Archaeology and Humanity's Story

A BRIEF INTRODUCTION TO WORLD PREHISTORY

SECOND EDITION

Deborah I. Olszewski

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In memory of my good friend, Harold L. Dibble
(July 26, 1951–June 10, 2018) and all the years of “Forward into the Past”

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Preface

Archaeology provides the evidence for the story of all humanity. The long time depth of this record and its worldwide coverage offer us a view of change and diversity over the tens, hundreds, and thousands of millennia that mark the human presence on planet Earth. The goal of this book is to convey a sense of the processes that occurred, why these changes may have taken place, and how human groups created relationships that allowed them to navigate both their social and their natural worlds.

Some of our earliest ancestors likely would not be recognized by us as human, but many of the challenges they faced were ones that continued to be significant to later modern human groups. A number of the important watershed events were linked in part to dietary shifts. For our earliest ancestors, these included eating more C_4 plants compared to the C_3 plants that our closest living relatives, the common chimpanzees and bonobos, eat. By doing so, these earliest ancestors expanded into a new econiche. Some of these early ancestors also began to incorporate more meat in their diet (another new econiche), which provided a rich food source to supply energy to the very energy-expensive brain. Along the way, the innovation of using sharp-edge stone artifacts gave our ancestors advantages in procuring meat and marrow from animal bones and eventually weapons with which to hunt. Of course, there were many other later technological innovations, such as hafting stone artifacts, the invention of spear throwers and the bow and arrow, and the knowledge of how to manufacture basketry and, later, how to fire clay to make pottery vessels, among many others.

One of the major economic transitions/dietary shifts, however, was the advent of food-production economies. Some human groups in the late Pleistocene and early Holocene epochs in both the Old and the New Worlds began to manipulate certain plants and animals in ways that led to their domestication. Whereas early farmers and pastoralists faced their own sets of challenges such as droughts, floods, and insects, generally speaking, food-production economies had the potential to create surpluses, which are a type of "wealth." How these surpluses were used by communities could vary significantly. In some groups, surpluses were shared, whereas in other groups, particular individuals and their families eventually gained increased access to surpluses. When this happened, there was potential for the development of "elites" who not only accumulated more surpluses but also became more powerful in terms of authority and decision-making for others. In a number of cases, through a variety of social processes, these elites became established as rulers, and the societies they led became increasingly politically complex. This type of transition often was marked by the development of features such as social classes and bureaucracies, and the polities are those we call kingdoms, states, and empires. Several of this book's chapters focus on these politically complex societies.

Organization and Themes

The intent of this book is to provide undergraduate students and the public with an overview of human prehistory and early history, as well as case studies for several societies that are examples of social complexity and of political complexity. By taking a case study approach, attention is paid in some detail to particular places and points in time at the expense of coverage of all past societies, processes, and events. This approach has the benefit of not overwhelming the reader with everything that is represented in the archaeological record, particularly because such coverage within one book either would require a rather lengthy presentation or would result in just the briefest of mentions for each site and event.

The book is organized into several parts as follows. Part 1 ("The Basics of Archaeology") contains one chapter. This part presents information on archaeological method and theory, dating, and issues such as "Who Owns the Past." In Part 2 ("Prehistory Before Political Complexity"), there are four chapters. Chapter 2 ("Humanity's Roots") discusses the earliest human ancestors in the interval from 7 to 1 million years ago and the origins of stone tool technology. Chapter 3 ("Becoming Human") provides information on later ancestors who began the series of out of Africa movements that led to populating the Middle East, Europe, and Asia. It also includes discussion of the origins of modern humans and of modern human behaviors. Chapter 4 ("A World of Modern Humans") examines the hunting–gathering–foraging groups of Later Stone Age Africa and Upper Paleolithic Europe. It provides information about modern human expansion into Australia/New Guinea and into the Americas, as well as materials on Paleoamericans. Chapter 5 ("Hunting, Gathering, Foraging, Farming, and Complexity") deals with events at the end of the Pleistocene and in the Early Holocene in the Old and New Worlds. These include discussion of the origins of food-production economies and some of the social consequences of these new lifeways. The concepts of social and political complexity are discussed in the context of the example of Hawaiʻi, as are examples of interpretive frameworks and themes in politically complex societies.

In Part 3 ("On the Threshold of Political Complexity"), there are three chapters. Chapter 6 ("Prehistoric Europe North of the Mediterranean") examines the archaeological background to changes in Europe, especially in the period following the expansion of food-producing economies from the Middle East. It concentrates mainly on the Bronze Age. Chapter 7 ("The North American Southwest") treats developments in the North American Southwest after the introduction of domesticated plants from Mesoamerica. It focuses specifically on the Ancestral Pueblo, particularly Chaco Canyon, but also includes some information on the Hohokam and Mogollon. Chapter 8 ("Eastern North America") examines the North American East where indigenous plants were brought into cultivation but some domesticates were later introduced from Mesoamerica. It highlights Cahokia during the Early Mississippian period.

Part 4 ("Politically Complex Societies") contains seven chapters. Chapter 9 ("Early Dynastic Mesopotamia") discusses developments in the Middle East and uses the Early Dynastic period of Mesopotamia as a case study of political complexity. Chapter 10 (“Pharaonic State and Old Kingdom Egypt”) does the same for Egypt, focusing especially on the Old Kingdom period there. Chapter 11 (“Shang China”) examines political complexity in East Asia using the Shang period as its case study. Chapter 12 (“The Indus Valley”) looks at the Harappan and the processes that led to the Mature Harappan period, especially the context of urbanism. Chapter 13 (“Mesoamerica, the Classic Maya, and the Aztec Empire”) provides a case study of early political complexity from the New World using the Classic period Maya. It also includes information on the later Aztec Empire. Chapter 14 (“Andean South America and the Inka Empire”) examines the contexts for the appearance of the Inka Empire and provides materials using the Inka as its case study. Chapter 15 (“Mapungubwe and Great Zimbabwe in Africa”) does the same for late politically complex societies in southeastern Africa.

In Part 5 (“Epilogue”), there is one chapter. This epilogue recaps the “disappearance” of politically complex entities and some lessons from past societies which are perhaps useful for today’s world.

New to the Second Edition

Global Changes

- New chapter (Chapter 6) on Europe.
- New section on the Aztecs in the Mesoamerican chapter (Chapter 13).
- All chapters have been updated to include current research and interpretations, as well as many revisions suggested by reviewers.
- New box feature, “Further Reflections,” now appears in all chapters except Chapter 1 and the Epilogue. This feature addresses a key topic or concept that is covered in each chapter.
- Detailed sections on early food production were moved from Chapter 5 to the relevant chapters on Europe, North American Southwest, Eastern North America, China, Mesoamerica, and Andean South America.
- Sections on political complexity, including Hawai’i, were moved from first edition Chapter 15 to second edition Chapter 5.
- Topography was added to map figures throughout.

Chapter by Chapter Changes

- **Chapter 1** (“Acquiring and Interpreting Data in Archaeology”):
    - Reworked section on theory in archaeology

    - Table added to show examples of theories and the chapters in which the examples are to be found
- **Chapter 2** (“Humanity’s Roots”):
    - New opening image
    - Added nonhoning chewing
    - Reduced discussion of *Ardipithecus ramidus* in main text; see “Further Reflections”
    - Added Lomekwian stone tool industry
    - New box: “Further Reflections: The Place of *Ardipithecus ramidus* in Human Evolution”
- **Chapter 3** (“Becoming Human”):
    - Deleted text and image for Movius Line (a concept now widely disputed re its usefulness)
    - Reorganized and rewrote sections on models for the origins of modern humans
    - Added image on Broca’s and Wernicke’s areas in the brain
    - Added box: “Further Reflections: Was There an Out of Africa Before 1.9 Million Years Ago?”
- **Chapter 4** (“A World of Modern Humans”):
    - New opening image
    - New images for engravings/painting in Upper Paleolithic caves added for Chauvet and for Altamira
    - New image showing Sahul and Sunda added
    - Moved some mentions of sites to endnotes (e.g., el Castillo) and deleted others (Kostenki12, 17, Kents Cavern, Grotta del Cavallo, Pech Merle, Devil’s Lair, Allen’s Cave, Huon Peninsula, Kara-Bom, Cactus Hill, Dent, Deborah L. Friedkin site, Lindenmeier)
    - Added sites of Madjebebe, Vilakuav, Carpenters Gap, Bluefish Caves, Wally’s Beach
    - New box: “Further Reflections: Megafauna in Australia”
- **Chapter 5** (“Hunting, Gathering, Foraging, Farming, and Complexity”):
    - New opening image
    - Added a second example of a Gobekli Tepe carved T-shape pillar

  - Added Shubayqa I and its evidence for early flat bread
  - As noted above, detailed sections of food production moved to other chapters, except for the discussion of food production and its background in the Levantine part of the Middle East
  - Reorganized/rewrote section “Why Food Production?”
  - As noted above, sections on complexity including themes and frameworks, as well as the example from Hawai’i) moved from first edition Chapter 15 to this chapter
  - New box: “Further Reflections: Thinking About Food Production”
- **Chapter 6** (“Prehistoric Europe North of the Mediterranean”):
  - New chapter to this edition
  - Boxes include:
    - “Timeline: Prehistoric Europe”
    - “Peopling the Past: Building Stonehenge”
    - “Peopling the Past: Bronze Age Elites”
    - “Peopling the Past: Violence, Ritual or Both in the Bronze Age?”
    - “Further Reflections: Characterizing Social and Political” Organization”
  - Topics covered include:
    - Early Holocene Hunter-Gatherer-Foragers (including Ertebølle)
    - Early Food Production (including Cardial Ware, Linear Pottery, Funnel Beaker)
    - Neolithic Megaliths and Other Monument Building
    - Interpretations of Neolithic Megaliths and Other Monuments in Great Britain
    - Bronze Age Europe
    - Iron Age Europe (Halstatt and La Tène)
- **Chapter 7** (“The North American Southwest”):
  - Added some material from first edition Chapter 5 on precursors to food production
  - Deleted sites (Atl Atl Cave)
  - New box: “Further Reflections: Elite Lineage at Pueblo Bonito”

- **Chapter 8** ("Eastern North America"):
    - New opening image
    - Added some material from first edition Chapter 5 on precursors to food production
    - Deleted sites (Turner)
    - New box: "Further Reflections: Cahokia: Paramount Chiefdom or State?"
- **Chapter 9** ("Early Dynastic Mesopotamia"):
    - New opening image
    - Two new images added: aerial view of Ur and a ziggurat
    - New box: "Further Reflections: Archaeology and Politics"
- **Chapter 10** ("Pharaonic State and Old Kingdom Egypt"):
    - New image added: mastaba
    - New box: "Further Reflections: Egypt's Multiple Rises and Falls"
- **Chapter 11** ("Shang China"):
    - Added some material from first edition Chapter 5 on precursors to food production
    - New images: map showing Neolithic culture areas and oracle bone with writing on it
    - Deleted sites (Haojiatai)
    - New box: "Further Reflections: Consolidating the Western Zhou State Identity"
- **Chapter 12** ("The Indus Valley"):
    - New box: "Further Reflections: Importance of Trade and Exchange Networks"
- **Chapter 13** ("Mesoamerica, the Classic Maya, and the Aztec Empire"):
    - Added some material from first edition Chapter 5 on precursors to food production
    - New images added: Monte Albán plaza area, aerial view of Pyramid of the Moon area at Teotihuacan, a *Spondylus* shell, map of the Aztec Empire, part of the Tlateloco market, stylized portray of the Aztec god Huitzilopochtli, altar with skull carvings at Templo Mayor
    - As noted above, a section on the Aztec Empire was added to this chapter, including:
        - The Triple Alliance

        - Aztec Trade and Exchange Networks
        - Aztec Social Life
        - Aztec Religion and Ritual
        - Aztec Warfare and Violence
    - New box: "Further Reflections: Historical Documents, the Maya, and the Aztecs"
- **Chapter 14** ("Andean South America and the Inka Empire"):
    - Added some material from first edition Chapter 5 on early food production
    - New images added: *Strombus* shell, aerial view of one of the Nazca lines, different example of a khipu
    - New box: "Further Reflections: Challenges to the State/Empire"
- **Chapter 15** ("Mapungubwe and Great Zimbabwe in Africa"):
    - New opening image
    - New box: "Further Reflections: The Bantu Expansion"
- **Epilogue**:
    - Previously appeared as Chapter 15
    - As noted above, sections on political complexity and on Hawai'i were moved to Chapter 5
    - Retained in this epilogue are the sections: "All Good Things Come to an End" and "Lessons from the Past?"

Features and Benefits

In all of the chapters, several sidebar boxes are provided. Every chapter has a timeline box showing the chronology relevant to that chapter. Each, except the last chapter, also has boxes that feature topics related to "The Big Picture" and to "Peopling the Past." These highlight themes such as methods and frameworks, behavioral strategies, stone and other tool traditions, art and ideology, and social life. Given the scope of the topics covered, the themes and boxes of the early chapters (Chapters 1 through 5) are necessarily different from chapter to chapter, as well as different from those in Chapters 6 on. Finally, all chapters except Chapter 1 and the Epilogue have boxes on "Further Reflections." These treat a variety of topics such as chiefdoms, the importance of "international" trade and exchange to early societies, the family structure of elites, and how elites consolidated their power or legitimacy.

To the extent possible, for all chapters beginning with Chapter 6 in Part 3, each case study has the same set of themes. These include Resource Networks, Trade, and Exchange; Social Life; Ritual and Religion; and Warfare and Violence. Many also have The Written Word. Of course, in some cases, evidence is either not available or these societies did not have certain features. For example, we have not yet deciphered the Indus script, and thus there is not a box on the written word in Chapter 11, whereas for the Inka, theirs was a nonwritten word in the form of the khipu. In some instances, other types of themes are then provided, such as Urbanization for the Indus Valley and Oral Traditions for Mapungubwe and Great Zimbabwe.

The main goal in providing similar themes for all the chapters dealing with social complexity and with political complexity is to have a framework making comparisons between the various case studies easier for the reader. In many cases, there also are analogies given to features in the modern world that are similar in some respects to those of these past societies. These provide a direct connection between us and past groups that help show the relevance of archaeology and its evidence.

A Word About Dates

How dates are shown in the archaeological literature can be quite confusing to the nonspecialist. This is because there are differences in the levels of accuracy; for example, some dates are calendar years, whereas others can be expressed in calibrated calendar years, and still others are absolute dates but not at the level of correlation to calendar years. On top of all this is an additional complexity because of the terms that are used. These can include bp or BP (before the present, which is based on AD 1950 as a baseline), bc or BC (before Christ) or BCE (before the Common Era), and AD or CE. As explained in Chapter 1, to the extent possible, dates in this book are shown/used in the following ways. Prehistory prior to 50,000 years ago is referred to using uncalibrated dates, shown as bp (the small letters indicating that they are not calibrated). For the period between 50,000 and 5000, dates are cal BC (calibrated BC) when appropriate (not all types of dates can be calibrated). From about 5000 to the BC/AD boundary, dates are shown as BC. This is because many of them are from early written records and calendars that can be correlated with the calendric system we use today. Rather than using both the cal BC and the BC standards for the same periods of time, I chose to reduce some of the confusion by using BC for this range of time. Finally, dates after the BC/AD boundary are shown as AD. I have chosen not to use the BCE/CE terminology primarily because this is not as familiar to most readers, and it presents some difficulties for earlier prehistory because this terminology is not used by paleoanthropologists.

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1 The Basics of Archaeology

CHAPTER 1

Acquiring and Interpreting Data in Archaeology

- Why Archaeology Is Important
- Survey and Excavation Methods
- Multidisciplinary Data Sets
- How Old Is It?
- Theories and Interpretations
- Who Owns the Past?

CHAPTER 1

Acquiring and Interpreting Data in Archaeology

ABOVE: Excavations at Tor at-Tareeq, Jordan, an Epipaleolithic site.

The British novelist Leslie P. Hartley (1895–1972) began his book *The Go-Between*[1] by observing that the human past was a bit like a foreign country where people did not do things in the same way that we do. The past, however, is both more and less than Hartley's remark suggests. It is more because the human past has a much greater time depth, range of cultural behaviors, and geographical extent than any single foreign country. It is less because we cannot directly or completely see the behaviors of the past as we might if we visited a foreign country and observed the culture(s) there. To develop an informed view of humanity's story given that we do not have firsthand observations of past living peoples and cultures, researchers in archaeology and **paleoanthropology** collaborate with specialists of other disciplines such as chronology, economics, **ethnoarchaeology**, **ethnography**, **geoarchaeology**, history, ancient texts, linguistics, **palynology**, materials conservation, **archaeometallurgy**, and **zooarchaeology** (among others) to find sites, retrieve data, analyze data sets, and interpret archaeological sites, cultures, and regions. This chapter discusses how archaeologists accomplish these tasks, all of which help establish our cultural heritage.

Why Archaeology Is Important

Technological advances in the past several decades, especially the Internet, have accustomed us to having nearly instantaneous access to information about almost everything happening in the world, often as it is occurring. We can watch streaming videos, chat online with people from other cultures, retrieve publications, read blogs, and post our own thoughts and images (of course, not everything on the Internet is accurate). Our unprecedented access to detailed information about peoples' activities, thoughts, and lives around the world, however, is recent. The truth is that most of humanity's story, the story of us and our ancestors, is one that took place in the absence of written records either because writing had not yet been invented or because, after the origins of writing, many groups continued to rely on oral traditions (some still do) rather than written accounts. We should not be lulled, however, into thinking that the written record preserves all features of past cultures, because written records (and even oral traditions) often were and are selective in what they record. Many of the earliest instances of writing, for example, are economic transactions, religious texts, stories of the lives of elite rulers, calendars, or recipes rather than accounts of the activities of everyday people.

Archaeology is the bridge we use to better understand the story of all humanity, both in remote periods and in relatively recent ones, because archaeology has methodologies and theories that focus on acquiring and interpreting evidence with the greatest precision and latitude possible. This evidence can include fossils of human ancestors, stone and metal tools, whole and broken pottery, animal bones, structures, grave goods, plant remains, historical documents, and a host of other cultural and natural materials found at archaeological sites and in the landscapes in which they are situated. The importance of archaeology is that it opens a window into our past by allowing us to collect data, record their precise context, and relate these data to each other at a particular site and to data from other sites of the same and

Paleoanthropology the study of human cultural and biological evolution by archaeologists and biological anthropologists; this term is commonly applied to biological anthropologists studying early hominin fossils.

Ethnoarchaeology a discipline that uses the study of the behaviors of living people to better understand past patterns in the use of cultural materials, site organization, and settlement systems.

Ethnography a subfield of cultural anthropology in which living people are studied using firsthand observation.

Geoarchaeology specialty in which geological analyses are used to aid in the interpretation of archaeological sites, such as the role of natural processes in how site layers form and of the formation of landscapes.

Palynology specialty that focuses on the study of plant pollen to better understand past environments, human impact on environments, human diet, and climate change.

Archaeometallurgy this archaeological specialty concerns the study of how metals were produced and used in the past.

Zooarchaeology the study of animal bones found at archaeological sites. Zooarchaeologists identify the types of animals and their uses to gain information about human behaviors.

different time periods and geographical regions. All of this information is used to examine and interpret the decisions and processes that transformed our ancestors' lives and activities.

Survey and Excavation Methods

One of the basic truths in archaeology is that context is everything. A painted Greek vase might be a beautiful object bringing a viewer aesthetic pleasure. Even a stone tool, such as a spear point, or a fossilized human bone might be an interesting object. But if we do not know its context, that is, not only the site where it was found but also its location within a site, its relationship to other cultural and natural materials found at that site, and whether it was a surface find or was recorded during excavation, it has lost most of its value in helping us understand the past. Precise recording of all information about context is of utmost importance, and archaeology uses many techniques to achieve this goal.[2] All of this is set within research designs that frame the choice of methods, techniques, and multidisciplinary studies for each archaeological project.

Research Design

The set of methods and ideas that archaeologists use in their survey and excavation projects is called a research design. It is based on research questions specific to a given project. We might be interested, for example, in gaining a better understanding of how and why early humans migrated out of Africa, what processes changed hunter–gatherer–forager decisions about what to eat into food-production ways of life in China, or how political organization influenced the types of sites and their distribution in the landscape in Mesoamerica. There are hundreds or thousands of questions that we have about the past, but it is not enough to simply have a question. The research designs that archaeologists use provide frameworks for investigating these questions.

In a research design, questions are placed within a theoretical perspective (read "Theories and Interpretations") that, along with the question, guides the choice of sites, relevant data sets, and methods. In some cases, a research question will help define which areas of the world might be most appropriate for certain types of archaeological research. An obvious case is a research question about the origins of modern humans, which we know from genetic and fossil information is in Africa. Other types of research questions can be investigated in more than one geographical area, for instance, the origins of food-production economies that occurred independently in at least nine world regions (the Middle East, South Asia, China, Southeast Asia, New Guinea, South America, Central America, North America, and Africa).

Whether we conduct investigations at a single site or multiple sites is also a research design choice. Excavations at a single site allow us to examine long-term processes, such as changes in political structure and regional power for a particular city, such as Tikal in Guatemala (see Chapter 13). In other cases, we might need to examine multiple sites to gain a better understanding of how people organized their activities across a landscape. One example of this strategy is research in Chaco Canyon in the North American Southwest, where detailed studies document the timing of the construction of the Great Houses (large pueblos), the import of turquoise and marine shells, and the persistence of many small pueblos (see Chapter 7). All of this work draws on archaeological information previously known about an issue, a time period, and a geographical region.

Although archaeologists carefully collect a variety of information from sites and landscapes, some types of data are more relevant to specific research questions within a research design. If we are investigating the origins of food production, for example, we will be especially interested in recovering evidence for past plant use, changes in human impact on local habitats, and a transition from mobile to settled lifestyles and providing accurate dating. Similarly, if we are examining the origins of modern human behavior, we will find materials likely associated with symbolism (a key characteristic of our behavior today) and innovation (early art, the first bone tools, novel technologies such as spear throwers) to be highly relevant in the interpretation of these origins. In some cases, the data archaeologists collect are used to test assumptions of the research question (read "Theories and Interpretations").

Finding and Recording Sites

Archaeologists often are asked how they find sites, especially those without large, obvious structures such as pyramids, mounds, or standing stones. The most common method is pedestrian survey. The size and scope of these surveys varies, depending on the research questions. A pedestrian survey involves a team of people who space themselves at equal distance intervals; for example, each person is spaced 5 meters (15 feet; many archaeologists use the metric system rather than inches and feet) from the next person. As they walk, they examine the surface and surrounding areas for artifacts (stone tools, broken pottery) and structures (read "The Big Picture: Archaeological Survey in Practice"). This technique is easiest in dry environments with little vegetation to obscure the region surveyed. When archaeologists survey in heavily vegetated areas, they modify their surveys to include methods such as shovel probes, which are small pits dug in the ground at evenly spaced intervals. Shovel probe pits allow them to "see" below vegetation covering the ground surface. Each pedestrian survey records information about the location, artifacts, features, and structures found.

Archaeological sites also can be located using aerial photographs, **remote sensing**, infrared photography, historical documents, and talking to landowners and hikers, as well as sites found during construction and farming. Past human impact on the land, for example, often is easily seen in photographs. An aerial photograph taken from a hot air balloon or a low-flying airplane or drone can reveal former agricultural fields or construction efforts (house foundations or hunting structures that

Remote Sensing uses technology such as satellite images, ground-penetrating radar, and LiDAR (light detection and ranging) to aid in the location of archaeological sites and buried or vegetation covered features of sites.

The Big Picture

Archaeological Survey in Practice

Traditional pedestrian surveys focus on locating and recording archaeological sites. The types of sites found and their locations are a guide to long-term processes that affected how people organized their activities. These processes include changes in climate, availability of water, the distribution of wild animals and wild plant foods, erosion of land surfaces and down-cutting by streams, decreased soil fertility resulting from sustained agriculture, and development of political or religious centers. Traditional surveys by **Cultural Resource Management (CRM)** teams on the Goldwater Range in southwestern Arizona, for example, helped indicate how land use patterns shifted from the Archaic to the Hohokam periods (see Chapter 7) based on where sites were found and what types of sites were present (Figure 1.1).

Nonsite pedestrian surveys record sites and cultural materials in the areas between sites.[3] This aids in understanding all the places that people used, including locales that were visited briefly. There are a number of ways to sample nonsite areas. The Abydos Survey for Paleolithic Sites in Middle Egypt, for instance, collected information every 100 meters (300 feet) using a standardized collection area (a 1-meter-radius (3.2 feet) circle). Every sample

FIGURE 1.1
Pedestrian site survey in the North American Southwest.

location was recorded with a Global Positioning System (GPS) unit and cultural artifacts (or their absence) in the circles were recorded in a database in a small handheld computer. All stone artifacts were analyzed for type, form, and length while in the field (Figure 1.2). The Egyptian high desert landscape examined by the Abydos Survey for Paleolithic Sites mostly yields Middle Stone Age artifacts, but earlier periods such as the Acheulian also are present. The combination of data on artifact types and GPS locations allows us to create Geographic Information Systems (GIS) layers, for example, the distribution of the Acheulian compared to sites and samples from other time periods (Figure 1.3).

FIGURE 1.2
Using digital calipers to record the dimensions of a stone artifact on the Abydos Survey for Paleolithic Sites, Egypt.

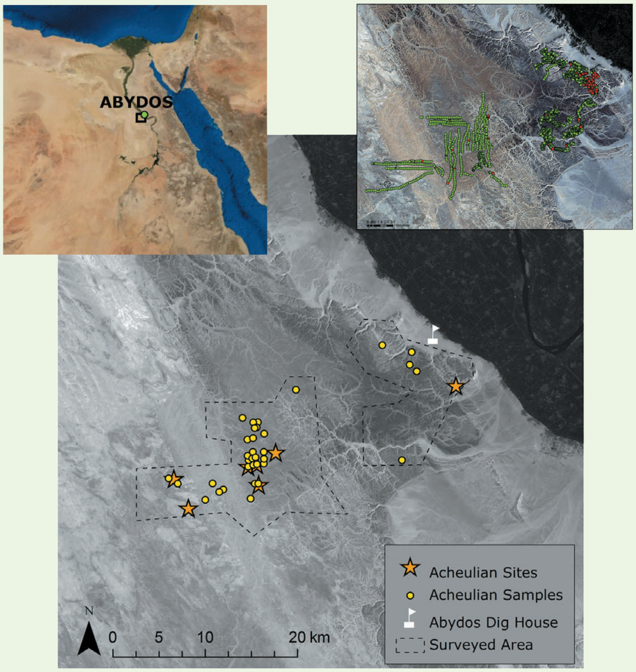

FIGURE 1.3
Data from the Abydos Survey for Paleolithic Sites in Egypt. *Top left*: location of the project area; *top right*: all sites (*red*) and samples (*green*) recorded during the surveys; bottom: the landscape distribution of the Acheulian sites and samples in the areas surveyed.

Cultural Resource Management (CRM) archaeologists who work in the field of CRM have projects that are based on recovering data about areas that will be impacted by new construction or otherwise potentially destroyed. Federal or state-owned lands, as well as federally funded projects, are subject to a number of laws, regulations, and reporting requirements.

UTM Coordinates Universal Transverse Mercator (UTM) coordinates are Easting and Northing numbers that are based on a system of metric grid cells that divide the world. Each Easting and Northing set of coordinates provides an extremely specific geographical location.

Total Station equipment that combines a theodolite (which measures vertical and horizontal angles) with an electronic distance meter (EDM). The EDM uses a laser beam to measure the distance from the total station to an object or point (where a prism is placed). The angles and distance are used to calculate *x*, *y*, and *z* coordinates (Cartesian coordinates) for each point.

Datum a reference point on the ground with known spatial coordinates, sometimes calculated as Easting (*x*) and Northing (*y*), as well as elevation (*z*). One or more datums are established at archaeological sites and used to set up site grids and for precision location measurement of artifacts, animal bones, structures, features, and samples found during excavation at a site, as well as for archaeological survey.

are not easily seen in their entirety while on the ground) (Figure 1.4). Remote sensing techniques, such as ground-penetrating radar and magnetometers, offer ways to see below the surface. Ground-penetrating radar, for example, sends radio pulses into the ground. These pulses bounce back when they encounter changes such as walls of structures, pits, or variations in the type of sediment. The recorded pulses also indicate the depth of the change based on the time it takes the pulse to leave and return. These data can be used to make maps of things not visible on the surface.[4] Magnetometers operate on a similar principle; they measure subtle changes in the magnetic field below ground surface. These subtle changes are caused by the presence of features (buried hearths, ditches, and walls). Heavy vegetation can cover structures and features at archaeological sites, making them difficult to find using pedestrian surveys. A new laser-based remote sensing technology called LiDAR (light detection and ranging) allows archaeologists to "see through" heavy vegetation cover (Figure 1.5).[5] LiDAR provides three-dimensional (3D) images (with *x*, *y*, and *z* coordinates; read "Excavating Sites") of the landscape taken from the air.[6] All changes in the topography or terrain can be seen and identified; one example is the recent discovery of thousands of additional structures near Tikal in Mesoamerica (see Chapter 13).[7]

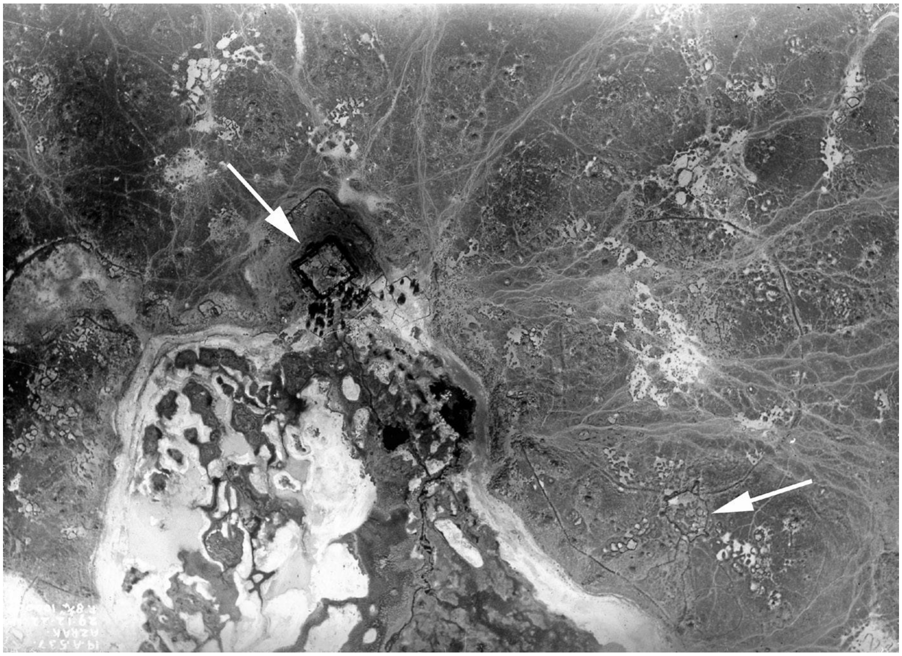

FIGURE 1.4
Use of aerial photography shows features not easily seen at ground level. The structure in the lower right (*lower arrow*) is a desert "kite" site, a type of hunting structure. The black rectangle in the upper left (*upper arrow*) is the Azraq Castle, Jordan (1920s aerial view) (arrows added to original image and input levels modified).

When archaeological sites are found, their location is recorded using GPS units that calculate the longitude, latitude, and elevation (or alternatively, the **UTM coordinates** and elevation). These data can be manually or digitally plotted on topographic maps as well. But a site's location is only one aspect of its context. Most archaeologists also record information about the type of site (stone artifact scatter, broken pottery vessel, cave, dwelling), the kinds and amounts of artifacts present, site size, types of structures (if present), distance to the nearest water source, potential for buried archaeological deposits, and placement (hilltop, floodplain, river bank, or canyon). Most sites and samples of representative artifacts and structures are photographed. Exceptional sites can be revisited and mapped using a **total station**. Digitally plotted sites and other relevant aspects, such as artifact types, can be incorporated into GIS programs, which allow a researcher to examine things such as the distribution of a particular type of artifact and site placement to see whether there might be patterning and how this could be behaviorally interpreted.

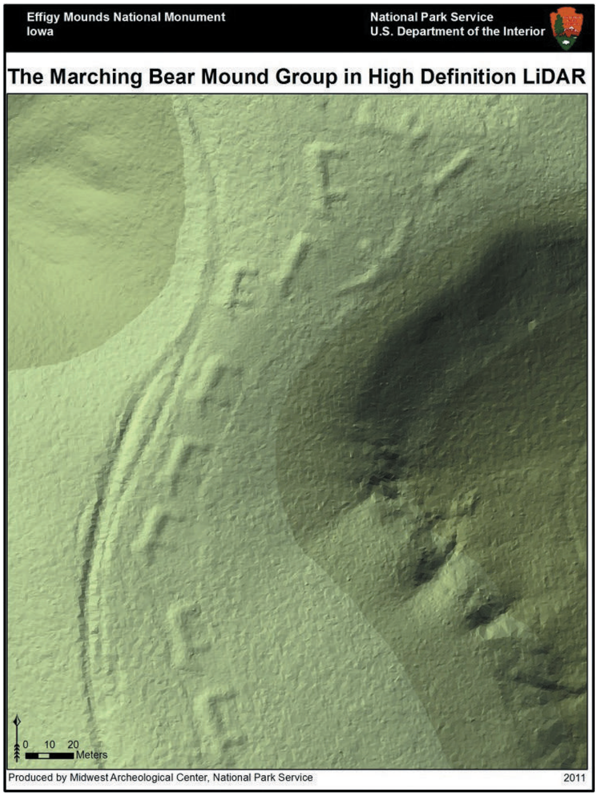

FIGURE 1.5
Use of LiDAR, a remote sensing technique based on laser light analysis, to map a mound site in Iowa in the United States.

Excavating Sites

Once sites with potential for buried deposits are located, one or more that likely can help answer questions in the research design are chosen for excavation. Maintaining precise control over context is just as important in excavations as it is in surveys.[8] The most basic strategy used by archaeologists is to establish two or more **datums** that are used to create a grid over the site. The grid consists of equal-size units, for example, 1 meter by 1 meter (3 feet by 3 feet); each unit has a name.[9] Based on their location at the site and relationship to each other and to structures and features (if present), certain units are chosen for excavation. Alternatively, some archaeologists who work at complex sites with numerous structures and features may choose to excavate mainly within structures and features, each of which has a designated name, for example, Structure 1 or Courtyard 5. These types of sites also use a systematic method of creating units for excavation within rooms, structures, and features.

Although grid systems can be established using a variety of instruments, many archaeologists today use a total station and associated computer software.[10] Most archaeologists prefer to work with positive rather than negative numbers (coordinates). This means that the entire site must be situated within the upper right section of a **Cartesian coordinate system** (Figure 1.6). One advantage of using a total station and its GIS software is that the total station calculates its exact coordinates and elevation every day based on its position relative to the site datums.

Cartesian Coordinate System
a three-dimensional grid system in which horizontal axes (*x* and *y*) are combined with a vertical axis (*z*) to calculate the position of any given point. Each axis is perpendicular to the others. At archaeological sites, the *x* grid axis often corresponds to north–south and the *y* grid axis represents east–west. The *z*-grid axis is the elevation of each point.

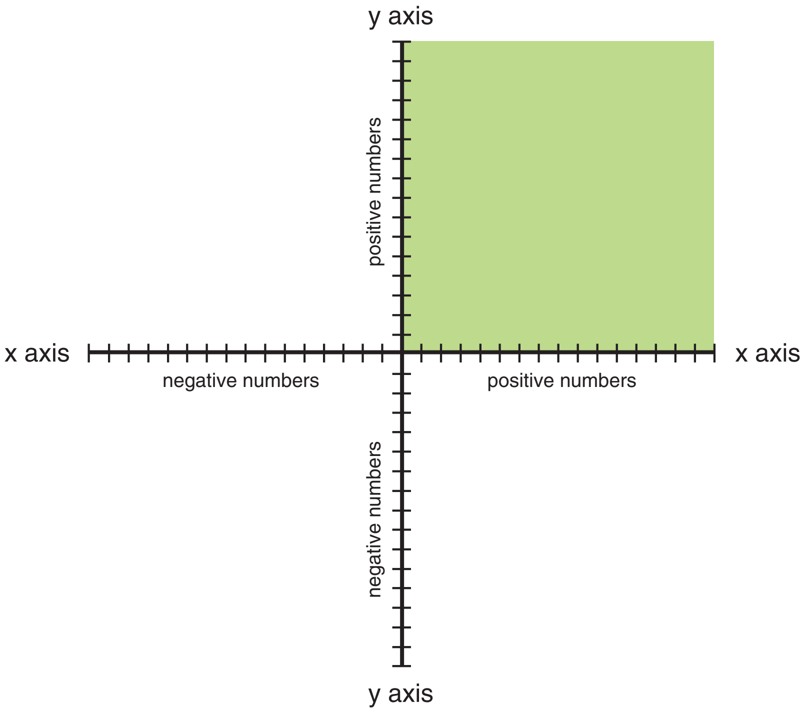

FIGURE 1.6
A Cartesian coordinate system. Archaeologists prefer to use positive numbers to name their grid units. Thus, site datums and the units at the site will be situated in the upper right (*green*) quadrant. Often, the *x* axis reflects W–E and the *y* axis S–N directions.

Stratigraphy the layers or levels at an archaeological site. These can be defined as natural (geological) or cultural and can be used as a relative dating technique in which cultural materials found in deeper levels or layers are older than those in overlying levels or layers.

The grid system establishes a two-dimensional (2D; *x* and *y* coordinates) plan of the site, but in digging a site, we also need a third dimension, the elevation (*z* coordinate). These are used in mapping the structures and features and recording levels (**stratigraphy**) and depth of artifacts and samples we collect while excavating. Although a total station can be used to determine the exact *x*, *y*, and *z* coordinates (called piece-plotting or point proveniencing) of specific artifacts and samples, archaeologists also designate levels, layers, or loci with which the piece-plotted artifacts and samples are associated. Some archaeologists who work at complex sites use a system in which different contexts are given different locus designations, A hearth might be Locus 2, for instance, whereas the sediment below it is called Locus 3, and the wall of the structure in which the hearth is located is called Locus 1.[11] These techniques allow archaeologists to control contextual data in ways that are useful for interpreting activities at sites and sequences in which structures at sites were built and added to during the occupation of the site (read "The Big Picture: Archaeological Excavation in Practice").

The Big Picture

Archaeological Excavation in Practice

The Western Highlands Early Epipaleolithic Project is investigating how hunter–gatherer–foragers used landscape resources in the millennia before the origins of food production economies in the Middle East. One of the sites is a small rockshelter (KPS-75) in west-central Jordan. We established datums and a grid system of 1-meter by 1-meter (3.2 feet by 3.2 feet) units with a total station (Figure 1.7). To gain perspective on the distribution of activities at the site, the units excavated represent contexts inside the rockshelter (N4), immediately in front of the rockshelter (K7, K9, K10, L11, L12, M9, and M10), and downslope (H9) (Figure 1.8).

Crew members excavated with trowels in increments of 3 centimeters within natural levels in 50-centimeter by 50-centimeter quads of each 1-meter by 1-meter unit. In some units, we point provenienced each stone artifact and animal bone larger than 2.5 centimeters with the total station, as well as each bucket of sediment from each 3-centimeter

FIGURE 1.7
Using a total station to record *x*, *y*, and *z* coordinates at site KPS-75, Jordan.

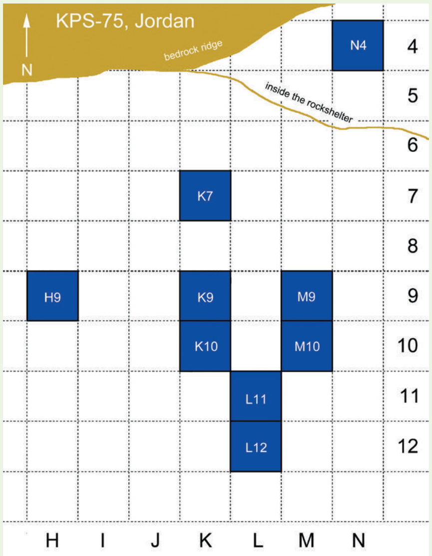

FIGURE 1.8
An example of an alphanumeric grid system. Excavated units are shown in blue, and the grid is in 1-meter increments.

increment within each unit quad. In other units, cultural materials from each 3-centimeter increment in each quad were recovered only from each point-provenienced bucket. The sediment from each bucket was screened to recover small artifacts and animal bones. We also collected sediment samples from every natural level in each unit (Figure 1.9); these are processed and analyzed for pollen, phytoliths, and macrobotanical remains.

FIGURE 1.9
Collecting a sediment sample for phytolith extraction from the profile of an excavation unit at site KPS-75, Jordan.

Point proveniencing allows us to closely examine the distribution of cultural materials across the site and in the different natural levels. This aids in the interpretation of site activities as well as in changes over time. We analyzed more than 94,600 stone artifacts and found, for example, that the way that people made small stone tools called microliths shifted over time. This may be related to changes in hunting equipment and the types of animals pursued by these hunter–gatherer–foragers. Changes in hunting patterns also may have affected the extent to which wild plant foods were collected.

Spit a term used by some archaeologists to describe an excavation unit that has an arbitrarily assigned specific depth and size.

Microfauna this term refers to small animals such as mice, moles, and snails; these small animals are sensitive to changes in local temperature and moisture and thus are valuable indicators of paleoenvironments.

Unless a site is covered by sterile sediment (no cultural materials), most excavation proceeds slowly and carefully using small tools such as masons' trowels, spoons, and dental picks, as well as brushes and a bucket to collect the sediment from each context (a level, layer, locus, or **spit**). In nearly all cases, all the sediment removed from a particular context has a context identification tag and is sieved through small mesh screens. This allows archaeologists to collect many extremely small materials, such as **microfauna**, small beads, and tiny stone artifacts. Many projects also recover small materials using wet screening, in which the sediment in a fine mesh screen is processed by running water through it, making it easier to see artifacts and other materials.

Excavating a site is not only about finding and recording cultural materials, structures, and features. Archaeologists also collect many types of samples that aid in interpreting sites. Some of these are sediment samples that are processed for environmental information (palynology), evidence of plant use (**phytoliths**, **macrobotanical remains**), and sediment-formation processes (geoarchaeology, **geochemistry**) that can be used to understand how a site became a site (**site taphonomy**) and where certain types of activities might have occurred (for example, where domestic animals were corralled). Other useful samples include materials such as charcoal that will provide dates (see "How Old Is It?").

Phytoliths microscopic plant parts composed of silica or calcium oxalate that have shapes and sizes specific to particular plants; they usually preserve well and can lend insight into plant use, plant foods, and local environments at archaeological sites.

Macrobotanical Remains plant remains that are sometimes recovered from archaeological sites. They can include seeds and wood charcoal and are useful in reconstructing plant use (including plant foods) by earlier people, as well as aspects of local environments.

Geochemistry specialty in which researchers study the chemical composition of artifacts, sediments, and bones as well as participate in laboratory analyses to determine the absolute age of sites.

Site Taphonomy the natural and cultural processes that affect archaeological sites. Natural processes include the actions of animals who might consume animal bones left at a site, the effects of rain and sun on exposed archaeological materials, and erosion. Cultural processes include pit digging by later occupants at a site, reuse of stone artifacts left at a site, and modern-day looting.

Multidisciplinary Approach to interpret the cultural materials and natural features of archaeological sites, site taphonomy, and landscapes, archaeologists collaborate with specialists within archaeology (phytolith researchers, zooarchaeologists, archaeometallurgists, and geoarchaeologists), as well as specialists from other disciplines (architects, materials conservators, geochemists, ethnographers, and chronology laboratories).

Multidisciplinary Data Sets

Archaeological sites have the potential to yield a diversity of data sets, although for a variety of reasons, not every site produces every type of information theoretically possible. Most sites, however, do contain multiple kinds of cultural and natural data. The best way to investigate, analyze, and interpret these data sets is for archaeologists to work with other archaeologists and with specialists from several other disciplines. This is known as a **multidisciplinary approach**.

Cultural materials from sites can include chipped stone artifacts, ground stone implements, broken or complete pottery, tools of bone or metal, figurines, ancient texts, art, sculpture, textiles, and personal ornamentation. The list is nearly endless, although organic materials often do not preserve over long periods of time (see "Theories and Interpretations"). To this list we can add hearths, roasting pits, ovens, and kilns, as well as burials, mounds, dwellings, storage rooms, courtyards, roads, temples, palaces, and pyramids. All of these were made by our ancestors, and many require special processing and analytical skill sets that aid in their interpretation.

Archaeologists often specialize in certain types of cultural materials. We might, for example, focus on how to classify and interpret stone artifacts or ceramic types and designs or metal tools and ornaments. Each category of cultural material also can be analyzed in much greater detail by specialists in other fields. The edges of stone artifacts, for instance, can be studied for residues such as phytoliths or blood, resulting in a better understanding of the tasks for which specific stone artifacts were used. An analysis of the chemical properties of the clay and temper (materials such as crushed shell, organic fibers, and crushed stone added to clay to keep vessels from breaking during firing) used in ceramics can help us understand the techniques people used to make their pottery and whether certain styles were imported or were locally made copies. At complex sites with many structures, archaeologists work with architects to better understand the sequence of building and rebuilding, as well as structure design. To decipher textual materials, we collaborate with specialists in ancient written languages such as Egyptian hieroglyphs, Sumerian cuneiform, or Maya glyphs.

Many cultural materials are fragile, especially organics such as wood and textiles. These require the specialized skills of conservators to stabilize and preserve them.

Fauna terrestrial and marine animals, birds, fish, reptiles and amphibians, as well as shellfish and microfauna.

Some types of evidence from archaeological sites were not made by people but are the result of their activities. This includes animal bone (**fauna**), plant assemblages (macrobotanical remains), and phytoliths. Zooarchaeologists specialize in studying the fauna and identify the types of animals, birds, rodents, and reptiles present. They also examine animal bone for burning, traces of use such as polish, cut marks from butchery, and whether some bone was modified into tools. Some of these researchers specialize in identifying fish scales or types of shellfish. Zooarchaeological analyses help determine whether people hunted wild animals or had domesticated stock, whether they focused on animal meat or also processed animal bones for nutrient-rich marrow, and to what extent past groups captured game that required innovative technologies such as traps and snares or made use of freshwater or marine food resources. Similarly, the careful study of macrobotanical remains by archaeobotanists helps archaeologists develop a better understanding of the types of plant foods (wild or domesticated), possible medicinal plants, and plant resources (such as reeds and rushes for bedding, roofing, and basketry) that people exploited. Other evidence for past plant use comes from the study of phytoliths that are extracted from sediment samples or are found on the edges of stone artifacts or on the surface of grinding tools.

Bioarchaeology specialists in this discipline examine human bones to identify features of individuals and populations. These include health, age, sex, habitual activities, height, diet, and nutrition.

Occasionally, archaeological sites contain human bones. Depending on the site type and its age, these can be fossils of early human ancestors or burials of more recent people, and there are many ethical considerations when human bones are found (see "Who Owns the Past?"). Although archaeologists can investigate how people were buried and the distribution of graves at a site, the study of the actual bones is done by specialists in biological anthropology or in **bioarchaeology**. Fossils of early human ancestors before 30,000 years ago tend to be examined and interpreted by paleoanthropologists. Such fossils are rare and often broken into many small pieces. They can require removal of the blocks of sediment in which they are buried and careful excavation in laboratory settings, as well as technical cleaning and reconstruction. Studies of the shape of the bones and other features help identify which group of fossils they represent, for instance, Neandertals versus early modern humans. Human bones found in more recent periods are studied by bioarchaeologists. They identify the age and sex of the human bones; health issues, including diseases; muscular stresses on bones that suggest activity patterns (such as postures used during the hand grinding of grains); prehistoric diet and nutrition; and how and when cavities in teeth became common. Additionally, geneticists sometimes can extract DNA from bone samples; these analyses have provided insights into the relationship of Neandertals to modern humans, as well as into prehistoric migrations such as the peopling of the Americas.

Paleoenvironment the types of environments and habitats characteristic of regions during the past; these developed because of changes in climate, as well as human manipulation of vegetation and animal communities.

Information about past environments (**paleoenvironments**) also is the result of specialized analyses. Certain large animals, for example, reindeer, indicate that climatic conditions were relatively cold. Our most detailed interpretation of paleoenvironments, however, comes from sources such as microfauna (small rodents and certain tiny snails), which are extremely sensitive to small changes in temperature and moisture regimes, and from the study of pollen (palynology). Palynologists extract pollen grains deposited by plants from site sediment samples. These grains can only be seen with a microscope. Each type of plant produces distinctively shaped and textured pollen grains, which the palynologist uses to determine whether a landscape was forested or open and whether the vegetation cover consisted of plants typical of dry/cool, wet/warm, dry/warm, or wet/cool climatic conditions. In some cases, the types of pollen grains present might suggest that domesticated crops were being grown.

Archaeologists also work with geoarchaeologists who investigate how sediments were deposited at a site, the microscopic characteristics of site sediments (composition and geochemistry), and the formation of the landscape in which a site is located. Geoarchaeological analyses are especially helpful for understanding how sites form and what happens to the sediments at sites over time (site taphonomy), in addition to determining whether some sites or site types have been removed as a result of erosion or other geological processes. Geoarchaeologists also locate prehistoric water sources such as ancient springs and lakes and can determine how river channels have changed over time.

A multidisciplinary approach allows archaeologists to collaborate with a variety of specialists to obtain more comprehensive information about cultural and natural materials present at sites and the activities they represent, understand site distribution across landscapes, and examine site and landscape formation processes. These studies are complemented by specialist data on paleoenvironment and paleoclimate, as well as techniques used to obtain dates for site occupations (see "How Old Is It?").

How Old Is It?

Establishing when occupations at sites occurred is a key component in developing an understanding of social and political organization, the distribution of activities and sites, and the types of cultural materials specific to different time periods, as well as for creating a timeline for the story of our past. Most of us today, however, rarely spend more than a moment thinking about today's date, not only because we have instant access to that information via the Internet or our cell phones but also because we are accustomed to written calendars. Several early complex societies, such as the Maya of Mesoamerica, also had calendric systems. But these types of records do not have great antiquity when we consider that humans and their ancestors have a history and prehistory that stretches back in time some 7 million years.

Relative Dating Methods

Until the twentieth century, archaeologists could date sites and site occupations only using **relative dating** methods (except for some sites for which written records exist, such as ancient Egypt). Relative dating does not provide a calendar year date but aids in building sequences of "older than" or "younger than." The two most common relative dating methods are stratigraphy and **seriation**. Stratigraphy works on a general principle similar to creating a layer cake; the bottom layer is the oldest (the first one deposited) and layers on top of it are progressively younger (Figure 1.10).

Relative dating dating techniques that provide a sequence of "older" and "younger" rather than calendar dates; examples include stratigraphy and seriation

Seriation a relative dating method in which the frequency of artifact types or styles is used to construct a chronology of "older than" or "younger than" based on the popularity of types or styles over time

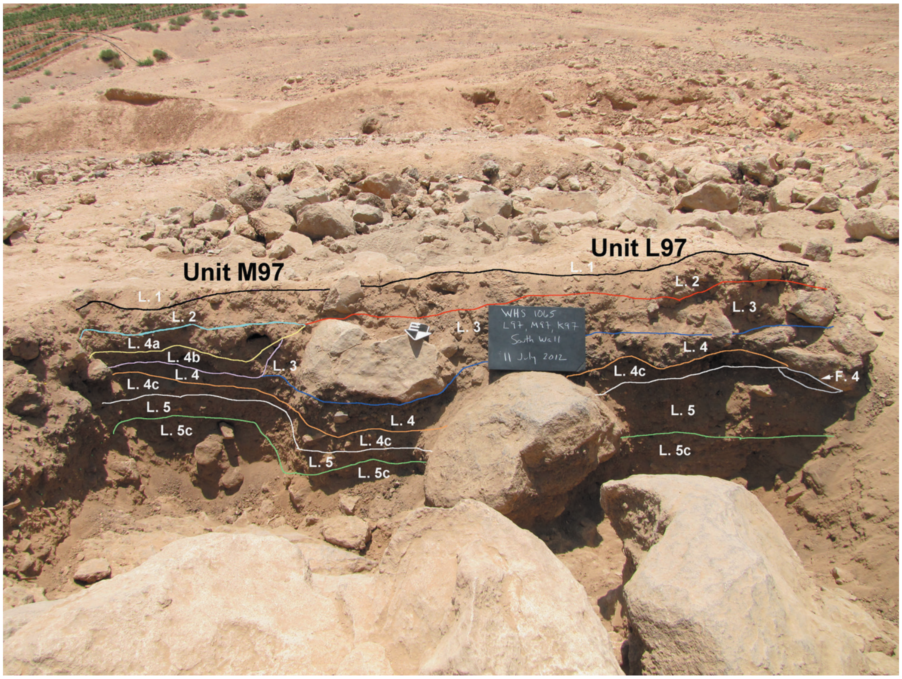

FIGURE 1.10
Stratigraphic layers at Tor at-Tareeq, Jordan.

By examining cultural materials contained in the different layers of a sequence of layers at a site, archaeologists build a relative chronology of which materials are older or younger than other types of materials. This relative chronology can be used across several different sites as long as each one contains at least a portion of the same sequence (Figure 1.11). One of the most basic of these sequences was called the Three Age System, which noted that tools were first made of stone, then bronze, and then iron.[12] There are some issues with these types of sequences, however, particularly those impacted by site taphonomy (see "Theories and Interpretations").

Seriation works in a way similar to stratigraphy but is based on the popularity of artifact styles over time. If we look at mechanical instruments for writing, for example, we see that manual typewriters, once invented, increased in quantity (popularity) as more and more people used them. The invention of the electric typewriter had an impact on the popularity of manual typewriters, the use of which declined as electric typewriters became the standard. The popularity of electric typewriters then declined when word-processing programs on computers linked to printers became available. Each artifact style thus has a pattern of initial low frequency, followed by a period of peak popularity, which in turn is followed by a return to low frequency or disappearance (Figure 1.12). The beginning and end points of these popularity curves must be anchored in time, which can be done by looking at their position in various stratigraphic sequences.

Absolute Dating methods of obtaining calendar dates for archaeological sites or fossil finds, including dendrochronology, radiocarbon dating, thermoluminescence, optically stimulated luminescence, and potassium–argon dating.

Absolute Dating Methods

Although relative dating methods helped establish temporal sequences, they were (and are) less than satisfying because we had to make educated guesses about the true age of a site. The advent of **absolute dating** methods, which yield dates in years, showed that many of the early educated guesses about the chronology of particular sites and prehistoric cultures were off by thousands or tens of thousands of years. There are now a diverse set of absolute dating methods that archaeologists use, and the choice of which of these is best depends on the types of materials recovered from sites or the near vicinity of sites, as well as how old the site is initially thought to be.

FIGURE 1.11
Example of horizontally laid stratigraphy at the site of Laugerie Haute, France.

The most precise of these absolute dating methods is **dendrochronology**, which was developed in the early part of the twentieth century by researchers working in the North American Southwest. Dendrochronology, often called tree-ring dating, is based on the principle that trees add a yearly growth ring that varies in thickness depending on whether the year was dry (thin ring) or wet (thicker ring) and that certain types of trees (such as bristlecone pine) more consistently add yearly growth rings. The sequence of thin and thick rings forms a distinctive pattern that can be traced from living trees (for which a known calendar year sequence can be calculated) and matched using overlaps in the pattern to ring sequences in logs used in the construction of ancient structures within certain regions (Figure 1.13). Because the sequence begins with a known calendar year and each growth ring equals one year, the tree-ring sequence is equivalent to a yearly calendar from which the date of cutting a log to be used in building a prehistoric structure can be calculated (see "Pithouse to Pueblo Transition" in Chapter 7 for an example).[13] Dendrochronological sequences, based on certain species of oak trees, also have been developed for parts of Europe.

Dendrochronological dating can be highly accurate, but there are two main drawbacks. First, this dating method can only be used in a small number of world regions and only at those sites with wooden timbers. Second, the sequence is not long, extending only some 8,700 to just more than 12,000 years in the past.[14]

Another absolute dating method used to obtain age ranges for archaeological sites is **archaeomagnetism**. This technique is based on the fact that the earth's magnetic field changes over time. Heating of a fixed feature, such as a clay-lined hearth, to about 650–700°C (1202–1292°F) will align the iron particles in the clay to the position of the magnetic north pole at the time of the firing. Once the orientation of the iron particles

Dendrochronology an absolute dating method that provides calendar year dates based on the analysis of tree-ring sequences of thicker and thinner annual growth rings; used in parts of Europe and in the American Southwest, but only extends back in time some 8,700 to 12,000 years.

Archaeomagnetism an absolute dating method that uses variation in the position of the Earth's magnetic pole over time. The orientation of the iron particles in a feature such as a clay-lined hearth align to the magnetic north pole when heated. This orientation is compared to a magnetic north pole sequence to determine an age for the firing of the feature. This technique can be used for sites that are younger than 10,000 years old.

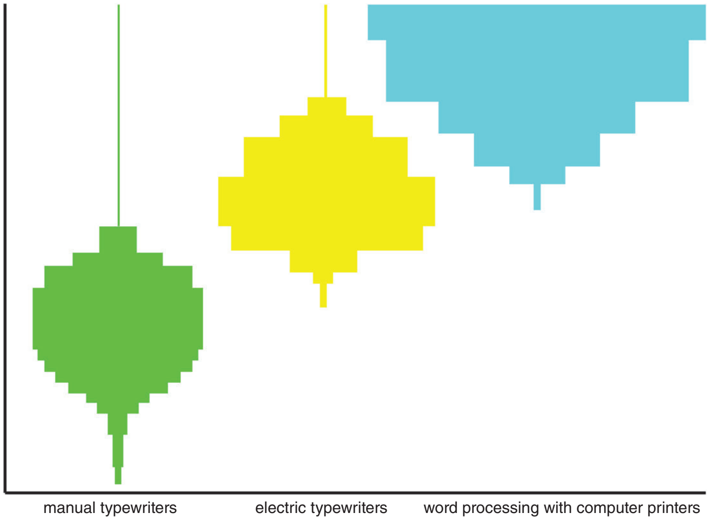

FIGURE 1.12
Example of seriation showing the origins of a technology or style, its peak popularity, and its decline as newer technologies or styles replace it. In this case, manual and electric typewriters continue to be used on rare occasions, although most people now use computer printers and word processing programs.

is known, it can be matched to a sequence showing where the magnetic pole was at different points in time. This technique can be quite useful for some sites that are 10,000 years or less in age. Magnetic reversals from the North Pole to the South Pole and back again also have occurred over much greater periods of time. These types of magnetic reversals (or **paleomagnetism**) can be used to date ancient sites prior to 780,000 years ago, when the last major reversal happened (Dmanisi in Chapter 3 is an example).

Several other absolute dating methods are **radiometric techniques**. These are based on the principle that certain

Paleomagnetism this type of absolute dating technique uses reversals in the magnetic pole of the earth; that is, at some points in time the South Pole was the magnetic pole, whereas at other times, such as today, the North Pole is the magnetic pole. The alignment of magnetic particles in rock can be measured to examine where the magnetic pole was at the time that the layer was deposited. This technique is useful for sites dating to 780,000 years ago and older.

Radiometric Techniques dating techniques that use the principle of a known rate of decay of specific radioactive isotopes into stable isotopes over time; examples include radiocarbon dating and potassium–argon dating.

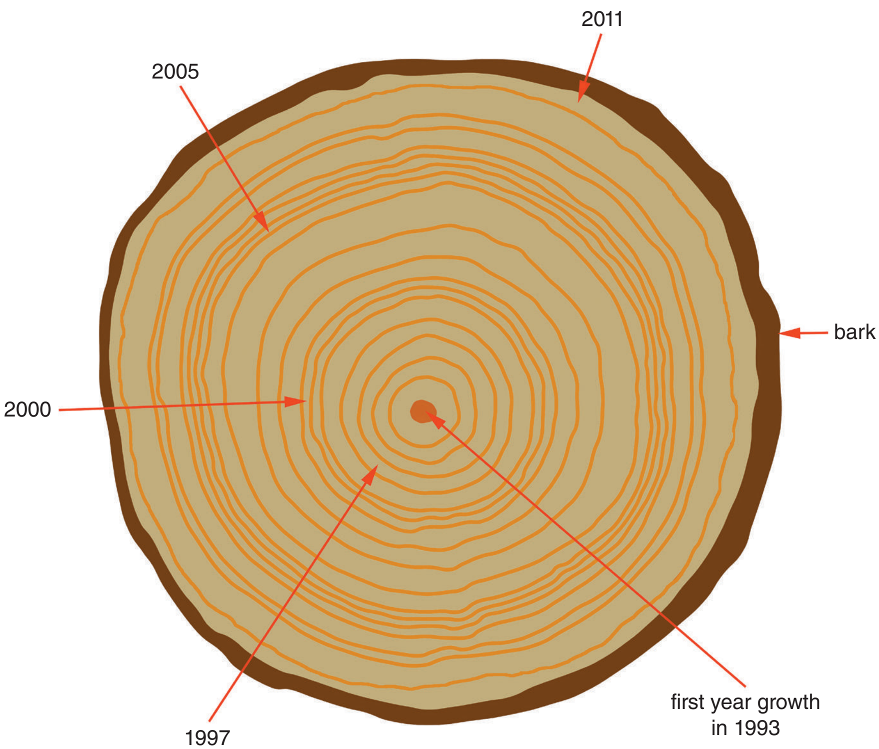

FIGURE 1.13
Example of a tree-ring sequence with one growth ring added each year. Wide tree rings indicate wet years and narrow tree rings show dry years.

radioactive elements have a known rate of decay over time into stable elements. The rate of decay is called a half-life, because half of the radioactive elements will decay into nonradioactive elements within a set interval of time. Each radioactive element has a different half-life. Radiometric techniques yield dates that are associated with a standard deviation. We might get a date, for example, of 10,000 ± 35 years ago. This means that the actual date of the site has a 68% chance of being within one standard deviation (35 years), so within the range of 10,035 to 9,065 years ago, and a 95% chance (two standard deviations or 70 years) of being within the range of 10,070 to 9,030 years ago.

The radiometric technique most people have heard about is **radiocarbon dating** (^{14}C dating). This method uses organic samples, such as wood charcoal, charred seeds, animal bone collagen, shell, or textiles. The major assumption of radiocarbon dating is that while any organism (people, plants, animals) is alive, it contains a ratio of the radioactive isotope, ^{14}C, to stable ^{12}C and ^{13}C isotopes in a proportion that mirrors the frequency of ^{14}C to $^{12}C/^{13}C$ present in the earth's atmosphere at that time. When an organism dies, it no longer ingests or absorbs ^{14}C and the existing ^{14}C in the organism begins to decay. Organic samples are processed by dating laboratories, where the amount of ^{14}C in a sample is measured. The less ^{14}C there is, the older the sample, and the actual date is the result of calculating how many half-lives have occurred since that organism died. Radiocarbon dating is effective for sites between 400 and 50,000 years ago (many sites have been dated using radiocarbon, see, for example, Chapters 4 and 5)[15].

Radiocarbon Dating an absolute dating method that uses the decay rate of the radioactive isotope carbon-14 (^{14}C) to calculate the age of organic materialsfound at archaeological sites. It can be used to date materials from the past 50,000 years. Because of fluctuations in the amount of ^{14}C in the earth's atmosphere over time, radiocarbon dates must be calibrated (adjusted) to obtain the actual date of a sample.

Another radiometric technique is **potassium–argon dating** (K/Ar), which is useful for dating sites and geological formations that are from 100,000 to tens and hundreds of millions of years ago. The ^{40}K isotope is incorporated into molten rock, and when the rock cools, ^{40}K begins to decay into the stable ^{40}Ar (argon) isotope. Potassium–argon thus is used to date inorganic materials, especially volcanic rocks such as lavas and tuffs, and has been especially useful in providing a chronological framework for the early ancestors of humans (Olduvai Gorge in Chapter 2 is an example). These volcanic beds lie below and above archaeological sites. The sites therefore are bracketed to the time period between the dates of the under- and overlying volcanic beds. Like radiocarbon dating, potassium–argon dates are shown with a standard deviation.

Potassium–Argon Dating a radiometric dating technique that provides absolute dates based on the half-life decay rate of the radioactive isotope ^{40}K (potassium) into the nonradioactive isotope ^{40}Ar (argon); used in dating inorganic materials such as lava flows or tuff beds in the period from 100,000 years ago to hundreds of millions of years ago.

Dates also can be obtained from absolute dating techniques such as **thermoluminescence dating** (TL). This method uses the measurement of light produced by electrons that are trapped in fired ceramics or burned chipped stone artifacts. TL works on the principle that when ceramics or chipped stone artifacts were fired/burned in the past, the "clock" was set to zero because heating to a sufficient temperature releases the trapped electrons in these materials. From that point on, new electrons from ionizing radiation in the sediment surrounding a ceramic or burned chipped stone artifact become trapped in these materials. The TL technique takes these materials and reheats them to release the trapped electrons and measure how much light is emitted. Special devices called dosimeters are placed in a site to measure the ionizing radiation present in the sediment. This information is used in the formula to work out the age of the ceramic or burned chipped stone artifact (when it was fired or burned). TL dating is useful for sites up to about a million years ago (Jebel Irhoud and Schöningen are examples in Chapter 3).

Thermoluminescence Dating an absolute dating technique that uses the principle of when a stone tool or a piece of pottery was last exposed to heating. Heating releases trapped electrons (light) and sets the clock to zero. After the heating event, ionizing radiation in the sediment of a site bombards the stone artifact or ceramic and electrons begin to accumulate in those pieces. In the laboratory, the electrons can be released as light and measured and then used to calculate when in time that piece was last heated.

Optically Stimulated Luminescence Dating an absolute dating technique in which quartz or feldspar grains are extracted from sediment samples from sites and subjected to laboratory treatment that releases light trapped in these grains. The emitted light, which accumulated from ionizing radiation in the sediment, is measured and used in calculating the last time the grains were exposed to sunlight. The accumulated light represents the period of time since the grains were buried.

Optically stimulated luminescence dating (OSL) also uses light from trapped electrons to calculate age. In this case, single grains of quartz/feldspar from sediment samples are the dated material. When the grains are exposed to sunlight during the site occupation, trapped electrons are released. This sets the OSL clock to zero. Once the grain is buried, it begins to accumulate electrons from ionizing radiation in the surrounding sediment. In the laboratory the light from trapped electrons is released by bombarding a sample with blue or green light. The light emitted by the trapped electrons is measured and used in formulas to calculate the last time that the grain was exposed to sunlight and thus the age of the sediment from that occupation at a site (Pinnacle Point 13B in Chapter 3 is an example). Like TL, OSL is appropriate for sites up to around a million years ago, and both TL and OSL dates have standard deviations (Figure 1.14).

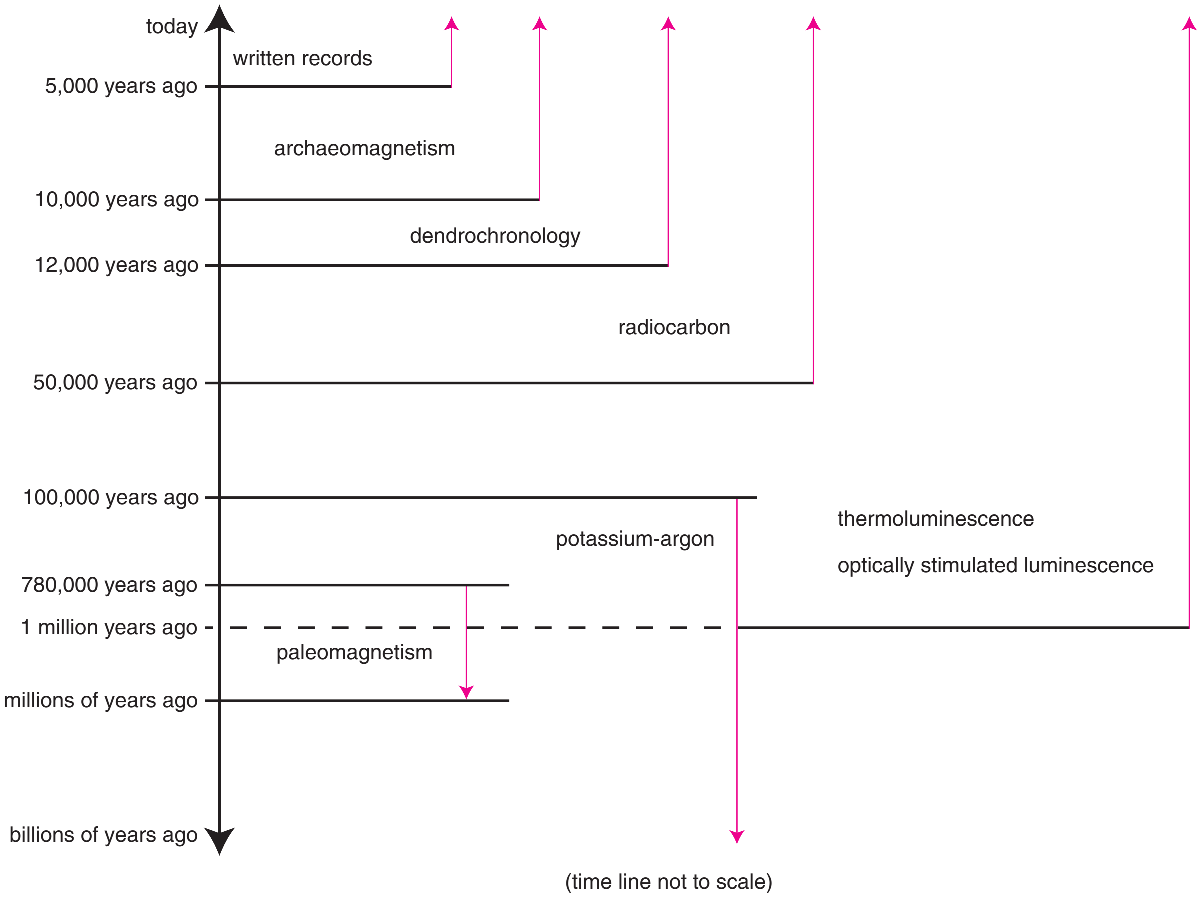

FIGURE 1.14
The range of time that can be dated by each of the absolute dating techniques.

Time Scales in Dating

Absolute dating methods allow archaeologists and others to place sites, artifacts, fossils of human ancestors, and many other finds and behaviors into a time scale. Although this appears to be relatively straightforward, there are several ways of referring to time scales that can seem a bit confusing. The one time scale that everyone knows is the system of AD and BC, which refer to Jesus Christ—AD is *anno Domini* (in the year of our Lord) and BC is before Christ. Some researchers who study the origins of politically complex societies, such as Mesopotamia, prefer to use terms that are not based on a religious figure. In this case, their time scale uses the abbreviations of CE (Common Era) and BCE (Before the Common Era). Essentially, AD = CE and BC = BCE. In this book, we will not use the CE/BCE terms.

For time periods before calendars, the time scales can be shown in BC (or bc) and BP (or bp). In many publications, using capitalized abbreviations means that the dates have been calibrated[16] or can be assigned based on historical sources such as early written documents. As noted previously, the term BP/bp means "before the present" and often is interchangeably used with the phrase "years ago." We know that it is not currently possible to calibrate dates older than 50,000 years ago. This means that archaeologists do not use BC/bc to refer to those time periods but instead use bp or years ago. The BP/bp term is based on assigning a time that is calculated from the baseline date of AD 1950; in other words, AD 1950 is considered the "present." Thus, the time scales that use BC/bc are offset from those using BP/bp by 1,950 years. A date of 10,000 BC, for example, translates into a date of 11,950 BP.

In this book, we will use time scale abbreviations as follows:

- Years ago and bp to refer to uncalibrated periods of time before 50,000 years;
- cal BC (calibrated BC) for the period between 50,000 and 5000 years ago, although not all dates can be calibrated and so those will be referred to as years ago;
- BC for the period between 5000 years ago and the start of the AD calendar;
- AD in the same way that many of us use it today.

Theories and Interpretations

Archaeologists, working with specialists from a variety of disciplines, collect and analyze a wide diversity of data. How we interpret these data depends on our specific research questions and on the theoretical viewpoint that guides our research (see Table 1.1 for examples). Prior to the mid-twentieth century, archaeology was concerned largely with data collection and the description of culture history, rather than explanations for the processes that led to change over time[17] (read "Timeline: The Development of Archaeology"). Since then, several different explanatory theories have been

TABLE 1.1.
Several examples of theoretical frameworks for interpreting the archaeological record.

THEORETICAL FRAMEWORK	CHAPTER	EXAMPLE
Agency	Chapter 5	Kamehameha I's social and political organization
Agency	Chapter 9	Abandonment of Late Archaic period mounds
Agency	Chapter 13	Farmers' role in decline of Harappan
Darwinian Archaeology	Chapter 4	Upper Paleolithic art as communication
Ecological Archaeology	Chapter 5	Younger Dryas theory
Ecodynamics	Chapter 5	Agriculture variables in pre-Contact Hawai'i
Gender Archaeology	Chapter 4	Interpretation of Upper Paleolithic "Venus" figurines
Human Behavioral Ecology	Chapter 5	Eastern North American small seeds use
Human Behavioral Ecology	Chapter 7	Archaic period use of wild vs. domesticated plants
Landscape Archaeology	Chapter 6	Interpretations of the Neolithic landscape in Britain
Networks and Boundaries	Chapter 5	King vs. commoner in Shang China
Niche Construction Theory	Chapter 5	Niche construction theory section and box
Postprocessual Archaeology (cognitive archaeology)	Chapter 15	Oral history–based interpretation of the Great Enclosure at Great Zimbabwe
Processual Archaeology (scientific method)	Chapter 13	Destruction vs. continuity in the Harappan
Scientific Method (biology)	Chapter 3	Peopling the Past: Genetics, Neandertals, and Modern Humans

used by archaeologists. Some of these are briefly examined here and will be seen in action in the chapters that follow.

Understanding the combination of peoples' available technologies, their population size and density (demography), the economic decisions they made in exploiting food resources (subsistence), and how they organized their activities across the landscape (settlement pattern) was the basis of an **ecological archaeology** approach proposed in the 1930s.[18] This perspective recognized that the archaeological record had great potential for examining long-term processes. The decisions that groups made about their settlement, economic, and technological strategies, which were partially responses to their ecological situations, formed a powerful explanatory approach for examining why things change.[19] Considering aspects of ecology continues to play an important role in many explanatory frameworks today (see Table 1.1 for an example).

Ecological Archaeology a theoretical perspective developed in the 1930s to interpret long-term cultural changes in how people responded socially, economically, and technologically to local ecology and changes in local ecology.

By the 1960s, a number of archaeologists came to believe that explanations in archaeology should be amenable to rigorous testing, similar to the hard sciences such as physics or mathematics.[20] This approach is called **processual archaeology** (or New Archaeology), and the use of **scientific method** is an important component. Scientific method involves observations and the creation of hypotheses (ideas) and test assumptions (expected outcomes) based on those observations. The data from the archaeological record are used to assess whether the test assumptions can be falsified. Because the test assumptions can be examined many times with different archaeological data sets, the use of scientific method should lead to refinement of hypotheses so that they more accurately reflect the actual processes leading to change in the past (see Table 1.1 for an example). Ecological aspects have been important in processual archaeology, in particular, the idea that past societies and cultures were systems of interrelated causes and effects. Climate change, for example, creates changes in vegetation that influence gathering and harvesting decisions. These decisions, in turn, affect how people distribute themselves across the landscape, the size and density of population that can be maintained, and the technologies that are subsequently developed.[21] Although the original systems approach is no longer a dominant aspect of processual archaeology, the notion of function (cultural practices develop to serve practical goals) remains important.

Processual Archaeology a theoretical perspective that uses social, economic, and environmental dynamics to interpret cultural changes over time; it is based on the use of scientific methodology.

Scientific Method the process of gathering information (through observation or experimentation) and using this information to create and test hypotheses (ideas); testing hypotheses allows new information to be added and facilitates corrections that need to be made to the hypotheses.

The framework of **Darwinian archaeology** (evolutionary archaeology) incorporates the principles of Darwinian evolution (such as natural selection and genetic drift) and applies them to the evolution of cultures.[22] Traits of cultural materials that are functionally beneficial are positively selected because they enhance reproductive success and thus persist (at least for some time) in the archaeological record (see Table 1.1 for an example). Darwinian archaeology does not give much emphasis to cultural influences, such as ideas, or individuals.

Darwinian Archaeology (evolutionary archaeology) a theoretical perspective that interprets changes in cultures over time as the result of evolutionary processes, such as natural selection, known from biological evolution.

Another evolutionary approach, but without the emphasis on Darwinian evolution, is the theories and models offered by **human behavioral ecology** (see Table 1.1 for examples). Many of these focus on costs and benefits as calculated in energy expended versus energy gained. They include prey-choice models, in which decisions are made about which food resources can be most efficiently collected so that the maximum amount of energy is gained. Another human behavioral ecology model is central place foraging, in which round-trip travel costs to resources and back to a home base carrying those resources affect hunter–gatherer–forager decisions about which resources to target. In this case, it may be more efficient to partially process foods before carrying them back to a base camp (for example, shelling nuts so that only the nut meat is carried back). These types of models are used to develop explanations of diversity in human behavior in time and space (see Table 1.1 for an example).[23]

Human Behavioral Ecology a set of theoretical models, based in ecology, that uses human decisions about resources (including food) and resource use to examine diversity in cultures across geographic space and through time.

Niche construction theory also is an evolutionary approach adopted from biology.[24] It differs from human behavioral ecology because it treats humans as active in shaping the landscape around them, rather than simply responding to environmental and other changes. Humans manipulate features of the landscape to create a niche (or habitat) in which they can successfully survive. One example of this is when hunter–gatherer–foragers deliberately set fires that burn off the groundcover vegetation. This clearing of

Niche Construction Theory the idea that humans actively change or manipulate features of the landscape around them and resources in those landscapes in ways that build a niche or habitat in which they can be successful over long periods of time. It incorporates evolutionary ideas from biology and applies them to humans.

Timeline: The Development of Archaeology

Today:	Broad acceptance by many archaeologists that a variety of theories and approaches can be used to understand the past; availability of numerous absolute dating methods (e.g., ^{14}C, K/Ar, TL, OSL) and technologies (computers, total stations, digital/other types of photography, GPS, GIS).
AD 1980s:	The advent of postprocessual archaeology, which stresses the role of ideas, the actions of individuals, the uniqueness of each past culture or society, and the influence of one's own cultural viewpoint on interpretations of the past.
AD 1960s:	The advent of processual archaeology (new archaeology), with its emphases on explanation (rather than just description), theory, general laws or rules of behavior, and scientific method.
Mid-AD 1900s:	Multidisciplinary archaeological projects become more common; radiocarbon dating is developed.
Early/mid-AD 1900s:	Research is aimed at establishing chronological sequences for different past cultures and societies and at describing these cultures and societies; emphasis is on explaining change over time as the result of migration and the spread of ideas (diffusion); development of dendrochronology.
Late AD 1800s:	The study of living peoples (ethnography), especially those with non-Western technologies, is used as a starting point for understanding peoples of the past; methodical techniques of scientifically excavating sites are developed.
Mid-AD 1800s:	Modern archaeology begins; the great antiquity of the human past is recognized based on observations from geology and the association of stone artifacts with the bones of extinct animals.
AD 1830s:	The Danish researcher, C. J. Thomsen, establishes the Three Age System (Stone Age, Bronze Age, and Iron Age).
AD 1700s:	First excavations, including Pompeii, and the first scientific excavation is performed by Thomas Jefferson in Virginia in AD 1784; he tests ideas about who constructed the earthen mounds found in many parts of the North American Southeast and Midwest.
AD 1500–1700:	Archaeological artifacts and other curious objects are randomly collected and displayed in "cabinets of curiosities." Antiquarians focus on reconstructing ancient life based on artifacts.
Prior to AD 1500:	Various people and groups are interested in their origins as known from oral and, more rarely, written accounts; ancient artifacts sometimes are collected and examined.

the ground promotes the growth of certain plant species that are more attractive as food to game animals, thus increasing the density of animals in these areas and offering more opportunities for successful hunting (see also an example in Table 1.1). Bodies of theory such as human behavioral ecology and niche construction theory exemplify a key goal of processual archaeology, which is to discover general rules and actions that characterize human behavior and to do so in ways that can be tested (scientific method).

For other archaeologists, the sets of generalized rules and the emphasis on ecology and the concept of efficiency (optimization) that characterize processual archaeology are limited because they do not take into account the role that ideas and beliefs have in influencing social–cultural activities and change. By the 1990s, several archaeologists developed a **postprocessual archaeology** approach. This theoretical perspective is interested in the specific history of cultures in the past (see Table 1.1 for an example). It also places more emphasis on the role of symbols and meaning in prehistoric societies, is less interested in scientific method, and believes that our interpretations of the past are not free of our own cultural values.[25] Postprocessual archaeologists argue that there is no single explanation for understanding a particular past society or culture but that multiple interpretations and approaches can best aid in gaining insight into the past. Among the many approaches are agency, landscape archaeology, and gender archaeology.

Postprocessual Archaeology a theoretical perspective that emphasizes the study of particular cultures and their histories, especially the role of ideology and the actions of individuals; it does not stress the use of scientific method.

Agency considers the role that people, as agents, played in deliberately shaping social organization and social change because of the choices they made (see Table 1.1 for examples).[26] There are several approaches within the theoretical framework of agency. In some cases, it is the actions of groups of people (based on social class or gender) that result in how social identity is created. In other cases, the actions of individuals whose life experiences intersect with the larger social processes of their groups allow us to glimpse how the individual is both affected by and affects others. In still other cases, the actions of individuals in attempting to gain social power or prestige, or alternatively, to resist those attempting that gain, produce unforeseen changes in society.

Agency a theoretical perspective that discusses the role of the individual in shaping change in cultures and societies.

In contemporary **landscape archaeology**, the landscape, as well as how it is used, is seen as shaped by the social and symbolic perspectives that people used to create meaning in the world around them; places are culturally meaningful (see an example in Table 1.1).[27] Landscape is not just the physical landscape but the importance that groups of people attached to places and things and the role these places and things played in constructing how people saw the world around them and interacted with it. There is thus a significant cognitive dimension that shaped the perception of the landscape at any given moment in time and the notion that people are active agents. The landscape archaeology theoretical framework can involve studies of settlement (ecology, land use, change over time, and occupations of places), social landscapes, ideological landscapes, and the distribution of archaeological materials across the landscape (a combination of information from sites and nonsites).

Landscape Archaeology a theoretical perspective that uses features of the natural landscape in combination with the placement of archaeological sites and the cultural materials at those sites to better understand potential cultural meanings, symbolism, and ritual in past societies.

In **gender archaeology**, archaeological data can be used to examine which past activities were linked to women as opposed to men, how the role of women was perceived in society, and what these findings mean for gender relations (for an example,

Gender Archaeology a theoretical perspective that examines the roles of women, men, and other genders, as well as their relationships, in prehistory.

see Table 1.1).[28] While gender archaeology has always been associated with the perspective of feminism, its theoretical framework goes beyond examining just women to encompass gender roles that are not those simply of biological male and female (for example, gay, lesbian, and queer studies). Gender archaeology examines social identities in past societies through the study of material culture (the archaeological record) but understands that the social identity of people is not based only on their gender. Instead, it is a complex mix of several variables, for example, sex, status, age, and ethnicity.

It is important to recognize, however, that many archaeologists do not fall squarely into processual or postprocessual archaeology but incorporate aspects of both of these major perspectives into their research.[29] A modern approach using ecology as one aspect, for example, is **ecodynamics**, which focuses on the interplay between the actions of humans and the environment using a complex web of interactions.[30] These include social processes (such as technology or ideology), ecological dimensions (such as changes in population size and density or the relationship between animals and those who prey on them), and nature (such as changes in climate and composition of habitats). One important feature of ecodynamics is that it does not present the story of people as linear but instead as changes that can fluctuate in many directions over time (see Table 1.1 for an example).

Ecodynamics a theoretical framework that combines social behaviors and natural landscape factors (soil fertility, rainfall, etc.) to understand the processes that led to the development of politically complex societies.

Another example of the melding of some aspects of processual and postprocessual ideas is the theoretical framework of **networks and boundaries**. These concepts are useful in the study of the rise of early politically complex polities (see Table 1.1 for an example).[31] The networks might involve power and authority among elites, whereas the boundaries were created by how people conceptualized their political identity or community. At their simplest, networks are much as we think of them today, that is, alliances that individuals make with each other. In the past, such alliances were based on gift exchanges, marriages, shared rituals, and other social mechanisms. Boundaries, on the other hand, relate to how people see themselves as allied to particular groupings within society. This is a feature of our society today, for example, in the contrast between membership in a family (a small bounded grouping) versus membership in a political party (a larger bounded grouping). Some members of a family might be Democrats, others Republicans, and others Independents, but all are members of the same biological family. The power of this theoretical approach is that is shows us that societal groupings and alliances are dynamic and that they are flexible.

Networks and Boundaries a theoretical framework that examines how networks of power and authority are developed and maintained in complex political societies. These networks integrate with how people create boundaries for their community and political identities.

Regardless of whether an archaeologist is mainly processual or postprocessual, some aspects of the archaeological record affect their explanations and interpretations equally. Two of the most significant of these data issues are organic preservation and site taphonomy.

We know that certain types of materials, such as stone artifacts and ceramics, are more durable than others because they are inorganic and thus are preserved over long periods of time. Organic preservation, however, is variable, which means that a vast amount of cultural materials and constructions do not survive to be excavated and recorded by archaeologists. The best situations for organic preservation are contexts that are extremely dry (deserts) or extremely cold (permafrost and high altitudes) and those that are very wet and lack oxygen (peat bogs; see Schöningen in Chapter 3). In each of these situations, organic materials do not decay as much or as rapidly as they do when exposed to soil acidity (which destroys bone and wood) or microorganisms such as bacteria (which destroy skin and hair). Examples of good organic preservation include the so-called "bog people" who were sacrificed in Europe and preserved in peat bogs, sandals made of plant fibers in the dry North American Southwest (see Chapter 8), and mummies of children in the Andes Mountains preserved due to very cold conditions (see Chapter 14). These exceptional preservation conditions are relatively rare when considered against the long time depth of the archaeological record and against the many places where archaeological remains are found. The rarity of organics means that many things that are valuable data for understanding the past are not available to archaeologists. They include wooden tools and containers, clothing, basketry, cordage, animal hides, seeds, and some types of writing materials (such as papyrus). Even animal and human bone can be rare at archaeological sites.

Aside from issues of organic preservation, the vast majority of archaeological sites are not perfectly preserved snapshots of the past. They are not versions of Pompeii, where a rapid disaster captured a moment in time and preserved it relatively faithfully. Instead, a variety of natural and cultural processes affect the formation of sites (site taphonomy) and therefore our explanations and interpretations of the behaviors represented at those sites. Natural formation processes include burial of sites, erosion, water flow, rodent burrowing, sediment movement, and preservation contexts that do or do not lead to the survival of organic materials. Through careful survey and excavation methodology, we might find, for example, that artifacts at a site have been moved from their original locations by the action of slow-moving water (sheet wash or a gently flowing stream). The distribution of the artifacts thus tells us more about natural processes affecting the site than about activity locales because the artifacts are no longer in situ (in place). Similarly, cultural formation processes—the actions of people both in the past and today—also affect what is found and its distribution at sites. Cultural formation processes consist of a variety of behaviors such as the original activities that deposited cultural materials at a site, digging of pits by later site inhabitants into older archaeological levels for storage or burial, tearing down and rebuilding dwellings and other structures, deliberate burning of sites, and looting and vandalism. Archaeologists must consider all these factors when examining data from sites so that the resulting explanations and interpretations of past behaviors are not based on inaccurate information.

Who Owns the Past?

The archaeological record is our primary source for data relevant to humanity's story, and, at a general level, it belongs to all of us.[32] Many people enjoy exploring cultural heritage—locally, regionally, and globally—by watching documentaries, visiting archaeological sites, reading newspaper and journal articles as well as books, attending public and professional lectures, experiencing museum exhibitions, volunteering on archaeological projects and in museums, and sometimes donating money to support conservation of archaeological sites and their cultural materials.

Because they study humanity's past, archaeologists in particular have an ethical responsibility regarding cultural heritage. Unlike so many portrayals of archaeologists in movies (for example, the Indiana Jones Hollywood series) and other media, we do not search for treasures but instead (as discussed above) focus on recording all the contexts for all materials recovered from archaeological sites. In many cases, the ethical responsibilities of archaeologists include working with conservators and other specialists to help preserve sites that are damaged or deteriorating, establishing protections (such as fencing and legislation) for sites; engaging in discussions with the public about the importance, significance, and protection of cultural heritage; and working closely with native communities to ensure that their concerns are incorporated into surveys, excavations, and presentations of archaeological information from their regions.

Cultural heritage often is thought of as the record of the ancestors of particular groups of people—"our" ancestors. These groups range in size from entire nations to local indigenous (native) communities. At the scale of nations (defined by modern political boundaries), cultural heritage of the archaeological record has been used for many purposes, including tourism, national pride, and various political goals. It is not difficult to find examples of cultural heritage used for tourism—the pyramids at Giza in Egypt, Colonial Williamsburg in the United States, the Parthenon in Greece, Machu Picchu in Peru, the Great Wall of China, and Petra in Jordan.[33] These places also are instances of national pride in the achievements of one's ancestors. And, of course, there are political undercurrents in issues of national pride. The modern country of Zimbabwe, for example, takes its name from one of its greatest archaeological sites, Great Zimbabwe, and the Zimbabwe Culture (see Chapter 15). But during its British colonial period, when it was known as Southern Rhodesia, the cultural heritage of the region, including Great Zimbabwe, was wrongfully attributed to outsiders such as the Phoenicians, Arabs, and the Queen of Sheba (!). These denials of indigenous achievements were political propaganda used by those in power, although archaeological work at Great Zimbabwe in the early 1900s demonstrated that Great Zimbabwe was indigenous. It took many decades until independence was achieved (in 1980) and the cultural heritage of the region could be reclaimed and used to name a new nation.

At the scale of local indigenous communities, cultural heritage also is used to serve many goals. Sometimes these are similar to those of nations—tourism, pride in ancestry, and political. Often, indigenous communities, drawing on a wealth of oral traditions, have interpretations of their past that can differ, for a variety of reasons, from those potentially offered by "outsider" archaeologists. It is easy to see how these differences can sometimes escalate into issues, whether between indigenous communities and archaeologists or between archaeologists themselves.[34] Fortunately, the value of indigenous knowledge, including knowledge about the past, is widely recognized today, and many indigenous communities are actively engaged in archaeology to pursue research about the past[35] (read "Peopling the Past: Indigenous Archaeology"). In some cases, the long-term continuity of indigenous communities within regions and maintenance of many of their traditions means that use of the landscape, identification of special features and sacred places, methods used to extract resources, and aspects of their oral traditions help create a better interpretive bridge to the past. In the North American Southwest, for example, I excavated at a site with a special type of pithouse often interpreted as a kiva (ritual space). As we excavated the kiva, we saw that the bench was painted—dark along the lower portion but with a lighter colored upper panel. In that upper panel were a number of motifs, including a humpbacked figure holding something to its mouth (Figure 1.15). The site is in a region occupied by ancestors of the Hopi and other Puebloan peoples, and it may be that the motif represents the Hopi figure commonly known as a kokopele (see Chapter 7). Although we must be careful about assuming that today's meanings of motifs are exactly the same as those of the past, without information from Hopi oral traditions, it would be impossible to know what this motif might have meant or what its role in social traditions might have been for the people who built and lived at this site in the AD 1200s.

FIGURE 1.15
Probable kokopele images from the LA 17360 site (Ancestral Pueblo), New Mexico. Note the humpbacked complete figure on the right.

Many countries today have laws and regulations that are intended to help protect and preserve cultural heritage. In the United States, for example, there are a series of federal laws including the American Antiquities Act of 1906, the Archaeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act of 1979, and the National Historic Preservation Act of 1966 (amended in 2000), and each state has a State Historic Preservation Office that oversees compliance with federal and state laws on lands that are state or federally owned or for any project that requires a federal permit.[36] Perhaps one of the most important federal laws, however, is the 1990 Native American Graves Protection and Repatriation Act.[37] This legislation requires consultation with Native American and Native Hawaiian groups about human remains, grave

Peopling the Past

Indigenous Archaeology

The field of **indigenous archaeology** combines archaeological methods and theories with the value and knowledge sets, as well as the concerns, of indigenous communities whose ancestors built on, lived in, and used various places in the landscape.[38] Its most fundamental principles are the recognition that understanding the past is greatly enhanced when it is possible to collaborate and consult with native groups and that the sovereignty of native peoples must be respected when considering the study of cultural materials from their past. One example of this process is from North Hālawa Valley on the island of O'ahu in Hawai'i.[39] This valley contains many sites with house and agricultural terraces, as well as a few *heiau* (temples) and other ritual structures. A Native Hawaiian group, the Women of Hale o Papa, occupied one region of the valley where a *heiau* for women had been recorded. During their stay, they identified several important features near this site that had not been recognized by archaeologists. Many of these features are natural formations, but they hold special significance because of their forms, their *mana* (spirit), and their proximity to the *heiau*. This type of traditional knowledge would not be available to non-Native Hawaiians, including the many archaeologists who worked in the valley. Additionally, the Women of Hale o Papa provided an interpretation for some of the petroglyphs on a boulder near the *heiau* (Figure 1.16). The figures have triangular-shape bodies and bowed legs, which may represent a birthing position and thus a link to the women's *heiau* at the site.[40]

FIGURE 1.16
Petroglyphs of figures with triangular-shape bodies and bowed legs on a boulder near a heiau in North Hālawa Valley, O'ahu, Hawai'i. Note the necklace at the top, left as an offering.