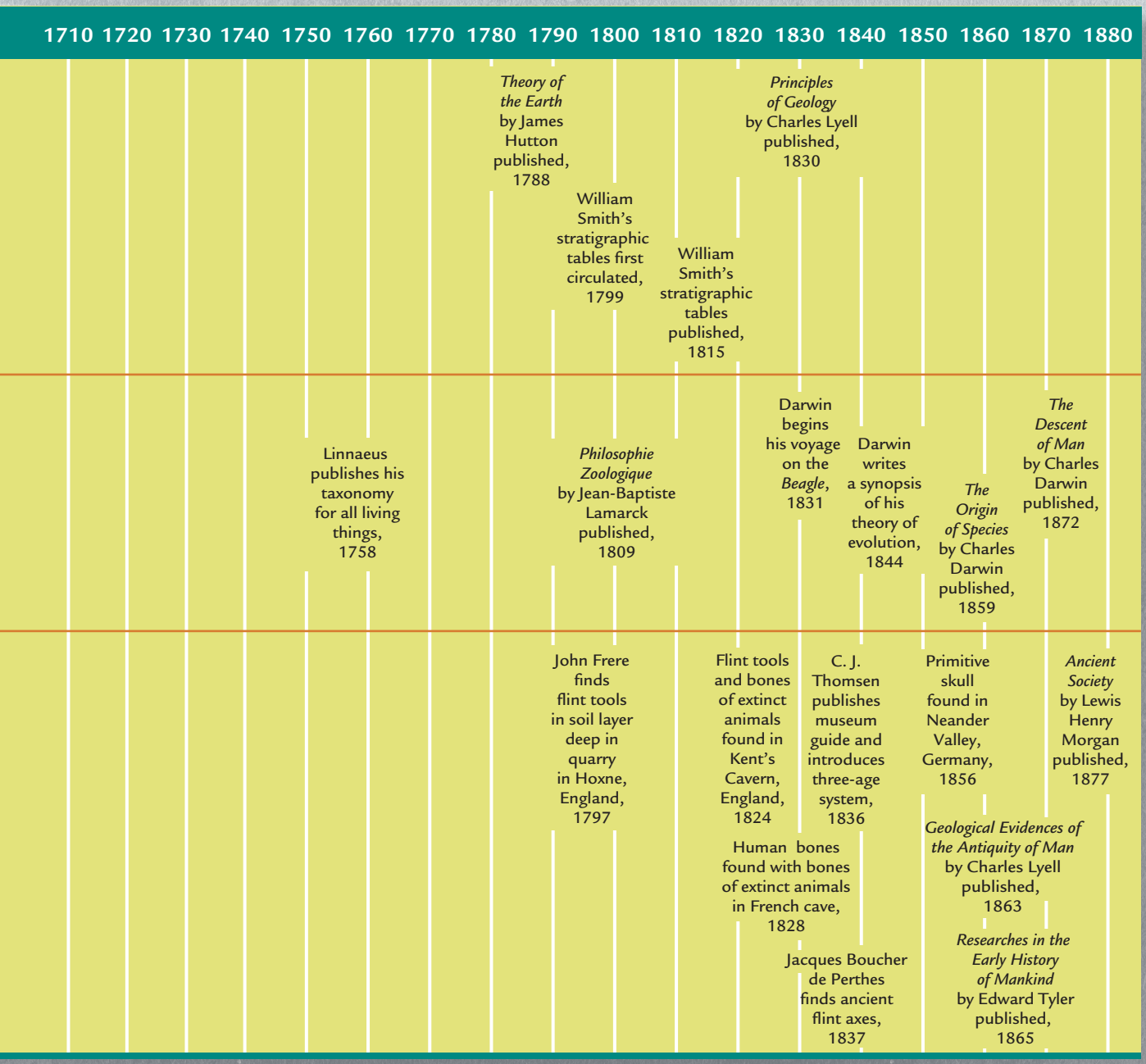
Encountering the Past

CHAPTER OVERVIEW

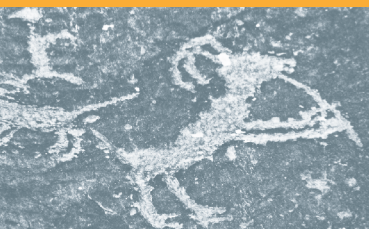
This book focuses on the work of archaeologists. Archaeology is a subdiscipline within the broader field of anthropology—the study of humanity. Whereas other anthropologists study living people, archaeologists concentrate on the cultural evolution of past human beings. Archaeologists accomplish this through the study of our ancestors' biological remains and, especially, the analysis of the physical objects that they made, used, and left behind.

Recognizing that the world and humanity were ancient, and understanding that elements of this ancient past were preserved and could be studied in the present, was difficult for past thinkers whose concepts of time were constrained by their traditional beliefs. Some viewed the world as the static product of a relatively recent, divine creation. Others came to understand that the earth is the result of slow-acting, natural causes that continue to operate in the present. In this now-accepted view, the world and all of its inhabitants, including human beings, have a lengthy history and are ever changing. Only by recognizing that the world is vastly ancient and characterized by change can the lengthy archaeological record of an ancient humanity be accommodated.




1710 1720 1730 1740 1750 1760 1770 1780 1790 1800 1810 1820 1830 1840 1850 1860 1870 1880
Theory of the Earth by James Hutton published, 1788
William Smith's stratigraphic tables first circulated, 1799
William Smith's stratigraphic tables published, 1815
Principles of Geology by Charles Lyell published, 1830
Linnaeus publishes his taxonomy for all living things, 1758
Philosophie Zoologique by Jean-Baptiste Lamarck published, 1809
Darwin begins his voyage on the Beagle, 1831
Darwin writes a synopsis of his theory of evolution, 1844
The Origin of Species by Charles Darwin published, 1859
The Descent of Man by Charles Darwin published, 1872
John Frere finds flint tools in soil layer deep in quarry in Hoxne, England, 1797
Flint tools and bones of extinct animals found in Kent's Cavern, England, 1824
C. J. Thomsen publishes museum guide and introduces three-age system, 1836
Primitive skull found in Neander Valley, Germany, 1856
Ancient Society by Lewis Henry Morgan published, 1877
Human bones found with bones of extinct animals in French cave, 1828
Geological Evidences of the Antiquity of Man by Charles Lyell published, 1863
Jacques Boucher de Perthes finds ancient flint axes, 1837
Researches in the Early History of Mankind by Edward Tyler published, 1865

PRELUDE



THE PAST IS DEAD AND GONE. At least that's what we usually think and say. Surely there is nothing much left of it beyond our dim memories. Perhaps the past is like the faces of people in an old printed photograph, people we once knew—people we once were. The image is crisp soon after the photo is taken but gradually fades as time hurries on, blurring into indistinct splotches of color on photo paper. Ultimately, the past, like these images, grows faint, becoming little more than an indecipherable haze. Indeed dead. Indeed gone. But is this common impression entirely accurate?

In fact, it isn't. In a very real way, the past sometimes and unexpectedly endures into the present. When we are lucky, its image can be brought back into sharp focus.

For example, take a walk out toward the margins of just about any modern town. Follow a trail into the desert or deep into the piney woods and recognize that, in a sense, the trail conveys the hiker back through time.

Consider the town of Simsbury, Connecticut. In the rural, northwest corner of town, out beyond the beautiful homes with their splendid views of the valley below, a trail meanders through the McLean Game Refuge, a 4,000-acre sanctuary for animals, fish, birds, and trees. The trail into the refuge surges downhill, propelling the hiker past stands of hemlock, white and red pine, maple, and oak. As you gaze around the curiously broad trail and scan the higher ground on either side, you notice that this uninhabited woodland bears witness to something far different in its past. Low-lying stone walls demarcate the edges of the wide path, and that in itself is a puzzle (Figure 1.1). No one in living memory built these walls, yet there they stand, mysteriously lining the edges of a hiking trail far wider than it needs to be, in the middle of a game refuge. And there is more. Look beyond the walls that border the trail and you will notice a web of more stone walls, often rather elaborate and well made, in some cases stretching for more than 100 feet before intersecting with yet other fieldstone walls. These walls serve to enclose segments of land, each several acres in size, as if demarcating the property holdings of invisible homesteads. But whose property? Whose homesteads?

FIGURE 1.1
Now deep in the forest, stone walls like this one once lined the roadways and gridded the fields used by the inhabitants of Pilfershire and hundreds of other communities scattered throughout New England. *(K. L. Feder)*

Again, mysterious. Why would anyone feel compelled to do all the work necessary to segregate sections of land by piling up thousands of heavy fieldstones in the middle of what now is a thickly treed, uninhabited game refuge?

As you continue farther along the trail into the woods, the stone walls seem to loom larger around you. They are taller, more elaborately made, and increasingly out of place in the apparent long-standing wilderness that surrounds you. Then, in the distance, along the trail, an opening in the trees becomes apparent. Arriving at the clearing, you spy a complex, well-made, fieldstone foundation of a large structure with a substantial square block of stones presenting fireplaces on each of its four faces (Figure 1.2, top). It is the remnant of the center chimney of a house whose superstructure, likely wood-framed and sheathed in clapboard

siding, is gone now, but whose stone-piled foundation clearly indicates its size and configuration. Walking around the foundation, it is easy to locate the well. Sprinkled about you on the ground, mixed in with oak and maple leaves, pine cones and needles, are bits and pieces of ceramic vessels; large chunks of thick-walled, utilitarian stoneware crocks; more delicate shards of plain, white-glazed dishes; spalls of oddly thick, green glass; and deeply rusted iron nails, not round like our modern ones but squared off, looking more like small metal spikes than nails (Figure 1.2, bottom; the Swiss Army knife is for scale).

FIGURE 1.2
This stone foundation (top) is all that remains of one of the structures that made up the long-since-deserted Pilfershire community located in north-central Connecticut. Stone walls, foundations, and wells, along with the objects used and then lost, abandoned, or discarded by the inhabitants of the community, represent that part of the past which endures into the present (bottom). This book presents what we know about the grand sweep of human history through the analysis of the enduring physical remains of the past. *(K. L. Feder)*

Curious enough that this foundation sits in the middle of the woods, a healthy walk from the nearest inhabited home, but even more curious when you continue past the large foundation and realize it is but one of several embedded deeply in the woods, some distance from the modern neighborhood of elegant homes.

What was this place? When was it inhabited? Who lived here? What happened to their seemingly once thriving small community? Why was it abandoned? Where did the inhabitants go? These are vexing questions, but one thing is certain: The past is not dead and gone here. Though now little more than a collection of stone walls and cellar holes in the middle of the woods, 200 years ago, in fact, this was the nucleus of a thriving community called Pilfershire, with homes, cleared fields, farms, barns, a cider mill, a school, various small industries, and shops. The children of Pilfershire once ran along village paths that are now hiking trails in a wildlife sanctuary. The path taken to get to this place, curiously broad for a simple hiking trail and mysteriously bounded by stone walls, is what remains

FIGURE 1.3
Hidden in a niche in a cliff in northern Arizona, Montezuma Castle was not really a fortress of the Aztec king Montezuma. It was, instead, a small community of Native Americans of the Sinagua culture (see Chapter 14) who inhabited the area more than 600 years ago (left). These Easter Island moai (right) were never completed and still rest in the quarry where it was being sculpted nearly a thousand years ago. Ancient communities and places of work, like quarries, mines, hunting grounds, and so forth, can all become part of the archaeological record. *(Left, K. L. Feder; right, Sonja Gray)*

of the old coach road that conveyed people and goods to and from the village. People worked, prayed, laughed, loved, lived out their lives, and ultimately died at this place. Now they are ghosts, and their community is little more than a point of interest in a nature trail guide. Oh, and one more thing: What was once their community is now an **archaeological site**, an enchanted place where the past has not evaporated, is not dead and gone, but continues to reside in the present.

Archaeological Site: A site is a place where people lived and/or worked and where the material objects that they made, used, lost, or discarded can yet be recovered and analyzed.

A FOREIGN COUNTRY

In the wonderful title of David Lowenthal's (1988) book whose wording he took from the English novelist L. P. Hartley, it is phrased in this way: *The Past Is a Foreign Country*. With that literary image in mind, we might say that the site where the remnants of the Pilfershire community can be found today represents a place where we in the present can visit that exotic land that is the past.

In a sense, Pilfershire represents an abandoned, forgotten part of human history, but it is not unique. All over Connecticut, throughout New England, scattered around the United States, and, in fact, dispersed across the globe, there are innumerable "lost villages," places where the detritus of past people lies abandoned in the woods, nestled under meters of sand, ensconced in ancient layers of soil, hidden deep in the recesses of dark caverns, and even embedded in rock (Figure 1.3). The pasts reflected in these lost villages—and lost quarries, encampments, fishing stations, sacred places (see Figure 1.4), trading posts,

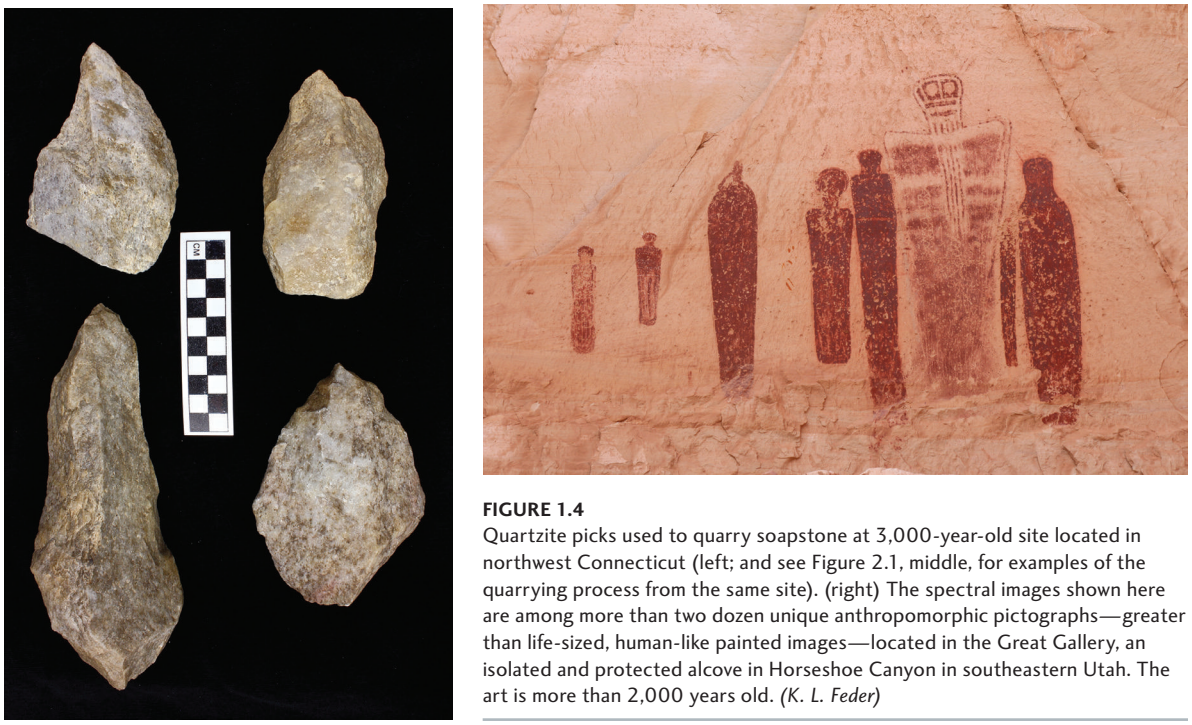


FIGURE 1.4
Quartzite picks used to quarry soapstone at 3,000-year-old site located in northwest Connecticut (left; and see Figure 2.1, middle, for examples of the quarrying process from the same site). (right) The spectral images shown here are among more than two dozen unique anthropomorphic pictographs—greater than life-sized, human-like painted images—located in the Great Gallery, an isolated and protected alcove in Horseshoe Canyon in southeastern Utah. The art is more than 2,000 years old. *(K. L. Feder)*

FIGURE 1.5
People in both the distant and recent past left memorials to those they loved and respected and for whom they grieved. Here, at the same location in Marietta, Ohio, but at entirely different times, Native Americans constructed a burial mound (about 2,000 years ago) and much more recently, eighteenth- and nineteenth-century Euro-American settlers interred their dead in the shadow of that mound. Those more recent people recognized the sacredness of the place, left the older burials intact, and then continued the practice of using the site as a graveyard. *(K. L. Feder)*

mines, hunting camps, and burial grounds (Figure 1.5)—reside in our present in the form of material remains left behind by human beings who lived their lives centuries, millennia, and even millions of years ago. The remnants of their homes and possessions—even the remains of their own bodies—continue their slow descent into oblivion, but at least for some of them, we have arrived before they have become dust, before they are, in fact, dead and gone. In these providential instances, we have arrived in time to tell their stories.

This book strives to accomplish that task of storytelling through the application of the sciences of **paleoanthropology** and **archaeology**. This book is not about a single time or place but of all the times and all the places of humanity. It is a travelogue, of sorts, in which together we will visit the "foreign country" that is our species' enduring past.

Paleoanthropology: Anthropological study of the evolution of our species.

Archaeology: The study of humanity through the analysis of the material remains of human behavior: the study of the things that people made and used in the past and that have been fortuitously preserved.

AN ANTHROPOLOGICAL PERSPECTIVE

Paleoanthropology and archaeology are subfields within the broader discipline of **anthropology** (Figure 1.6). Contemporary anthropology is the study of people. Of course, the other social sciences—economics, political science, psychology, sociology—also study people but from very particular perspectives, focusing on specific aspects of human behavior. Anthropology, on the other hand, attempts to be **holistic** and **integrative** in its approach. If other social scientists specialize in the workings of specific systems within human society, anthropologists tend to be generalists who want to know how human society, with all its interrelated parts, works as a whole and how it came into existence.

Anthropology: The study of humanity. A broad social science with varied foci on human biological and cultural adaptations, human origins, and biological and cultural evolution as well as modern cultures.

Holistic: The approach in modern anthropology to view human biology and behavior together, as a whole, to understand our species.

Some anthropologists—called **ethnographers**—study humans by residing in particular societies and observing the behaviors of the people living in them. For example, projects conducted by ethnographers in my anthropology department

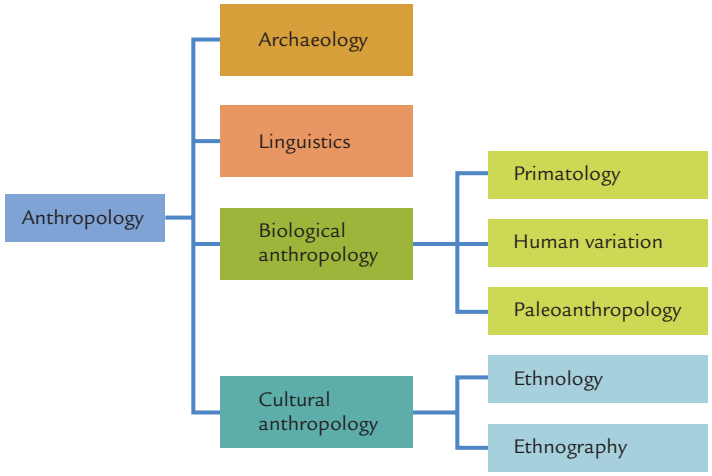


FIGURE 1.6
The major subdivisions of the field of anthropology, including the two that are the focus of this book: paleoanthropology and archaeology. While these subdivisions represent distinct approaches, there is a great amount of connectivity among them. Each of these subdivisions can, in turn, be further subdivided into various anthropological specialities.

have included the investigation of the religion of the modern Maya people of Mexico, the economy of Viet Nam, and African American hairdressers in Connecticut. Researchers who go beyond examining a particular group of people to compare the behaviors of different cultures are conducting **ethnology**. An ethnologist might take the work of several ethnographers who have conducted detailed studies of specific human groups and investigate, for example, how those various peoples deal with death, discipline their children, choose a mate, or build their houses. A highly specialized subfield of anthropology is **anthropological linguistics**. Here, the focus is language—how it evolved and the historical relationships among the known languages.

Primatologists also live with the groups they study. Instead of living among and studying people, these anthropologists focus their attention on the group of animals called the nonhuman **primates**. Prosimians (like lemurs), monkeys, apes, and humans are all primates (see Chapter 3). Primatologists aim to better understand our nearest living relatives. Believing that all primates share a common evolutionary heritage, primatologists hope to gain insights into our ancestral line. Jane Goodall (Figure 1.7), who has devoted much of her life to living among and learning about chimpanzees in the wild, is perhaps the best-known primatologist. Dian Fossey lived and worked with gorillas in the African nation of Rwanda. Her life and work as a primatologist was the subject of a biography by Farley Mowat, *Woman in the Mists* (1987), and the Hollywood movie *Gorillas in the Mist* (Phelan 1988).

If you watch the popular TV show *Bones*, you see the work of another kind of biological anthropologist: a **forensic anthropologist**. "Forensic" literally means the application of scientific procedures in the solution of a crime. *Bones* is based on the work of a real forensic anthropologist, Kathy Reichs. Using their knowledge of the human skeleton, especially skeletal trauma and pathology, forensic anthropologists work with law enforcement in investigating crimes. For example, a Connecticut colleague of mine, Al Harper (1999), was able to contribute to the solution of a murder in which a woman's body was run through a wood chipper by her husband. Though the vast majority of the murdered woman's skeleton had been pulverized, using standard techniques applied by archaeologists and

Integrative: Within a holistic approach, anthropologists recognize that human behavior can be broken down into a series of component parts that work together to allow people to survive.

Ethnographer: Cultural anthropologist who lives among a group of people or a cultural group.

Ethnology: The comparative study of culture. Ethnologists study human behavior cross-culturally, looking for similarities and differences in how people behave.

Anthropological Linguistics: Subfield of anthropology that focuses on language.

Primatologist: A person who studies primates: prosimians, monkeys, or apes.

Primate: Members of the taxonomic order Primates. Animals possessed of grasping hands and feet, stereoscopic vision, and relatively large brains (in proportion to body size).

Forensic Anthropologist: A biological anthropologist who specializes in the identification of the human skeleton, often in the investigation of a crime.

FIGURE 1.7
Jane Goodall is among the field's best-known primatologists. Goodall's work among the chimpanzees has directly provided enormous insight into the lives of the chimps, and, indirectly, into the lives of our ancient ancestors. *(© Karl Ammann/CORBIS)*

Cultural Evolution: Just as biological evolution posits ordered change through time among biological organisms, cultural evolution posits ordered change through time among cultures.

Culture: The invented, taught, and learned patterns of behavior of human groups. The extrasomatic (beyond the body or beyond the biological) means of adaptation of a human group.

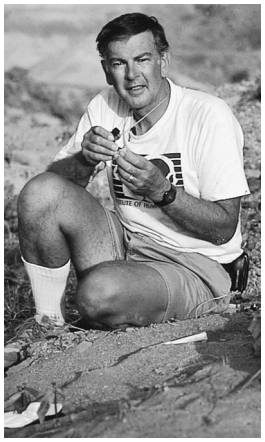


FIGURE 1.8
Don Johanson's work in east Africa has revealed the remains of some of our most ancient hominin ancestors. He is shown here at Hadar, a fossil locality that has provided the remains of Lucy and other members of the species *Australopithecus afarensis* (see Chapter 3). *(© Institute of Human Origins, Arizona State University)*

paleotanthropologists (see Chapter 2), Al and his team recovered a tooth and a fingertip (with a manicured nail) that they were able to trace to the missing flight attendant. Her husband, who had claimed that his wife wasn't dead, just missing, was arrested, tried, and convicted of the murder.

Paleoanthropologists and archaeologists investigate the evolutionary history of humanity, both the biological evolution of our species and its **cultural evolution**. Paleoanthropologists have as their database the biological history of our species, often as reflected in the skeletal remains of our ancient human ancestors (Figure 1.8). Paleoanthropologists search for and analyze the fossils of our ancestors, and they rely increasingly on the analysis of modern human DNA in an attempt to solve the puzzle of our genetic roots. In a few lucky instances, they have even been able to extract DNA from ancient bones, reading the genetic instructions for some of our ancestors (see Chapter 5).

Archaeologists rely on the material remains left behind by past peoples, including those same varieties of human beings whose bones the paleoanthropologists unearth (Figure 1.9). Material remains may include the things people made and used, from simple stonecutting tools to complex monuments. Although archaeology is often perceived as being a romantic enterprise, it is perhaps better described as the study of "other people's garbage," as a PBS TV documentary called it (PBS 1980).

We humans are not only biological organisms whose adaptation is rooted in our genes but also cultural organisms whose uniquely great intelligence allows us to invent much of our strategy for survival. As researchers first recognized in the eighteenth century, these invented adaptations—our **cultures**—have evolved just as surely as have our bodies and brains. Not only did our human ancestors leave behind their physical remains, which reflected their biological adaptation, but also they left behind the material objects they made and used as part of their cultural adaptation. The study of these two sources

of information—their bones and **artifacts**—allows us to paint a picture of the lives of our ancient human ancestors.

FIGURE 1.9
Archaeologist Dr. Warren Perry is seen here at the excavation of the homesite of Venture Smith (born Broteer Furo). Smith was a free African living in Connecticut. After purchasing his freedom, he became a successful entrepreneur and wrote an autobiography. *(John J. Spaulding)*

AN ANCIENT WORLD

An understanding of the context of time is crucial in our journey to the "foreign country" of the past. How deep is the human story? How far back in time can we trace our species? Any discussion of ancient societies requires the recognition that time itself is ancient, and this recognition is relatively recent in Western thought.

The Age of the Earth

It was commonly believed by Europeans in the sixteenth and seventeenth centuries that the world was only a few thousand years old. In 1642 John Lightfoot calculated creation's date at 3928 B.C., making the world 5,570 years old at that time (Brice 1982:19). There were other, similar estimates.

Most people in the Western world came to accept the very precise determination of Irish archbishop James Ussher who, in 1650, calculated that the earth had been created in 4004 B.C. and that God had begun the work "upon the entrance of the night preceding the twenty-third day of October" (from Archbishop Ussher's *Annales*, in Brice 1982:18). Beginning in 1701, this date was printed as a marginal note in English bibles. Though Ussher's precise figure is often maligned by modern scientists and writers at least he didn't grab the number out of thin air. He arrived at it in 1650 through detailed historical research, analysis of astronomical cycles, and reference to biblical genealogies (Gould 1991).

Along with a young earth, many Western thinkers believed the world to have been created by God, just as we now see it, during the creation week discussed in the Old Testament of the Bible. Most believed that the world was "fixed" or set at creation and that, apart from minor, cyclical changes, like the alternation of the seasons, everything that was a part of that world—plant and animal species, as well as human beings—had changed little, if at all, since creation less than 6,000 years previously. John Ray, a minister in the Anglican Church, a naturalist, and scientist, was perhaps the most eloquent spokesman for this **creationist** perspective. In his view (1691, Preface), the world around him reflected "the works created by God at first and by him conserved to this day in the same state and condition in which they were first made."

Artifact: Any object manufactured by a human being or human ancestor. Usually defined further as a portable object like a stone spearpoint or clay pot to distinguish it from larger more complex archaeological features.

Creationist: One who believes that the universe, the earth, life, and humanity are the product of the creation of an all-powerful god.

A WRECK OF A WORLD

Some Western thinkers disagreed with Ray's perspective, believing, instead, that the earth had changed radically from the original creation and that this change had been decidedly for the worse. They agreed that the world God created had

been perfect and that some of that perfection could still be seen and used as an argument for God's existence, but they also viewed the modern world as a pale reflection of the perfect place God had created. Many naturalists in the late seventeenth through eighteenth centuries were **catastrophists**. They believed the world had changed dramatically since creation through a series of catastrophic, natural processes set in motion by God upon his original creation of the world. Perhaps most important from our perspective here, catastrophists generally believed that these natural processes could be understood through careful study.

Catastrophist: An adherent to the perspective that the current appearance of the earth can be best explained as having resulted from a series of natural catastrophes—for example, floods and volcanoes.

Noah's Flood

One example catastrophists pointed to as evidence of the process of catastrophic deterioration of the earth was Noah's flood. The Bible states that God decided to destroy the world and all its living things through a great universal deluge, saving only the family of Noah and representatives of each kind of animal. Though the flood was viewed by catastrophists as a supernatural event caused by God, some believed that God had used a natural process to initiate it. Astronomer Edmund Halley (after whom Halley's comet is named) proposed in 1694 that a comet crashing into the earth (sent, of course, by God) might have initiated the great flood.

Some catastrophists believed that great floods, like Noah's but of a smaller magnitude, had been the primary natural agency by which God caused his creation to wind down. Imagine devastating tsunamis, like the one that struck the Pacific coast of Japan in March 2011, or cataclysmic hurricanes like Katrina in 2005 afflicting the planet on a frequent basis.

Catastrophists, however, faced a problem of scale and timing. Flooding is a natural phenomenon that often causes great destruction, and volcanoes and earthquakes are capable of incredible devastation; but these processes seemed to be too infrequent and far too limited in power to produce, in the accepted time frame provided by Bishop Ussher, the kinds of planetary deterioration catastrophists believed characterized the earth. Though enormous on a human scale, great floods, powerful volcanic eruptions, and devastating earthquakes seemed trifling on a planetary scale. Certainly, the Great East Japan earthquake of 2011 and the subsequent tsunami were devastating natural events. Nearly 20,000 people were killed, another 30,000 injured, and 130,000 buildings were destroyed. But even this incredible catastrophe was largely local in its impact. The 2011 tsunami and the 2010 Haitian earthquake still were not catastrophes on a planetary scale. Most of the earth and most of its people did not suffer direct effects from these disasters. Catastrophists had to posit that calamities—the likes of which human history had never witnessed or recorded—had occurred in the past on a fairly regular basis in order to produce the degree of degeneration they perceived in the physical world.

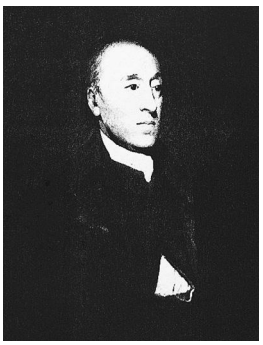


FIGURE 1.10
Eighteenth-century Scottish geologist James Hutton, one of the first and most persuasive proponents of the perspective of uniformitarianism. *(James Hutton,* Theory of the Earth, *1795)*

EQUABLE AND STEADY CHANGE

Scottish scientist James Hutton became one of the first proponents of a hypothesis that stood in opposition to catastrophism (Figure 1.10). In his view, first

espoused in his seminal and revolutionary work *Theory of the Earth*, "The operations of nature are equable and steady," not unpredictable and catastrophic (1795:19). This viewpoint, held by others as well, gave rise to the new perspective of **uniformitarianism**.

Hutton viewed the world as a marvelously constructed, perfectly synchronized machine—not merely switched on at creation and destined to run down, but brilliantly conceived to readjust and re-create itself continually. Hutton proposed a world designed by a creator so clever that slow and steady processes of decay were eternally offset by the slow and steady cycle of rejuvenation. In a conceivably indirect criticism of Bishop Ussher's calculation of a young earth, Hutton maintained that "time, which means everything in our ideas and is often deficient in our schemes, is to nature, endless" (1795:15). Processes like **erosion** and **weathering**—seen every day in rivers cutting their channels, in tides sculpting the shore, or in wind carving canyons—could have produced the present appearance of the earth if afforded sufficient time (Figure 1.11). Hutton argued that once it was accepted that these ordinary processes were responsible for earth's alteration since creation, our planet's actual age could be deduced. Through the careful scientific study of the rates and patterns of ordinary processes of erosion and weathering, "we find . . . means for concluding a certain portion of time to have necessarily elapsed, in the production of those events of which we see the effects" (1795:19).

For the earth to have attained its appearance, modern observable phenomena must have been operating long enough to have produced mountain chains, meandering rivers, great canyons, and eroded valleys. Because the rates of erosion and weathering could be measured, one needed only to ask how long such processes must have been operating in order for modern features to have formed.

Uniformitarianism: The belief that the appearance of the earth could best be understood as resulting from the slow action of known processes over a very long period of time.

Erosion: The disintegration and transportation of geological material by wind, water, or ice.

Weathering: The decomposition and disintegration of rock, usually at or near the earth's surface.

FIGURE 1.11
I may be biased, but I think there's no better place on earth to see the incredible combination of time and erosion than the American Southwest. The only appropriate word to apply to Delicate Arch in Arches National Park in Utah is phantasmagoric (top); it looks like something you'd expect to see on Mars. The remarkable beauty of the delicate spires of Bryce Canyon, also in Utah, is another remarkable example of nature's ability to sculpt the planet (bottom). I've traveled a bunch but I don't think I've ever seen a more beautiful vista. *(K. L. Feder)*

FAIRY STONES?

If the earth was far more ancient than Bishop Ussher's calculation suggested, where did human beings fit in? Throughout the sixteenth and seventeenth centuries, beautifully chipped, symmetrical stone "axes" were found across Europe, often buried deeply in the soil. Perhaps these were the product of human manufacture from an ancient period before the use of metal. Many seventeenth-century observers rejected this—after all, the Bible didn't mention a "stone age," a period of time when people made only stone tools—and proposed, instead, that these objects had been fashioned not by ancient people but by elves and fairies! In the mid-1600s, in a more naturalistic explanation, Ulisse Aldrovandi suggested that such objects were produced by nature when lightning strikes the ground. This led to these objects being called "thunderstones," an only slightly more reasonable name than "fairy stones."

Other scientists in the seventeenth century were not quite so enamored of explanations that relied on fairies and elves or thunder and lightning. They suggested that these flint objects had been made by people in the past. But this explanation still was hampered by the restriction that a previous race of stone-tool-using humans could be no more than about 6,000 years old because that was the age of the earth and the universe that God had created.

John Frere's Discovery

In 1797, only two years after the publication of Hutton's expanded version of *Theory of the Earth*, John Frere, a young Englishman, found some of these curious stone axes in a brick-earth quarry in the small English village of Hoxne (Figure 1.12). His letter describing the artifacts to the London Society of Antiquaries was read before the group in the same year and printed in its journal in 1800 (Frere 1800).

FIGURE 1.12
Two views of one of the flint implements found and reported on in 1797 by John Frere. Frere proposed that the great depth of the implements as well as their position in a soil layer beneath one in which the bones of extinct animals were found suggested great antiquity for the makers of such tools. *(© The Society of Antiquaries of London, reproduced by kind permission of the Society of Antiquaries of London)*

What made Frere's discovery so significant was that for perhaps the first time, primitive stone tools had been excavated at great depth (in this case, 12 ft below the surface) and that the bones of extinct animals were found *above* the tools, in more recently deposited soil layers. Frere recognized that from a uniformitarian perspective, this placement implied a great age for the tools and, in turn, a significant age for the humans who had made them.

Frere's argument for the antiquity of the artifacts he found was based on their **stratigraphic** position in the quarry. Frere and members of the London Society of Antiquaries may have been aware of the work of British surveyor William Smith, who a few years earlier had recognized that the soil beneath the earth's surface

occurred in layers and that the layers produced ordered and regular groups of fossils. Smith showed that the layers could be identified and distinguished by their population of fossil species, with sequentially lower layers representing increasingly ancient time periods. In 1799 Smith circulated a handwritten table showing the order of strata he had encountered, but he did not publish a detailed report until 1815, laying the groundwork for the analysis of **stratigraphy** (see Chapter 2; Grayson 1983).

Stratigraphic (Stratigraphy): Related to the geological or cultural layer in which something has been found.

More Stone Tools . . . and Bones

Jacques Boucher de Perthes was a French customs official with a passion for artifact collecting, finding hundreds of flint implements in his excavations in the high gravel terraces overlooking the River Somme in northern France. In the title of the book he wrote presenting his work, published in 1847, he labeled these chipped stone tools *antediluvian*, meaning, literally, "from before the flood." Certainly the tools appeared to be primitive and ancient, but, just as important, like Frere, Boucher de Perthes found the artifacts in deep excavations, in the same layers where he also recovered the bones of extinct animals, including those of bison, woolly mammoth, woolly rhinoceros, and cave bears (Boucher de Perthes 1864). The stratigraphic context and association of the tools with fossil bones provided strong evidence for their great antiquity, dating, in fact, from a time when people relied on stone, not metal, for their weapons and tools and when animals long since extinct roamed the European countryside.

Frere's and Boucher de Perthes's discoveries implied a greater antiquity for the human species than was allowed for in Bishop Ussher's biblically based chronology. Their unearthing of tools and bones seemed to place our species deep in time in Hutton's uniformly changing, ancient earth.

THE SLOW AGENCY OF EXISTING CAUSES

Hutton had fired the first salvos in a revolution in thinking about the processes responsible for the physical features of the earth and the age of the planet. The brilliant British geologist Charles Lyell (Figure 1.13) continued this revolution in thinking about the past. To come to a rational understanding of the earth, Lyell felt it necessary to dispense entirely with "imaginary pictures of catastrophes and confusion such as haunted the imagination of the early cosmogonists" (1990:72). His fundamental assertion was that "all past changes on the globe had been brought about by the slow agency of existing causes" (1830:63). That really was the heart of Lyell's argument: explaining the appearance of the earth by reference to existing processes that acted slowly over vast spans of time.

Perhaps the most revolutionary and problematic deduction from such a hypothesis concerned the time necessary to produce the kinds of geological features seen on the earth if only the "slow agency of existing causes" was considered. Lyell himself admitted, "The imagination was first fatigued and overpowered by endeavoring to conceive the immensity of time required for the annihilation of whole continents by so insensible a process" (1830:63). But he

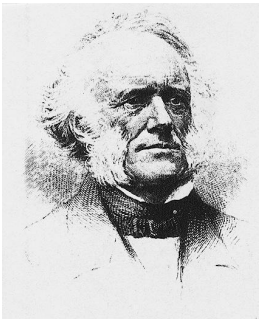


FIGURE 1.13
Nineteenth-century English geologist Charles Lyell. Lyell was the most eloquent and thorough of the uniformitarianists. In his view, the appearance of the modern world was due not to ancient catastrophes but to "the slow agency of existing causes." This led him to the conclusion that the earth was far more ancient than was generally believed. *(Charles Lyell,* Principles of Geology, *1830)*

went on to apply his fundamental axiom of uniformitarianism to estimate the ages of significant geological features. In a work published in 1863, for example, Lyell calibrated the modern rate at which the Mississippi Delta was growing and concluded that at its current rate of growth it must have taken 100,000 years to have attained its size.

Uniformitarianists who followed Lyell applied a similar approach: measure current erosion or deposition rates and calculate how long those processes of erosion or deposition must have been ongoing to produce the size of the particular geological feature. For example, in the late nineteenth century, British geologist Archibald Geikie examined the erosion rate of the Colorado River in the Grand Canyon. Based on that rate, he estimated that it took about 1,200 years for the river to cut one vertical foot into the underlying rock, making the mile-deep canyon, by this calculation, a little more than 6 million years old (5,280 feet × 1,200 years = 6,336,000 years; Atkinson and Leeder 2008). Recent research confirms that the Colorado River did, indeed, begin carving through the canyon about 6 million years ago, though parts of what we now call the Grand Canyon existed for tens of millions of years before that (Karlstrom et al. 2014).

Needless to say, these estimated ages for the Mississippi Delta and Grand Canyon were shocking to those who accepted Bishop Ussher's determination for the age of the entire earth; 100,000 years is nearly eighteen times longer and 6 million years is about 1,000 times longer than the entire duration of earth's history if you accepted Ussher's calculation. Lyell was viciously attacked in print and charged with heresy, but such allegations rang hollow. Though the Bible measures the period of creation as six days, it does not place that creation week in time; nowhere does the Bible actually record the age of the universe, earth, or life. Hutton and Lyell's view and that of uniformitarianism may have contradicted the interpretation of an archbishop, but they did not disclaim the word of God.

Lyell was a great scientist and a persuasive proponent of the uniformitarian perspective. His work resonated in the minds of many geologists, biologists, and archaeologists and freed them from the perspective of a recent earth into whose chronology all of their observations and deductions had to be crammed. Charles Darwin later was to state, without too much exaggeration, "The science of geology is enormously indebted to Lyell—more so, as I believe, than to any other man who ever lived" (F. Darwin 1961:51).

ANCIENT HUMANS REVISITED

With Lyell, uniformitarianism was to become the orthodox perspective in geology. The earth was old, and its story could be read in its ancient layers. With the discovery of clusters of such stone tools ensconced in deep stratigraphic layers and with no evidence of the use of metals found alongside, it became increasingly clear to many that human beings had been around for far longer than 5,700 years and that their cultures had changed dramatically since the makers of those stone tools had lived.

Cultures Ancient and Changing

Just six years after the initial publication of Lyell's *Principles of Geology*, a guidebook was published describing the artifacts that could be seen in the Danish National Museum in Copenhagen. Written by Danish museum curator Christian Jurgensen Thomsen, the guidebook organized the museum's collection chronologically into three prehistoric ages—stone, bronze, and iron—based on the most-favored raw materials used to make tools during each of the three epochs. Inherent in Thomsen's **three-age system** was the notion that culture had changed through time, in a predictable sequence. The three ages were developmental as well as chronological. There was an implied succession of increasing technological sophistication, an evolution toward tools that were better (more effective, more durable) and that also required more knowledge and skill to manufacture.

That culture had been undergoing great change during human tenure on the planet was no more evident in the nineteenth century than was the notion of an ancient earth. Thomsen deserves credit for recognizing and making explicit in his guidebook that the archaeological record clearly shows great changes in human technological abilities.

Thomsen's three-age system became the first in a series of approaches to the changes in culture that can be labeled **unilineal evolution**, based on the assumption that there was a single pathway of technological progress along which all cultures passed. Perhaps the best-known unilineal cultural evolutionary sequence was suggested in the nineteenth century by Lewis Henry Morgan (1877), who posited that all cultures progress through a series of fixed stages of development that he called savagery, barbarism, and civilization. According to Morgan, cultures at the savagery stage subsisted on fruits, nuts, and fish; used fire for cooking, heating, and light; and developed the bow and arrow. At the barbarism stage, societies developed agriculture and the ability to make ceramics and forge iron. Finally, upon reaching the civilization stage in Morgan's sequence, people developed a system of writing. In Morgan's view, due to the lack of some key technological invention, some cultures became stuck at either the savagery or barbarism stages, thus accounting for the presence of "primitive" people in the modern world. As we will see throughout this book, the unilineal approach is not supported by the archaeological record, which reflects, instead, the many and diverse pathways in which different people adapted to their surroundings and adjusted to change. The modern view, in contrast to the unilineal model, is multilinear. If unilineal evolution can be seen as a single ladder of progress up which all people climb, **multilineal evolution** can be represented as a dense bush of many branches growing in myriad directions.

Three-Age System: Chronological breakdown of the history of human culture into a stone, bronze, and iron age. Developed in 1836 by J. C. Thomsen.

Unilineal Evolution: The no longer accepted view that all cultures change or evolve along the same pathway, usually one of increasing complexity.

Multilinear Cultural Evolution: The view that there are many pathways of change a culture may take over the time span of its existence.

CHARLES DARWIN AND THE ANTIQUITY OF LIFE

In 1828 a bright, young Englishman entered Cambridge University in pursuit of a degree in theology. His name was Charles Darwin (Figure 1.14). Darwin took a natural science course at Cambridge with John Stephens Henslow, a remarkable teacher who became a mentor to many of his students. Henslow genuinely liked Darwin and felt that he had a knack for observing nature. He recommended his

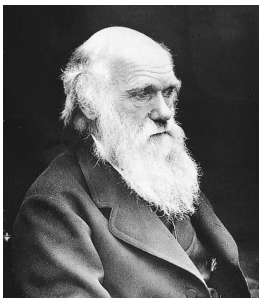


FIGURE 1.14
Charles Darwin, the father of modern biological evolutionary theory. *(Image #108781, American Museum of Natural History)*

young student to a position aboard a British government survey ship, the *Beagle*, which was to produce detailed sailing charts of the coast of South America and then circumnavigate the world. The voyage would begin in 1831, when Darwin was just 22 years old. Despite some initial misgivings on the part of his father, who was still supporting him financially, Darwin accepted the position and began a mission that was supposed to last 2 years but actually lasted closer to 5. Though officially hired to be a companion to the ship's young captain, Darwin's training was as a naturalist, and he spent much of his time on the voyage around the world observing nature and collecting plant and animal specimens in places far removed from England. Thus, events had conspired to push the young theology student to collect the data that would, 28 years later, lead to one of the most important books ever published in the name of science.

AN EVOLUTIONARY PHILOSOPHY

Evolution: Systematic change through time of biological organisms or human cultural systems.

Evolution is the focus of Darwin's work and the organizing theme of this book. The term itself evokes so much emotion and misunderstanding that it is important first to put it in context, especially here, in a book whose underlying outline is based on the physical and cultural evolution of our species (Park 2012).

Biological evolution simply implies a process of systematic change through time. The natural world is vast and diverse, and many living things are born into it. Some of those living things possess characteristics that improve the chance of their survival and of their having descendants who share those advantageous characteristics. By chance, an individual may be faster, stronger, more dexterous, or able to move more efficiently through its habitat. It may be better camouflaged, have better visual acuity, be better at attracting a mate, or possess greater intelligence. These advantages may make it more likely to survive and more likely, therefore, to pass those characteristics on to subsequent generations.

Over vast spans of time, an entire species can be moved toward these advantageous characteristics, because those who lack them tend to die more quickly—often before becoming old enough to mate and produce descendants who also lack them. Through the slow and steady accumulation of advantageous characteristics or as the result of the rapid appearance of a dramatically different and advantageous feature, a species can become so different that it no longer is even the same kind of animal. It has become a new and different species: It has evolved.

Adaptation: Mode or strategy for survival. An adaptation can be a physical or a cultural behavior.

The varied and changing natural world provides the context in which an organism must live and to which it must adjust. Biological evolution is not directed; species do not actively develop strategies for survival—called **adaptations**. And biological evolution has no direction; species do not inevitably become bigger, stronger, or faster. In fact, the fossil record shows that most species become extinct. Those that survive do so because at least some individual members are lucky enough to possess physical or behavioral adaptations that allow them to.

For some species, the means of adjustment go beyond the solely biological. Such species are able, as a result of their great intelligence, to develop new adaptations virtually instantly. They can invent new ways of surviving and teach these

new ways to other members of their species and to their offspring. These survival methods are not genetically determined in the manner of a thick coat of fur, powerful jaws, or grasping hands and feet; they are cultural. Though made possible by the biological feature of a large and complex brain, culture represents a strategy for survival beyond that which is provided by an animal's physical characteristics. Modern human beings rely, as did our ancient human ancestors, on cultural adaptations for survival. A discussion of these adaptations and how they, too, have systematically changed through time makes up a large portion of this book.

The Mutability of Species

Although he didn't think it was important at the time, Darwin recognized that animals he encountered on islands off the coast of South America resembled, but were not identical to, animals found on the mainland, where they must have originated. The island descendants of mainland species seemed to have altered from their original state after migrating. The descendants must have become better adjusted, or **adapted**, to the different environmental conditions in their new habitats. Even on different islands within island chains, individual kinds of animals resembled each other, though differing in significant attributes from island to island.

Adapted: The state of being biologically capable or culturally prepared to survive in a given environment.

For example, on the Galápagos Islands, 500 miles west of the northwestern coast of South America, Darwin found that tortoises living on each of the dozen large islands could be differentiated, and so could finches—small birds whose source was certainly the mainland. The finches did not look precisely like any other South American finch, and they differed in form and behavior among islands. How had each type of finch become uniquely adjusted to the particular features of its island if the finch species was immutable and fixed at creation? This mystery simply could not be explained within the accepted paradigm of the fixity of species.

In 1836, after a long and successful voyage, Darwin and the *Beagle* returned triumphantly to England. Many of Darwin's reports and specimens had preceded him, and he returned to find his work roundly praised by the scientific community. Darwin met and was befriended by geologist Charles Lyell, who was extremely grateful that Darwin's geological observations matched precisely his uniformitarian view of the evolution of the earth.

THE ORIGIN OF SPECIES

Darwin's masterpiece, *The Origin of Species by Means of Natural Selection*, was published in 1859. In the introduction to the book, Darwin succinctly articulates the essence of his theory:

> *As many more individuals of each species are born than can survive; and as, consequently, there is a frequently recurring struggle for existence, it follows that any being, if it vary, however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be* **naturally selected.** *From the strong principle of inheritance, any selected variety will tend to propagate its new and modified form.* (*Darwin 1859:7*)

Natural Selection: The process proposed by Charles Darwin for how species evolve. Those individuals in a species that possess advantageous characteristics are more likely to survive and pass down those characteristics than are individuals that do not possess those advantages.

As Darwin saw it, variation within a species—of tortoises, finches, and so on—provided some individuals with characteristics that allowed them a better chance for survival under the conditions established by nature. He called this process "**natural selection**" because, in essence, those individuals were passively "selected" by nature to survive and pass along their advantageous characteristics to their offspring. In this way, for example, finches of a single species might lose their way in a storm and get blown to an island where conditions were quite different from those at their mainland home. Many of the finches would die, unable to survive in their new circumstances; but a few might, by chance, possess characteristics that would enable them to endure. They would pass those features on to their offspring; and over many generations, birds with those qualities would continue to be selected for—that is, to survive. After a time, the island finches would no longer resemble the mainland finches. Given sufficient time, they might become so different that they would be a different species entirely.

Human Evolution

Darwin understood the controversy that would erupt if this evolutionary perspective were to be applied to human beings. In 1857 he wrote to his colleague Alfred Russell Wallace: "You ask whether I shall discuss 'man.' I think I shall avoid the whole subject, as so surrounded with prejudices; though I fully admit that it is the highest and most interesting problem for the naturalist" (Bowlby 1990:325). He hinted at the applicability of natural selection to humanity in *Origin* when he concluded that, by the application of the theory, "Much light will be thrown on the origins of man and his history" (Darwin 1859:243). As we will see throughout this book, Darwin was right.

In fact, in 1856, the year before Darwin indicated to Wallace his desire to steer clear of any mention of humanity in his discussion of evolution, a partial fossil skull was found in the Neander Valley in Germany (see Figure 5.7). At least two similar skulls had been found previously in Europe (in Belgium and on Gibraltar). The Neander Valley skull, like those found previously, was as large as a modern human skull, though it looked quite different. Some saw it as representative of an ancient and primitive race of humans.

With the notion of a uniformly changing, very ancient earth in place, the skeletal evidence began to convince many people of the great antiquity of the human species. There still was substantial debate over what "great antiquity" meant on any kind of a fixed time scale. No date could be assigned to the early humans who had made the stone tools, nor could any age be assigned to the German skull. But scientists were clearly shifting their opinion and beginning to view the earth and the human species as ancient—far older than Ussher's 5,700 years.

CULTURES EVOLVING

Led first by Hutton and then Lyell, the uniformitarianists had shown that the earth was old; the pages of its ancient history were the strata that lay beneath our

feet. Archaeologists had discovered human-made objects on those ancient pages, proving the great antiquity of humanity within that stratigraphic history of the planet. Darwin had gone on to show that within the lengthy history of the earth, plants and animals had changed dramatically; they had, in fact, evolved. And now, the ancient human-made objects found by the early archaeologists—the stone tools—provided clear evidence that human culture had evolved over an enormous period of time as well. As Charles Lyell himself pointed out (1863:379), if culture had remained constant throughout human history, then archaeologists should have been finding "buried railways or electrical telegraphs" along with other scientifically advanced artifacts in ancient stratigraphic layers. Instead, archaeologists were finding stone tools, admittedly finely made but technologically simple, associated with the bones of extinct animals in ancient soil layers. Clearly this was evidence of great change from the culture of the earliest humans to that of the modern (nineteenth-century) world. As surely as geologists had shown that the earth had sustained enormous change over a vast expanse of time and as surely as biologists now were showing that life itself had experienced great change, so archaeologists were showing that human behavior had also changed greatly during our species' history on earth.

OUR MODERN VIEW

We began our historical discussion with a belief in an unchanging universe that was created less than 6,000 years ago by an omnipotent God and that was populated by plants, animals, and people whose forms and qualities were forever fixed at creation. That universe was simple, predictable, and reassuring.

We now hold the modern scientific view of the universe and life, initially espoused by Lyell and Darwin, as ancient and dynamic, unpredictable and serendipitous, awesome and awful.

What we have lost in terms of a pleasant and comforting view of the world and the human species' place in it is more than made up for in the infinitely fascinating story we can now tell of the evolution of our species. And, as seventeenth-century scientist and clergyman John Ray stated, "Those who scorn and decry knowledge should remember that it is knowledge that makes us men, superior to the animals and lower than the angels, that makes us capable of virtue and happiness such as animals and the irrational cannot attain" (Raven 1950:251).

SUMMARY

Though many people assume that the past is merely dead and gone, in fact it can endure into the present in the form of the material remains of the things ancient people made and used. The sciences of archaeology and paleoanthropology endeavor to find and analyze those remains in an attempt to tell the story of human antiquity. That story is the focus of this book. Time is the backdrop against which the story of humanity is played out, and until fairly recently the depth of time was unknown. Most Western thinkers in the seventeenth century believed that the

world and all life within it had been established during a creation week that had occurred not even 6,000 years previously. They further believed that their world was just as God had made it and reflected the perfection of creation.

Some natural scientists, on the other hand, saw the world as a "wreck," which had decayed since the time of creation. Viewing the world as quite young, perhaps no more than 6,000 years old, these thinkers suggested that the history of the earth had been marked by a string of catastrophes.

James Hutton and Charles Lyell were spokesmen for a different perspective. Rejecting claims of hypothetical catastrophes, they explained the appearance of the earth on the basis of observable, slow, steady, and uniform natural processes. They asserted that such observable natural phenomena could produce the current state of the earth if afforded sufficient time. They measured the age of the earth not in thousands of years but in hundreds of thousands and even millions of years. Especially during the nineteenth century, researchers began uncovering tantalizing bits of evidence—in the form of flint implements together with the bones of extinct animals and even those of human beings—that suggested this ancient earth had been populated by early forms of humanity.

Charles Darwin viewed the biological world as the result of natural processes of change. His theory of natural selection provided an overarching explanation for the diversity of life on the planet. With the amount of time provided by Hutton and Lyell's perspective of earth history, the process of natural selection could have produced the great diversity of life seen on the planet, the differences and similarities among different kinds of organisms, even the evolution of humanity.

Web links for this chapter can be found at www.oup.com/us/feder

TO LEARN MORE

Two excellent sources on the history of archaeological and paleoanthropological thoughts are Glyn Daniel and Colin Renfrew's *The Idea of Prehistory* (1988) and William Stiebing Jr.'s *Uncovering the Past: A History of Archaeology* (1993). For more detailed coverage of the early history of the discipline, see Donald Grayson's *The Establishment of Human Antiquity* (1983) and A. Bowdoin Van Riper's *Men Among the Mammoths: Victorian Science and the Discovery of Human Prehistory* (1993). If you are interested in a detailed discussion of the life of Charles Darwin, John Bowlby's 1990 monograph, *Charles Darwin: A New Life*, is simply terrific. For a wonderful summary of the evolutionary perspective (with lots of amazing photographs), take a look at *Exploring Evolution* by my friend and colleague, Michael Park (2012).

KEY TERMS

adaptation, 18
adapted, 19
anthropological linguistics, 9
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archaeological site, 7
archaeology, 8
artifact, 11
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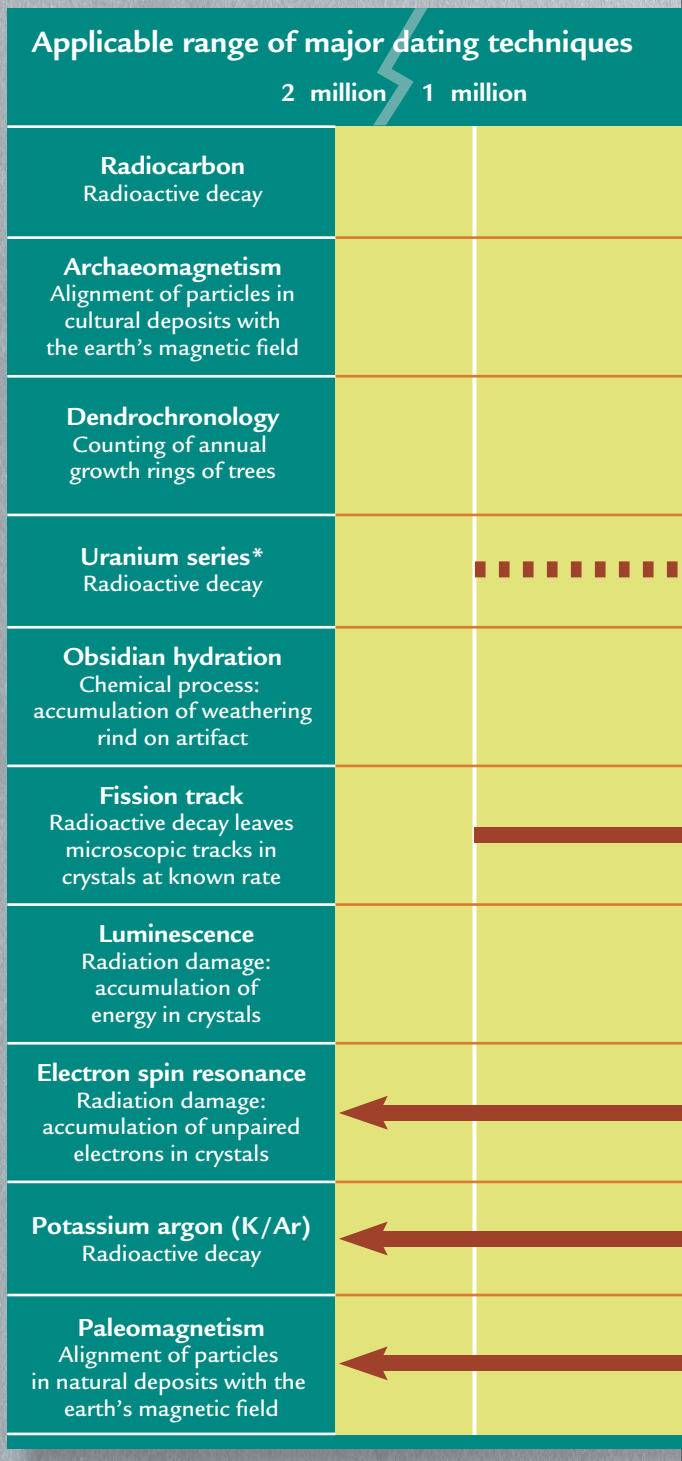
2

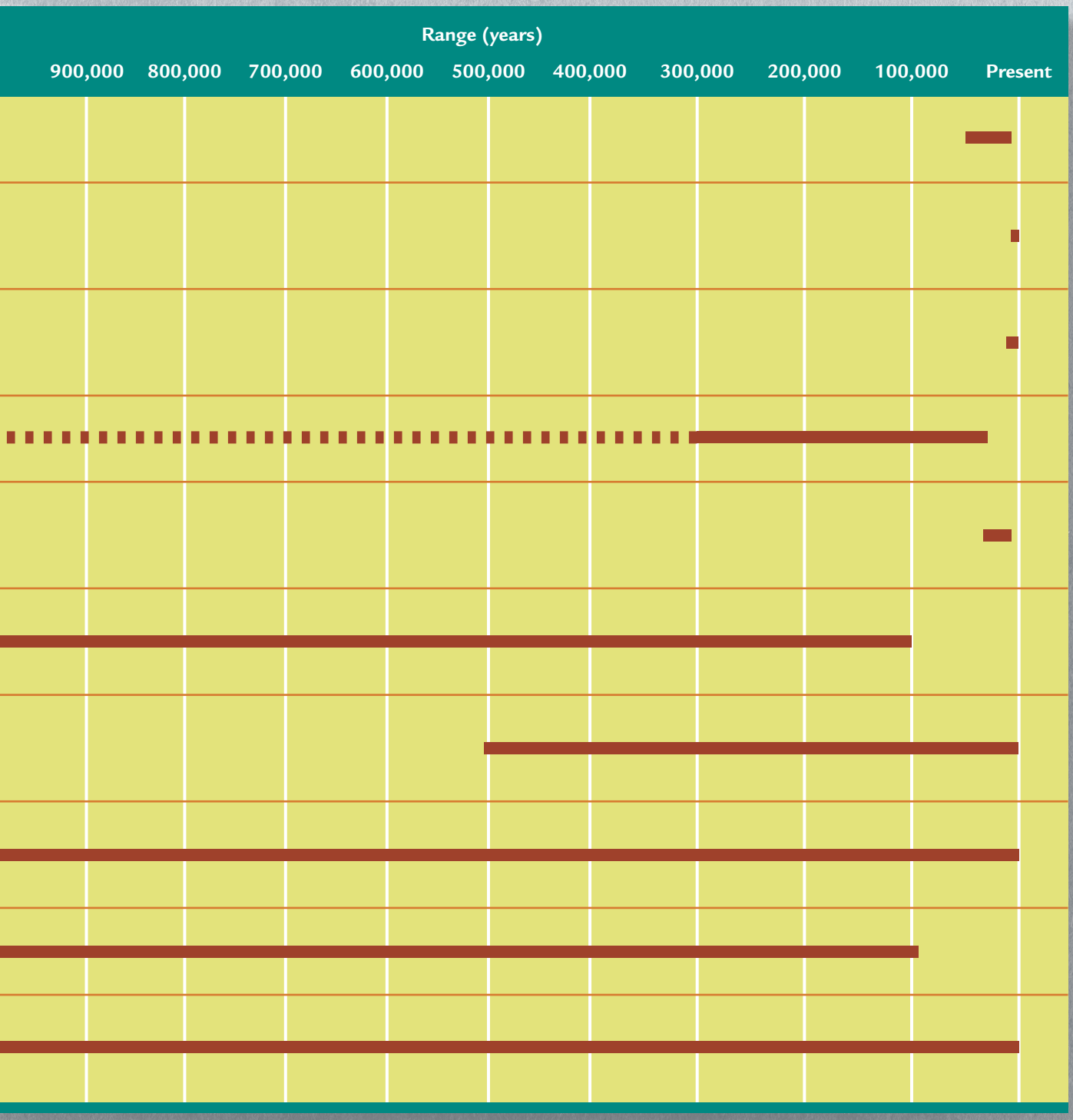
Probing the Past

CHAPTER OVERVIEW

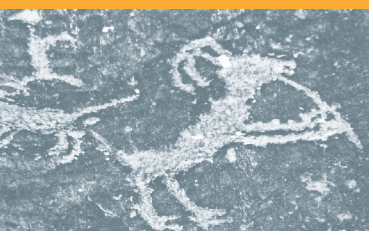
Paleoanthropologists and archaeologists study the actual physical remains of human beings and those of our evolutionary ancestors. They also examine the material remains of the behavior of these ancient ancestors: the things that past humans made and used and then lost or discarded. By the investigation of the bones of humans and human ancestors as well as analysis of the objects they left behind—tools, weapons, items of adornment, works of art, structures, and so on—paleoanthropologists and archaeologists hope to better understand the ways in which our ancestors evolved and adapted. This chapter summarizes many of the most important and widely used techniques relied on by these scientists to paint a picture of the human past.



*Uranium series results older than 300,000 years are statistically questionable.


Range (years)
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
Present

PRELUDE



ONE OF MY FAVORITE TELEVISION SHOWS when I was a kid was the cartoon series *Rocky and Bullwinkle*. Don't tell anybody, but actually it remains one of my favorite shows to this day. Smart, funny, and subversive, the cartoons were laced with adult humor, puns, and politically astute commentary, all from a smart-ass talking squirrel and a goofy moose. My favorite segment of the show was Peabody's Improbable History. Mr. Peabody was a bipedal, talking dog who happened to be a genius (you could tell by his glasses) and who, with his boy Sherman (whom he adopted from the local pound), would time travel in one of Mr. Peabody's inventions, the Way Back Machine. After setting a date and place on the machine's control panel, Peabody and Sherman would travel back, for example, to the sixteenth century to help Galileo figure out gravity, or they'd visit Columbus in the fifteenth century and point the way to the New World.

I bring this up because, as a prehistorian, I have to admit I'd love to have a Way Back Machine. It would render my profession so much easier. Instead of the slow and laborious process of looking for paleoanthropological and archaeological sites, excavating them, analyzing the artifacts we recover, and trying to come up with a comprehensible story of the biological evolution and cultural development of our species, we could simply travel back in time with Sherman and Peabody and be eyewitnesses to antiquity.

But we don't have a Way Back Machine. Instead, we must rely on some extremely cool real-world techniques to find archaeological sites and then extract information from the stones, bones, soils, and plant materials left behind. It can be a daunting process, but we rely on an approach that authors Michael Shermer and Alex Grobman (2000) characterize as "a convergence of evidence." In each historical discipline, including archaeology, paleoanthropology, historical geology, and history, we search for knowledge and meaning along different, independent pathways. We are confident in our conclusions when those different and independent streams of data point to the same conclusion, when they converge at the same point. It is, for example, difficult to figure out when the first people entered the New World and where they came from (see Chapter 7), but when geological data, archaeological investigations in the Old and New Worlds, and genetic information from both ancient bones and modern people separately and independently point to the same scenario, when they converge on the same story, we can be pretty confident that our reconstruction matches the way things really were. This chapter is a very brief summary of how we obtain the information necessary for that convergence.

EPISTEMOLOGY: HOW WE KNOW WHAT WE KNOW

Every field of scientific study presents its own set of challenges. Researchers in each branch of science must develop a specific set of methods for data collection as well as techniques of analysis and interpretation. Archaeology and paleoanthropology are no different. Our data are the objects that ancient humans and human ancestors made, used, lost, abandoned, or discarded; environmental data that inform us about the natural conditions our ancient forebears experienced and to which they adapted; and their actual biological remains. Archaeologists