

CHAPTER OVERVIEW

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.

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The Wisdom of God
by John Ray
is published,
1691

William Whiston
proposes the
collision between
earth and a comet
caused Noah's
flood, 1696

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Theory of the Earth
by James Hutton
published,
1788

William Smith's
stratigraphic
tables first
circulated,
1799

Principles of Geology
by Charles Lyell
published,
1830

William Smith's
stratigraphic
tables
published,
1815

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

Jacques Boucher
de Perthes
finds ancient
flint axes,
1837

Geological Evidences of the Antiquity of Man
by Charles Lyell
published,
1863

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

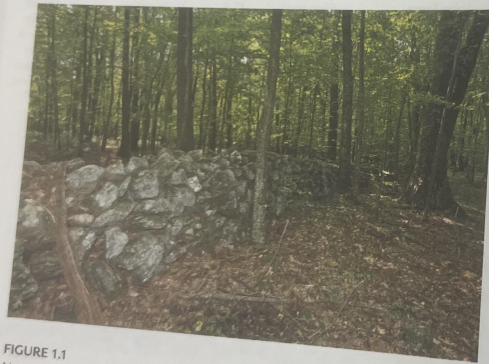


FIGURE 1.1

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

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?

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 Pilsfeshire 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 Pifershire, with homes, cleared fields, farms, barns, a cider mill, a school, various small industries, and shops.

The thick woods that appear to make the existence of the stone walls, foundations, and wells of Pifershire so mysterious are, in fact, relatively recent. A glance at the statistics compiled for forest cover in Connecticut by the Department of Energy

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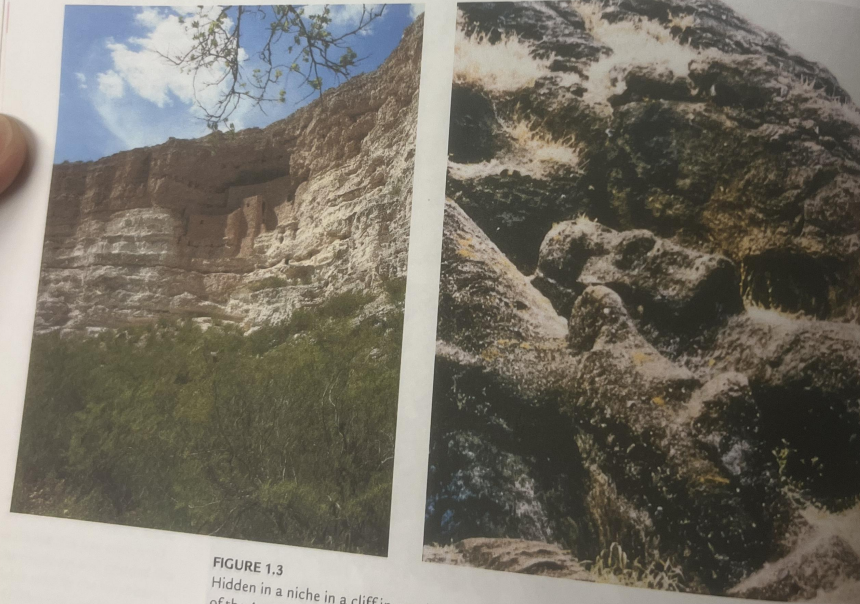


FIGURE 1.3
Hidden in a niche in a cliff in northern Arizona, Montezuma Castle was not really a fortress of the Aztec king Montezuma. It was, instead, a small community of Native Americans of the Sinagua culture (see Chapter 14) who inhabited the area more than 600 years ago (left). These Easter Island 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)

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and Environmental Protection (2012) shows that while approximately 60% of Connecticut currently is forested, it was far less so in the past as a result of clearing for agriculture, and, especially after 1850, for the production of charcoal, the fuel that fed the furnaces of the state's robust iron industry. By 1860 less than 30% of the state remained forested, and places like Pilsfershire were characterized by open pastureland. When cheap coal from Pennsylvania became available and as farmers in Connecticut's uplands, try as they might, could not make an economic go of it in the waning years of the nineteenth century, individual farms and entire villages were abandoned. The forest slowly grew up around those abandoned homesteads, creating the currently creepy ambience at places like Pilsfershire, but there's no mystery; it was all about economics.

The children of Pilsfershire 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 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.

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 Pilsfershire 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, Pilsfershire 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, 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.

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.

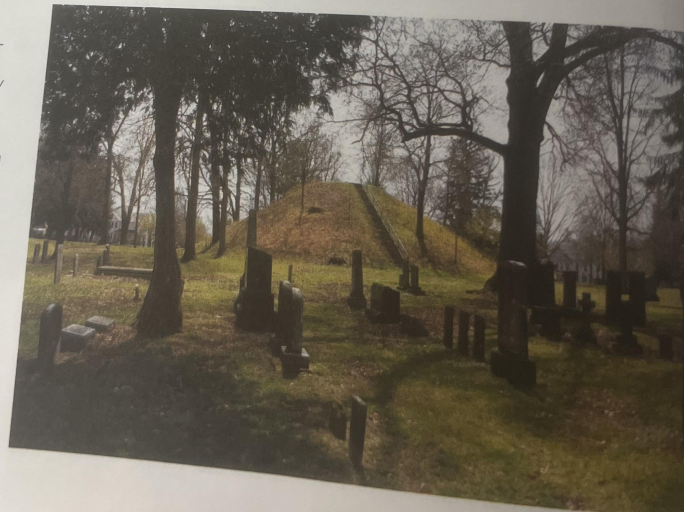
Paleoanthropology: Anthropological study of the evolution of our species.

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.



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)



AN ANTHROPOLOGICAL PERSPECTIVE

Anthropology has traditionally been compartmentalized into four subfields: (1) **cultural anthropology** (the study of living people, including **ethnography**, the study of the **cultures** of individual societies, and **ethnology**, cross-cultural studies); (2) **physical or biological anthropology** (human evolution, human variation, and primatology); (3) **archaeology** (prehistoric and historic); and (4) **linguistics**. In fact, you can still find universities that apply what is called a “four-field approach” in their gateway or introductory course, though linguistics often gets short shrift in such courses.

This four-field division has always been an oversimplification of the discipline and today has become a gross oversimplification. Let me give you the example of the degree of research diversity within my own small anthropology department. Abigail Adams conducts research on the Tzotzil Maya of Mesoamerica with a focus on how their religious practices reflect their practice of **syncretism**, merging their traditional beliefs and gods with the Catholicism brought to them by missionaries beginning more than four hundred years ago. Along with modern Maya, Dr. Adams always studies modern diet and food acquisition strategies and the challenges faced by current residents of central Connecticut. Dr. Evelyn Philips has a wide array of research projects, including the compilation and preservation of oral histories of African Americans living in Connecticut, but she also has investigated contemporary hair care practices of African American women. Dr. Ivan Small has a long-standing interest in the economics of Vietnamese expatriates living in the United States and their practice of providing money—called remittances—to their families still living in Vietnam. Warren Perry (Figure 1.6) is an archaeologist who has worked in Africa and also at African American sites, including the seventeenth-, eighteenth-, and nineteenth-century African Burial Ground in Manhattan.

His work explores the cultural strategies of captive Africans in the American Northeast for resisting both slavery and cultural genocide. Thomas Rein is a **paleoanthropologist** who studies human evolution with a focus on the shift from walking on all fours to the modern, bipedal mode of locomotion. I have concentrated my fieldwork on Native American sites dating to before the period of European colonization of southern New England, but one of my long-standing field projects focuses on the remnants of an eighteenth- and nineteenth-century village whose inhabitants included Native Americans, Euro-Americans, and African Americans. My research also involves what amounts to an ethnography of what people believe about human antiquity, especially as it relates to the nonsense they can often find on cable TV and the Internet (see the section *Coping with Crap*).

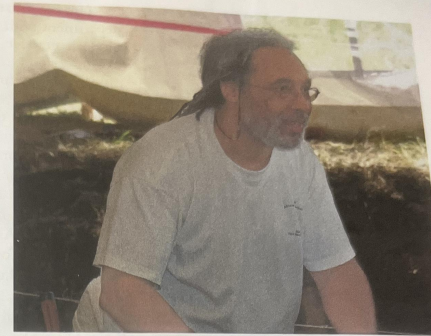


FIGURE 1.6
Archaeologist Dr. Warren Perry is seen here at the excavation of the homestead of Venture Smith (born Brotoer Furo). Smith was a free African living in Connecticut. After purchasing his freedom, he became a successful entrepreneur and wrote an autobiography. (John J. Spaulding)

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.

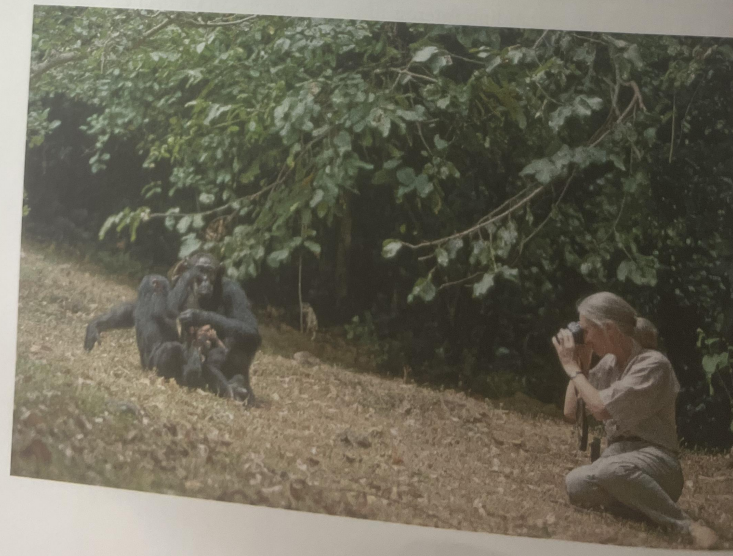
Ethnographer: Cultural anthropologist who lives among a group of people or a cultural group.

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 1.7
Biological anthropologist and geneticist Jennifer Raff works on the DNA of both ancient and modern peoples.
(Courtesy, Jennifer Raff. Photo by Justin Tackney)

FIGURE 1.8
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 Documentary/Getty Images)



This broad array of interests and research, even within my small department with only six full-time faculty, is pretty typical in the modern practice of anthropology. For example, there are people like my friend and colleague Sarah Parcak (2019), who is sometimes called a “space archaeologist” for her application of satellite imagery in the search for often ancient archaeological sites. She was the recipient of the prestigious TED Prize in 2016 for her work in identifying and protecting archaeological sites by conscripting an army of volunteers who pore over aerial and satellite imagery in the search for evidence of ancient habitations. I guess we can call Alice Gorman (2019) an entirely different kind of “space archaeologist” for her research on archaeological sites related to the space program. Another friend and colleague here in Connecticut, Al Harper, is a **forensic anthropologist** who helped solve an infamous crime, the “wood chipper murder” of a flight attendant by her pilot husband, through the application of standard archaeological and biological anthropological methods. Long before the movie *Fargo*, Al and his crew screened the debris produced by the wood chipper and were able to recover human teeth and even part of a manicured fingernail which they proved belong to the murdered

woman. Another friend and colleague, anthropologist Jennifer Raff, is a geneticist who investigates questions concerning the peopling of the Americas (Figure 1.7).

She is at the forefront of a movement to coordinate the work of geneticists and archaeologists in an effort to create what can be called a “composite window into human history” (Johannsen et al. 2017). There are also well-known scientists like Jane Goodall, Dian Fossey, and Biruté Galdikas, whose respective studies of chimpanzees, gorillas, and orangutans in the wild have helped revolutionize our understanding of the **primates** who are our nearest living biological relatives (Figure 1.8).



FIGURE 1.9
Primatologist Jacob Feder
recording his observations of
gelada behavior in northern
Ethiopia as part of his research
at Stony Brook University.
(Courtesy of Jacob Feder)

As a proud dad, I'll also mention another up-and-coming anthropological **primatologist**, my son Jacob Feder, a graduate student who is studying geladas (a baboon-like monkey) high in the mountains of Ethiopia by living among them and, believe it or not, collecting their poop and pee for hormonal studies (Figure 1.9). When your dad writes the textbook, you get a shout-out like that.

So, you see, it's misleading to pigeonhole anthropology into four—or six or eight or however many—distinct categories or fields. The broader point here is that anthropologists apply an approach to the study of people that is both broadly **holistic**—we study the totality of the human experience—and **integrative**, putting together the many and varied aspects of the human experience and the trajectories of our past. We may apply different perspectives and focus on different elements of the human story, but it ultimately is about, as the simple dictionary definition usually phrases it, the study of people.

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.E., making the world 5,570 years old at that time (Brice 1982:19). There were other, similar estimates.

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.

Syncretism: A combination or blending of religious beliefs and practices. For example, when Christianity was introduced to some native people in the New World, they interpreted Christian saints to be the embodiment of their traditional gods and spirits.

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

Forensic Anthropologist:

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

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).

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

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.

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

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.

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.E. 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.”

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.

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. These flood fans were called Neptunists. Other catastrophists, the Vulcanists, thought volcanoes and earthquakes were the primary causes of the Earth's deterioration.

Whether Neptunists or Vulcanists, catastrophists faced problems both 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 and geographical extent 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. 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.

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 slow and steady cycles 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).

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.

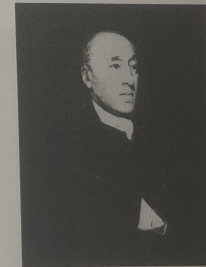
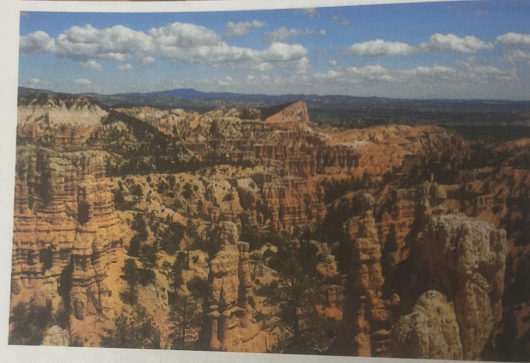
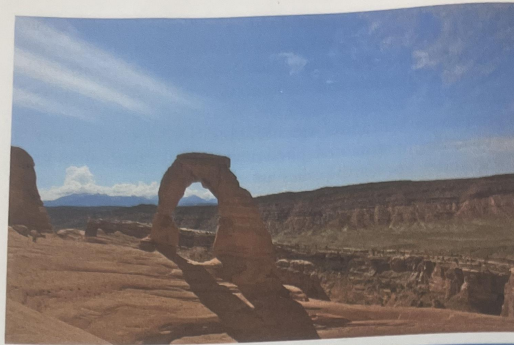


FIGURE 1.10 Eighteenth-century Scottish geologist James Hutton, one of the first and most persuasive proponents of the perspective of uniformitarianism. (James Hutton, *Theory of the Earth*, 1795)

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)



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.

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. There simply wasn't room in accepted chronologies for a period of time in which people made stone tools, so many otherwise learned people accepted nonsensical explanations involving fairies and lightning.

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).

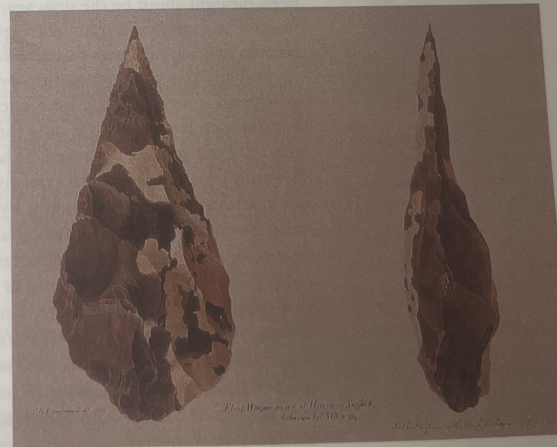
What made Frere's discovery so significant was that for perhaps the first time, primitive stone tools had been excavated at great depth (in this case, 12 ft below the surface) and that the bones of extinct animals were found *above* the tools, in more recently deposited soil layers. Frere recognized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

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)



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 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 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. That’s not nearly as old as the Mississippi Delta is, but when you start from a position in which the entire world is only 6,000 years old, suggesting that it has to be at least 100,000 is a big deal.

Uniformitarianists who followed Lyell applied a similar approach: measure current erosion or deposition rates and calculate how long those processes of

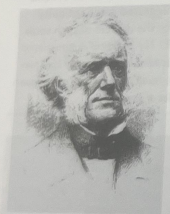


FIGURE 1.13
Nineteenth-century English geologist Charles Lyell. Lyell was the most eloquent and thorough of the uniformitarianists. In his view, the appearance of the modern world was due not to ancient catastrophes but to “the slow agency of existing causes.” This led him to the conclusion that the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

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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 (that's 100 years for one inch), making the mile-deep canyon, by this calculation, a little more than 6 million years old ($5,280 \text{ feet} \times 1,200 \text{ years} = 6,336,000 \text{ years}$; 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 and, therefore, ancient 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

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

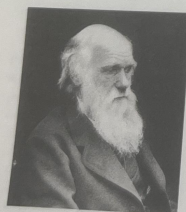


FIGURE 1.14
Charles Darwin, the father of modern biological evolutionary theory. (Courtesy of the American Museum of Natural History)

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, **multilinear evolution** can be represented as a dense bush of many branches growing in myriad directions.

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, a remarkable Darwin and felt that he had a knack for observing nature. He recommended his 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 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 long enough to reach maturity and to mate 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.

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 consciously strive to 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.

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

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

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.

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.

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

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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.

A New Catastrophism?

I clearly remember watching on television the live broadcast from NASA of the collision between the Shoemaker-Levy 9 comet and the planet Jupiter in July 1994. This was the first time astronomers had actually witnessed a cosmic collision of this immensity, and it was an intrinsically interesting event. I also clearly remember the serious conversation in the aftermath in which scientists speculated about the possible and very catastrophic results of such an impact between a celestial body like a comet or an asteroid with not Jupiter but Earth. The math was pretty clear that, depending on the size of the impactor, such a collision had the potential to result in an extinction event, one in which perhaps entire categories of living things might be extinguished. Human beings might be one of the victims of such an event.

It is a sobering thought, and—withstanding Bruce Willis's heroics in the movie *Armageddon*—there's not a damn thing we can do about it. Even more sobering is the knowledge that it actually has happened before. Celestial impacts have, in the 4.5-million-year history of the Earth, caused massive extinction events. The most famous of these is the collision of a 10-kilometer (6-mile) wide asteroid that crashed into Earth about 65 million years ago, leaving a 180-kilometer (110-mile) wide crater near the Yucatan Peninsula of Mexico, initiating colossal fires, significantly altering the climate of the entire planet, and wiping out the dinosaurs. If a similar impact were to occur today, our modern civilization would be decimated.

Other smaller-scale events have happened since. The Barringer Meteor Crater in northern Arizona is about 1.2 kilometers (0.7 miles) in diameter and resulted when a meteorite about 50 meters (160 feet) across crashed into the Earth about 50,000 years ago (Figure 1.15). More recently, what most likely was part of a comet entered the Earth's atmosphere and exploded over the Tunguska River in Siberia, Russia. Since the main body never reached the Earth, there's no crater, but the explosion created a circular area of devastation of the forest as trees were blown down below the airburst in a circle about 2,000 kilometers (770 miles) in diameter.

It has also been suggested that what appears to have been a sudden decline in worldwide temperature between about 12,800 and 11,700 years ago, a period called the Younger Dryas, resulted from the kind of extraterrestrial impact just mentioned (see Gramling 2018 for a detailed summary of the hypothesis). A small group of scientists believe that they have discovered unique markers of an impact in North America along with evidence of extensive fires dating to 12,800 years ago. I think it's fair to say that most scientists remain skeptical of a cosmic cause



FIGURE 1.15
The 50,000-year-old Barringer Meteor Crater in northern Arizona. It is about 1.2 km (0.74 miles) in diameter.
(K. L. Feder)

for the Younger Dryas; there's no sign of a crater, and the evidence for extensive fires is unconvincing.

Even though the Younger Dryas probably wasn't caused by the impact of a comet or meteorite, that provides cold comfort (there's a play on words in there for an explanation of a descent into glacial conditions) to us in the present. The Earth is not immune to extraterrestrial impacts, and, though there does not appear to be anything on the horizon, NASA and space agencies all over the world are scanning the skies for any such threats from above. If you are at all nervous about this possibility, whatever you do, don't visit <https://cneos.jpl.nasa.gov/sentry/>, where NASA keeps track of any possible celestial bodies headed our way.

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" (Ray 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 quite young, perhaps 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.



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TO LEARN

Two excellent archaeological thoughts. *The Idea of the Past* (1993). The history of the world and A. T.

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