

ARCHAEOLOGY: IT'S MORE THAN DIGGING IN THE DIRT



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CHAPTER OVERVIEW

1: Anthropology and Archaeology - An Overview

Learning Objectives

- Define anthropology and explain the holistic perspective.
- Identify, describe, and distinguish between the four sub-disciplines of anthropology.
- Characterize the anthropological approach and methods used to gather information.
- Define material culture.
- Describe the origins of archaeology.
- Compare *pothunting* to scientific excavation.

[1.1: What is Anthropology?](#)

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Image: Statue of Xochipilli. National Museum of Anthropology, Mexico City, 2011, by [gripso_banana_prune](#) Antony Stanley, under [CC BY-SA 2.0](#) via Wikimedia Commons.

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1.1: What is Anthropology?

From museums, science magazines, television shows, and even films, most of us have had some exposure to archaeology and have become familiar with some of the world's most famous archaeological discoveries. Perhaps you chose this course because you are interested in Ancient Egypt, Greece, or Stonehenge. However, have you ever met an archaeologist in person? We commonly deal with many professions we see in the media, such as doctors, lawyers, police officers, firefighters, and teachers, but rarely do we have personal contact with archaeologists. As a result, we mostly rely on stereotypes portrayed in the media to understand archaeologists and the work they do. First, archaeology is much more than digging! Archaeology is just one of the sub-disciplines of the larger field of anthropology.

AMERICAN ANTHROPOLOGY

Anthropology is the study of humankind. It studies all humans, at all times and in all places. A key distinguishing feature of American Anthropology is that it uses a four-field approach to the study of all things human (Layton & Kaul, 2006). From culture to languages to material remains and human evolution, American anthropologists examine every dimension of humanity. The four-fields approach of American Anthropology are *biological anthropology*, *linguistics*, *cultural anthropology*, and *archaeology*. When talking about American Anthropology, we can not forget the importance of Franz Boas to the development of the discipline as we know it today. Boas promoted the importance of taking a holistic approach to the study of humankind and stressed the importance of the scientific method, fieldwork, and cultural relativism. The sub-disciplines of anthropology are united into one field by a shared interest in humans and use of the scientific method, which is applied in anthropology through fieldwork and a holistic perspective.



Figure 1.1.1: The Father of American Anthropology, Franz Boas. Circa 1915.

Biological Anthropology

Biological anthropology studies humans from a biological perspective. This includes biological variation among humans both past and present as well as our closest living relatives, monkeys and apes. *Primatology* is the study of primates such as lemurs, monkeys, and apes. One of the most well-known anthropologists who studied primates is Jane Goodall. She is responsible for significant discoveries about the similarities between humans and chimpanzees such as tool-use, socializing their young, emotional lives, and strong maternal-infant bonds (Goodall, 1996).

biological anthropology

The study of human origins, evolution, and variation.

Paleoanthropologists are biological anthropologists who focus on the study of ancient humans and related-species. The field of *paleontology* is constantly changing as new discoveries are made in the fossil record and new dating techniques are developed.

Linguistics

Language is an important characteristic of culture, and linguistic anthropology examines the linguistic aspects of human cultures in greater detail. Linguistics is the study of the relationship between language, thought, and culture. Areas of specialization in the study of language include: **structural linguistics**, which is the study of patterns in sound, structure, and grammar; **historical linguistics**, the study of how language develops and changes over time; and **sociolinguistics**, the study of the social aspects of language.

linguistics

The study of the relationship between language, thought, and culture.

structural linguistics

The study of the patterns in structure, sound, and grammar. Also called descriptive linguistics.

historical linguistics

The study of how language develops and changes over time.

sociolinguistics

The study of the social aspects of language.

Cultural Anthropology

Cultural anthropology, in contrast, studies humans from a cultural perspective. **Culture** is the learned behaviors of a group of people and it includes many, many elements—the languages they speak, the foods they eat, how they build their homes, what they believe, their customs, and more. Cultural anthropology observes and documents these practices and compares the cultures of various groups. Cultural anthropologists collect data and study cultures through **participant observation**, which involves living with, observing, and asking questions of the people they study.

cultural anthropology

The study of similarities and differences among living societies and cultural groups.

culture

A set of beliefs, practices, and symbols that are learned and shared. Together, they form an all-encompassing and integrated whole that binds people together and shapes their worldview and lifeways.

participant observation

A research technique in which the anthropologist observes and participates in the events and activities of the culture being studied.

Archaeology

The field of anthropology, which is the topic of this textbook, **archaeology** also studies culture. It asks many of the same questions as cultural anthropology but uses different data. Rather than relying on observations of living participants, archaeology studies **material culture**—items people made, modified, and used in the past to understand the culture of our ancestors. Through the systematic recovery and analysis of material culture, archaeologists attempt to reconstruct, describe, and interpret human behavior and cultural patterns (Kottak, 2011).

archaeology

The study of past human behavior through the systematic recovery and analysis of material remains.

material culture

Objects produced or modified by humans such as tools, art, buildings, clothing, etc.

The Fifth Sub-discipline: Applied Anthropology

Applied anthropology is sometimes considered a fifth sub-discipline of anthropology. It involves applying theoretical elements of anthropology to real-world problems. Probably the most famous applied anthropology is forensic anthropology, popularized in television and film. Forensic anthropologists apply the principles and theory of biological anthropology to the identification of human skeletons in the context of crimes. Archaeologists who conduct surveys and excavations in the setting of construction

projects, known as Cultural Resource Management (CRM), apply the principles and theory of archaeology to this real-world setting, which is another variety of applied anthropology.

applied anthropology

The application of the anthropological data, perspectives, theory, and methods to identify, assess, and solve contemporary social problems (Kottak, 2011, p.12).

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Images

Figure 1.1.1 The Father of American Anthropology, Franz Boas. Circa 1915. Canadian Museum of History under Public Domain.

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1.2: The Anthropological Approach

THE HOLISTIC PERSPECTIVE

What sets anthropology apart from related disciplines, such as history, sociology, and psychology, is that it combines the scientific method, fieldwork, and a holistic perspective. These methods and perspectives are what define the **anthropological approach**. Anthropological analysis is built on a **holistic perspective**, which is the understanding that all of the various aspects of human biology and culture are necessarily interrelated. For example, humans' biological makeup and large brains make our complex cultures possible. For anthropologists, the holistic perspective maintains connections between the four sub-disciplines and recognizes that developments in one area affect the questions asked in other areas of anthropology just as a change in one area of culture can have an impact on other areas of culture and even the environment.

anthropological approach

A method of research using the scientific method, fieldwork, and a holistic perspective.

holistic perspective

The understanding that all of the various aspects of human biology and culture are necessarily interrelated.

Cultural Relativism

A second perspective and a guiding philosophy of modern anthropology is **cultural relativism**—the idea that we should seek to understand another person's beliefs and behaviors from the perspective of their culture rather than our own. Anthropologists do not judge other cultures based on their values and do not view other cultural ways of doing things as inferior. Instead, anthropologists seek to understand people's beliefs and behaviors within the context of the system they have for explaining things. In the field, anthropologists must temporarily suspend their own value, moral, and esthetic judgments and seek to understand and respect the values, morals, and esthetics of the other culture on their cultural terms.

cultural relativism

The idea that we should seek to understand another person's beliefs and behaviors from the perspective of their culture rather than our own.

The Scientific Method

Archaeology and biological anthropology rely on a scientific deductive approach to the analysis of the data. The **scientific method** is a process by which scientists ask questions, collect data, test hypotheses, and gain knowledge about the natural world. Its steps have been described in various ways but consistently address four basic elements: observation, hypotheses, experimentation/data collection, analysis, and conclusions. When applied, these steps are more like a cycle than a straight linear process as hypotheses can be revised after some initial data collection or experimentation, and new ideas and technologies can change the assumptions on which hypotheses were initially based. As we learn more and draw new conclusions, we develop new and different questions.

scientific method

A process by which scientists ask questions, collect data, test hypotheses, and gain knowledge about the natural world.

Scientific vs Humanistic Approaches

As you may have noticed from the discussion of the different sub-fields of anthropology, anthropologists are not unified in what they study or how they conduct research. Some sub-disciplines, like biological anthropology and archaeology, use a deductive, scientific approach. Through hypothesis testing, they collect and analyze material data (e.g. bones, tools, seeds, etc.) to answer questions about human origins and evolution. Other subdisciplines, like cultural anthropology and linguistic anthropology, use humanistic and/or inductive approaches to their collection and analysis of nonmaterial data, like observations of everyday life or language in use.

At times, tension has arisen between the scientific and humanistic subfields. For example, in 2010 some cultural anthropologists critiqued the American Anthropological Association's mission statement, which stated that the discipline's goal

was “to advance anthropology as the science that studies humankind in all its aspects.”^[1] These scholars wanted to replace the word “science” with “public understanding.” They argued that some anthropologists do not use the scientific method of inquiry; instead, they rely more on narratives and interpretations of meaning. After much debate, the word “science” remains in the mission statement and, throughout the United States, anthropology is predominantly categorized as a social science.

Note

1. See the [American Anthropological Association Statement of Purpose](#)

Fieldwork

Fieldwork is the hallmark of anthropological study and the process by which anthropologists collect data. Fieldwork collects data in “the real world”—with groups of humans and at living and archaeological sites. Some of the data is analyzed in the field as well, while other types are analyzed in laboratories, sometimes years later. For cultural anthropologists, fieldwork consists of participant observation. Typically, fieldwork in anthropology involves spending many hours with the subjects, which can be a group of people in cultural and linguistic anthropology or a troop of baboons in biological anthropology. In archaeology, fieldwork consists of observing landscapes to identify locations of past human activity and excavation.



Figure 1.2.1: Excavations near Dedurovka, Orenburg.

fieldwork

Collection of data in “the real world” from both current and past sites of human activity.

Comparative

Anthropologists of all the subfields use comparison to learn what humans have in common, how we differ, and how we change. Anthropologists ask questions like: How do chimpanzees differ from humans? How do different languages adapt to new technologies? How do countries respond differently to immigration? In cultural anthropology, we compare ideas, morals, practices, and systems within or between cultures. We might compare the roles of men and women in different societies, or contrast how different religious groups conflict within a given society. Like other disciplines that use comparative approaches, such as sociology or psychology, anthropologists make comparisons between people in a given society. Unlike these other disciplines, anthropologists also compare across societies, and between humans and other primates. In essence, anthropological comparisons span societies, cultures, time, place, and species. It is through comparison that we learn more about the range of possible responses to varying contexts and problems.

IMAGES

Figure 1.2.1 Excavations of the giant Sarmatian necropolis near the village Dedurovka, Orenburg region. 2016. By Galina Fomina under [CC BY 4.0](#) via Wikimedia Commons.

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1.3: The Origins of Archaeology

BEFORE THERE WAS AN INDIANA JONES

It seems that people have always been curious about cultures of the past. Evidence of the interest in studying the past goes back at least as far as New Kingdom Egypt (1570-1069 BC) when officials preserved monuments from the Old Kingdom (2613-2589 BC). In the 15th century, King Thutmose IV ordered the Great Sphinx of Giza, which had already nearly been buried in sand, to be excavated. A record of his work was left recorded on a stone tablet, known as the Dream Stele, that was placed between the paws of the monument (Ashmore & Sharer, 2014, p. 27). King Nabonidus of Babylon (556-539 BC) dug into the temples of his predecessors in search of objects belonging to earlier time periods and created exhibits displaying the artifacts of his Sumerian predecessors (Ashmore & Sharer, 2014, p. 27). These early examples illustrate three characteristics of contemporary anthropology: *excavating ancient remains, recording the work, and preserving the finds.*



Figure 1.3.1: Great Sphinx of Giza with the Dream Stele.



Figure 1.3.2: Nabonidus, king of Babylonia; slab in the British Museum.

The Renaissance and Antiquarians

The roots of archaeology lie in the works of individuals who, like King Thutmose IV and Nabonidus, were interested in the people and cultures of their past. In the early European Renaissance (14th to 17th centuries), curiosity about past civilizations increased and wealthy individuals began to travel to collect art and other objects from ancient times, referred to as **antiquities**. Those individuals became known as **antiquarians** (Ashmore & Sharer, 2014, p. 26). They not only collected what could easily be found, but they would dig as well. These excavations began to take on some elements of scientific study as people who were specifically interested in the past were seeking to learn more about past cultures and peoples, but the scientific method was not employed.

Definition: antiquarians

A nonprofessional who collects antiquities and/or studies the past for its artistic or cultural value.

Definition: antiquities

Relics or monuments of ancient times.

Such early projects included excavations in 1709 at the ancient Roman town of Herculaneum, which had been covered by volcanic ash during the eruption of Mount Vesuvius in 79 AD (Fagan, 2006, p. 5). The same event that destroyed Pompeii. In 1738, the king of Italy, Charles III, commissioned the excavation of the site. Unfortunately, this endeavor was largely a glorified treasure hunt and the artifacts that were collected were not analyzed.



Figure 1.3.3: Ancient Roman Herculaneum, Campania, Italy.

While early excavation methods may not have followed today's scientific standards, some antiquarians attempted to study, classify, and interpret the material remains that were found (Ashmore & Sharer, 2014, p. 27). In 1587, William Camden compiled a work, *Britannia*, of all the archaeological sites and artifacts that were known in England at the time. John Aubrey and William Stukely both did pioneering work in trying to interpret the purposes of the now-famous Avebury and Stonehenge stone circles (Ashmore & Sharer, 2014, p. 27). While their interpretations may be speculative, it demonstrates another future goal of archaeology, *understanding the past*.

Pothunting and Looting

Not all those who collected artifacts had scholarly motives. What today would be called *pothunting* or *looting*—digging up items for their value rather than as part of a scientific endeavor—was a widespread and accepted practice used for thousands of years to acquire antiques and relics for personal collections or financial gain. Unfortunately, many of the early excavations can be considered equivalent to treasure hunting. As a result, much of Europe's pre-historic past is a "jumble of stone and metal tools and clay vessels" (Fagan, 2006, p. 6). When an artifact is removed from the context of the site, it is difficult for archaeologists to learn anything about the culture that produced it.

Looting was not a new practice. Tomb raiding was common and a serious problem for the Early Egyptians. Although builders tried to construct the tombs in a way that would prevent **looters** from gaining access to the riches and treasures buried with pharaohs and their families, they were unsuccessful. While we may be familiar with the pyramids of Giza, nothing was left of the people who were laid to rest in them...not their treasures, nor their bodies (Mark, 2017). Looting continues to be a major problem today.



Figure 1.3.4: Looting pits on the Yasin Tepe Ancient mound, Iraq.



Figure 1.3.5: Left: A looter's pit at the ancient Sumerian city of Kish, Iraq
Right: Fragments of pottery are scattered near the pit.

Definition: looters

Individuals who plunder archaeological sites to find artifacts of commercial value.

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Images

Figure 1.3.1 Great Sphinx of Giza with the Dream Stele. (2009). By Chanel Wheeler under [CC BY-SA 2.0](#) via Wikimedia Commons.

Figure 1.3.2 Nabonidus, king of Babylonia; slab in the British Museum (n.d.). By British Museum under [CC BY 3.0](#) via Wikimedia Commons.

Figure 1.3.3 Ancient Roman Herculaneum, Campania, Italy. (2006). By Pierre Andre Leclercq under [CC BY-SA 4.0](#) via Wikimedia Commons.

Figure 1.3.4 The upper surface of Yasin Tepe ancient mound. Innumerable looters' pits can be seen. Shahrizor Plain, Sulaymaniyah Governorate, Iraqi Kurdistan. (2016). By Osama Shukir Muhammed Amin FRCP(Glasg) under [CC BY-SA 4.0](#) via Wikimedia Commons.

Figure 1.3.5 A looter's pit (left) at the ancient Sumerian city of Kish, Iraq and Fragments of pottery (right) are scattered near the pit. (unknown date).

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1.4: Chapter One Review

Test your knowledge

1. What are the four sub-disciplines of anthropology and how do they relate to the holistic nature of the field?
2. How are cultural anthropology and archaeology similar? How are they different?
3. How do anthropologists collect data?
4. Apply what you have learned about anthropologists to answer the following question. How can anthropologists use or be informed by the scientific method since most anthropologists do not generally conduct “traditional” experiments?

GLOSSARY

- **antiquarians** A nonprofessional who collects antiquities and/or studies the past for its artistic or cultural value.
- **antiquities** Relics or monuments of ancient times.
- **anthropology** The study of humankind.
- **anthropological approach** A method of research using the scientific method, fieldwork, and a holistic perspective.
- **applied anthropology** The application of the anthropological data, perspectives, theory, and methods to identify, assess, and solve contemporary social problems
- **archaeology** The study of past human behavior through the systematic recovery and analysis of material remains.
- **biological anthropology** The study of human origins, evolution, and variation.
- **cultural anthropology** The study of similarities and differences among living societies and cultural groups.
- **cultural relativism** The idea that we should seek to understand another person’s beliefs and behaviors from the perspective of their culture rather than our own.
- **culture** A set of beliefs, practices, and symbols that are learned and shared. Together, they form an all-encompassing and integrated whole that binds people together and shapes their worldview and lifeways.
- **fieldwork** Collection of data in “the real world” in both current and past sites of human activity.
- **historical linguistics** The study of how language changes over time.
- **holistic perspective** The understanding that all of the various aspects of human biology and culture are necessarily interrelated.
- **linguistic anthropology** The study of the relationship between language, thought, and culture.
- **looter** An individual who plunders archaeological sites to find artifacts of commercial value.
- **material culture** Objects produced or modified by humans such as tools, art, buildings, clothing, etc.
- **participant observation** A research technique in which the anthropologist observes and participates in the events and activities of the culture being studied.
- **scientific method** A process by which scientists ask questions, collect data, test hypotheses, and gain knowledge about the natural world.
- **sociolinguistics** The study of the social aspects of language.
- **structural linguistics** The study of the patterns in structure, sound, and grammar. Also called descriptive linguistics.

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CHAPTER OVERVIEW

2: Early Archaeology (Before the 1960s)

Learning Objectives

- Explain the Three Age System of classification of the prehistoric past.
- Explain the approach of Unilineal Cultural Evolution and what led to the rejection of this paradigm.
- Explain the approach of the classificatory-historical paradigm.
- Compare and contrast the two approaches of Unilineal Cultural Evolution and the classificatory-historical paradigm.

[2.1: Archaeology in Europe](#)

[2.2: Archaeology in North America](#)

[2.3: Chapter Two Review](#)

Image: Stonehenge. (1645). By Blaeu, J. under Public Domain via Wikimedia Commons.

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2.1: Archaeology in Europe

THE SEARCH FOR PREHISTORY IN EUROPE

The early excavators sometimes attributed the stone tools they would find to mythological creatures, such as elves, and not to humans. These conclusions were largely a result of limited frames of reference and perspectives that guided their research. During this early period of archaeology, researchers and the general public in Western Europe and the United States believed that the Bible was a literal, historical document. Consequently, they understood that humans did not exist before Biblical times, which restricted human history to approximately 4,000 years at that time. Anything discovered that appeared to be incongruent with this strict interpretation of the Bible, such as “primitive-looking” stone tools and structures, was attributed to non-human sources.

However, in 1656, the British prehistorian and antiquarian, Sir William Dugdale, in his work, the *Antiquities of Warwickshire*, identified stone tools as “weapons used by the Britons before the art of making arms of brass or iron was known” (Ashmore & Sharer, 2014, p. 29). Although originally met with skepticism and ignored, the scientific community of the day eventually accepted that these stone tools were evidence of human activity in **prehistory**, the span of time before recorded history in written form.



Figure 2.1.1: Sir William Dugdale

prehistory

The span of time before recorded history in written form.

Three Age System

Once it was accepted that early stone tools were made by humans, early archaeologists looked for a way to classify and date the past. A breakthrough came when the Danish antiquarian/archaeologist, Christian J. Thomsen, grouped artifacts that were found near in proximity to each other into three chronological categories (Fagan, 2006, p. 7). *Stone Age* included stone tools with little to no metal, the *Bronze Age* included stone and bronze tools, and finally, the *Iron Age*, which included iron tools. The work of Jens Jacob Warsaae provided further support for Thomsen's theory. His excavations of burial mounds, **middens**, and other sites revealed that Stone Age artifacts were deposited in a sequence: stone artifacts at the bottom oldest level, followed by bronze artifacts in the middle level, and iron artifacts in the top youngest level (Fagan, 2006, p.7). This historical **model** of dating artifacts, based on tool technology, became known as the **three-age system** (see Figure 2.1.2).

model

A theoretical scheme constructed to understand a specific set of data or phenomena (Ashmore & Sharer, 2016, p. 282).

midden

An accumulation of debris and refuse from human activity.

three-age system

A model of categorizing artifacts in the Old World into three historical time periods based on the materials used in tool production: Stone Age, Bronze Age, and Iron Age.

As research continued, the timeline and sequence of the three-age system became more detailed. In 1865, Sir John Lubbock, distinguished the skills used in producing stone tools and defined them as the Old Stone Age and New Stone Age. Eventually, the Stone Age was divided into Old Stone Age, or **Paleolithic Period** (2.5 mya to 10,000 BC), comprised of stone tools that were chipped to form edges and points (Ashmore & Sharer, 2016, p.35). The Middle Stone Age, or **Mesolithic Period** (10,000 BC to 8,000 BC), in which the tools were still chipped and flaked stone but also composite tools, such as bows and arrows as well as the use of ceramics in art objects. Finally, the New Stone Age, or **Neolithic Period** (8,000 BC to 3,000 BC), is when humans began to transition to the cultivation of plants and animals as well as the use of ground or polished stone tools. Likewise, the Bronze Age could be divided into two periods: the Copper Age, in which tools were made of copper, and the Bronze Age, when copper and tin were mixed to produce bronze metal works.



Figure 2.1.2: The Three-Age System

Cultural Evolution

The three-age system contributed to the development of early anthropological theory about culture. Continued research and data from geologists, biologists, and botanists provided evidence that humans had existed far longer than had been interpreted from the Bible. Scientists were challenging literal Biblical translations and were drawing new conclusions, culminating in Charles Darwin's work on evolution via natural selection, which described how species had changed over time. This became established as part of the realm of science and general public knowledge. Darwin's work fundamentally changed the study of biology and human history. Researchers tried applying his premises to other fields, including the study of human civilizations. Herbert Spencer, E.B. Tylor, and William Henry Morgan independently applied Darwin's principles to the study of civilizations across the globe, developing approaches that collectively became known as the theory of **Unilineal Cultural Evolution**, sometimes referred to *Progressive Social Evolutionary Theory* (PSET), in which human civilizations were seen as points on a continuum and as having progressed in a linear fashion along this continuum from savagery to barbarism and, ultimately, to enlightened, civilized society (see Figure 2.1.3). It was assumed that all cultures originated as primitive societies and were in the process of becoming more civilized—more evolved. These theorists placed cultures along the continuum using particular diagnostic characteristics that included the adoption of agriculture, the development of a writing system, tool technologies that relied on metallurgy, and belief systems focused on a single god. Proceeding along the continuum (toward civilization) indicated the level of progress a culture had achieved.

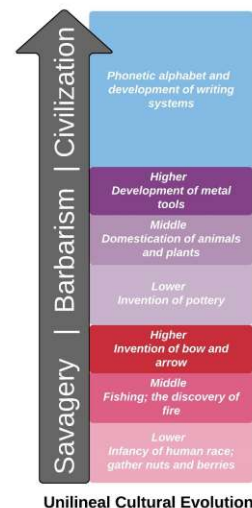


Figure 2.1.3: Unilineal Cultural Evolution

Perhaps it is not surprising that the traits of a "civilized" society essentially described the Western European culture of the theorists and developments made possible by the environmental conditions in those areas. Metallurgy, for example, was possible because Western Europe was endowed with many natural ores. However, the data they collected in other geographic regions of the world did not always fit the model. They labeled many early cultures such as the Maya, Aztecs, Incas, and North American tribes as having "devolved"—moved backward on the continuum—because they found evidence that those cultures had possessed "civilized" traits at one time but no longer did.

Unilineal Cultural Evolution

The belief that cultures moved through various stages (savagery, barbarism, and civilization) of development according to different levels of rational knowledge resulting in a culture that resembled Western European society. Sometimes referred to as Progressive Social Evolutionary Theory (PSET).

Unilineal Cultural Evolution has long been abandoned for its flawed concept of progress and biased view of culture and society. However, the three-age system remains a primary method in placing prehistoric artifacts into a chronological timeline in Europe, the Middle East, and some parts of Asia.

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Images

Figure 2.1.1 William Dugdale by Wenceslas Holler. (1665). Under Public Domain via Wikimedia Commons.

Figure 2.1.2 The Three Age System. (2021). By Crystal Scheib under [CC BY-NC-SA 4.0](#).

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2.2: Archaeology in North America

THE SEARCH FOR PREHISTORY IN THE AMERICAS

The three-age system worked well in places in which early peoples used all three materials over time to make various tools. However, in other parts of the world, such as Africa and the Americas, people did not use those tool technologies in the same sequence, and some didn't use one or more of the technologies at all. Many historians and researchers at the time chose simply to ignore this problem and even forced the data to fit the theory.

Early Excavations in the United States

Third president of the United States. Lawyer. Architect. Founder of the University of Virginia. These are just some of the titles associated with Thomas Jefferson. However, he could also be known as the first American archaeologist as well. Thomas Jefferson, archaeologist? Thomas Jefferson was familiar with the various *barrows* (burials covered with mounds of earth or stone) that were in the region around his home and he had heard many different theories about their purpose. In order to satisfy his curiosity, he organized an excavation of one site near his property. He became the first American to undertake a systematic investigation and archaeological study of a site (Hantman). He also used a technique that would not be introduced in archaeology until around 100 years later. He studied the strata (layers) in the mound. We do not know what Jefferson did with any artifacts or remains that he found in the mound and there are no field notes. However, he did write about the dig in *Notes on the State of Virginia* in 1785.

Thomas Jefferson, Archaeologist

Thomas Jefferson's Notes from the Excavation in *Notes on the State of Virginia*

The mound was "of spheroidal form, of about 40 feet diameter at the base, and had been of about twelve feet altitude ... I first dug superficially in several parts of it, and came to collections of human bones, at different depths, from six inches to three feet below the surface. These were lying in the utmost confusion, some vertical, some oblique, some horizontal, and directed to every point of the compass, entangled, and held together in clusters by the earth. ... to give the idea of bones emptied promiscuously from a bag or basket, and covered over with earth, without any attention to their order" (Jefferson & Peden, 1955).

Jefferson continued by making "a perpendicular cut through the body of the barrow, that I might examine its internal structure. This passed about three feet from its center, was opened to the former surface of the earth, and was wide enough for a man to walk through and examine its sides" (Jefferson & Peden, 1955). There were several strata of bones. Those nearest the top of the mound were the least decayed and Jefferson "conjectured that in this barrow might have been a thousand skeletons" (Jefferson & Peden, 1955). Some of the stories suggested that the mounds were cemeteries for the dead that had died in a battle. "There was no evidence of violence to the bones such as holes made from bullets or arrows. The latter finding argued against the view that the remains in the mounds were of warriors killed in battle; nor did Jefferson find that the bodies had been placed upright as others had speculated based on local Indian lore" (Zechmeister, 2010).



Figure 2.2.1: Thomas Jefferson, 1800.

Read More about Thomas Jefferson's Excavation

[The Jefferson Monticello: Jefferson's Excavation of an Indian Burial Mound](#)

[Encyclopedia Virginia: Jefferson's Mound Archaeological Site](#)

Enter Franz Boas

The problems associated with the three-age system and cultural unilineal evolution (PSET) were not addressed by North American researchers until Franz Boas, now known as the Father of American Anthropology, rejected theorizing from incomplete data sets and developed what is known as the *classificatory-historical paradigm*, or what is also known as **Historical Particularism**. Boas demanded that anthropology be conducted in a scientific manner. Therefore, theories could be developed only after precisely collecting, classifying, and analyzing artifacts. He argued that too little was known about the diversity of human cultures—past and present—and that unilineal evolution had been formulated too early and was based on too little actual evidence. Boas and his students established, rather than applying a particular explanatory theory, the collection of data as the fundamental task of

anthropology, marking the point at which archaeology became a fully scientific endeavor. This new paradigm recognized that observation must be the first step to inform the scientific method since it allows one to formulate relevant questions to pursue in subsequent steps. Theory does not start the process of scientific inquiry but rather is developed from extensive study of the natural world. Boas and his successors realized that the anthropological technique of ethnography, which involved careful observation of living peoples and their cultures, could be applied to cultures of the past through archaeology.

Historical Particularism

The perspective that each society has its own unique historical development and must be understood based on its own specific cultural and environmental context, especially its historical process (Franz Boas and His Students). **Also known as classificatory-historical paradigm.**

Boas also realized that little time was left to study traditional Native American cultures before colonization, genocide, and realization of America's ideals of Manifest Destiny destroyed many of them. The effects of these processes were already underway. Native American populations were rapidly declining in number, being forcibly moved from their ancestral lands, and experiencing massive cultural upheaval. This motivated Boas and others to focus on Native American cultures and to collect every conceivable type of anthropological data and artifact—a true holistic study.

Their extensive research and data collection identified broad adaptive patterns shared by various cultures in regions such as the Plains, Southwest, California, and Northeast. The cultural traits of the groups in these regions were not identical but they were broadly similar. In California, for example, pottery was common, and most groups hunted and gathered their food rather than cultivating crops. In some cases, the regions were further subdivided when broad patterns warranted it. The Great Basin in the Southwest, for example, was subdivided into three cultural groups—the Paiute, Shoshone, and Ute. Though **culture areas** sometimes involve overlaps and do not describe the various cultures perfectly, they are still used today to help archaeologists better understand and compare Native American cultures and ways of life.

culture areas

Geographic regions based on ethnographically defined cultural similarities (Ashmore & Sharer, 2014, p. 14).

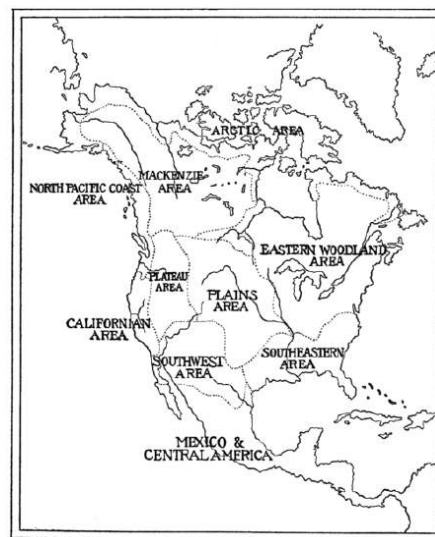


Figure 2.2.2: Culture Areas in North America. 1913.

Within the classificatory-historical paradigm, archaeologists worked with data from these cultural areas to develop chronologies and spatial orderings of artifacts, a **culture history**, specific to each region. A culture history approach to archaeology assuming that artifacts can be used to develop a general understanding and interpretation of human culture in time and space (Fagan, 2006, P. 63). For example, W.C. McKern developed the *Midwestern Taxonomic System*, an artifact sequence for cultural sites in the Midwest. These chronological works were important since, at the time, there were few methods for dating artifacts and, consequently, the archaeological sites from which they came.

culture history

The approach to archaeology assuming artifacts can be used to build a generalized picture of human culture and descriptive models in time and space, and that these can be interpreted (Fagan, 2006).

Midwestern Taxonomic System

In 1932, W.C. McKern and other Midwestern archaeologists developed a system to classify the large volume of artifact collections that were found in regions where stratified sites were somewhat uncommon (Fagan, 2015). By grouping artifacts into *assemblages*, *components*, *foci*, *aspects* the artifacts would be placed into *patterns* (see Figure 2.2.3).

McKern and his colleagues identified three different patterns:

- **Archaic** - lacked pottery but included ground slate artifacts
- **Woodland** - semi-sedentary sites with cord-marked pottery and stemmed or side-notched projectile points
- **Mississippian** - sedentary settlements with incised pottery and small triangular stone points.

The Midwestern Taxonomy System has been mostly abandoned in contemporary American archaeology; however, the distinction between the Woodland and Mississippian cultural traditions is still recognized today (Yerks, 1988).

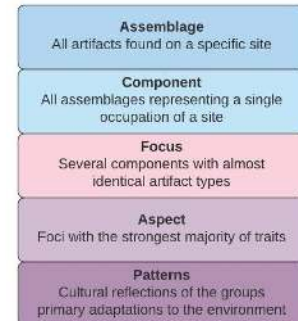


Figure 2.2.3: Midwestern Taxonomic System



Figure 2.2.4: Dendrochronology

The ability to date artifacts and archaeological sites expanded beginning in the 1920s with studies of tree rings, **dendrochronology**, and was greatly enhanced in the late 1940s with the development of radiocarbon dating techniques, which shifted the focus of archaeology. Collecting data was still critically important, but archaeologists were no longer limited to identifying an artifact's period based solely on the layer in which it was deposited. These new dating techniques allowed archaeologists to obtain relatively exact dates from items such as wooden artifacts and could use those dates to establish the sequence of their development.

dendrochronology

The study of tree-ring growth patterns, which are linked to develop a continuous chronological sequence (Ashmore & Sharer, 2014).

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Images

Figure 2.2.1 Thomas Jefferson. 1800. By Rembrandt Peale under Public Domain via Wikimedia Commons

Figure 2.2.2 Left: Culture Areas in North America. 1913. By Popular Science Monthly Volume 82 under Public Domain via Wikimedia Commons.

Figure 2.2.3 Midwestern Taxonomy System

Figure 2.2.4 Dendrochronology sample. (2004). By Stefan Küh under [CC BY 3.0](#) via Wikimedia Commons.

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2.3: Chapter Two Review

Test Your Knowledge

- What is the three-age system and why can it not be applied to all cultures?
- How did Unilineal Cultural Evolution explain the evolution of cultures?
- What is the primary focus of the classificatory-historical paradigm (Historical Particularism)?
- What contributions of the classificatory-historical paradigm are still used by archaeologists today?

GLOSSARY

Cultural Unilineal Evolution The belief that cultures moved through various stages (savagery, barbarism, and civilization) of development according to different levels of rational knowledge resulting in a culture that resembled Western European society. **Also known as Progressive Social Evolutionary Theory (PSET).**

culture areas Geographic regions based on ethnographically defined cultural similarities.

culture history The approach to archaeology assuming artifacts can be used to build a generalized picture of human culture and descriptive models in time and space, and that these can be interpreted (Fagan, 2006).

dendrochronology The study of tree-ring growth patterns, which are linked to develop a continuous chronological sequence (Ashmore & Sharer, 2014).

Historical Particularism The perspective that each society has its own unique historical development and must be understood based on its own specific cultural and environmental context, especially its historical process (Franz Boas and His Students). **Also known as classificatory-historical paradigm.**

Mesolithic Period The period of time in prehistory in which humans transitioned from group hunting large animals to a hunting gathering lifestyle. The use of composite flaked and chipped tools such as bow and arrows.

midden An accumulation of debris and refuse from human activity.

model A theoretical scheme constructed to understand a specific set of data or phenomena.

Neolithic Period The period of time in prehistory in which humans transitioned to a more sedentary lifestyle and began cultivating plants, domesticating animals, and using ground and polished stone tools.

Paleolithic Period The period of time in prehistory in which humans developed chipped and flaked stone tools.

prehistory The span of time before recorded history in written form.

three-age system A model of categorizing artifacts in the Old World into three historical time periods based on the materials used in tool production: Stone Age, Bronze Age, and Iron Age.

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CHAPTER OVERVIEW

3: Contemporary Archaeology (1960s and Beyond)

Learning Objectives

- Explain what processual archaeologists thought was lacking from the classificatory-historical approach.
- Describe the integration of ethnographic techniques with archaeology.
- Explain the multiple approaches to analysis that arose from processual archaeology.
- Describe the basic principles of post-processual archaeology.
- Explain the goals of contemporary archaeology.

[3.1: Evolution of Archaeology](#)

[3.2: Archaeology Today](#)

[3.3: Chapter Three Review](#)

Image: Archaeological Excavations at a prehistoric American Indian site in North-central Oregon (USA). 1977. By John Atherton under [CC BY-SA](#) via flickr.

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3.1: Evolution of Archaeology

THE NEW ARCHAEOLOGY

Prior to the 1960s, the pendulum of archaeological research had swung from one extreme to the other, at least in the United States. Early work in archaeology had viewed archaeological data through an evolutionary lens and tried to fit the three-age system that worked so well in Europe to data from North America. However, anthropologists such as Franz Boas began to realize that the three-age system and PSET did not fit the cultures of North America in general and Native American archaeology in particular. In response, they developed the classificatory-historical paradigm for archaeological research, which emphasized gathering data and conducting research over applying established theories. This new paradigm worked well and provided archaeologists with vast amounts of comparative data, but it was somewhat limiting since gathering data and analyzing artifacts did not give archaeologists the opportunity to explore broader human behavioral patterns.

PROCESSUAL ARCHAEOLOGY

Frustrated by the limits of the classificatory-historical paradigm, archaeologists began to introduce a third paradigm, **processual archaeology**, in the 1960s. They wanted to examine human behavior more broadly rather than just recover artifacts. In other words, they wanted to further understand the changes by looking at the *how* and *why* the changes took place. So the primary idea underlying processual archaeology is that artifacts and data can be used to explain the past, not just describe it. At the same time, new technologies such as computing and absolute dating techniques were providing researchers with new kinds of data and analytical capabilities that simply did not exist before.

processual archaeology

An approach to archaeology that uses deductive research and the scientific method to analyze the conditions of cultural change. The emphasis is on applying both descriptive and explanatory models using ecological and materialist views of culture (Ashmore & Sharer, 2014; Fagan, 2006). Sometimes called the **cultural process approach**.

Middle Range Theory

Since the focus of processual archaeology was on theoretical interpretations of data, several theoretical approaches developed over time that made explicit the connection between the specifics of archaeological data and the broad theoretical applications. **Middle range theory (MRT)**, for example, was based on the idea that linking archaeological data to theories is a matter of linking artifacts made by people to the behaviors that created the artifacts. American archaeologist Kent Flannery advocated the use of **systems theory**, which was designed to help researchers see the complex whole as a series of smaller subsystems that could be pulled apart and analyzed independently along with the whole. Ultimately, these theories were deemed to be unnecessarily complicated and unworkable with actual data. Once again, broad theoretical applications were found to be suitable only in some situations and to be too broad to have general scientific value.

Middle-range theory

An approach to integrating theory and empirical research that attempts to apply theories to the archaeological record by linking material remains to the human behavior that created them.

systems theory

The notion that any organism or organization can be studied by breaking it down into many interacting systems or parts (Fagan, 2006).

Ethnoarchaeology

Lewis Binford, an American archaeologist who is often cited as the father of processual archaeology, advocated for the importance of theory using a new technique, **ethnoarchaeology**, which applies ethnographic techniques used by cultural anthropologists when comparing living peoples to the archaeological record. This approach relies on **ethnographic analogy**, or interpreting the archaeological record based on similarities observed in ethnographically described cultures. Binford, for example, accompanied Inuit hunters and studied the debris they left behind at hunting stands. He then used that contemporary data to predict what Inuit hunting stands of the past would have looked like and to interpret hunting artifacts found in Inuit excavations. On the other hand, it

may also bring to light some challenges for the archaeologist as in the case of the piece of broken ceramic below (see Figure 3.2.1). Archaeologists can learn a lot about a ceramic pot and how it was used in past cultures by examining the residues left inside. However, if the pot or part of the pot is used for a different purpose than its intended use the residue contents can be misleading. This is the case for the broken pottery seen in a Senegal village. The broken pot is being used as a watering bowl for chickens. This is a very simple example of how studying living societies can inform the process of interpreting past cultures, even if it is to reveal that residue analysis could be skewed by the "re-purposing" of an artifact.



Figure 3.1.1: Ceramic Ethnoarchaeology.

ethnoarchaeology

An approach to archaeological study that uses *ethnographic analogy* to understand and interpret the archaeological record through observing contemporary peoples.

ethnographic analogy

Interpreting past cultures based on similarities observed in ethnographically described living cultures and societies.

Experimental Archaeology

Experimental archaeology is an attempt to understand the archaeological record through recreating or reconstructing tools, structures, or events found in the past. This is a primary way of gaining information about the archaeological record that would be impossible just by examining an artifact such as the wear on a stone tool used to carve a dugout canoe. Experimental archaeology is one approach that helps archaeologists bridge the gap between the past and the present.

experimental archaeology

Carefully controlled modern experiments to replicate past conditions and/or events to provide data that can be used to aid in the interpretation of the archaeological record.

EVOLUTIONARY ECOLOGY

Processual archaeology was not scrapped despite failing to meet many of its lofty goals. Quite the opposite; it is still actively used today. Processual archaeology's lasting contribution is its use of data and scientific methods to support theoretical applications and analysis, and some of the theoretical approaches proposed, such as predictive human behavioral models, continue to be used in *evolutionary ecology* to predict and interpret past human behavior. These models, common in economic analyses, use data to identify optimal human behavioral patterns: which food items to include in their diets, patches in which to forage, how far to travel to hunt, etc. The resulting description of optimal behavior does not necessarily reflect what past humans did but does predict the choices humans would have made if they could rationally optimize their choices. Surprisingly, some of the most interesting results occur when the model predictions do not match the archaeological data. For example, California archaeologists have used this approach to understand why acorns, which were a time-intensive, low-calorie food source, were widely used by many of California's Native American groups. Those groups were not acting "optimally," but the sheer abundance of acorns combined with declines in "more optimal" food sources made acorns a practical "best" solution.

The most common optimal behavior models used in archaeology today are *diet breadth* (also called *prey choice*), which predicts what humans should have included in their diets in given areas based on how long it would have taken to find a food item and prepare it for consumption relative to the food's caloric return; *patch choice*, which evaluates how productive a given environment would have been and predicts how long a group would have stayed in one area before moving on; and *central place foraging*, which predicts how much of an animal would have been brought back to the group's home base given the distance to that base (the longer the distance, the less animal brought back).

POST-PROCESSUAL ARCHAEOLOGY

Many archaeologists viewed processual archaeology as having a limited value. In the late 1970s and in the midst of the feminist and postmodern movements in other disciplines, archaeologists began formulating a new approach called **post-processual**

archaeology. This paradigm stressed the potential for multiple interpretations of the archaeological record and recognized that every interpretation is affected to some degree by researchers' biases. Its proponents argued that something as complex as human behavior could not be investigated by testing hypotheses. Instead, their goal was to obtain as broad a perspective of the past as possible by interpreting the data from various vantage points and trying to see the artifacts and data from an "insider's" perspective (emic). The post-processual paradigm also placed a greater emphasis on obtaining information about a culture's religion, symbolism, world view, and iconography from the archaeological record. Post-processual archaeology brought a stronger focus on the role of women, children, and minorities in the past because it encouraged archaeologists to analyze data that previously would have been ignored.

Post-processual archaeology

An approach to interpreting the archaeological record with a focus on reconstructing the point of view of past peoples and an emphasis on the social factors in their society (Ashmore & Sharer, 2014; Fagan, 2006).

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Images

Figure 3.1.1 Ceramic ethnoarchaeology in West Africa -- another view. (1982). By John Atherton under [CC BY-SA](#) via Flickr.

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3.2: Archaeology Today

THE GOALS OF ARCHAEOLOGY

Today, both processual and post-processual paradigms are used in archaeology. This is a unique situation since, in the past, new paradigms replaced old ones. These two paradigms are quite different and, typically, college and university archaeology faculty rely on only one of the paradigms. It is rare for a faculty to be composed of researchers who use different paradigms. The same data can be analyzed from each of these vastly different perspectives to bring distinct interpretations to the data. However, both approaches contribute to meeting archaeology's one overarching goal: *managing, conserving, and preserving the material remains of the past for future generations* (Fagan, 2006).

Whether it is through looting, construction, or a systematic excavation, once a site is disturbed, the archaeological record in its original context is gone forever. The act of excavating a site is actually a destructive process. However, when a site must be disturbed, a systematic excavation with detailed records of what was found and where it was found is the beginning of understanding and reconstructing the history of the people and helps to document and preserve the knowledge learned for future generations. In archaeological research, there are three primary goals: 1) constructing the culture history (form), 2) reconstructing past lifeways (function), and 3) interpreting and explaining culture change. Each of the three primary goals helps archaeologists achieve their overarching goal, to preserve the archaeological record (Fagan, 2006).

Primary Goals of Archaeology

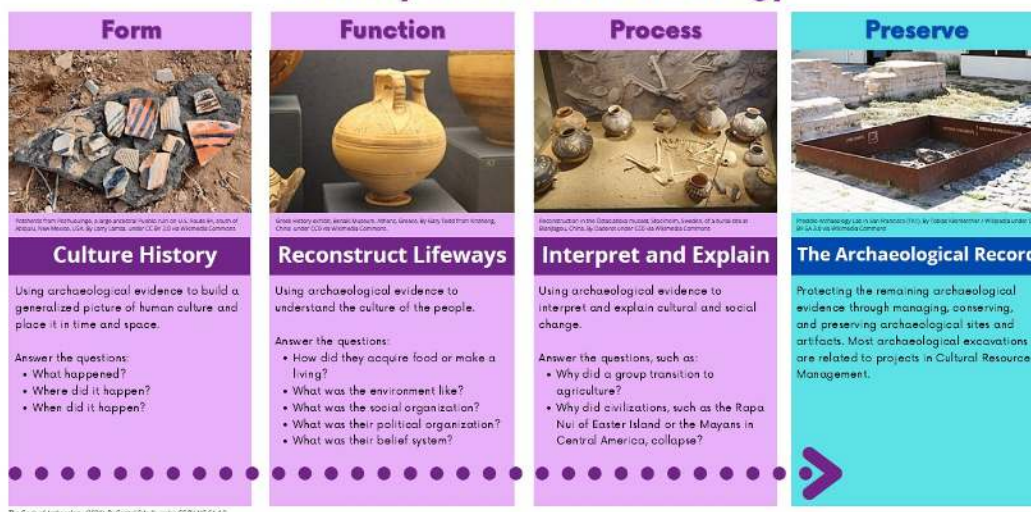


Figure 3.2.1: Primary Goals of Archaeology.

Constructing Culture History

As we learned in Chapter 2, culture history is the approach to archaeology that assumes artifacts can be used to build a generalized picture of human culture and descriptive models in time and space (Fagan, 2006). The first goal of archaeology is to build a culture history through classifying material culture and archaeological sites in the context of time and space. In other words, it looks to answer the questions: what happened, where did it happen, and when did it happen? Through detailed descriptions and classification of sites and artifacts, a chronology is developed. The archaeological site can be placed in a timeline based on the sequences of artifacts identified, such as pottery style and stone tool technology.

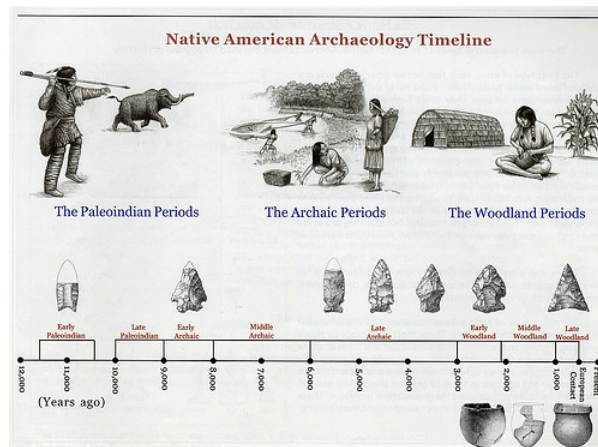


Figure 3.2.2: Through sequencing pottery and stone tools, archaeologists construct a culture history that is used to date archaeological sites.

Reconstruct Past Lifeways

The second goal of archaeology is to reconstruct the life of the people who lived in the past. The archaeologist moves beyond asking what, where, and when a site was inhabited to asking, "Who lived here and how did they live?". Material culture can help us identify when people inhabited a site, but it does not tell us about the people who created that material culture. How did the people make a living? What did they believe? How did they interact with each other? Archaeologists use artifacts to reconstruct ancient **lifeways**. Lifeways can be broken into four broad categories: **subsistence**, environmental modeling, human interaction, and social organization/religious beliefs (Fagan, 2006).

lifeways

The activities of human life including subsistence, human interaction, social organization, religious beliefs, and the environment they live in (Fagan, 2006).

subsistence

How people make their living or acquire food.

Subsistence

Using archaeological evidence found at a site, such as animal bones, seeds and nuts or the presence of pottery or grains can all help archaeologists determine how the people were acquiring food. For example, a storage pit and a grinding stone were found on a site, this is evidence that the people were growing and processing grains. On the other hand, if the site lacks any signs of pottery and no grains are found, this could be evidence that the group relied on hunting and gathering for their subsistence.



Figure 3.2.3: Archaeologists study subsistence activities through the material culture such as tools, pottery, seeds, grains, and animal bones. Different modes of subsistence will produce distinguishing artifacts and features in the archaeological record.

Environmental Modeling

Subsistence and the environment are interrelated. Therefore, in studying the people's subsistence activities, archaeologists also attempt to reconstruct the environment in which they lived and how it influenced their behavior.

Human Interaction

Another aspect of past societies that archaeologists study is the ways in which the people interacted. Archaeological sites and artifacts can provide clues on other features of culture such as gender roles, status and rank among the people, how goods were distributed or traded between groups, and family organization.

Social Organization and Religious Beliefs

As discussed in Chapter 1, culture is the beliefs, practices, and symbols that are learned and shared in a society. While this is a challenging task and we may never fully understand the culture of the prehistoric peoples, archaeologists attempt to learn about the social organization and religious belief systems of past societies. Through studying the material culture (i.e. artifacts, art, architecture, burial practices, and grave goods, etc.) can give us clues about the intangible culture (i.e. beliefs and behavior).



Figure 3.2.4: Studying the art and architecture of past societies can give us a glimpse into their cultural practices and religious beliefs.

Image 1: These prehistoric rock paintings, found in in Manda Guéli Cave in the Ennedi Mountains, Chad, Central Africa, camels have been painted over earlier images of cattle, perhaps reflecting climatic changes.

Image 2: This clay model from Kamilari, Greece, dated to about 1500-1450 BCE, depicts a two-columned *stoa* (roofed colonnade), a wall with windows, and four figures seated on low seats in the interior. Two smaller standing figures holding vessels are giving offerings on alters.

Image 3: A Mesoamerican *pok-ta-tok* goal from a Mayan ball court in Uxmal, Mexico.

Image 4: Depiction of a ballplayer on a Mayan ballgame marker exhibited at Museo Nacional de Antropología e Historia, México.

Interpret and Explain Cultural and Social Change

The third goal of archaeology takes the research even further by attempting to answer the question, "Why?" Specifically, archaeologists study the process of cultural and social change over time and look for explanations for those changes. This is perhaps the most challenging of the aspects of archaeology. Why did a population move from foraging to horticulture or horticulture to agriculture? Why did complex, urban civilizations develop? Why did some civilizations collapse? Rather than just describing the culture, archaeologists seek to explain events using global comparisons and scientific methods.

PRESERVING THE ARCHAEOLOGICAL RECORD

As mentioned earlier in this section, the overarching goal of archaeology is managing, conserving, and preserving the archaeological evidence of past societies. The three primary goals all work together to achieve this final objective. Today, most archaeological excavations are devoted to managing and preserving the surviving archaeological sites and artifacts that are in danger of being destroyed by present-day construction and infrastructure projects such as highways and pipelines. Cultural Resource Management (CRM), which is discussed in a later chapter, is now the predominant paradigm. If a site is unable to be preserved, archaeologist will conduct an excavation to collect artifacts, document the site, and learn as much as they can before the site is destroyed as a result of modern development.

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Images

Figure 3.2.1 The Goals of Archaeology. (2021). By Crystal Scheib under [CC BY-NC-SA 4.0](#).

Figure 3.2.2 [Archaeology Timeline](#). (2007). By placevm under [CC BY-NC-SA 2.0](#) via flicker.

Figure 3.2.3 Bayaka people in the Dzanga Sangha Ndoki reserve. Central African Republic rainforest. (2014). By JMGRACIA100 under [CC BY-SA 4.0](#) via Wikimedia Commons.

Figure 3.2.4 Image 1: These prehistoric rock paintings are in Manda Guéli Cave in the Ennedi Mountains, Chad, Central Africa. Camels have been painted over earlier images of cattle, perhaps reflecting climatic changes. (2015). By David Stanley from Nanaimo, Canada, [CC BY 2.0](#) via Wikimedia Commons.

Figure 3.2.4 Image 2: Clay model of a two-columned *stoa* (roofed colonnade) and a wall with windows. Four figures are shown seated on low seats in the interior and receiving offerings on altars, made by two smaller standing figures holding vessels. The most likely interpretation is that the model depicts an ancestor-cult scene relating to those buried inside the tomb. Kamilari, 1500-1450 BC. By Zde under [CC BY-SA 4.0](#) via Wikimedia Commons.

Figure 3.2.4 Image 3: View from inside a *poc-ta-tok* field, Mexico. By Sebastien Paquet from Moncton, New Brunswick, Canada, under [CC BY 2.0](#) via Wikimedia Commons.

Figure 3.2.4 Image 4: Maya ballgame marker exhibited at Museo Nacional de Antropología e Historia, México. (2010.) By Maunus under [CC BY-SA 3.0](#) via Wikimedia Commons.

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3.3: Chapter Three Review

Test Your Knowledge

1. What motivated the development of processual archaeology?
2. How does ethnoarchaeology incorporate ethnographic research into archaeology?
3. What aspects of processual archaeology led to the development of post-processual archaeology?
4. Which theory discussed so far appeals most to you and why?
5. What are the three primary goals of archaeology?
6. What is the overarching goal of contemporary archaeology?

Terms You Should Know

ethnoarchaeology An approach to archaeological study that uses *ethnographic analogy* to understand and interpret the archaeological record through observing contemporary peoples.

ethnographic analogy Interpreting past cultures based on similarities observed in ethnographically described living cultures and societies.

experimental archaeology Carefully controlled modern experiments to replicate past conditions and/or events to provide data that can be used to aid in the interpretation of the archaeological record.

lifeways The activities of human life including subsistence, human interaction, social organization, religious beliefs, and the environment they live in.

Middle-range theory (MRT) An approach to integrating theory and empirical research that attempts to apply theories to the archaeological record by linking material remains to the human behavior that created them.

post-processual archaeology An approach to interpreting the archaeological record with a focus on reconstructing the point of view of past peoples and an emphasis on the social factors in their society

processual archaeology An approach to archaeology that uses deductive research and the scientific method to analyze the conditions of cultural change. The emphasis is on applying both descriptive and explanatory models using ecological and materialist views of culture (Ashmore & Sharer, 2014; Fagan, 2006). Sometimes called the **cultural process approach**.

subsistence How people make their living or acquire food.

systems theory The notion that any organism or organization can be studied by breaking it down into many interacting systems or parts.

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CHAPTER OVERVIEW

4: The Archaeological Record

Learning Objectives

- Describe the types of data archaeologists use.
- Explain the significance of context to archaeological interpretation.
- Characterize the different types of sites studied by archaeologists.
- Identify the significance of the different processes that affect sites after deposition.

[4.1: Evidence of Past Human Activity](#)

[4.2: Context and Deposition](#)

[4.3: Chapter Four Review](#)

Image: "Meadowcroft Rockshelter revealed [North America's](#) earliest known evidence of [human](#) presence and the [New World's](#) longest sequence of human occupation. All of eastern North America's major cultural stages appear in its remarkably complete archaeological record." By Jbarta under [CC0](#) via Wikimedia Commons.

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4.1: Evidence of Past Human Activity

THE ARCHAEOLOGICAL RECORD

As mentioned in Chapter 3, the overarching goal of archaeology is to preserve the archaeological record. What is the archaeological record? We tend to think of archaeologists as primarily studying **artifacts**, objects made, used, or modified by humans. However, archaeologists are interested in anything that is evidence of past human activity. This evidence can be a farmer's dwelling, a campsite, a cache of stone tools, a burial site, a scatter of flint flakes, or an ancient city. Just as anthropology studies "all things human", archaeology studies all things related to past human activity. Combined, the material remains of past human activity, such as the locations, artifacts, food remains, and refuse is the **archaeological record**.

archaeological record

The material remains of past human activity, which includes sites, artifacts, food remains, and refuse.

Archaeological Data

As defined in Chapter One, archaeology is the study of past human behavior through the systematic recovery and analysis of material remains. Through excavation and detailed recording, archaeologist recover the data from the ground. There are different forms of archaeological data, including *sites*, *artifacts*, *ecofacts*, and *features*. Together, all of these pieces of evidence observed at and collected from an archeological site make up an **assemblage**.

assemblage

All the artifacts and data collected from an archaeological site.

Sites

Archaeological **sites** are any place where there is evidence of human activity. The evidence of human activity does not necessarily mean that the location was occupied for extended periods of time. However, they are reflections of human behavior and activities. The number of artifacts needed to qualify a location as a site varies based on the context, excavation funding as well as state or federal agency criteria. At the most basic level, they can be broken down into two types: open sites and natural shelter sites. An **open-air site** is one that had no protection from the elements while **natural shelter sites** such as caves and rock overhangs provide protection from the elements. A *cave* is technically defined as an opening in a cliff or rock face that is deeper than it is wide, setting it apart from a **rock shelter**, which is typically a shallow rock overhang or cliff. Site type provides important information for archaeologists. It indicates the likely function of the site and allows archaeologists to predict the types of artifacts and ecofacts likely to be uncovered. An open site, for example, will rarely contain well-preserved perishable artifacts or features because of damage from wind, rain, heat, and cold. Caves, on other hand, are excellent places to find preserved perishable items such as wooden artifacts and basketry.



Figure 4.1.1: Open-air Site
Pueblo Bonito, Chaco Canyon, New Mexico.



Figure 4.1.2: Rockshelter
Smith Rock Shelter, McKinney Falls State Park, Texas.
In use from around 500 BCE until the 18th century.

site

A spacial cluster of archaeological evidence of human activity such as objects, features, and ecofacts.

open-air site

A site that has no protection from the elements.

natural shelter sites

A site that has natural protection from the elements such as caves and rock overhangs.

rock shelter

A shallow rock overhang or cliff. A type of *natural shelter site*.

Function

Archaeologists also pay attention to the potential functions of a site—how the site was used by humans. Naturally, an important function of many sites is *habitation*; artifacts are concentrated where people lived for more than a few days or weeks. Sites of short-term habitation such as encampments typically offer few archaeological remains simply because of the short time humans were there. Sites where food was acquired and, in particular, processed are important parts of the archaeological record. They include **processing sites** where humans prepared plants and animals for consumption, such as *animal kill sites* and *butchering sites*; *storage sites* where items such as grains were kept for long periods of time; *hunting blinds and traps* humans used to catch and kill animals; and *agricultural sites* where humans cultivated crops for food and other uses. *Cemeteries* also yield important information about a people, even without exhuming the bodies.

habitation sites

Sites where people lived for more than a few days or weeks with evidence of domestic activity, such as food preparation.

processing sites

Sites where humans prepared plants or animals for consumption, such as *animal kill sites* and *butchering sites*.

Manufacturing

Archaeologists are interested in many other types of sites as well, including *quarries* where humans harvested stones for tools and building and **lithic scatters** (sometimes at quarries) where they made and repaired stone tools, which could include **debitage**. Finally, more recent excavations dealing with historic archaeology have focused on travel routes such as historic and prehistoric *trails* identified by shallow linear depressions over the ground and rock faces. *Industrial and commercial sites* are also an important part of historic archaeology and have a profound impact on our understating of economies of the past.

lithic scatter

A scatter of stone artifacts and debris.

debitage

The material produced as a product of lithic reduction in process of making stone tools.

Art

Other sites provide information about human cultures and uses of symbolism, such as *rock art sites* at which humans painted *pictographs*, carved or etched *petroglyphs*, and scraped rocks and the soil to make *geoglyphs*.



Figure 4.1.3: Rock Art Sites

Image 1: Prehistory *pictographs* found in Seminole Canyon State Park and Historic Site, Texas.

Image 2: Fremont culture *petroglyphs* found in Dinosaur National Monument, Utah.

Image 3: Aerial view of the "Spider". One of the many Nazca Lines *geoglyphs* in Peru's Nazca Desert.

Artifacts

As previously discussed, **artifacts** are objects that were used, modified, or made by people. They are also defined as portable and could have been carried by humans from place to place. Common examples of archaeological artifacts are projectile points (arrowheads), ceramic pots, baskets, nails, and glass bottles. Of course, there is a natural preference for complete artifacts since many objects at sites were discarded and were broken before being found, entering the archaeological record because they were thrown in the trash. As a discipline, however, archaeology must analyze all types of artifacts to get the most complete picture of human occupation and behavior. It is also easy to miss single-use artifacts such as a rock used to pound a tent stake in place because no one packed a hammer or mallet. Archaeologists spend much of their time thinking about and analyzing artifacts because the items were made or used by humans and correlate directly to human behavior. Thus, many features of artifacts can be analyzed, such as the material from which they were made, their artistic or functional style, and their design. Archaeologists also create **typologies**, which provide a way to understand how an artifact such as a pot changed over time in shape, form, and use. Typologies also provide useful estimates of the period in which the artifacts were made.

artifacts

Portable objects made, used, or modified by humans.

typology

Classification of objects according to their physical characteristics such as shape, form, and use.

Ecofacts

Besides artifacts, archaeological sites provide **ecofacts**, which are the organic and environmental remains such as animal bones, plant remains, and soils that occur at archaeological sites but were not made, modified, or used by humans. Ecofacts can reveal much about human behavior. For example, plant and animal remains can allow archaeologists to reconstruct the environment when humans lived there, effectively telling researchers what types of plants or animals would have been available for humans to use. Another type of object found at sites is a **manuport**, which is an object brought to the site by humans but not modified by them. For example, an unusual stone material known for its excellent heating properties could be found in a hearth or fire pit.

ecofacts

An object not modified by humans but brought to the site by past human activity, including both organic and inorganic materials.

manuport

An object brought to the site by humans but not modified by them.

Features

A **feature** is an artifact such as a hearth, storage pit, midden (trash pile), house, or other structure that is not portable. Features cannot be removed from the site without damaging, altering, or destroying them. Features usually define an area where past activities or events have taken place. For example, in Figure 4.1.4 below shows several different features uncovered during a 2017

excavation of a Native American Farmstead in the Chattahoochee-Oconee National Forest. The most notable feature is a hearth, designated as feature #30 in the photograph). To the top and right of the hearth, there are slight discolorations of the soil, which indicate post-holes (designated by features #17, #18, and #31). These features are produced by past human domestic activities. Finally, along the top of the image, there is another area of discolored ground with what appears to be charcoal. This feature indicates a past event. This dwelling had burned around 1600 CE and this feature is what remains of the collapsed roof of the building. During a second excavation of this same site, another hearth or fire pit was uncovered. Further investigation led to the discovery that the site had been occupied 200 years earlier with the later dwelling being built on top of the earlier dwelling. For more information about the excavations, you can visit the [Chattahoochee-Oconee National Forest website](#).

feature

A non-portable human-made material remains such as a fire pit, hearth, storage pit, house, or structure that cannot be moved from the site.



Figure 4.1.4: Features can help tell the story of past activities and events that took place at a site. For more images from Chattahoochee_Oconee National Forest archaeological investigations, you can visit their [Archaeology & Heritage photo gallery](#).

Images

Figure 4.1.1 Pueblo Bonito, Chaco Canyon, New Mexico. (2007). By James Q. Jacobs under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 4.1.2 The Smith Rock Shelter located in McKinney Falls State Park, Texas, United States. (2006). By Larry D. Moore under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 4.1.3 Image 1: Seminole Canyon State Park and Historic Site, Texas. Native American wall engravings inside one of the prehistoric caves, thought to be thousands of years old. By Zereschk under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 4.1.3 Image 2: McKee Springs Petroglyph. (2019). By Robert Shea under [CC BY-NC 2.0](#) via flickr.

Image 4.1.3 Image 3: Aerial view of the "Spider", one of the most popular [geoglyphs](#) of the [Nazca Lines](#), which are located in the [Nazca Desert](#) in southern [Peru](#). (2015). By Diego Delso under [CC BY-SA 4.0](#) via Wikimedia Commons.

Figure 4.1.4 2017 American Indian Farmstead Archaeology Investigation IMG_4770. By ChattOconeeNF under [CC BY 2.0](#) via flickr.

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4.2: Context and Deposition

CONTEXT

We tend to think of archaeologists as primarily studying artifacts but there is much more to archaeological investigations. Archaeologists are not solely interested in the "things" of the past but are most concerned with the **context** or how an artifact or other type of archaeological find was found in relation to everything else at the archaeological site. Each feature and artifact found on a site has a relationship in time and space to the other features and artifacts at the same site. The **primary context** is the undisturbed, original position of a find. In other words, the find is found in the spot that it was placed by the last person who was using it. A **secondary context** is when the find has been disturbed by later human or natural activity such as a burial mound being used for a later burial at the same spot and disturbing the first burial. Natural disturbance of a site could occur through floods, tree roots, animal activity, earthquakes, or flooding. In order to evaluate the context of archaeological data, archaeologists must record the *provenience*, *association*, and *matrix* of the find.

Investigations at American Indian Farmstead and Context



Figure 4.2.1: 2017 Excavations at the American Indian Farmstead site in the Chattahoochee-Oconee National Forest.

The 2017 excavations at the American Indian Farmstead site in the Chattahoochee-Oconee National Forest is an example of how context helps archaeologist understand the archaeological record. The description below explains how features discovered at the same site were identified as two separate occupations separated by 200 years.

"Previous excavations ([www.fs.usda.gov/detail/conf/news-events/...](http://www.fs.usda.gov/detail/conf/news-events/)) determined a house burned at the location around A.D. 1600. Evidence for this house consists of a prepared clay hearth, the remains of posts, and a large mass of fired clay that would have been a mud-plastered wall that baked in a fire. Large amounts of charcoal from burned wall supports and roof timbers were also present.

In 2017, investigators uncovered more of the house and discovered the remains of additional wall posts and a second hearth, or fire pit. This seemed strange, as having hearths in two different parts of the house would have been quite unusual. Radiocarbon dating of charcoal from the hearth revealed that the answer to this unusual appearance was that the hearth dated at least 200 years earlier (A.D.1355) than the burned wall. This discovery reveals that this site was occupied twice by Late Mississippian people, with two different houses superimposed on top of one another."

From the image description by ChattOconeeNF. (2017) Retrieved from <https://www.flickr.com/photos/chatto...7648930293454/>

context

The position of an archaeological find in relation to other finds on the site, including its associations, provenience, and matrix as well as what has happened to it since it was buried or placed on the ground.

primary context

The undisturbed position of a find after original deposition.

secondary context

The position of an archaeological find that has been partially or wholly disturbed after its original deposition by human or natural activity.

Provenience

Provenience is recording the exact three-dimensional location of the find. Horizontal location is usually measured relative to a geographical grid system. Vertical location is recorded as an elevation above or below sea level. The provenience provides information for the association and context as well as allows for later reconstruction of the site.

provenience

The location, horizontally and vertically, that the archaeological find was positioned on the site. Sometimes referred to *provenance*.

Association

Association is the relationship of an archaeological find with the other artifacts found around it. It is based on the principle that an artifact is contemporary with other artifacts and features found near it...the same matrix. The artifacts found in a burial have an association with the human bones found in that same burial. As result, the artifacts can give archaeologists insight into the person's gender, status, occupation, and, ultimately, the culture of the time.

association

The relationship and position of an archaeological find to other artifacts and features that are in the same archaeological level at the site.

Matrix

The **matrix** is the natural materials such as sediments surrounding that the artifact, ecofacts, and features. The soils, sands, gravel, or rock that are surrounding the object or feature can provide important information. Artifacts found in alluvial sediments, clay or silt deposited by rushing streams, could indicate that this it is not in the original place of deposit, but rather has been carried there by the water. This of course will affect the context of the find.

matrix

The natural materials, such as sediments, surrounding and enclosing the archaeological find in place.



Figure 4.2.2: Archaeologists do not just dig holes. They carefully excavate in a grid pattern so they can record the provenience, association, and matrix of each artifact and feature in order to evaluate the context of the finds.

When a site is looted or excavated by amateurs, the context of the artifact is lost even if the artifact is left behind. Excavation strips the site of much of its most important information, components that tell a fuller story of the object and the site, leaving behind an item with no story left to tell. Ideally, items found during an excavation are left *in situ*, which is Latin for “still,” meaning they are

in their original place of deposition. This is why archaeologists tell you to leave any item you find, especially on public land, untouched no matter how tempting it is to pick it up, look at it, and put it in your pocket to show your friends!

in situ

When an archaeological find is left in the original place that it was found.

DEPOSITION

As previously mentioned, context at a site is critical to a full understanding of the archaeological data. Archaeologists need to understand the types of artifacts and sites they encounter. There are two phases that data undergo as they become archaeological remains. The first is the behavioral process, which is how remains can enter the archaeological record, and the transformational process, which is what happens to remains after they are deposited by humans.

Behavioral Process

Artifacts, ecofacts, and features are all the result of either deliberate or accidental human activity. This is known as the **behavioral process**, sometimes referred to as *cultural formation process*. Obviously, not all human behavior and practices produce archaeological evidence, however, many activities do. Those activities that produce material remains fit into four stages: *acquisition, manufacture, use, and deposition*. The stone material used in tool making is first gathered (acquisition), then fashioned into a tool (manufactured), used for hunting, and then either lost or discarded when broken (deposition). Likewise, food is gathered or hunted, prepared, eaten, and then the waste is discarded. All archaeological data is the result of the behavioral process and follow this same pattern, whether it is a single artifact, an ecofact, a feature, a structure, or a site.

behavioral process

Human activities and behavior, including acquisition, manufacture, use, and deposition, that provide tangible archaeological remains (Ashmore & Sharer, 2014). Sometimes referred to as *cultural formation process*.

Transformational Process

Natural events, such as wind storms, floods, volcanic eruptions, organic decay, and even the effects of plant roots and animal burrowing, are known as **transformational processes**. Sometimes referred to as *natural formation processes*, these are the events and conditions that affect the material remains after it has been deposited until it has been found or uncovered. Human activity such as plowing and looting are a transformational process as well. When archaeologists understand what forces and events could have had an impact on the position of archaeological remains, they are better equipped to answer questions about whether marks on a bone came from animal gnawing or are signs of early human tool use and whether a collection of artifacts was deposited haphazardly or was affected by a mudslide. For organic remains, archaeologists look to the field of **taphonomy**, the study of what happens to organic remains (plant and animal) and the process of fossilization.

transformational process

Conditions and events that affect archaeological data from the time of deposition to the time of recovery. Sometimes referred to *natural formation process*.

taphonomy

The study of what happens to organic remains (plant and animal) and the process of fossilization.

Turbation

One very interesting type of transformational process is **turbation** in which objects are mixed together. There are many ways for the archaeological record to get mixed up. Examples include roots of plants and trees pushing artifacts away from their original positions called *floralturbation*. Burrowing animals can push artifacts up or down in the ground, known as *faunalturbation*. Climate can cause *cryoturbation* in areas where the ground goes through freeze/thaw cycles or *agrilliturbation* where wet/dry cycles in clay soils affect the position of archaeological remains. At various points during these cycles, the soil swells and deposited objects rise with the soil. When the soil shrinks, objects are pushed downward. Of course, gravity can also have an

impact, especially on objects in wet substrates, and can easily move archaeological materials down a slope, away from their original place of deposition, which is known as *graviturbation*.

turbation

Mixing of soils or sediments.

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Images

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4.3: Chapter Four Review

Test Your Knowledge

1. Explain why you shouldn't pick up an artifact you come across in nature.
2. What are the differences between an artifact, an ecofact, and a feature?
3. Give an example of a transformational process and a behavioral process.
4. Explain the role turbation can have in moving an artifact from its *in situ* location. Give an example.

Terms You Should Know

archaeological record The material remains of past human activity, which includes sites, artifacts, food remains, and refuse, which form the database with which to study the human past.

artifacts Portable objects made, used, or modified by humans.

assemblage All the artifacts and data collected from an archaeological site.

association The relationship and position of an archaeological find to other artifacts and features that are in the same archaeological level at the site.

behavioral process Human activities and behavior, including acquisition, manufacture, use, and deposition, that provide tangible archaeological remains. Sometimes referred to as *cultural formation process*.

context The position of an archaeological find in relation to other finds on the site, including its associations, provenience, and matrix as well as what has happened to it since it was buried or placed on the ground.

debitage The material produced as a product of lithic reduction in process of making stone tools.

ecofact An object not modified by humans but brought to the site by past human activity, including both organic and inorganic materials.

feature A non-portable human-made material remains such as a fire pit, hearth, storage pit, house, or structure that cannot be moved from the site.

geoglyph A large drawing scraped into the ground or soil.

habitation sites Sites where people lived for more than a few days or weeks with evidence of domestic activity, such as food preparation.

in situ When an archaeological find is left in the original place that it was found.

lithic scatter A scatter of stone artifacts and debris.

matrix The natural materials such as sediments surrounding and enclosing the object in place

manuport An object brought to the site by humans but not modified by them.

natural shelter site A site that has natural protection from the elements such as caves and rock overhangs.

open-air site A site that has no protection from the elements.

petroglyph A drawing etched or carved into stone.

pictograph A painting on stone.

primary context The undisturbed position of a find after original deposition.

processing sites Sites where humans prepared plants or animals for consumption, such as *animal kill sites* and *butchering sites*.

provenience The location, horizontally and vertically, that the archaeological find was positioned on the site. Sometimes referred to as *provenience*.

quarry A site where stones were harvested for tools and building.

rock shelter A shallow rock overhang or cliff. A type of *natural shelter site*.

secondary context The position of an archaeological find that has been partially or wholly disturbed after its original deposition by human or natural activity.

site A spacial cluster of archaeological evidence of human activity such as objects, features, and ecofacts.

taphonomy The study of what happens to organic remains (plant and animal) and the process of fossilization.

transformational process Conditions and events that affect archaeological data from the time of deposition to the time of recovery. Sometimes referred to *natural formation process*.

turbation Mixing of soils or sediments.

typology Classification of objects according to their physical characteristics such as shape, form, and use.

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CHAPTER OVERVIEW

5: Artifact Preservation

Learning Objectives

- List the three categories of agents of deterioration and give examples.
- Articulate the three conditions needed for decomposition.
- Discuss what happens when the conditions needed for decomposition are not present in an archaeological site.
- Compare and contrast the preservation capabilities of various artifact types.
- Discuss the impact of the matrix surrounding the item and climate types on the preservation of archaeological sites.

[5.1: Deterioration and Decomposition](#)

[5.2: Preservation](#)

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Image: The upper part of bog body [Windeby I](#) a 16 year old boy on display at Archäologisches Landesmuseum [Gottorf Castle](#), Schleswig Germany. C14 dated between 41 and 118 AD. (2010). By Bullenwächter under [CC BY-SA 3.0](#) via Wikimedia Commons.

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5.1: Deterioration and Decomposition

DETERIORATION

Most artifacts related to the earliest known humans are made of stone or clay. The oldest stone artifacts found are at least 2 million years old. In contrast, some of the oldest organic remains found are woven Fort-Rock-type sandals from Elephant Mountain Cave in southwestern Oregon that date to approximately 10,000 years ago. That is quite a difference! Why are some artifacts preserved so much longer than others? It depends on the material of the artifact and the environment in which the object was deposited when it first entered the archaeological record. If the conditions are right, an artifact's preservation may be extended such as in the case of human remains and artifacts found in peat bogs and ice patches.

Whether the artifact is made of stone, metal, or an organic material such as wood, they are all subject to deterioration. The agents of deterioration can be grouped into three categories: *chemical*, *physical*, and *biological* (Fagan, 2006). While all three types of deterioration will cause damage to an artifact, it is the biological agents that can cause the most harm to organic materials. This is why there are very few organic artifacts that have been recovered from prehistory.

Agents of Deterioration

Chemical		Physical		Biological	
Water and Oxygen	Corrosion on metals	Water movement	Fracture and wear of artifacts; erosion	Bacteria	Start the process of decay
Acidic soils	Dissolve bones	Cycles of wet and dry or freezing and thawing	Causes wood to crack and rot; causes stone and concrete to crack	Insects	Infestations of organic materials in the process of decomposition
Sunlight	Irradiation of materials	Rainwater	Erosion of artifacts and walls	Fungi	Destructive to wood and plant matter (especially in warm, damp climates)
Saline soils	Retards decay in organic material Severe reactions with copper, iron, and silver	Natural events such as earthquakes and volcanoes	Damage and move artifacts; changes the landscape of the site	Animals such as dogs, hyenas, and rodents.	Scavenge bones and other organic matter from abandoned sites

CONDITIONS OF DECOMPOSITION

Organic remains including skeletal, animal, plant, and textiles, all suffer from decomposition, and their survival depends largely on the material surrounding them, called the *matrix*, and on the climate. In terms of the matrix, chalk tends to preserve bones quite well because it acts as a desiccant (drying agent), removing all of the moisture from objects within it. Acidic soils, on the other hand, tend to destroy bones and wooden artifacts quite quickly. Other conditions of the matrix that can slow down decomposition and promote preservation include natural salt and oil pools that kill bacteria. A famous example in California is the La Brea Tar Pits located in central Los Angeles. This naturally occurring asphalt pool has preserved more than 35 million specimens of plants and animals from the last 50,000 years!



Figure 5.1.1: Tar Bubbles at the La Brea Tar Pits in Los Angeles, California



Figure 5.1.2: Tar pits preserve animal and plant remains.

Although stone can crack and weather, it is inherently more durable compared to organic materials used for basketry, textiles, and tools. Artifacts made of wood, papyrus, and bone, for example, are perishable and prone to rapid decomposition (rot and decay), making them difficult to recover. Decomposition occurs when organisms such as molds and bacteria inhabit and often consume organic material. Three conditions are required for microorganisms to survive: *warmth, moisture, and oxygen*. Without all of these conditions present, the environment is sterile and decomposition will not occur, greatly increasing the potential for organic artifacts to be preserved. Therefore, a **sterile environment** that is free from microorganisms provides the best conditions for the preservation of a wide variety of archaeological remains.

sterile environment

An environment free from microorganisms.

La Brea Tar Pits

Today, we use asphalt for things like paving roads and parking lots, but humans have been using asphalt for up to 40,000 years, which is supported by evidence such as bitumen-coated flint implements from the Mousterian period (Harris, 2015). However, asphalt is not only used for tools and highways, tar pits create the conditions for the preservation of the organic remains of prehistoric life. After the animals were trapped in the tar pits, the skin and flesh decomposed. However, the bones would quickly sink into the asphalt's oxygen-deprived environment where they began the fossilization process. The asphalt was absorbed into the bones and created the fossils we find today. The world's best-known deposit of asphaltic **fossils** is located in Los Angeles, California, at the La Brea Tar Pits. The tar pits are naturally occurring deposits of asphalt (or bitumen), which have been preserving the remains of trapped animals for thousands of years, including the bones of a young woman dating to about 9,000 BC.

fossils

The preserved remains or traces of remains of ancient humans, animals, and plants.

The tar pits at La Brea were used by both Native Americans and European settlers. They were aware that animals would get trapped and die in the pits, but it was in 1875 that they discovered that the pits contained the fossilized remains of prehistoric times as well (Harris, 2015; La Brea Tar pits History). However, systematic recovery of the fossils did not occur until the early 20th century. At first, they focused on fossils of the *megafauna* (large mammals of the region), but by 1969 they began to study and collect the remains of smaller animals and *flora* (plants of the region) (Harris, 2015; La Brea Tar pits History). Since 1906, over a million bones have been recovered from the tar pits with 231 species of vertebrates, 159 species of plants, and 234 species of invertebrates (La Brea Tar Pits and Hancock Park).

Visit their website to learn more about [La Brea Tar Pits](#).

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Figure 5.1.1 Tar Bubbles at the La Brea Tar Pits. (2004). By Daniel Schwen under [CC BY-SA 2.5](#) via Wikimedia Commons.

Figure 5.1.2 Lake Pit with Life-size models of mammoths with one entrapped in the tar. (2008). By Jerrye and Roy Klotz MD under [CC BY-SA 3.0](#) via Wikimedia Commons.

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5.2: Preservation

CLIMATE

It is not only the conditions present in the matrix, but climate affects the preservation of organic remains as well by dictating how much oxygen, warmth, and moisture are present. Caves are natural conservatories. Their chambers are protected from the elements and the soils and water inside them are often alkaline, which prevents the growth of bacteria, thus protecting whatever is inside them, including footprints! Tropical environments like those found in the Yucatan peninsula where the Maya lived, on the other hand, are typically highly destructive because of their heavy rains, acidic soils, warm temperatures, high humidity, erosion from weather, and abundant plant, animal, and insect activity. Additionally, the overgrowth common in jungles can quickly overwhelm sites, hiding them from outsiders (a good thing for overall preservation since it makes the sites hard for looters to find). The Temple of the Inscriptions at Palenque in Mexico (Figure 5.2.1), for example, was once brightly painted, but because of rain, humidity, and heat, the paint on the temple is no more. Temperate climates like those found in North America and Europe also are poor conditions for preservation because they are relatively warm but go through seasonal changes in temperature and moisture. One surprisingly good environment for preserving organic artifacts comes from natural disasters. The volcanic eruption of Mt. Vesuvius rapidly covered Pompeii, Greece in ash, and a violent wind storm at Skara Brae in Scotland (Figure 5.2.2) completely covered the site in sand. Both sites were exquisitely preserved. Rapid burial of sites through flooding, storms, and volcanic eruptions have preserved many of the world's most impressive archaeological sites.



Figure 5.2.1: Temple of Inscriptions, Palenque, Mexico



Figure 5.2.2: Skara Brae, Scotland

NONORGANIC MATERIALS

The materials from which archaeological remains were made also affect their preservation, or lack of it. Objects made of stone, clay, and metal are commonly found at archaeological sites. They are the most commonly preserved materials because they are inorganic and do not decompose, though they can weather, a process in which wind and water erode and wear away their surfaces. Stone tools dating back more than 2.5 million years have been found in archaeological sites and many are so well preserved that microscopic wear analysis can determine how the stones were used and even the dominant hand of the toolmaker. Baked clay and pottery can also survive most conditions as long as the items were adequately fired. However, highly acidic soils can damage the surfaces of baked clay items, and objects that were poorly fired or made from porous clay can become quite fragile in humid conditions. Metallic objects made with gold, silver, and lead can survive quite well, but objects made with copper, bronze, and other soft metals usually oxidize (rust) and can completely disintegrate, leaving only a green stain where they once rested. Underwater, metals at sites such as shipwrecks are preserved by the naturally occurring metallic salt in seawater that accumulates on their surfaces. In fact, these salts actually permeate metal objects, and it can be quite laborious to remove the encrustations.

CONDITIONS FOR PRESERVATION

King Tutankhamun's tomb is an excellent example of prime conditions for the preservation of material remains. First, his tomb remained undisturbed from 1323 BC until it was opened in 1922 by Howard Carter and his team. Although Carter believed there was some evidence that thieves had entered the tomb in antiquity (Treasures Removed from Luxor Tomb), the young pharaoh's tomb is known for the treasures, artwork, clothing, chariots, and multiple other artifacts that were buried with him. Second, the tomb had been sealed for over 3200 years keeping the conditions favorable for the preservation of the organic artifacts inside.



Figure 5.2.3: Howard Carter (kneeling), an Egyptian workman, and Arthur Callender at doors of burial shrines in Pharaoh Tutankhamun's tomb. (1922).



Figure 5.2.4: Tutankhamun receives flowers from Ankhesenamun. Image on the lid of a box found in King Tutankhamun's tomb.

Lack of Warmth

Extremely cold environments such as glaciers and year-round snowpack also provide optimal conditions for preservation. A bittersweet benefit of climate change is that many archaeological sites are being uncovered by the thawing of glaciers around the world. Examples of finds from such **ice patch archaeology** include *atlatl* (spear thrower) darts, baskets, clothing, and arrows still coated in paint and decorated with feathers. Other things that have been preserved in cold conditions include entire bodies of animals such as mammoths and even humans (Ötzi the ice man is perhaps the most famous example) that were frozen soon after their deaths and left unchanged until being recently uncovered.



Figure 5.2.5: Leather shoe discovered in an ancient snowdrift. Dated between 1420 to 1260 BCE.

ice patch

Accumulations of snow and ice at high elevations that do not completely melt during summer.

ice patch archaeology

Archaeological research that identifies and documents artifacts and organic materials left behind as the ice patches melt.

Another amazing ice discovery was made in 1993 on the Ukok Plateau of southern Siberia. Russian archaeologist, Natalya Polosmak excavated a burial chamber containing an ice-filled log coffin. After thawing the coffin, she found it contained the body

of a young woman along with an elaborate headdress, clothing made of wool and silk, a wood-handled mirror, and colorful tattoos. Near the site, they also discovered six horses that appear to have been buried in order to accompany her to the afterlife. You can learn about "The Ice Maiden", as she has become known, by watching the Nova documentary [Ice Mummies: Siberian Ice Maiden](#).

Lack of Oxygen

Oxygen is necessary for the microorganisms that cause decay to survive and reproduce so remains that were enveloped in sealed, airless environments—typically waterlogged conditions such as bogs—can be remarkably well-preserved. Bogs commonly produce oxygen-deprived **anaerobic** conditions. Examples of items that archaeologists have recovered from bogs include carts, wooden roads, and even ships such as ones from the 1800s and 1900s found in areas that were formerly part of San Francisco's waterfront. One exceptional find is the nearly 50 "bog bodies" discovered at sites around the world, including the Windover bog body from Florida (researchers were able to identify his last meal) and Tollund Man from Denmark. These human remains are remarkably well-preserved thanks to conditions in the bogs. Their skin is darkened but is preserved, as are many internal organs, while their bones typically are not preserved.

anaerobic

Absence of oxygen.



Figure 5.2.6: The upper part of bog body discovered in Windeby, Germany.

Lack of Moisture

The extremely dry conditions typically found in deserts allow for the preservation of textiles, basketry, and other woven items. Entire Navajo *hogans* (homes) have been preserved in the American Southwest. Likewise, the dry conditions preserved the twine sandals, shown in Figure 5.2.7, which were worn by the Anasazi who lived in the cliff dwellings of Mesa Verde National Park in Colorado during the 12th century AD. Perhaps most remarkable is the natural mummification of bodies in places such as Egypt and Peru. Preservation can be so complete that Egyptian mummies retain their fingernails and hair and Incan mummies still have visible tattoos on their skin and retain the woven textiles in which their bodies were wrapped after death. However, it is not only mummies but other artifacts as well, as in the case of the Moche Lords of Sipán (Figure 5.2.8). The dry environment preserved their sepulchers, ceremonial regalia, jewelry, and scenes on pottery that provided information about the individuals' status in the culture.



Figure 5.2.7: Twine sandals from the 12th century AD.



Figure 5.2.8: Reconstruction of the tomb of the Lord of Sipán in Huaca Rajada, Peru.

PRESERVATION AFTER RECOVERY

The problem with artifacts recovered from these three types of conditions is that artifacts remain well-preserved only as long as they're kept in the conditions that allowed for their preservation. Once ancient wood is removed from waterlogged conditions, it

splinters, cracks, and quickly begins to decompose. Likewise, once mummified bodies are exposed to normal (moist rather than dry) conditions, decomposition resumes. Once all three of the elements required for microorganisms to grow—heat, moisture, and oxygen—are restored, decomposition will occur and can actually be accelerated, sometimes quite dramatically. The terra cotta warriors in Xi'an, China, for example, had been preserved for more than 2,000 years in an enclosed chamber underground. Since being exposed in 1979, the 7,000 unique, brightly painted terra cotta warrior figures' colors have faded, and the figures themselves have begun to disintegrate. Excavations at the site were halted until researchers could find a way to prevent further damage.



Figure 5.2.1: After being uncovered in 1979, the Terra Cotta Warriors in Xi'an, China, the brightly painted colors have faded.

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Figure 5.2.1 Temple of Inscriptions at Palenque, Chiapas, Mexico. (2010). By Strobilomyces under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 5.2.2 Skara Brae was built on the coast of Orkney. (2013). By Archaeology Scotland under [CC BY-SA 4.0](#) via Wikimedia Commons.

Figure 5.2.3 Howard Carter (kneeling), an Egyptian workman, and Arthur Callender at doors of burial shrines in Pharaoh Tutankhamen's tomb. By Harry Burton under [Public Domain](#) via Wikimedia Commons.

Figure 5.2.4 Tutankhamun receives flowers from Ankhesenamun. By Tiger cub under [Public Domain](#) via Wikimedia Commons.

Figure 5.2.5 Leather shoe discovered in the Jotunheimen Mountains in eastern Norway in 2006. By Vegard Vike/Kulturhistorisk museum under [CC BY-SA 4.0](#) via Wikimedia Commons.

Figure 5.2.6 The upper part of bog body Windeby I a 16 year old boy on display at Archäologisches Landesmuseum Gottorf Castle, Schleswig Germany. C14 dated between 41 and 118 AD. (2010). By Bullenwächter under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 5.2.7 Anasazi footwhere from Mesa Verde National Park. By inkknife_2000 under [CC BY-SA 2.0](#) via Wikimedia Commons.

Figure 5.2.8 Reconstruction of the tomb of the Lord of Sipán in Huaca Rajada, Peru. By Bernard Gagnon under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 5.2.9 The Color of Terracotta Warriors. (2009). By Kevin Poh under [CC BY 2.0](#) via flickr.

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5.3: Chapter Five Review

Test Your Knowledge

1. What three elements are needed for decomposition to occur? What happens when one of those elements is missing?
2. Select one of the preservation conditions—cold, dry, or wet—and describe what happens to archaeological materials in that condition.
3. Characterize an environment that would generally fail to preserve organic artifacts. Describe at least three characteristics of that environment that thwart preservation.
4. Describe an environment in which preservation conditions would be ideal or would likely preserve organic artifacts well. Are there any types of organic artifacts that wouldn't survive well in that environment?

Terms You Should Know

anaerobic Absence of oxygen.

flora Plants of a geographic region or geological time period.

fossils The preserved remains or traces of remains of ancient humans, animals, and plants.

ice patch Accumulations of snow and ice at high elevations that do not completely melt during summer.

ice patch archaeology Archaeological research that identifies and documents artifacts and organic materials left behind as the ice patches melt.

megafauna Large mammals of geographic region or geological time period.

sterile environment An environment free from microorganisms.

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CHAPTER OVERVIEW

6: Locating a Site

Learning Objectives

- Explain the six stages of archaeological research.
- Describe the elements of a research design.
- Describe the three general approaches used by archaeologists to identify sites.
- Compare and contrast the techniques used for reconnaissance.
- Characterize the various types of evidence of archaeological sites that can be detected through remote sensing..

[6.1: Archaeological Research](#)

[6.2: Finding Archaeological Sites](#)

[6.3: Chapter Six Review](#)

Image: Under the Direction of Paul Frish, Skilled Navajo Workmen Perform Delicate Archaeological Operations. The Dig Is a Project of the Museum of Northern Arizona. (1973). By U.S. National Archives under Public Domain via flickr.

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6.1: Archaeological Research

BEFORE THE DIG

You may think that archaeologists just walk into the field and begin digging up amazing artifacts. Actually, many hours have been spent preparing for that moment when the archaeologists pick up their shovels. Extensive planning is required before excavation or even a survey can begin. The archaeologists must formulate a research question, which will guide all aspects of the work including where to excavate, what kinds of data to collect, and what types of artifacts are relevant to the study. This is a critical step that never gets portrayed in the movies!

ARCHAEOLOGICAL RESEARCH

In the early days of archaeology, archaeologists focused on the excavation of sites. They would find a site, dig, and study the artifacts. However, they were not as concerned about the broader context of their findings. How did humans of the time interact with their environment? Today, archaeologists approach research in a more focused with specific goals in mind. Again, the overarching goal of archaeology today is to preserve the archaeological record, which means actually digging is the last resort in achieving that goal. The best way to preserve a site is to leave it in its original state. Before field or laboratory work begins, archaeologists plan their research in six general stages: *research design, implementation, data acquisition, processing and analysis, interpretation, and publication* (Fagan, 2006).

Research Design

The first stage of archaeological research is to carefully formulate a systematic plan to execute the research, known as **research design**. It is during this stage that background research is completed. A research design needs to be thought out and thorough including the details that will be needed to acquire funding and permissions. Many times, excavations are related to cultural resource management projects, which means the plan also needs to take into account **compliance** to applicable cultural resource management (CRM) requirements. As the research design is being developed, there are some key elements that need to be considered.

Elements of Research Design

- **Define the context of the research.** A research design should include defining the goals of the project and how the findings will fit into the existing archaeological record. What will the new knowledge contribute to what we already know? Is the project addressing a problem that has been identified (problem-oriented)?
- **Define the research questions.** The research questions can be general or specific, but in either case, they need to be related to the goals of the project. These questions will help to develop the next element of design.
- **Define the data to be collected.** What data will be needed to answer the research questions and meet the goals of the project?
- **Define the methods to collect data.** How will the data be collected? What tools and technology will you need? Is excavation necessary or will remote sensing provide the necessary data? Can the site be left "undisturbed"?
- **Define the methods of analysis and interpretation.** How will the data be studied and interpreted to answer the research question?
- **Define how the findings will be disseminated.** How will the research findings be made accessible to the academic community and the public?

research design

The careful formulation of a systematic plan for the execution of archaeological research.

compliance

In CRM, the process of ensuring that all legal requirements relating to archaeological resources are fulfilled.

Implementation

Once the research design is in place, then the implementation phase begins. This is when archaeologists begin procuring the funds to undertake the research project as well as putting together the research team. Identifying any consultants and volunteers, if needed, to assist with the project as well as ensuring all necessary equipment is accessible. Most importantly, archaeologists must

obtain all necessary permissions from federal, state, and local governments in addition to tribal authorities before any excavation can begin.

Data Acquisition

After the team has been assembled, equipment gathered, and all permissions have been granted, the collection of data begins. However, the shovel and trowel are not the first tools for which an archaeologist reaches. Research begins with an archaeological survey using non-intrusive tools. An excavation, actual digging, is only initiated if it is determined necessary after the initial survey has been completed.

Processing and Analysis

As artifacts are collected, they are sent to the lab for processing and analysis. This phase begins during excavation and can continue long after the archaeologists have closed down the excavation and recovered the site. Artifacts are cleaned, labeled, classified, cataloged, and prepared for curation. This is when materials may be sent out for radiocarbon dating or pollen samples sent to specialists for analysis.

Today, archaeological data is entered in a computer database, most often this is a **Geographic Information System (GIS)**. Geographic Information Systems is a powerful new tool for mapping archaeological sites as well as the data related to those sites. In addition to generating maps, GIS can be used to perform analysis on aerial imagery and LiDAR models.

curation

Organizing and managing the long-term care of artifact collections.

Geographic Information Systems (GIS)

A computer system that creates, manages, analyzes, and maps all types of data.

Interpretation

In the interpretation phase, all information that has been gathered from the research is brought together in a final summary or report of the findings. This explanation of the findings must relate to the original research questions. It is a report on the knowledge that has been learned through the research project.

Publication

Finally, all research results must be made accessible to, at the minimum, the academic community but preferably to the public as well. If the results of the research are not recorded, the archaeological record of that site has been lost. The site has been destroyed by excavation and the data collected is lost. Until the research is published and recorded, the archaeological record is incomplete.

STAGES OF ARCHAEOLOGICAL FIELDWORK

There are three stages when undertaking archaeological fieldwork: *finding the site*, *assessing the site*, and *excavating the site* (Fagan, 2006). The rest of this chapter focuses on the first two stages, while Chapter 7 will look at the third. If at all possible, excavation is avoided if the goals of the research project can be accomplished in the first two stages.

Finding And Assessing The Site

There are some archaeological sites that are we have no problem identifying, such as The Pyramid of the Sun in Teotihuacán, the Pyramids of Giza in Egypt, and the burial mounds and earthworks in eastern United States. However, most sites are inconspicuous and well-hidden. Many archaeological sites have been located through accidental discovery. You have probably seen different news stories on some exciting new discoveries during the construction of a parking lot or highway. One of the most famous archaeological finds was accidentally discovered by a cowboy who lived near Folsom, New Mexico. George McJunkin was searching for a lost cow and repairing fence lines when he noticed some old bones and a spear point (Nash, 2017). The bones were later determined to be an extinct species of bison...and the spear point? The spear point is now known as a Folsom Point. The Folsom point was once the oldest stone tool in North America, dating to about 10,000 years ago, until the Clovis style point was discovered, which dates to about 11,500 BCE.

However, we cannot always rely on an accidental discovery. One way to locate sites is to research historical documents. Old historical documents often contain descriptions of a former settlements or burial grounds which sometimes include a general

location of a site that has long been lost. These documents can give archaeologists a starting point when searching for the site using aerial imagery and newer technologies such as LiDAR. Many times the survey techniques and tools used in assessing the site are the same that are used for finding the site.



Figure 6.1.1: A Folsom Point from the Paleo-indian Lithic Stage

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6.2: Finding Archaeological Sites

RECONNAISSANCE

Sites not uncovered by chance or by reviewing archaeological and historical documents are usually detected using three types of reconnaissance: *aerial reconnaissance*, *ground reconnaissance*, and *subsurface detection*. **Reconnaissance** is the preliminary survey of the site. Basically, it is the initial gathering of information that will inform how to proceed and determine if additional research is needed. Aerial reconnaissance and some subsurface detection methods can be labeled **remote sensing**. Remote sensing is using methods of reconnaissance that detect subsurface features and sites through the use of devices and technology such as aerial photography, LiDAR, and ground-penetrating radar. Today, archaeologists rely heavily on remote sensing technologies to investigate and study a site in a non-intrusive manner.

reconnaissance

The process of conducting a preliminary survey.

remote sensing

Methods of reconnaissance that detect subsurface features and sites through the use of devices and technology such as aerial photography, LiDAR, and ground-penetrating radar.

Aerial Reconnaissance

As the name suggests, **aerial reconnaissance** locates, records, interprets and monitors archaeological sites from above. Aerial photography was first used in archaeology in the early twentieth century and its use expanded significantly after World War I. Archaeologists and their pilots would fly over areas they were interested in investigating, looking for signs of archaeological sites and land formations in which sites or artifacts are commonly found and then photographing them from the air. Aerial reconnaissance is particularly useful when studying large-scale patterns of habitation and the use of a landscape. The photos also sometimes reveal buried sites in a surprising way. Earthworks, crop marks, and soil marks, which are all evidence of human habitation and cultivation, are often apparent in aerial photographs, and trained eyes can identify areas in the images that suggest archaeological remains beneath the surface. For example, **earthworks**, which consist of buried ditches, banks, and stone walls, often show up as shadows in aerial photos. In the aerial image of The Hill of Tara (Figure 6.2.1 Image 1), you can clearly see the mounds and ditches of the ceremonial and burial mounds that were in use during the Neolithic and Bronze Ages. **Crop marks**, on the other hand, appear in vegetated areas when plants are growing over buried walls or ditches that stunt or boost their growth relative to the rest of the plants in the area as shown in Figure 6.2.1 Image 2. **Soil marks** can be revealed when, for example, a plow uncovers a buried stone feature that is close to the surface, exposing a distinct difference in soil color and texture. In Figure 6.2.1 Image 3, the circle of darker soil in the plowed field indicates a former ditch that has been backfilled.



Figure 6.2.1: Aerial Reconnaissance

Image 1: Earthworks - The Hill of Tara, Ireland.

Image 2: Crop Marks - Grézac, France.

Image 3: Soil Marks - Parsonage Farm Lincolnshire, United Kingdom

aerial reconnaissance

A method of locating, recording, interpreting, and monitoring archaeological sites from above.

earthwork

An embankment or construction made of earth that has been created as a result of human activity such as ditches, banks, stone walls, and burial mounds.

crop mark

Archaeological site or feature that is identified from the air by the differential growth in crops and vegetation.

soil mark

Differences in soil color visible in plowed fields resulting from the presence of an archaeological feature such as a former bank or ditch.

LiDAR

As technologies have changed and developed, new avenues of aerial reconnaissance have opened up. One such technology is **Light Detection and Ranging**, known as **LiDAR**, which involves lasers scanning landscapes and sites. An aircraft flies over its target sending pulses of light to the surface and measuring the time it takes to reflect back to the receiver. The receiver collects thousands of data points that can be used to create **digital elevation models** (DEMs).

The models are then used to create 3-dimensional topographic maps of the surface. This technology “sees through” dense vegetation and ground cover to reveal the topography below. This allows archaeologists to identify earthworks, overgrown structures, and other features that are hidden in overgrown forests and jungles.

Recent applications of LiDAR in Mesoamerica have been incredibly successful, leading to the discovery of 60,000 Mayan structures that include homes, fortifications, and causeways. Thanks to this work, we now know that the Mayan world was much more densely populated and interconnected than previously thought. Archaeologists have revised their estimates of the Mayan population to include millions more people in previously unknown city-states.

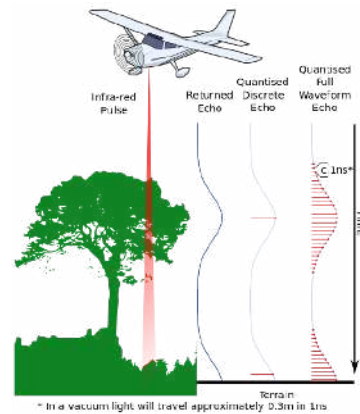


Figure 6.2.2: Sending pulses of light to the surface, LiDAR is used to create 3D topographic maps.

Light Detection and Ranging (LiDAR)

A technology used to create high-resolution models of ground elevation with a vertical accuracy of 10 centimeters (4 inches) (What is Lidar data and where can I download it?).

Digital Elevation Model (DEM)

A representation of the bare ground (bare earth) topographic surface of the Earth excluding trees, buildings, and any other surface objects (What is a digital elevation model (DEM)?).

Drones, Satellite Imagery, and Google

The availability of drones with photographic equipment attached has dramatically increased the accessibility and affordability of aerial reconnaissance efforts. Archaeologists who once needed to hire a pilot can conduct many aerial reconnaissance flights themselves. However, with the advent of Google Earth, initial reconnaissance flights might not be needed since Google’s satellite imagery is freely available and can often provide necessary aerial images. Since this tool is right at a person’s fingertips, it can be

used as a first pass of preliminary reconnaissance, guiding future, more detailed inquiries with techniques that offer a greater resolution. Google Earth also provides historical data through satellite imagery archived over time, allowing archaeologists to compare views of a location, potentially revealing changes in environmental conditions, water levels, and even a site's condition (before plowing, construction, or some other disturbance).

Since Google Earth is free and drone technology is increasingly affordable, barriers to conducting reconnaissance have decreased, which is good for archaeologists but also allows anyone who is curious to search. Many sites had been protected from disturbance and looting by the fact that they were buried underground or overgrown by the jungle—few people knew they were there. Now, as drone technologies and Google Earth satellite imagery make the search accessible to everyone, sites are being discovered, disturbed, and looted, which is a sad drawback of these scientifically useful modern technologies.

Ground Reconnaissance

Eventually, of course, archaeologists must get out of airplanes and their offices and check out potential sites in person to see what is actually there. They conduct **ground reconnaissance** to find, record, interpret, and monitor archaeological sites. This type of reconnaissance does not involve excavation. It examines what is visible and accessible directly on the surface of the ground. A primary tool is a **surface survey**—a systematic search for artifacts by methodically walking the site...that means a lot of walking. How the survey is conducted depends on one's research question and the specific conditions at a site. Researchers can, for example, consider an area outlined by a trajectory such as a radius or a line extending outward from a central or starting point. The surveyors look for artifact scatter and/or unusual discolorations that suggest prior human behavior. When a possible artifact or feature is identified, the surveyor places a flag in the ground to identify its location and continues surveying. No excavation occurs at this time. Once the survey is complete, the flagged locations are precisely identified by GPS coordinates. Their locations are recorded and artifacts can then be collected, if appropriate, given the research question.

ground reconnaissance

A method of locating, recording, interpreting, and monitoring archaeological sites through observing what is visible and accessible on the surface of the ground.

surface survey

A technique of systematically discovering, gathering, and mapping archaeological data and artifacts found on the surface by methodically walking over the site.

Subsurface Detection

Since the goal of archaeologists is to preserve the archaeological record, they prefer using methods that are non-intrusive and have minimal impact on the integrity of the site. What happens when the features of a site are hidden underground? Thankfully, today's technology provides the tools for **subsurface detection** and to "see below the ground" without digging. Using remote sensing equipment, archaeologists can identify walls, buildings, and burials that can not be seen from the surface as in the case of the underground crypt in Figure 6.2.6. However, there are times where some digging may be necessary to verify the findings or to understand what is being shown in the data. That is when archaeologists may use probing or test pits for the initial survey of the site.

subsurface detection

Survey techniques used to identify and locate subsurface features including non-intrusive remote sensing technology and techniques that involve minimal destruction to the site such as probing.

Non-intrusive Tools

Archaeologists also have subsurface detection tools that allow them to conduct reconnaissance below the surface of the ground without excavating. One way to do preliminary exploring below the surface is to use a metal detector. However, the most important non-destructive tools are geophysical sensing devices such as **Ground Penetrating Radar (GPR)**. These devices actively probe underground by passing various types of energy, laser, or radio waves through the soil and measuring how the waves are reflected back to find out what is below the surface. Passive geophysical sensing devices measure the physical properties of the soil, such as gravity and magnetism. As with LiDAR, these tools capture data that generate a map of what lies below the surface. These highly

technical non-destructive subsurface methods require a trained practitioner capable of running the machines over the site and interpreting the resulting data.

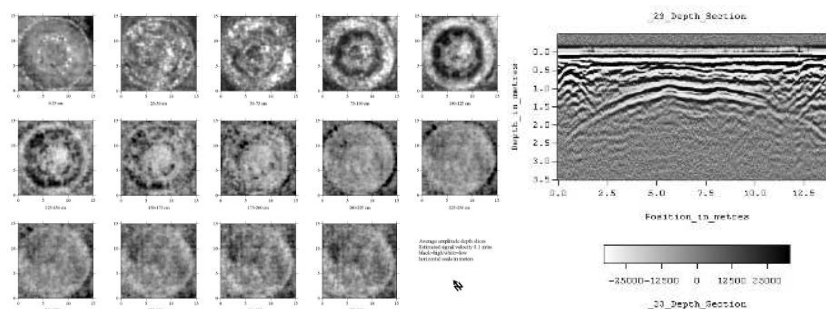


Figure 6.2.3: Ground Penetrating Radar (GPR) images depicting a crypt at a historic cemetery in Saint Paul, Minnesota, USA.

Image 1 (Left): Ground Penetrating radar depth slices of an underground structure. Planview maps isolating specific depth are constructed from many lines of data collected at close intervals.

Image 2 (Right): Ground penetrating radar depth slice. Profile view showing the domed roof of a large subterranean crypt.

Ground Penetrating Radar (GPR)

A geophysical sensing device that uses radar pulses to create an image of subsurface features.

Methods That Disturb The Site

As a last resort, archaeologists can use *probes* that physically dig below the surface to learn more about what lies underground but risk damaging the site. A probe involves using a rod or *auger*, which looks like a giant drill bit, inserted into the ground to drill down as far as possible into the soil. The auger is then brought back to the surface, carrying with it samples of soil (that may or may not contain artifacts) from various levels below the surface. It is easy to see why this method must be used sparingly and with caution as it involves plunging a sharp, destructive device into the ground, potentially damaging anything it encounters, including human burials. Another method of physically examining the subsurface is making **shovel test pits**, which are essentially very small excavations, usually smaller than one meter by one meter in size (it varies), to see if there is a potential archaeological site under the surface. Typically, several test pits are opened at the same time at a consistent distance from one another. This method is particularly useful for confirming the results of other forms of reconnaissance.



Figure 6.2.4: Archaeologists use an auger to take a sample of sediment during a survey.

shovel test pits

A subsurface survey technique involves digging to determine the density and distribution of archaeological remains at a site.

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Images

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Figure 6.2.1 Image 2 Crop and soil marks in fields by Parsonage Farm near Binbrook: aerial 2021 (2). (2021). By Simon Tomson under [CC BY-SA 2.0](#) via Geograph Britain and Ireland.

Figure 6.2.2 Used to determine the differences in response between full waveform and discrete echo ALS or LIDAR. (2012). By Anthony Beck under [CC BY-SA 3.0](#) via Wikimedia Commons

Figure 6.2.3 Image 1: Ground Penetrating Radar depth slices of an underground structure. (2010). By Tapatio under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 6.2.3 Image 2: Ground Penetrating Radar depth slice (profile view) showing the domed roof of a large subterranean crypt in a historic cemetery. (2011). By Tapatio under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 6.2.4: Archaeologists use an auger to take a sample of the sediment during a survey of Chichester Harbour. (2005). By Wessex Archaeology under [CC BY-NC-SA 2.0](#) via flickr.

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6.3: Chapter Six Review

Test Your Knowledge

1. Research an existing site at which earthworks, crop marks, or soil marks were found. What was visible aerially? What was determined about the site through further investigation?
2. Why would an archaeologist strive to limit the use of probes such as augers and test pits?
3. Compare and contrast aerial and ground reconnaissance strategies. What are some benefits and pitfalls of each?
4. Describe how new technologies such as drones, GPS, and Google Earth are changing how archaeologists locate sites.
5. What are some potential benefits and drawbacks of the new technologies being applied to archaeology today?

Terms You Should Know

aerial reconnaissance A method of locating, recording, interpreting, and monitoring archaeological sites from above.

compliance In CRM, the process of ensuring that all legal requirements relating to archaeological resources are fulfilled.

crop marks Archaeological sites or features that are identified from the air by the differential growth in crops and vegetation.

curation Organizing and managing the long-term care of artifact collections.

Digital Elevation Models (DEMs) A representation of the bare ground (bare earth) topographic surface of the Earth excluding trees, buildings, and other surface objects.

earthworks An embankment or construction made of earth that has been created as a result of human activity such as ditches, banks, stone walls, and burial mounds.

Geographic Information Systems (GIS) A computer system that creates, manages, analyzes, and maps all types of data.

Ground Penetrating Radar (GPR) A geophysical sensing device that uses radar pulses to create an image of subsurface features.

ground reconnaissance A method of locating, recording, interpreting, and monitoring archaeological sites through observing what is visible and accessible on the surface of the ground.

Light Detection and Ranging (LiDAR) A technology used to create high-resolution models of ground elevation with a vertical accuracy of 10 centimeters (4 inches).

reconnaissance The process of conducting a preliminary survey.

remote sensing Methods of reconnaissance that detect subsurface features and sites through the use of devices and technology.

research design The careful formulation of a systematic plan for the execution of archaeological research.

shovel test pits A subsurface survey technique involves digging to determine the density and distribution of archaeological remains at a site.

soil marks Differences in soil color visible in plowed fields resulting from the presence of an archaeological feature such as a former bank or ditch.

subsurface detection Survey techniques used to identify and locate subsurface features including non-intrusive remote sensing technology and techniques that involve minimal destruction to the site such as probing.

surface survey A technique of systematically discovering, gathering, and mapping archaeological data and artifacts found on the surface by methodically walking over the site.

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CHAPTER OVERVIEW

7: Excavation

Learning Objectives

- Articulate why the decision to excavate must be related to a project's research design.
- Compare and contrast the goals and research potential of vertical and horizontal excavations.
- Describe the role of the Pythagorean theorem in the excavation process.
- Outline the typical process of excavation.

[7.1: Excavation Planning](#)

[7.2: Excavating](#)

[7.3: Chapter Seven Review](#)

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7.1: Excavation Planning

BEFORE THE DIG

This chapter explores the process of excavation and how it relates directly to the implementation of the archaeologist's research design and the gathering of data to answer the research questions. Perhaps the first truly scientific excavations, in the United States, directed by specific questions about the past were conducted by Thomas Jefferson in 1784 when he dug a trench in a burial mound to discover who had made it and why (see [Chapter 2 Section 2.2](#)). This excavation allowed Jefferson to collect data that pointed to Native Americans as the mound builders and indicated that they had used the mound on multiple occasions.

Finally, it's time to get your hands dirty...well almost. Excavation is not an easy task and not an endeavor to jump into without having a plan. First, it is an expensive proposition in terms of time and financial resources. More importantly, however, it is a destructive technique since the archaeological record is not renewable. If an error is made during the excavation process, the archaeologist cannot undo that work or even redo it—what's been dug up stays dug up. Kent Flannery, a prominent archaeologist, once quoted a seasoned colleague who said, "Archaeology is the only branch of anthropology where we kill our informants while studying them" (Flannery, 1982). It is critical that nondestructive methods are used whenever possible and that excavation is used only when there is no other way to gather the data needed to accomplish the research goals. With this in mind, the first step in excavation is planning. Archaeologists must ensure that excavation proceeds in a controlled, methodical, and scientific manner. This allows for the preservation of the archaeological record through detailed recording of the data.

Types of Excavation

Excavations can be small in scale, such as the shovel test pits discussed in earlier chapters, or large in scale, such as entire villages or settlements. The scale of excavation units for a study is selected based on the types of questions the researcher hopes to address. The initial research questions will inform the types of excavation needed at the site. Preliminary excavations may answer some research questions and may potentially require researchers to change the scope or even nature of future excavations at the site. Initial findings may lead to the need to dig deeper or to expand the boundaries of the site. It also could be that after initial excavations have been completed, the decision is made that no additional digging is needed because all questions have been answered.

Sampling

The increasing number of CRM projects, costs, and other factors can make it difficult, or unethical, for excavation of the whole site. In these situations, archaeologists are depending on **statistical sampling** as a means to gather data. Sampling is a very complex topic, so we will only take a very general look at it here. Often, archaeologists will use *probabilistic sampling*, which is a means of relating small samples of data in mathematical to the larger population. Using this sampling method, the conclusions that are reached based on the sample of artifacts found are considered to be a relatively reliable representation of the site. *Random sampling* is often used on sites where nothing is known beforehand. A grid of units is set up with random numbers. The numbers are randomly selected for the units that will be excavated. These are only two of the sampling methods an archaeologist may choose. A more in-depth look at sampling methods is beyond the scope of this introductory textbook.

statistical sampling

The science of assessing the reliability of information through the theory of probability.

Site Testing

As mentioned in [Chapter 6](#), new technologies in aerial reconnaissance and subsurface detection have become very useful in determining whether a site needs further excavation. However, probing, shovel test pits, **test pits**, and trenches are used to further explore any subsurface anomalies that may be found as well as define the site boundaries. Test pits are similar to shovel test pits but larger in size. Typically, test pits are the size of an excavation unit, which is normally 1 meter by 1 meter. Sometimes this is referred to as "phone booth archaeology". You can see why in Figure 7.1.2 below. Trenches are useful when there are several anomalies identified through GPR or a need to get a cross-section of a complex site. Site testing is very useful and important in CRM projects.



Figure 7.1.1: Shovel Test Pit



Figure 7.1.2: Excavation Unit Test Pit



Figure 7.1.3: Trench Excavation

test pit

An excavation unit used to sample a site before further, more large-scale excavation takes place.

Vertical Excavation

If the preliminary sampling and site testing indicate additional excavation is needed. One approach archaeologists can use is **vertical excavation**, in which trenches or excavation units are deepened to determine the depth of the time scale in the archaeological record. They examine the stratigraphic profiles and the artifacts deposited in the layers to see how long the site was occupied, if it was occupied at different times in history, and whether the culture changed over the course of time in which the site was occupied. Many times, vertical excavations are used for cross-sections of mounds and buildings to establish the timeline of their use.



Figure 7.1.4: To establish a chronological sequence, *vertical excavation* focuses on depth.

vertical excavation

Excavations that involve depth to establish the chronological sequence over a limited area.

Horizontal Excavation

Horizontal excavation, sometimes called *area excavation*, exposes a large, relatively shallow area to answer questions about the larger site context and function. Typically, horizontal excavations are used to study large-scale regional areas to understand how the use of the environment differed across space. Horizontal excavations usually are not as deep as vertical excavations because time depth is not a critical component in such studies. In most cases, horizontal excavations involve uncovering house plans, settlement layouts, and villages. Burial mounds, hunter-gather campsites, or isolated structures may be completely excavated. However, in the case of large settlements, several portions of the larger area will be excavated to get a sample representation of the site as a whole. Since preservation of the site is the goal, horizontal excavation is carefully monitored and must be consistent with the goals and objectives of the investigation.



Figure 7.1.5: Horizontal excavations focus on large areas of excavations.

horizontal excavation

Excavations designed to expose large areas of a site, especially to uncover settlements. Sometimes called *area excavation*.

Stratigraphy

Stratigraphy, the study of layers of soil, is an important component of all excavations but particularly critical for vertical excavations. Stratigraphic data assist archaeologists in putting the archaeological record into context; the data provide a relative way to date the site and its contents and can provide some contextual clues about natural formation processes that occurred after the site was abandoned. For stratigraphy to be used scientifically, the researcher must make two assumptions, both based on the work of Nicolaus Steno, a geologist from the seventeenth century.

The first assumption is that soils accumulate in layers that are laid down horizontally to the Earth's surface. This is known as the **Law of Original Horizontality**. This is related to the principle of association (discussed in [Chapter 4 Section 4.2](#)). For example, if a site has had multiple occupations, artifacts that are found in the same stratigraphic layer are, by association, assumed to have been deposited during the same occupation of the site.

The second assumption, the **Law of Superposition**, assumes that older soils will typically (but not always) be found below younger soils. In other words, the old stuff will be on the bottom. These two assumptions allow archaeologists, and others using stratigraphy in their work, to understand how the soils accumulated and to use the layers to “tell time.” Obviously, the artifacts in the bottom layers will be older than those in the top layers. Archaeologists often are on the lookout for a **marker horizon** when studying stratigraphy. Marker horizons are distinct layers, such as a layer of ash between layers of clay, that provide additional context to the stratigraphic profile or story of the site. Marker horizons can help identify the chronology of artifacts found above and below the horizon.



Figure 7.1.6: Volcanic tephra horizons in south central Iceland.

stratigraphy

The study of rock and soil layers and layering.

Law of Horizontality

Layers of soil or sediment are originally deposited horizontally on the surface of the earth as a result of gravity.

Law of Superposition

A stratigraphic layer laying on top of another is younger than the layer below it.

marker horizon

A distinct layer of soil that provides additional context to the stratigraphic profile.

Mapping the Site

Once archaeologists determine that excavation is needed to answer their research questions, they must tackle several steps. The first step is to map the site and create a grid system is based on the coordinates of a fixed point, the **datum** or datum point, which is used for all of their future measurements. The datum can be a prominent geographic feature of the site such as a large boulder, building, or fence post to which a GPS point can be affixed. Using an immovable object as the datum point allows future researchers who excavate in the same area to make reference to earlier work.

datum

A set point on the site from which all points are measured, both horizontally and vertically.

Excavation Methods

After the site has been mapped, if not already determined in the initial planning phases, an excavation method is selected. The archaeologists consider whether to dig trenches or deep pits in a vertical excavation or a relatively shallow horizontal excavation over a large area of the site. The natural geography, strata, and/or cultural layers will dictate which excavation method is used. Other excavation choices can be dictated by the archaeologists' training. One method of excavation is **Wheeler box grid**, which

commonly used in other countries other than the United States. It was developed by Mortimer Wheeler when he and his wife, Tessa, were excavating the town of Verulamium, a Roman town located in Britain and inhabited from around 45 BCE to 450 CE. When using the Wheeler box grid method, intact **baulks** (walls) are left between each grid-square unit so the stratigraphy of the site can be more easily “read.” A balk can vary in size, from 50 centimeters to 2 meters in width depending on the depth of the excavation unit. At the end of the excavation, the baulks are sometimes removed. At times, you may see a site that there are no partitions between the units, but each unit is excavated to a different level. This is another way to gather data on the stratigraphy of each unit. The method that is often used in the United States is **open area excavation**. Open area excavation still uses a grid system but with no baulks left between the units; the grid squares adjoin each other and are entirely cleared. Often, this method is used when the investigation involves a single occupation of a site.



Figure 7.1.7: Wheeler box grid method at site near Motza, Israel.



Figure 7.1.8: Open area excavation in Lancaster County, Pennsylvania.

Wheeler box grid

A method of archaeological excavation that involves using a grid system leaving partitions between units to allow for stratigraphic study.

open area excavation

A method of archaeological excavation that involves opening large areas of a site.

balk

A side wall of an excavation unit or a partition wall between two units. (Plural: baulks)

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7.2: Excavating

GET OUT THE SHOVELS!

When the excavation method has been selected, actual digging can begin. Archaeologists are systematic when they excavate since, as mentioned earlier, archaeological data cannot be renewed. At this point, archaeologists know where they are digging and what methods they will use to dig. The next decisions to be made are related to how they will dig.

Preparing to Dig

Finally, the last step before the archaeologists begins to move dirt, there must be some preparation. Decisions have to be made on the tools needed, excavation units to be mapped out, and the unit levels need to be determined.

Tools

The tools used in excavation will depend on the research design and the goals of the investigation as well as the site conditions. Obviously, shovels and trowels will always be required when digging. However, the tools of excavation can be as large as a backhoe or front-end loader to as small as a dental pick or chopstick to work on recovering a small or delicate artifact. Basically, archaeologists will use any tool that can get the job done without damaging the artifacts that are hidden in the ground. Large equipment, such as a back-hoe, would be used to uncover a larger area by removing overlying topsoil that may be covering a site. However, the operators must be very experienced and the process is monitored by the watchful eye of an archaeologist in order to avoid disturbing any important archaeological finds.

The list of tools of an archaeologist is endless. However, it is not just tools for digging and recovering artifacts. Remember archaeology is much more than digging up the past, it is also recording and preserving the details about the findings. This means their toolkit also includes surveying and GPS equipment, mapping tools, cameras, notebooks, and laptops.



Figure 7.2.1: A back-hoe clearing topsoil from a site.



Figure 7.2.2: An archaeologist meticulously recovers skeletal remains.



Figure 7.2.3: The archaeologist toolkit includes notebooks and sketchpads, not just tools for digging.

Excavation Units

After the site has been cleared, the next step is to map out your excavation units. You have probably seen photographs of excavations, in this text and in other texts and publications, in which the “holes” are square rather than round. Why does the shape of the hole matter? By digging a square hole, archaeologists can easily calculate how many artifacts and other items are present per unit—in this case, a measure of volume. Since a square is made up of two equally sized right triangles, archaeologists ensure that the holes they dig are perfectly square using the *Pythagorean Theorem*: $a^2 + b^2 = c^2$. Using this calculation when the initial grid lines of the map are drawn and when individual units are established will ensure that each archaeological unit is a perfect square.

Levels

The next decision, likely made before excavation begins, is how deep each level will be since the excavation is in three dimensions—length, width, and depth. Some archaeologists elect to tie the depth of each level to the **natural strata** of the site with each layer representing a level. Sometimes based on the site conditions, archaeologists select an **arbitrary strata** depth such as 10 or 20 centimeters regardless of the stratigraphic layers. Arbitrary strata are most often used when the natural strata is not known or more than 10 cm thick.

natural strata

A layer of rock or soil that is formed by natural processes.

arbitrary strata

A standard measured vertical subdivision of an excavation unit that does not follow the natural strata.

Let The Digging Begin!

When excavators reach the bottom of a natural or arbitrary strata level, several things occur. First, the archaeologist typically takes measurements of the depth of excavation across the entire square to ensure it was excavated to precisely the same depth throughout. This is important as the surface, where excavation begins, is typically naturally uneven, but the bottom of the strata level should be flat. Since the ground is rarely level, a plumb bob or line level is often used when taking the measurements. The archaeologist and workers then draw sketches of the excavated layer and its stratigraphic profile and photograph the entire unit, the stratigraphic profile, and important characteristics of the soil to document the stratigraphy. One photograph documents the unit's location on the grid system and the depth of the layer excavated using a sign and a tool such as a trowel pointing north to make it easy to orient the unit and identify its location later.

This process continues until the archaeologists have gathered all the information they can from the unit, encounter something unexpected (such as the water table or bedrock), or come to the end of the project. Before the unit is backfilled, they take high-quality photographs and draw sketches of it. Sometimes, before backfilling a site, the archaeologists put something modern, such as a contemporary soda can, at the final depth excavated. This indicates their stopping point to archaeologists who resume excavation there in the future. The depth and, of course, the marker are indicated in the archaeological report.



Figure 7.2.4: Recording depth from a datum plumb line.

Screening

As excavation proceeds, the material removed from the excavation units is sorted using a screen. The screening method used varies with the circumstances, including the type of matrix or soil and the artifacts or other archaeological remains they expect to uncover. Typically, screens consist of a wooden frame with window screening material affixed to the bottom. The soil is put into the screening box, and workers sift the soil through the screen, which leaves larger chunks and objects behind. The screens' dimensions vary based on the artifacts of interest to the archaeologist. The mesh's hole size can be anywhere from one-half to one-sixteenth inch. During the screening process, workers sift the materials and pull out artifacts and ecofacts.

When archaeologists are especially interested in locating pollen or other small plant remains, they can use a water screening process called **flotation**, in which the excavated material is flushed through a water sieve that allows the lighter materials to float to the surface, making them easy to recover. Water screening is also sometimes used for larger objects encased in a matrix that is primarily clay or some other dense or wet soil. In that case, hoses or buckets of water are used to wash the dirt off the objects.

flotation

Using water to separate plant remains and seeds from the surrounding matrix.

Decisions about whether to use wet or dry screening methods and the size of the screen to use have a dramatic impact on the kinds of artifacts that can be recovered and the condition in which they are retrieved. Small artifacts will be lost to time if the screen is

too large, and pressure from a water hose can damage or even destroy fragile artifacts. So these seemingly small decisions are a critical part of planning an excavation.

Recording

During the entire excavation and screening process, workers recover the artifacts, ecofacts, and information about features of the site. Artifacts and ecofacts are preliminarily put in a bag clearly marked with its provenience (three-dimensional coordinate information, including its layer and its specific position relative to the surface—the depth at which it was found). Eventually, a **field catalog** will be created that records everything that was uncovered in the field. Both identification of the finds and creation of the catalog will be refined once the team returns to the lab.



Figure 7.2.5: A porcelain cup handle found during the process of screening.

field catalog

A record of all archaeological finds that includes provenience data.

After The Digging Is Done

It is important to realize that there is a lot of work to complete after excavating a site—many archaeologists would argue that most of the work is done after they return from the field! A common estimate of the breakdown in time spent in the field versus the lab is 1 to 5. For every 1 week spent in the field excavating, archaeologists expect to spend at least 5 weeks in the lab processing what they found. Some archaeologists wash the artifacts when they return to the lab; others prefer not to wash them because they are interested in obtaining DNA or other types of trace materials for analysis. Each artifact and piece of archaeological material is given a catalog number that corresponds to a listing of it in the permanent catalog, which is built from the field catalog. The **permanent catalog**, which commonly is a computer database, records the provenience data for the item and a brief description of it and often includes a photo. The catalog number is written on the artifact in permanent, archival ink. These numbers need to be written legibly in an inconspicuous but noticeable place. So, obviously, not across the face of a Pakal's mask! With such a mask, the catalog number would likely be written on the inside surface of the mask. The items are then placed in bags with the provenience information written on the outside of the bag and, usually, on a small tag placed inside the bag. This seeming duplication of information is critical in case the information on the bag rubs off or something happens to the number on the artifact.

permanent catalog

A database of archaeological finds that includes a catalog number, provenience data, description of the artifact or feature, and photographs.

UNDERWATER ARCHAEOLOGY

The process used for underwater excavations is somewhat different for obvious reasons. Underwater excavations usually are not designed to recover the artifacts; rather, the task is to record all of the artifacts visible on the lake or sea floor. It is difficult and costly to bring artifacts to the surface, and, once exposed to air, many artifacts, such as metal encrusted with metallic salts, must be stabilized in a laboratory to prevent them from deteriorating. When underwater archaeologists do collect artifacts and bring them to the surface, additional technologies such as suction hoses and baskets with balloons attached are needed.

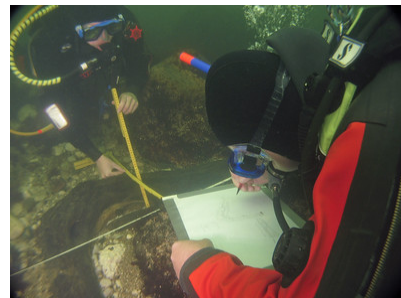


Figure 7.2.6: Underwater archaeology still requires the same meticulous methods of recording.

The tools used depend on the depth of the water and the types of artifacts being removed. Miniature submarines, submersible watercraft, scuba gear, and other technologies allow archaeologists to see below the surface. **Side-scan sonar** can also be used to locate shipwrecks and other archaeological sites beneath the surface. Side-scan sonar is similar to LiDAR; sound waves are sent to the ocean floor, and the scanner measures how long it takes for the sound waves to return, creating a topographical map of the floor's surface. Side-scan sonar mapping is expensive, however, and a somewhat less sophisticated sonar technology used on fishing boats to locate fish has been used successfully in archaeological expeditions.

side-scan sonar

A sonar system used to create surface maps of the sea floor, similar to LiDAR.

IMAGES

Figure 7.2.1 Clearing the topsoil. (2005). By Wessex Archaeology under [CC BY-NC-SA](#) via flickr.

Figure 7.2.2 Cliffs End Farm - excavating a burial. (2005). By Wessex Archaeology under [CC BY-NC-SA](#) via flickr.

Figure 7.2.3 Çatalhöyük South Area Excavations. (2010). By [Çatalhöyük](#) under [CC BY-NC-SA](#) via flickr.

Figure 7.2.4 Recording Depth. (2009). By Brian Hoffman under [CC BY-NC-SA](#) via flickr.

Figure 7.2.5 Porcelain cup handle, Civil War Archaeology in Lafayette Square. (2011). By Baltimore Heritage under [CC BY](#) via flickr.

Figure 7.2.6 Drawing underwater. (2008). By Maritime Archaeology SDU under [CC BY-NC-SA](#) via flickr.

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7.3: Chapter Seven Review

Test Your Knowledge

1. Describe some of the pitfalls an archaeologist could encounter during an excavation. What can archaeologists do to avoid those pitfalls?
2. How are horizontal and vertical excavations different?
3. When and why would flotation be used as part of the screening process?
4. Why are assumptions made about the formation of stratigraphy important for archaeologists?
5. What are the roles of the field and permanent catalogs? How are they created, what kind of data do they store, and how is the data used later in the lab?

Terms You Should Know

arbitrary strata A standard measured vertical subdivision of an excavation unit that does not follow the natural strata.

balk A side wall of an excavation unit or a partition wall between two units. (Plural: baulks)

datum A set point on the site from which all points are measured, both horizontally and vertically

field catalog A record of all archaeological finds that includes provenience data.

flotation Using water to separate plant remains and seeds from the surrounding matrix.

horizontal excavation Excavations designed to expose large areas of a site, especially to uncover settlements. Sometimes called *area excavation*.

Law of Horizontality Layers of soil or sediment are originally deposited horizontally on the surface of the earth as a result of gravity.

Law of Superposition A stratigraphic layer laying on top of another is younger than the layer below it.

marker horizon A distinct layer of soil that provides additional context to the stratigraphic profile.

natural strata A layer of rock or soil that is formed by natural processes.

open area excavation A method of archaeological excavation that involves opening large areas of a site.

permanent catalog A database of archaeological finds including a catalog number, provenience data, description of the artifact or feature, and photographs.

side-scan sonar A sonar system used to create surface maps of the sea floor, similar to LiDAR.

statistical sampling The science of assessing the reliability of information through the theory of probability.

stratigraphy The study of rock and soil layers and layering.

test pit An excavation unit, typically one meter by one meter, used to sample a site before further large-scale excavation takes place.

vertical excavation Excavations that involve depth to establish the chronological sequence over a limited area.

Wheeler box grid A method of archaeological excavation that involves using a grid system leaving partitions between units to allow for stratigraphic study.

A derivative work from

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CHAPTER OVERVIEW

8: Dating Methods and Artifact Analysis

Learning Objectives

- Compare and contrast relative and absolute dating techniques.
- Describe several dating techniques, including when and where each would likely be used and their limitations.
- Explain the principle of radioactive decay and how radiometric dating techniques use it to determine the absolute age of archaeological evidence.
- Describe the role of an artifact typology in archaeological analysis.
- Characterize the most common artifact types and how archaeologists study them.
- Explain the role of trace analysis in archaeology.

[8.1: Dating Methods](#)

[8.2: Artifact Analysis](#)

[8.3: Chapter Eight Review](#)

Image: Printing the Past: 3-D archaeology and the first Americans. (2016). By Bureau of Land Management under [CC BY](#) via flickr.

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8.1: Dating Methods

SO HOW HOLD IS IT?

After excavating a site, one of the first questions to answer relates to time. Much of the meaning that can be inferred from a site comes from the context—when the site was used and when the various artifacts collected were made, used, and left behind. It is a straightforward question to ask, but one that has long been difficult to answer.

Newer, more advanced dating techniques now allow archaeologists to establish when sites were occupied and artifacts were made. We can determine when items were discarded, plants were harvested, wood and other items were burned, and tools were made. How specific these dates can be depends on the technique used. Most provide dates as ranges of time, and the ranges are subject to a margin of error (e.g., 10,000–20,000 years ago $\pm$ 2,000 years). Archaeologists combine multiple techniques to further narrow these time frames and increase their accuracy.

Direct dating tests the archaeological evidence with techniques such as radiocarbon measurements while **indirect dating** estimates the age of archaeological evidence by dating something else, such as the matrix in which the evidence was found. Dating techniques are also categorized by the kind of dates they provide. *Relative dating* estimates are based on associations and comparisons of the item with other things found at the site and describe an object as being older or younger than the comparison objects. *Absolute dating* determines an age range (and sometimes a margin of error) for the objects themselves.

direct dating

Determination of the age of an artifact, ecofact, or feature through analysis of the object itself.

indirect dating

Determination of the age of an artifact, ecofact, or feature by looking at its association with the matrix or object of a known age.

Relative Dating

Relative dating techniques use association and comparisons to place an item chronologically on a timeline. The item is not given an actual age but, rather, it is given classified as rather older or younger than the other items on the timeline. This can be done through evaluating the stratigraphy in which the item is found or by examining the sequence of other artifacts in the archaeological record.

relative dating

Determination of chronological sequence based on associations and comparisons rather than a fixed time scale.

Stratigraphic Dating

One way archaeologists date objects relatively is from the stratigraphy in which they were found. This method relies on the *Law of Horizontality* and the *Law of Superposition* (discussed in [Chapter 7 Section 7.1](#)), which form the basis of **stratigraphic dating** or stratigraphy, in which archaeologists construct a relative chronological sequence of the soil layers from earliest (at the bottom) to youngest (at the top). This technique provides relative dates not just for the layers in a deposit but also for objects found within them—in this case, the date of discard rather than the date of creation or use. As long as the layer has remained sealed and there has been no intrusion from other layers, stratigraphy tells archaeologists that anything in that layer is at least as old as the soil in which it was found.

stratigraphic dating

A relative dating method where the age of an artifact, ecofact, or feature is determined by its association with the stratigraphic layer in which it was deposited.

Seriation

Classifying artifacts using **seriation**, ordering objects chronologically, can also assist us in dating. When using seriation, the artifacts often are categorized or “typed” based on their qualities and attributes, such as the material from which they were made

and their shapes and decorations. Changes in style are particularly useful. Artifacts produced at the same time (and by the same group) will resemble each other in style, but stylistic changes occur gradually over time and small differences accrue. As a result, artifacts from different time periods can look quite different from one another. Consider television sets. You could probably easily put a collection of television sets from their invention nearly 100 years ago to today in correct chronological order based on a few basic characteristics such as screen size, screen depth, and features such as knobs, buttons, and antennas. This is a modern example of **stylistic seriation** in which dating relies on placing artifact assemblages in serial order based on stylistic changes in their features. Archaeologists frequently use stylistic seriation to date pottery, baskets, and projectile points.



Figure 8.1.1: The type of clay, construction, and decoration can place pottery in a chronological time period.

seriation

A relative dating technique where artifacts are ordered chronologically based on the assumption that materials, manufacturing techniques, and decoration change over time and can be associated with a certain time period (NPS Archeology Program: Archeology for Interpreters).

stylistic seriation

Placing artifact assemblages in serial order based on stylistic changes in their features.

Frequency seriation places artifact assemblages in serial order by examining the relative frequency of different types of artifacts. It is based on our understanding that stylistic differences in objects often follow similar patterns in terms of popularity—new styles are at first used in small numbers and then, if they become popular, are used more than older styles so more of them show up, at the time and in the archaeological record. A new style can eventually replace previous styles altogether. Charting the frequency of artifacts that have stylistic variations results in “battleship shaped” curves (think about what the deck of a battleship looks like from above) that are narrow at first (reflecting the artifact’s limited use), become wider as the item is adopted and used more frequently, and narrow again as it is displaced by newer styles. However, objects that are purely utilitarian typically have linear curves that appear as straight columns in frequency graphs. Frequency seriations are created for multiple sites in an area using stratigraphy to identify the periods of time to compare. Decorated pottery styles are often dated using frequency seriation. The colors and decorations of the ancestral Puebloans, for example, were sequenced by examining changes in their pottery styles.

frequency seriation

Placing artifact assemblages in serial order by examining the relative frequency of different types of artifacts.

ABSOLUTE DATING

While relative dating techniques offer many benefits, including the use of techniques such as stratigraphy for virtually any type of material, they also have limitations. Relative dating techniques can be used to determine what is older and younger than something else but not how many years, decades, or millennia ago the item was made and used. **Absolute dating** techniques that can assign a range of years to an artifact were developed only in the past century and dramatically expanded archaeologists’ knowledge of the past and ability to classify objects. Even historical records such as hieroglyphs in Egypt and Mayan ruler lists recorded on *stelae* (inscribed upright stone markers) must have some basic information to be dated. Establishing a chronology requires conscientious work to link their dates to our own calendar.

absolute dating

Determination of age using a specific time-scale such as years before present (B.P.) or according to a fixed calendar (Ashmore & Sharer, 2014).

Terminus Post Quem

Coins and other items inscribed with dates are useful for determining the age of a site, though those kinds of items occur only in certain cultures and contexts. Because such items usually were marked when they were created and then were used long afterward, the date stamped on the item tells us only the earliest time of its use rather than when it was actually used at the site. This form of dating is known as **terminus post quem (TPQ)**, Latin for “time after which.” For example, if there are multiple coins recovered from a site, and the most recent coin from the collection is dated 1665, this indicates that the coin was deposited on the surface of the site sometime after the year 1665. Therefore, the site was actively in use after that date.

terminus post quem (TPQ) dating

The date after which a stratum, feature, or artifact must have been deposited (NPS Archeology Program: Archeology for Interpreters).

Varves

Natural annual cycles also provide methods for dating in some contexts. **Varves**, which are paired layers of outwash gravel and sediment deposited in glacial lakes by retreating ice sheets, allow archaeologists to date the deposits and evidence associated with them. This is possible because melting glaciers deposit coarse silt during summer months via running water and fine clays during winter months when the lakes are covered by ice and fine particles suspended in the water gradually settle to the bottom. Each annually deposited pair of coarse silt and fine clay layers represents one year, allowing archaeologists to establish sequences that count back in time from the most recent layer, which has a known age, to the point at which artifacts were deposited. In Sweden, for example, these glacial sequences have been used to date items back as far as 12,000 years.



Figure 8.1.2: Varves are common sedimentary units in Pleistocene proglacial lake settings.

varves

Paired layers of outwash gravel and sediment deposited in glacial lakes by retreating ice sheets.

Dendochronology

Perhaps one of the most commonly understood means of dating using natural cycles is *dendochronology* (see Chapter 2 Section 2.2). Many varieties of trees have one period of growth each year, producing a growth ring that can be seen in the cross-section of the trunk. These rings reflect the environmental conditions of that year’s growing season and are similar in the various trees growing in the same region, often with thick growth rings during wet years and thin rings in years of drought. Archaeologists compare the rings of living and dead trees to create regional sequences that count back from when the first tree in the sequence was cut down to when trees that were used for timber in archaeological sites were felled, such as support beams for a structure.

Dendochronology works quite well at sites in which trees were used for building and the environmental conditions preserved the wood over time. Naturally, its use is limited to regions in which trees that produce clearly defined rings grow in climates that have marked summer and winter seasons. It has been applied extensively in the American Southwest, for example.

Radiometric Dating

The specific conditions needed for absolute dating techniques such as dendochronology and glacial seriation long limited the ability of archaeologists to provide a specific range of dates for many sites. That changed in the mid-twentieth century when studies of radioactivity led to tools for measuring the natural rate of *radioactive decay*, the loss of radioactivity, of elements in archaeological deposits. In fact, dates determined using radioactive decay are calculated from 1950, the year in which this dating method was developed. Radioactive materials, such as uranium, decay at a consistent rate known as a **half-life**—the number of years it takes for half of that radioactive element to decay (converting it into a non-radioactive element). Each radioactive element has a specific, known half-life, and these dating methods measure the amount of the radioactive element and of its stable decay

product, called the *daughter element*, to determine how many half-lives (years) have passed since the decay process began. These methods are collectively called **radiometric dating**.

half-life

The number of years it takes for half of the radioactive element to decay.

radiometric dating

Absolute dating techniques that measure the relative proportions of specific radioactive isotopes present in a sample.

Radiocarbon Dating

One of the most widely known radiometric dating techniques is **radiocarbon dating**, which measures the decay of Carbon-14 (C-14). Many elements exist in both stable and unstable (radioactive) forms called *isotopes*. For example, carbon has an atomic number of 6, which is the number of protons. Carbon isotopes vary by the number of neutrons they contain. Carbon-12 is a stable (non-radioactive) carbon isotope, named for its *atomic weight*, which is the total number of protons (6) and neutrons (6). Carbon-14 is a radioactive isotope that has 6 protons and 8 neutrons. Its instability leads it to decay, and it has a half-life of 5,730 years.

radiocarbon dating

An absolute dating technique based on the knowledge that living organisms build up organic carbon. When the organism dies, Carbon-14 (C-14) atoms disintegrate at a known rate, which makes it possible to calculate the date of an organic object by measuring the amount of C-14 in the sample (NPS Archeology Program: Archeology for Interpreters).

Carbon-14 is significant for archaeology because it is common in archaeological deposits. It is produced when cosmic radiation strikes the atmosphere and is incorporated into molecules of carbon dioxide. As plants naturally absorb the carbon dioxide, they incorporate Carbon-14 into their structures, and organisms that consume the plants incorporate Carbon-14 into their tissues. Organic material found in archaeological deposits, including wood, plants, baskets, textiles, as well as human and animal remains, all contain this carbon. Over time, the Carbon-14 in the deposits decays at the rate of its half-life of 5,730 years so samples can be taken from organic remains in archaeological deposits to determine how much time has passed since their deaths. The more recently the organic matter died, the greater the ratio of Carbon-14 to its non-radioactive carbon by-product since there has been less time for decay to occur. Small amounts of Carbon-14 relative to its non-radioactive by-product indicate that the organic matter died in the more distant past. Essentially, archaeologists can use anything found in the archaeological record that was once living and ingesting carbon to obtain a date using radiocarbon dating.

Radiocarbon dating is performed by chemists, who analyze samples sent to them by archaeologists. The samples must be kept free from contamination so recent sources of carbon (such as paper tags) must not be bagged with anything that will undergo C-14 analysis. This technique can date objects and materials with a high degree of accuracy but requires calibration as we now know that carbon concentrations in the atmosphere have not remained constant over time. The concentration of C-14 in the atmosphere at the time affects the amount of C-14 that is incorporated into the cells of plants and animals. Additionally, our ability to date accurately with this technique is limited to samples that are between 400 and 50,000 years old; accuracy declines beyond that range. There are other issues with C-14 dating as well, including the **marine reservoir effect**, which affects radiocarbon dating of shells. Many marine organisms ingest both atmospheric carbon from the environment and older carbon from materials they consume that come from deep within the ocean and are transported to the surface by circulating water and currents. Radiocarbon dating performed on the remains of aquatic life requires calibration to account for these complexities.

marine reservoir effect

A phenomenon whereby the radiocarbon content of terrestrial organisms is not the same as marine organisms and organisms that ingest them.

Other Radiometric Dating Methods

Dating Technique	Material Dated	How It Works

Dating Technique	Material Dated	How It Works
Potassium-Argon (K/Ar)	Igneous (volcanic) rock, which contains radioactive Potassium-40	The ratio of radioactive Potassium-40 to its daughter product, Argon-14, is measured in rock samples to determine the number of half-lives that have passed. The half-life of Potassium-40 is 1.3 billion years so this method is most accurate for materials that are older than 1 million years.
Uranium series	Travertine (calcium carbonate), which is found in cave walls and floors	Provides highly accurate dates for materials that are between 50,000 and 500,000 years old.
Fission track	Obsidian and other glassy volcanic materials	Determines age based on the natural splitting (fission) of Uranium-238, which leaves tracks behind in the surface of the material.

Other Absolute Dating Techniques

Dating Technique	Material Dated	How It Works
Thermoluminescence (TL)	Ceramics and glass	Over time, ceramics and glass trap electrons that have been released by natural radiation. Heating the material beyond a critical point allows it to release the electrons as light energy, which can be measured. This method is used to determine the last time the material was heated (such as when a ceramic was fired). Effectively dates materials that are 100 to 500,000 years old.
Electron spin resonance (ESR)	Materials that decompose when heated, such as tooth enamel	Similar to TL dating but less sensitive. Effective for confirming dates obtained using other methods.
Archaeomagnetic dating	Clay	Earth's magnetic fields have changed over time, causing the location of magnetic north to shift. Magnetic particles in clay record the direction of magnetic north at the time the clay was heated.
mtDNA	Mitochondrial DNA	Compares the DNA of individuals and populations found in their cells' mitochondria (an organelle responsible for energy processing) to establish patterns of migration over time.
Y chromosome	Y chromosomes	Compares the DNA from Y chromosomes (male sex chromosomes) of individuals and populations to establish patterns of migration over time.

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Images

Figure 8.1.1 Artifacts in the visitor center in Wupatki National Monument in Arizona. (2013). By Fredlyfish4 under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 8.1.2 Proglacial lacustrine rhythmic argillite from the Precambrian of Virginia, USA. (2016). By James St. John under [CC BY 2.0](#) via Wikimedia Commons.

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8.2: Artifact Analysis

HOW WAS IT MADE AND WHAT WAS IT USED FOR?

The artifacts made and used by humans are critical to archaeological work and analysis of past human behavior. Their interpretation and the information they provide largely depends on the environmental conditions to which the artifacts have been exposed, which influences their preservation. This section focuses on various kinds of artifacts and specific types of information archaeologists can learn from types of artifacts.

Typology

Once artifacts have been excavated, processed in the lab, and cataloged, what happens next? Usually, the artifacts are sorted into broad categories by the types of materials, such as stone (lithics), bone, and ceramic. Once sorted into those initial categories, the categories can be subdivided by other physical attributes such as decorations, color, shape, size and other physical dimensions, raw material sources (e.g., chert or obsidian for stone tools), and manufacturing techniques. These sub-categories can then be further refined until all the artifacts that share similar attributes and/or physical properties are grouped together and define artifact types, creating a *typology*. Typologies, which were used extensively by archaeologists working under the classificatory-historical paradigm, are thorough visual descriptions of a group of like artifacts. In their analyses, archaeologists often must determine the range of variation that is acceptable when assigning artifacts such as projectile points and arrowheads to a type. Typologies were particularly important tools prior to the development of radiocarbon dating techniques and are still used as a preliminary dating method in the lab and in the field.

Stone Tools

Each artifact type is defined by features and attributes archaeologists look for when completing their analysis. Stone artifacts are one of the most studied types simply because of their excellent preservation and longevity. Some of the stone artifacts found in archaeological sites are more than 2 million years old. Stone tools such as projectile points consist of a **core** stone that will become the tool and a *hammerstone* that is struck against the core stone to shape it. The toolmaker, called a *flintknapper*, removes large chunks from the core to begin to achieve the rough shape of the desired tool. Often, the first few hits of the hammerstone are designed to remove the *cortex* of the core, which is the rough outer covering of the rock. The resulting waste flakes are called *debitage*, and they provide archaeologists with important clues about how the tool was manufactured. After the large pieces of cortex are removed and the artifact is roughly the desired shape, the flintknapper switches to a finer, more-precise method of removing flakes using a softer touch and a softer material such as an antler or other object that applies less force. The *debitage* produced at this stage is typically called *trimming flakes*. Each flake (especially larger ones) carries critical information an archaeologist can use to recreate the process by which the stone tool was made. Archaeologists look for the *striking platform* (where the core was struck) and the *bulb of percussion* (a raised area formed due to percussion) on the flakes, which indicates the angle and exact point of contact of the hammerstone. Coming off the bulb of percussion are *ripples* that are similar to ripples made when a stone is thrown into a lake; they extend outward from the point of impact.



Figure 8.2.1: A Neolithic Flint Core

core

A lithic artifact from which flakes are removed and used as a tool or a blank from which other tools are made.

Wear Analysis

Once they understand the process by which an artifact was produced, the archaeologist's next question is what the artifact was used for. The shape and dimensions of stone tools provide clues to their function, but other techniques such as **microscopic wear analysis** can provide additional information. Different activities, such as sawing back-and-forth motions and downward-angled engraving used for writing produce different marks on the edges of stone artifacts that are clearly visible under a microscope, allowing an archaeologist to perform microscopic wear analysis.

microscopic wear analysis

A method of analysis that identifies the use and function of artifacts by examining their working surfaces and edges through magnification.

In *experimental archaeology*, archaeologists try to recreate artifacts using authentic methods and traditional materials. They have expanded our knowledge of ancient processes for manufacturing various types of artifacts. Archaeologists also fit collections of debitage back together like a three-dimensional puzzle to learn more about flintknappers' processes and craft.

Organic Artifacts

While stone is probably the most studied artifact type, there are many other types of artifacts archaeologists look at. Wood, for instance, was an important material for early tools made by humans based on what we know about current and ethnographic studies of tool materials. Wood was used for tools such as axes and spears, and plant and animal fibers were used to make things like baskets, cordage (ropes), and fabrics. However, as noted in earlier chapters, these types of organic artifacts do not survive for long periods unless deposited in an anaerobic, very hot, or very cold environment so they are much rarer than stone artifacts. Additionally, experimental archaeologists in particular have been able to draw conclusions about ancient organic tools by studying ethnographic artifacts and current makers of those tools (e.g., baskets). For example, the complex weaving rules used in basketry, such as twining versus coiling, and the difference between the *warp* (the longitudinal or lengthwise run of a fabric or fiber) and the *weft* (the transverse run of a fabric or fiber that is typically woven in an under-and-over pattern) are well known among weavers working today and archaeologists who primarily study those types of artifacts.

Ceramics

After stone tools, ceramic artifacts are probably the next most studied type. Pottery is typically seen as evidence that a group was sedentary since it is a heavy material. The earliest ceramics date back to the Jomon period in Japan, approximately 14,000 years ago. Pottery has been made using a variety of techniques, including coiling, building pots by hand, and using a potter's wheel. Archaeologists who focus on the study of ceramics (ceramists) can determine how vessels were manufactured by looking at a piece, sometimes even a small *sherd* (piece of ceramic) and the firing method. Ceramics can be air-fired or fired in a kiln, and the extent of *oxidation*, which is the process of organic substances in the clay burning off, provides clues about how a piece was fired.



Figure 8.2.2: Jomon pottery dating to between 11000 to 7000 BCE.

An important component of manufacturing ceramics and stone tools is the use of fire, or *pyrotechnology*. In addition to oxidizing, ceramic vessels can be glazed, *vitrified*, by intense heat. Heat-treating stone is a way to change its physical properties, allowing for thinner, more precise tools to be crafted.

vitrified

Converted into glass or a glasslike substance, typically by exposure to heat.

Metal

Without fire, it would have been impossible to produce metal tools. **Archaeometallurgy** is the archaeological study of metal artifacts, which, at the most basic level, are categorized by the type of metal used: *non-ferrous* metals that do not contain iron and *ferrous metals* that do contain iron. Of all the non-ferrous metals used by humans in the past, the most important was copper.

Copper, which is a soft metal, can be combined with another metal such as tin, creating a stronger *alloyed* metal (bronze in the case of copper and tin). Metals contain trace elements that allow archaeologists to determine the original source of some artifacts. Additionally, through a **metallographic analysis** in which a piece is examined microscopically, an expert can determine the exact manufacturing technique used to construct the tool. Only after basic heating and manufacturing techniques with metal were understood could more-advanced metal working with the ferrous metals begin. Iron is much more common than copper but could not be used to construct items until people developed *smelting*, in which iron is heated to a high temperature to remove all impurities, strengthening it.

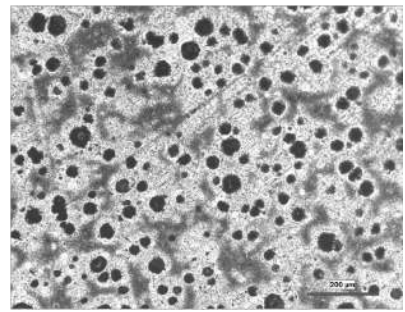


Figure 8.2.3: The microstructures of ductile cast iron.

archaeometallurgy

The study of the past use and production of metals by humans.

metallographic analysis

The microscopic study of the physical structure and components of metals.

WHERE DID IT COME FROM?

Once archaeologists understand the basic properties of an artifact and the process of manufacturing it, they can begin to ask questions about human behavior related to the artifact, such as how they traded and exchanged goods. The first step in understanding more about exchange behavior is understanding the source of the artifact in question. **Trace analysis**, an examination of the chemical signatures of stone and metal objects, points to where the objects came from. Volcanos, for example, produce rocks that have unique chemical signatures. Obsidian produced by an eruption can be traced chemically back to its volcanic source using several methods that can be completed by an archaeologist or in an archaeological laboratory.

trace analysis

A means of identifying the source of artifacts and raw materials using techniques such as x-ray spectrometry to identify distinctive trace elements in stones and minerals (Fagan, 2006).

Once the source of the material is determined, archaeologists can begin to investigate how the artifact might have ended up where it was found, especially when the source area is not local. When investigating trading, archaeologists typically create a distribution map showing the locations of raw material sources in relation to where such artifacts have been found across the globe (such as all locations where pots with the same design have been found). By graphically identifying all of the locations, archaeologists can investigate patterns to understand how trading worked and if there were more-extensive exchanges and interactions.

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Images

Figure 8.2.1 A Neolithic flint core. (2017). By Shusheela Burford, The Portable Antiquities Scheme under [CC BY 2.0](#) via Wikimedia Commons.

Figure 8.2.2 Incipient Jomon pottery from Hinamiyama site. Date between 11000 and 7000 BCE. By PHG under Public domain via Wikimedia Commons.

Figure 8.2.3 Light optical micrograph of polished and etched ductile iron from lawnmower camshaft. (2009). By Michelshock under Public domain via Wikimedia Commons.

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8.3: Chapter Eight Review

Test Your Knowledge

- What is the difference between relative dating and absolute dating? Provide an example of each.
- Why was discovery of the principle of radioactivity so significant for archaeology? Explain the developments that were made possible and why they are so important.
- Your friend observes that you have just learned about many different dating techniques in your archaeology course and wonders why so many methods are needed to figure out how old something is. Describe how you might answer your friend's question and consider at least two reasons for multiple dating techniques in archaeology.
- Describe the role experimental archaeology has played in the study of lithics and other classes of artifacts.
- What is the difference between ferrous and non-ferrous metals?
- Why is the study of debitage important to archaeologists?

Terms You Should Know

absolute dating Determination of age using a specific time-scale such as years before present (B.P.) or according to a fixed calendar.

archaeomagnetic dating Used for dating clay by examining the magnetic particles in the clay that record the direction of magnetic north at the time the clay was heated.

archaeometallurgy The study of the past use and production of metals by humans.

core A lithic artifact from which flakes are removed and used as a tool or a blank from which other tools are made.

direct dating Determination of the age of an artifact, ecofact, or feature through analysis of the object itself.

electron spin resonance (ESR) Effective for confirming dates obtained using other methods. Useful for materials that decompose when heated, such as tooth enamel.

ission track dating Determines age based on the natural splitting (fission) of Uranium-238, which leaves tracks behind in the surface of the material.

rekuensi seriation Placing artifact assemblages in serial order by examining the relative frequency of different types of artifacts.

half-life The number of years it takes for half of the radioactive element to decay.

igneous Volcanic rock, which contains radioactive Potassium-40.

indirect dating Determination of the age of an artifact, ecofact, or feature by looking at its association with the matrix or object of a known age.

marine reservoir effect A phenomenon whereby the radiocarbon content of terrestrial organisms is not the same as marine organisms and organisms that ingest them.

metallographic analysis The study of the past use and production of metals by humans.

microscopic wear analysis A method of analysis that identifies the use and function of artifacts by examining their working surfaces and edges through magnification.

mtDNA dating Compares the DNA of individuals and populations found in their cells' mitochondria to establish patterns of migration over time.

otassium-Argon dating (K/Ar) dating Half-life of 1.3 billion years. Most accurate for materials that are older than 1 million years.

adiocarbon dating An absolute dating technique based on the knowledge that living organisms build up organic carbon. When the organism dies, Carbon-14 (C-14) atoms disintegrate at a known rate, which makes it possible to calculate the date of an organic object by measuring the amount of C-14 in the sample.

radiometric dating Absolute dating techniques that measure the relative proportions of specific radioactive isotopes present in a sample.

relative dating Determination of chronological sequence based on associations and comparisons rather than a fixed time scale.

- sedimentary rock

seriation A relative dating technique where artifacts are ordered chronologically based on the assumption that materials, manufacturing techniques, and decoration change over time and can be associated with a certain time period

stratigraphic dating A relative dating method where the age of an artifact, ecofact, or feature is determined by its association with the stratigraphic layer in which it was deposited.

stylistic seriation Placing artifact assemblages in serial order based on stylistic changes in their features.

terminus post quem The date after which a stratum, feature, or artifact must have been deposited.

thermoluminescence Effectively dates ceramics and glass that are 100 to 500,000 years old to determine the last time the material was heated.

trace analysis A means of identifying the source of artifacts and raw materials using techniques such as x-ray spectrometry to identify distinctive trace elements in stones and minerals

travertine Calcium carbonate, which is found in cave walls and floors.

uranium series dating Provides highly accurate dates for materials that are between 50,000 and 500,000 years old.

varves Paired layers of outwash gravel and sediment deposited in glacial lakes by retreating ice sheets.

vitrified Converted into glass or a glasslike substance, typically by exposure to heat.

Y chromosome dating Compares the DNA from Y chromosomes (male sex chromosomes) of individuals and populations to establish patterns of migration over time.

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CHAPTER OVERVIEW

9: Reconstructing Environment and Subsistence

Learning Objectives

- Explain what archaeologists learn by reconstructing past environments.
- Describe what archaeologists learn by studying flora and fauna in the archaeological record.
- Outline the types of macro and micro evidence used by archaeologists.
- Articulate specific types of evidence archaeologists use to determine if a site was used by foragers or agriculturalists.
- Calculate minimum number of individuals (MNIs) and number of identified specimens (NISPs).

[9.1: Reconstructing Environments](#)

[9.2: Reconstructing Subsistence Patterns](#)

[9.3: Chapter Nine Review](#)

Image: Preserving food - The Bodewadimi in the 1700s. (2010). By ellenm1 under [CC BY-SA](#) via flickr.

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9.1: Reconstructing Environments

ENVIRONMENT

To understand and interpret past human behavior, archaeologists need a complete understanding of the past natural environment and regional climate at a site. Reconstructing the environment and climate allows archaeologists to identify the plants and animals with which humans shared the landscape and examine how humans at the time adapted in response to the resources available to them. This chapter reviews a few of the ways archaeologists can use data to reconstruct the environment and climate at the time a site was occupied and identify food resources in terms of the *flora* (plants) and *fauna* (animals) that would have been available to the site's occupants.

The Climate

Archaeologists try to reconstruct the climate of the time period during the occupation of a site whether it was one occupation or many occupations over many years. As we know, the earth has undergone cycles of warm and cold throughout its history. Much of the archaeologist's research can give us clues about the climate in which humans of the past lived including examining the geology, flora, and fauna of the time period and region. For example, tree rings can provide useful information about regional variations in climate, particularly in terms of the amount of rainfall at the time. For many types of trees, each ring in a cross-section of the trunk identifies one year of growth with the widest rings during unusually wet years and thinnest rings during severe drought years. Individual tree species respond differently to climatic conditions and thus provide somewhat different data. Archaeologists trained in *dendrochronology* can “read” the tree ring data and obtain information about the climate that existed when the rings were created, including changes in the climate over time.



Figure 9.1.1: Tree rings of a 200 year old douglas fir indicating a period of drought.

The Geology

Geoarchaeology plays a large role in reconstructing past landscapes and environments. There are several ways in which archaeologists rely on research techniques and knowledge from the Earth sciences for their own research. We have already covered some of these techniques in other chapters of this textbook, such as: *the use of remote sensing devices to identify sites and features, studying site-formation and artifact deposition, and relative dating sites through stratigraphy, using palynology to reconstruct the environment* (Fagan, 2006). **Sedimentology**, which analyzes how sediments, such as sand, silt, and clay were deposited. This is another tool archaeologists use to analyze past environments and climates. The size and shape of deposits and the texture, size, and shape of the material they contain all give archaeologists clues about how the sediment ended up at a particular location. For example, a glossy, rounded sediment that's relatively small in size was likely carried a long distance by water before being deposited. Scattered fields of rocks and other debris of various sizes and shapes, on the other hand, point to transportation by a glacier.

geoarchaeology

The branch of archaeology that uses techniques and subject matter from geography, geology, and other Earth sciences to inform archaeological research.

sedimentology

The study of sediments and the processes that result in their formation, transportation, and deposition.

The Flora

Other large plant remains, called **macrobotanicals**, are also useful in reconstructing environments. Archaeologists can identify plant species at a site even when they are no longer present in the fossil record such as imprints left behind by seeds and fruits in sediment and from charcoal left behind from burning wood in a fire pit. Reconstructing the environment helps determine whether plants found at a site were native to the area or likely came from another region and environment, indicating travel and/or trading relationships. By examining the associations between macrobotanical remains and other artifacts, we gain information about how the plants were used by humans in the past.

macrobotanicals

Plant remains that can be seen with the naked eye such as seeds, nuts, and wood fragments.

Small **microbotanical** remains include items such as pollen grains, which are microscopic, and small seed and plant structures. They are often abundant in archaeological sites but are not always studied because collection requires fine screening techniques such as water flotation. **Palynology** refers to the study of pollen grains, which has been an integral part of archaeology since the early twentieth century. Their size, shape, and structure can be used to identify the genus of plant that produced the grains. Like all organic matter, pollen grains are best preserved in dry environments such as caves and in anaerobic conditions such as those found in peat bogs.

microbotanicals

Ancient fragments or structures of plant tissues that are not visible to the naked eye, such as pollen and phytoliths.

palynology

The study of pollen grains and other spores, especially as found in archaeological or geological deposits.

Pollen is collected using a tool similar to an auger probe. Archaeologists extract long vertical cores of soil and sediment and examine carefully measured segments of the cores under a microscope to view and identify the pollen. Sometimes a more-involved chemical process is needed to remove the pollen grains from the matrix. In that case, the task is turned over to a palynologist. Once the grains are visible, each type of pollen in the sample is identified (typically at the genus level only) and counted. The results can be presented graphically to show how plant species present at the site changed over time or during its occupation.

Phytoliths are another type of microbotanical remains. They are minute particles of silica (silica also makes up sand) from plant cells that can survive long after all other parts of a plant, including pollen, decompose. Plants produce these particles in large quantities, and phytoliths are commonly found in the remnants of hearths, in layers of ash, inside pottery that at one time contained plants, and wedged in the crevices of animal teeth. Phytoliths can, in many cases, identify plants at the genus and species level and are used to confirm pollen sequences determined from core samples.

phytoliths

Fossilized particles of plant tissue.

Diatoms are a type of plant microfossil that consist of single-celled algae found in water that have silica cell walls instead of the cellulose cell walls found in plants. Thus, like phytoliths, diatoms survive long after cellulose plants decompose. Diatoms have been studied for more than 200 years, and many varieties, each with a unique structure, have been identified and classified. Their well-defined shapes allow archaeologists to identify the specific diatoms uncovered at a site, and the assemblage of diatoms present can be used to answer questions about the salinity (salts), alkalinity (bases), and nutrient content of the water in which they formed.

diatoms

A single-celled algae that have a cell wall of silica.



Figure 9.1.2: Pollen grains of common hazel, magnified 1200x.

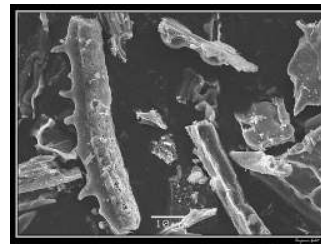


Figure 9.1.3: Image of *phytoliths* from *Elephant Grass*.



Figure 9.1.4: Image of *diatoms* magnified 2400x.

The Fauna

When archaeologists study animal (fauna) remains at a site, they are particularly interested in how the animals wound up there—whether they were raised there by occupants, were wild and occurred naturally at the site, or were brought there by the occupants or by predators. Generally, large animal remains (**macrofauna**) are not as useful to archaeologists when reconstructing an environment as small animal remains (**microfauna**). Animals such as deer, buffalo, and boars often occupy large territories that shift with changes in the environment. Small animals such as rodents, bats, and other insectivores tend to be associated with localized geographic features such as caves and swamps. Burrowing animals present a challenge, however, because remains found at a site could represent animals present when the site was occupied or animals that burrowed down to that location hundreds or thousands of years later.

macrofauna

Animals that are larger than 2mm in size.

microfauna

Microscopic and organisms that exhibit animal-like qualities.

Another example of microfauna remains that can be useful in reconstructing an environment is *owl pellets*—something you might have dissected in school. The pellets are the regurgitated remains of the owl's meal, consisting of the bones, teeth, claws, and fur that they cannot digest. Owls do not travel far when hunting so their pellets provide a snapshot of the microfauna available at the time within a radius of just a few kilometers.

Remains of birds and of land and marine mollusks (snails) are also good indicators of climate change and the local environment. Both species are generally fairly well preserved, and the particular species present reflect the local climate. Birds, for example, occupy different types of climates in terms of annual average temperature and the presence or lack of fresh and saltwater. Archaeologists compare modern species of mollusks and the habitats they prefer with changes in the percentage of various marine mollusks in the past to reveal interesting information about shifts in coastal micro-climates that determine whether a shore is rocky or sandy.

Whatever type of animal species archaeologists study when reconstructing a past landscape, it is important not to rely on a single species indicator. Basing a reconstruction solely on the calcium carbonate of land mollusks, for example, would likely miss important details represented by other animal remains at the site.



Figure 9.1.5: Dissection of an owl pellet.

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Images

Figure 9.1.1 Tree rings. (2010). By Jason Hollinger under [CC BY](#) via flickr.

Figure 9.1.2 Pollen grains of common hazel. (n.d.) By Doc. RNDr. Josef Reischig, CSc. under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 9.1.3 Phytoliths are extracted from plant material (Elephant Grass) by dry ashing method. (2013). By Benjamin Gadet under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 9.1.4 Various diatoms. (n.d). By Doc. RN Dr. Josef Reischig, CSc. under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 9.1.5 Inside the owl pellet. (2017). By Art Siegel under [CC BY-NC](#) via flickr.

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9.2: Reconstructing Subsistence Patterns

DIET

In addition to climates and natural environments, archaeologists reconstruct the diets of those who occupied a site using plant and animal remains. It is important to realize that there is a big difference between a meal and a diet. A *meal* is a single event—your dinner last night, for example. From an archaeological perspective, it is nearly impossible to reconstruct a single event at a site. That kind of information typically comes from analyses of fecal matter, stomach contents, and written records. **Diet**, on the other hand, is the long-term pattern of consumption and represents the types of foods eaten on a regular basis. Many lines of evidence are used to reconstruct the diet of a culture. Archaeologists will turn to two areas of study, paleoethnobotany and zooarchaeology to examine the diet of past cultures. However, as noted earlier, archaeologists have to understand the preservation of the site and its taphonomy (see [Chapter 4](#)) to determine whether the archaeological materials in question were brought to the site and consumed by humans or wound up in the archaeological record in another way.

diet

The long-term pattern of consumption and represents the types of foods eaten on a regular basis.

Fruits and Vegetables

Paleoethnobotany is the study of how plants and plant-based materials were used by humans in the past. When trying to reconstruct diet using macrobotanical remains, archaeologists need a large sample size. One cannot conclude anything about diet from the presence of one peach pit or one grape seed; in fact, from such scant evidence, it is not clear whether the fruit was eaten at all, let alone whether it was a regular part of a human's diet. When using pollen data, or microbotanical, archaeologists must collect a minimum of 100 grams of pollen of a species before they can clearly determine the plant's importance in a diet.

paleoethnobotany

The study of how plants and plant-based materials were used by humans in the past.

Whatever types of plant remains are recovered, it is important to quantify the remains by weight and number and arrange them graphically by abundance much in the same way palynological pollen data is presented when reconstructing a past landscape. Plant remains are both weighed and counted because either method alone would favor certain types of plants over others.

It is important to reconstruct diets not only for hunter-gatherers and other prehistoric groups but also for more-recent agricultural groups. An analysis of chemical residues such as proteins, fatty acids, and DNA can be used for simple identifications of plants in agricultural settings. Residues (phytoliths) found on artifacts such as stone sickles used to harvest wheat, for example, can confirm that the occupants engaged in harvesting practices. The study of the domestication of wild plant species is also important in archaeology. Sometimes the transition from wild to domestic is fairly easy to see archaeologically, such as morphological changes in a plant's structure. For example, the transition from maize to the corn cob we know today is obvious.

Meats

Zooarchaeology is the branch of archaeology that studies animal remains from archaeological sites. When analyzing animal remains for their role in a people's diet, archaeologists have to take several factors into account. One is how the animal ended up at the site. Another important consideration is whether the animal was eaten or was used for some other purpose, such as providing milk or antlers, horns, and skins for tools and clothing. To determine if the animal was used for food, archaeologists look for marks on bones that indicate that a human scraped meat from the bone with a tool or cut the bones versus marks of predators gnawing on the carcass and etching of the bones by plants. A scanning electron microscope can examine the bones for minute signs of wear. Human-made tools typically leave V-shaped marks while gnawing of carnivores leaves more rounded marks.

zooarchaeology

The branch of archaeology that studies animal remains from archaeological sites.

When trying to make sense of animal remains at an archaeological site, some basic data are collected and tabulated before they are examined more thoroughly. Often the first step is to identify the species, if possible. Then, the remains are quantified to determine

both how many pieces of bone there are and the likely number of individuals the remains represent. The raw count of pieces of bone is the **number of identified specimens (NISP)**. So, say, twelve femurs from ancient cattle. The **minimum number of individuals (MNI)** accounts for how many individual animals can be represented by the number of specimens. Consider the twelve femurs from cattle. If four of the specimens are right femurs and eight are left femurs, the MNI (*minimum* number) is four since each cow had only one right femur. Archaeologists also calculate the **meat weight** provided by an individual specimen, which varies with the age and sex of the animal and the season in which it died.

number of identified specimens (NISP)

The raw count of pieces of bone collected from a site.

minimum number of individuals (MNI)

The fewest possible number of people or animals represented in a skeletal assemblage.

meat weight

A calculated estimate of the biomass of an individual specimen.

After collecting basic quantitative data about bones at a site, archaeologists study other aspects of the remains, such as the sexes and likely ages of the animals, which can provide clues about whether the animals were wild or domesticated. Methods for determining the age and sex of animals from bones are similar to ones used with human skeletons. Like humans, male and female animals have different pelvic structures. Archaeologists also look at teeth, horns, and antlers since female deer species do not have antlers and male carnivores typically have larger canine teeth. They also examine the eruption and amount of wear on teeth and how developed long bones such as femurs are, which points to the age of the animal. Seasonality—when the animals died—is estimated using the animals' characteristics, such as births and shedding of antlers that occur only in certain seasons. Migratory patterns are also useful for determining the time of year when many species of mammals and birds died.

One last feature that is important to archaeologists is whether the animals were domesticated or wild. As with plants, many physical properties of an animal change as a result of domestication. In general, as they are domesticated, animals tend to get smaller, and changes in their diets can be reflected in their teeth. The presence of some agricultural tools such as plows and yokes indicate that the animals were used to work the land. Finally, some deformities and diseases evident on animal skeletons also point to domestication; osteoarthritis, for example, is often present in the lower limbs of animals used for plowing and transportation.

Let's Look At Teeth

Finally, to truly understand what human occupants of a site ate, archaeologists examine and analyze their teeth. Abrasive particles in food can leave striations on the enamel, and the orientation and length of the striations are directly related to the occupants of the site as well as their food preparation and cooking processes. Abrasive particles in food also lead to tooth decay. Native Californians, for example, routinely ate acorn meal, an extremely gritty food that left marks on their teeth and accelerated tooth decay, distinguishing them from other native people who did not consume acorns. Substantial tooth decay and loss can also be an indicator of diets dominated by starchy and sugary foods and carbohydrates, which would have been consumed because they were the most abundant food source. In recent years, analysis of isotopic markers found in both teeth and human bones have expanded our knowledge of past peoples' long-term dietary patterns, including whether they relied primarily on land or marine resources for food. Additionally, isotopic markers can identify substantial shifts in diets, which are typically understood to have arisen when individuals moved to new locations.

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9.3: Chapter Nine Review

Test Your Knowledge

1. Suppose you have an archaeological site that contains the remains of sloth bones. In the assemblage are 6 phalanges (toe bones), 5 complete skulls, 10 femurs, and 55 vertebrae. Calculate the MNI and NISP for the sloths at this site.
2. What can phytoliths and diatoms tell archaeologists about a past environment?
3. What is the difference between a meal and a diet? Give an example.
4. What specific kinds of archaeological evidence related to flora and fauna can provide archaeologists with clues that the site was occupied by agriculturalists?
5. Why are macrofauna less useful than microfauna when reconstructing the past environment?

Terms You Should Know

diet The long-term pattern of consumption and represents the types of foods eaten on a regular basis.

diatoms A single-celled algae that have a cell wall of silica.

geoarchaeology The branch of archaeology that uses techniques and subject matter from geography, geology, and other Earth sciences to inform archaeological research.

macrobotanical Plant remains that can be seen with the naked eye such as seeds, nuts, and wood fragments.

macrofauna Animals that are larger than 2mm in size.

meat weight A calculated estimate of the biomass of an individual specimen.

microbotanical Ancient fragments or structures of plant tissues that are not visible to the naked eye, such as pollen and phytoliths.

microfauna Microscopic and organisms that exhibit animal-like qualities.

minimum number of individuals (MNI) The fewest possible number of people or animals represented in a skeletal assemblage.

number of identified specimens (NISP) The raw count of pieces of bone collected from a site.

paleoethnobotany The study of how plants and plant-based materials were used by humans in the past.

palynology The study of pollen grains and other spores, especially as found in archaeological or geological deposits.

phytoliths A fossilized particle of plant tissue

sedimentology The study of sediments and the processes that result in their formation, transportation, and deposition.

zooarchaeology The branch of archaeology that studies animal remains from archaeological sites.

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CHAPTER OVERVIEW

10: Reconstructing Socio-Political Organization

Learning Objectives

- Describe the four categories used to characterize a political organization.
- Compare and contrast egalitarian, rank, and stratified societies.
- Explain some of the methods used by archaeologists to better understand the social characteristics of the societies they study.

[10.1: Socio-political Organization](#)

[10.2: Social Analysis](#)

[10.3: Chapter 10 Review](#)

Image: Ruins of the antique city of Tlos, Turkey. (2207). By Toksave under [CC BY-SA 3.0](#) via Wikimedia Commons.

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10.1: Socio-political Organization

POLITICAL ORGANIZATION

Political organization describes how the people of a community organize themselves and their relationship with other communities around them. What kind of leadership do they have? How do they make decisions for the group, such as the rules to follow? How do they make the decision to migrate to another site or area? How do they deal with internal and external conflicts, including incursions by groups from nearby territories? What is the social structure of the community? Archaeologists use a system of classification developed by anthropologist Elman Service. These levels of political organization are known as: *bands*, *tribes*, *chiefdoms*, and *states*. These same categories are used to classify both past and living societies that can be directly observed. The levels of political organization are typically closely associated with a specific mode of subsistence and social system.

Levels of Political Organization

In reality, of course, societies often fall somewhere along a continuum of degrees of political organization and do not necessarily fit neatly into traditional categories. Archaeologists assess the complexity of a group's political organization by analyzing its settlement patterns and written records. By comparing them with the political structures observed in other cultures, archaeologists can infer how the group that lived on a site may have been organized.

Bands

The first category of political organization is the **band**, which refers to mobile hunter-gatherer groups that typically number less than 100 individuals and are rarely integrated politically with others. These relatively small societies tend to forage for food over a large area and are *nomadic*, moving frequently with the seasons and availability of various food resources. Consequently, their sites are some of the most difficult to identify archaeologically because they leave few artifacts behind in widely distributed archaeological deposits. The number of individuals and families making up nomadic bands varies with the season, as family and gender groups separate for a time and then rejoin in seasonal movements known as **seasonal rounds**. Usually, leadership in a band is informal and temporary, and many decisions are made by the community, though individuals who are admired can have greater influence. One example of a society organized as a band is the Paiute from the Great Basin of the western United States, who were studied extensively by archaeologist Julian Steward. In the pre-contact era (before colonists from Europe came to North America), the Paiute lived in family bands and moved frequently to access various seasonally available food resources, including grass seeds, pinyon nuts, ducks, geese, and jackrabbits. Archaeological evidence uncovered from their occupation sites consists primarily of projectile points and other lithic artifacts and a few other items, such as tule reed and feather duck decoys that were stored in **caches** in protected areas for future use. Bands typically leave behind little evidence of areas they occupy—occasionally, archaeologists find remains of temporary sites used for making projectiles and for butchering and preparing food.

band

The smallest unit of political organization, consisting of only a few families with no formal leadership positions. Typically, they have a population of less than 100, are a nomadic society, are hunter-gathers, and have an egalitarian social system.

seasonal rounds

Patterns of movement from one resource to another in an annual cycle.

caches

Collection of tools and/or materials stored for future use.

Tribes

A second political organization is the **tribe**, which consists of several small territorial populations that mostly act autonomously but sometimes interact with other groups linked to them by customs, kinship, and/or age for political or military purposes and sometimes send representatives to tribal gatherings. They usually join together in pursuit of a limited objective or gather informally in social customs. Tribes tend to be egalitarian and produce their own food by subsistence horticulture and/or tending herd animals (*pastoralism*). They typically are more sedentary than bands, establishing relatively permanent settlements in which hundreds of individuals live. Tribal archaeological sites include villages containing numerous semi-permanent dwellings indicated by post

holes, hearths, and/or food storage pits that reveal both longer-term occupations and the relatively coordinated labor of a greater number of individuals. Leadership in individual tribal groups typically consists of part-time leaders.

tribe

Political units organized around family ties that have fluid or shifting systems of temporary or part-time leadership and living in semi-permanent or permanent settlements with a population in the hundreds. Typically, they are an egalitarian society that practices horticulture and/or pastoralism.

Chieftdoms

Chieftdoms represent a shift from the loosely organized political structure of tribes to more formal political structures involving multiple communities. The *chief* has greater authority and higher social standing (rank) than the rest of the communities' members, and the role is permanent and can be hereditary and passed on to children. Chieftdoms typically are densely populated and use intensive agriculture, horticulture, and/or pastoralism. Chiefs typically do not have the power to compel others to obey them but are highly respected, often as religious authorities, and redistribute goods, direct public behavior, and perform other leadership tasks. Societies organized as chieftdoms often erect large-scale monuments made possible by the coordinated labor of a large number of people. One such monument is Stonehenge in England. These early, relatively hierarchical political organizations also led to differentiated burials in which individuals were buried with items valued by their cultures that pointed to differences in status.

chieftdom

Large political units involving multiple communities in which a permanent chief, who usually is determined by heredity, holds a formal position of authority. Typically, they are a sedentary, ranked society with large populations and practice horticulture or agriculture.

States

State societies represent an even greater level of integration between communities; they are autonomous political units that link and govern many communities in a territory. States are characterized by centralized governments that have the power to collect taxes, draft people for labor and to fight wars, and enact and enforce laws. States typically rely on intensive agriculture and pastoralism for subsistence and therefore need additional territory as they expand. Consequently, colonialism was a common way to obtain access to needed resources. States tend to incorporate multiple communities, often separated by great distances. In addition, state societies are stratified, assigning individuals to classes or castes, and frequently construct large public monuments such as palaces, temples, and public buildings.

state

The most complex form of political organization characterized by a central government that has formal power and authority. They are autonomous units that link and govern many communities in a territory. They are typically stratified societies that rely on intensive agriculture.

State societies typically leave behind abundant archaeological evidence, including terraced fields, highways, record-keeping devices (e.g., the Incan complex system of knotted string known as **kipu**), monumental buildings and cities (e.g., Machu Picchu and Cuzco in South America), and mummified human remains. These elements of infrastructure and monumental works are characteristic of state societies because they are possible only when rulers can conscript thousands of human laborers and compel taxes.

kipu

Knotted strings used for collecting data, record keeping, and government management. Also spelled *quipu*.

Grave goods in state-level societies vary substantially because of social stratification in those cultures. A well-known, one-of-a-kind example of the grandiosity of grave goods often included in burials of state leaders is the burial of Qin Shi Huang, the first emperor of China, which included 6,000 life-size warriors molded from terra cotta and a depiction of the world in miniature, complete with stars above and rivers made of liquid mercury.

SOCIAL ORGANIZATION

While political organization looks at the relationship of a community with others around it, social organization looks at the internal organization of the people within the community. Social systems are typically based on whether the resources and advantages of the society are equally available to everyone or available only to higher-status individuals. An increase in social stratification in society leads to an increase in differential access to resources. Sociologist, Max Weber, identified three dimensions of social stratification (Kottak, 2012):

- **wealth:** things that are considered valuable in a culture, such as land, tools, money, goods, and wealth; a person's material assets.
- **power:** the ability to exercise one's will over others; often making others do things they do not want to do, such as slave labor.
- **prestige:** particular honor or respect; approval for acts, deeds, or qualities considered exemplary.



Figure 10.1.1: Quipu in the Museo Machu Picchu, Casa Concha, Cusco.

Egalitarian

In **egalitarian** societies, individuals are not grouped by access to economic resources, power, or prestige. They can individually achieve status in their lifetimes, but their status is not passed down to other members of their families. Everyone in an egalitarian society is born with an equal opportunity to attain society's advantages, and prestige is granted to anyone who earns it through exceptional skills or efforts. Most egalitarian societies were comprised of foragers, horticulturalists, and pastoralists. They relied heavily on sharing to attain needed items, which ensured equal access to economic resources and functionally separated actual wealth from recognition of skill. In these societies, there is no dominant leader, and the group uses **social leveling mechanisms** to maintain equality. These devices consist of behavior such as ridiculing, teasing, and shunning of would-be leaders that reduce their status in the group and prevent them from becoming more powerful than others.

egalitarian

Societies in which there is no great difference in status or power between individuals. Foragers, horticulturalists, and pastoralists are typically egalitarian societies.

social leveling mechanisms

Practices that ensure an individual does not gain more power than others such as ridiculing, teasing, and shunning.

Ranked

Ranked societies, which are typically agricultural and sometimes pastoral, assign individuals to social groups that have unequal access to prestige (but not to wealth or power). Coastal fishing societies in northwestern North America were rank societies. The abundance of salmon and their success in harvesting and preserving the fish allowed them to stockpile food resources that were subsequently given away in ceremonies known as **potlatches** that served to reinforce the host's social status as high ranking. Rank societies were often ruled by chiefs since no one had the ability to force people to work but could influence others to work by working hard themselves.

ranked

Societies in which there is unequal access to prestige but little difference in wealth and power; prestige was gained through a demonstration of generosity. Typically, ranked societies practice horticulture or agriculture.

potlatch

A gift-giving ceremony of the Northwest Pacific Coast Native Americans in which distribution of gifts affirms or reaffirms an individual's status in the community.

Stratification

When some groups have greater access to these societal advantages because of their identities rather than having to earn them, the society is considered to have **social stratification**: unequal access to resources, power, and/or prestige. Evidence of social stratification first appears in the archaeological record at the same time as the development of agriculture. At the ancient Egyptian site of Gebel el Silsila, for example, the remains of four young children (between four and nine years old) showed evidence of mummification and were buried, likely in a wooden coffin, with multiple valued items as *grave goods*, including amulets, a bronze bracelet, and pottery. Since the children would not have earned the status associated with those items (**achieved status**) in their short lives, they likely inherited their status through kinship, which is called **ascribed status**.

social stratification

Individuals have unequal access to resources, positions of power, and/or prestige. Associated with state-level societies.

achieved status

Individuals receive a status based on meeting certain criteria through personal efforts or the efforts of others (Kottak, 2012). They can be positive or negative.

ascribed status

A status an individual has no choice or control over (Kottak, 2012). You are born into it or grow into it, such as family prestige or status attained at a certain age.

In **class** societies, social groups have unequal access to economic resources, power, and prestige. Some have greater opportunities in life simply because of the social group into which they are born. Class societies are also called fully stratified societies. They can be **open-class societies**, in which individuals can move into a different class, or **closed-class societies (caste societies)**, in which individuals can never change their class status. Because many past class societies have assigned classes based on specialized professions and crafts, archaeologists can infer the presence of a class society from dedicated sections of cities by occupation.

class

Social groups with unequal access to economic resources, power, and prestige.

open-class societies

The division of society into hierarchical levels in which individuals have social ability and can move between classes, either into a higher or lower class.

closed-class societies

The division of society into hierarchical levels; one's position is determined by birth and remains fixed for life (Stratified Societies and States, 2021). A characteristic of a *caste system*.

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Images

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10.2: Social Analysis

Methods of Analyzing Social Stratification

When attempting to reconstruct the social and political organization of prehistoric societies, it can be a bit challenging. Archaeologists have to solely rely on the archaeological record that is recovered from the site. Archaeologists use a variety of techniques to identify the social dynamics of the past societies they study.

Settlement Analysis

Settlement analysis identifies patterns in how different groups of people use particular locations using surveys, remote sensing, and other techniques and then compares those patterns to patterns of settlement at other sites. Traded and other non-local items are useful when identifying multiple sites occupied by a single group at different times. For example, site surveys, some excavation, and ethnoarchaeology methods can be used to better understand how a hunter-gatherer group used a regional location in its seasonal rounds. All of these lines of evidence can be used by an archaeologist to determine if any and what type of social stratification was practiced by a particular group whose remains are being studied archaeologically.

settlement analysis

The study of settlement patterns and the use of the landscape.

Burial Analysis

Another approach used by archaeologists to analyze the social organization of a group is **burial analysis**, which examines human remains and analyzes the rank and status indicated by the grave goods that accompany them. They analyze the skeletons to reveal the age and sex of the individuals when they died, their causes of death (e.g., disease, dietary deficiencies), and whether the remains were buried individually or communally. Sex and age differences contribute to determining potential differences in wealth and status. If, for example, only some older adults were buried with status goods, archaeologists interpret those burials as reflecting an egalitarian society. Status goods sometimes found buried with children and babies point to ascribed status, indicating a stratified society.

burial analysis

The process of studying human remains, burial practices, and grave goods to establish a possible rank or status of the individual.

Monuments and Public Works

Monuments and public works are particularly useful when analyzing the type of stratification present in a society. The size, spacing, and construction requirements associated with public works such as roads, irrigation systems, earthen works, monuments, and large-scale buildings tell us a great deal about the social structure of the society that produced them. The larger and more involved the project, the more hours of labor required to construct it. Thus, large-scale projects require a greater level of social and political organization. The Great Wall of China, for example, represents multiple generations of labor organized during a series of dynasties spanning 2,000 years. The oldest sections cover more than 13,000 miles, representing the labor of at least 400,000 people, many of whom died from the harsh conditions experienced during construction.



Figure 10.2.1: Machu Picchu, Peru



Figure 10.2.2: Roman Aqueduct in Segovia, Spain.



Figure 10.2.3: Great Wall of China.

Historical Records

Naturally, a society's historical records provide important information about the social structure at the time. The ancient Egyptians and the Chinese during some of the earliest dynasties kept detailed records of family lineages and individual families' ties with past leaders. Other cultures have recorded business transactions, taxations, literature, and laws. Of course, many cultures did not keep written records, and many of the records that were kept were lost to time or poorly preserved. Inscriptions in clay and on stone buildings and stelae (inscribed upright stone markers) can potentially survive, but records made using papyrus and other perishable organic materials are only rarely preserved.



Figure 10.2.4: Upper portion of a stele from the Babylonian King Nabonidus, 555-539 BCE.

Other Types of Social Analysis

Ethnicity

Ethnicity—one's membership in a particular cultural group defined by language, religion, and other cultural traits—can be challenging to identify in the archaeological record. One indicator archaeologists use is distinctive styles of pottery and other materials. For example, excavations in one section of the Mesoamerican city of Teotihuacan have uncovered distinctive pottery styles and burial practices associated with the Zapotecs in Oaxaca. Archaeologists believe that this site reflects a community of Oaxacan Zapotec immigrants living in Teotihuacan. Much of the information discovered so far about ethnicity has come from written records. But even when documents remain, it is difficult to infer much about people's ethnicities and potential differences in their social status unless there is some kind of obvious separation as there is in Teotihuacan.

ethnicity

The degree to which a person identifies with and feels an attachment to a particular group based on shared cultural characteristics and ancestry (Ethnicity, 2021).

Gender Analysis

Gender analysis is used by anthropologists and archaeologists to understand the **gender roles** and relationships assigned to each *biological sex* (male, female, and sometimes other sexes). We can often infer more about gender roles than about ethnicity from documents and representations of daily life and rituals for some ancient cultures, but much of that information is not preserved. For example, a Viking burial that was first excavated in the 1870s was recently re-analyzed, and archaeologists discovered that a highly ranked warrior uncovered during those early excavations was not a man, as had always been assumed, but was a woman. None of the items in the burial were typically associated with women in Viking culture. Some have speculated that this grave points to a transgender warrior, but researchers have cautioned against trying to interpret the site through such a narrow lens. Archaeologists recognize that gender roles within a culture are unique and that we cannot apply terminologies and categories from Western cultures to ancient civilizations.

gender roles

The set of expectations about tasks, attitudes, and behaviors that are culturally assigned based on biological sex and gender.

Consider the ethnic groups and gender identities present in our culture today. What aspects of those identities could be preserved for future archaeologists to discover and what types of sites would those archaeologists study? What kinds of evidence of ethnic and gender identities likely would not be preserved? Despite the challenges associated with interpreting the archaeological record to understand ethnic groups and gender roles of past cultures, the potential discoveries are worth the effort and benefit from new technologies.

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Images

Figure 10.2.1 Early morning in wonderful Machu Picchu. (2007). By Pedro Szekely by [CC BY-SA 2.0](#) via Wikimedia Commons.

Figure 10.2.2 Aqueduct of Segovia, located in the city of Segovia, Spain. (2009). By Bernard Gagnon under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 10.2.3 The Great Wall of China at Jinshanling. (2013). By Severin.stalder under [CC BY-SA 3.0](#) via Wikimedia Commons.

Figure 10.2.4 Detail. Stele of the Neo-Babylonian king Nabonidus, 555-539 BCE. (2013). By Osama Shukir Muhammed Amin FRCP(Glasg), [CC BY-SA 4.0](#) via Wikimedia Commons.

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10.3: Chapter 10 Review

Test Your Knowledge

1. What characteristics distinguish a tribe from a chiefdom?
2. Compare and contrast egalitarian, rank, and class stratified societies. In what ways are they similar? What is most significant among their differences?
3. How do achieved status and ascribed status differ? In which forms of social stratification are achieved status and ascribed status most significant?
4. Why do you think ethnicity and gender can be complex to identify and study archaeologically?
5. What are two ways in which monuments are significant to social archaeology?

Terms You Should Know

achieved status Individuals receive a status based on meeting certain criteria through personal efforts or the efforts of others (Kottak, 2012). They can be positive or negative.

ascribed status A status an individual has no choice or control over (Kottak, 2012). You are born into it or grow into it, such as family prestige or status attained at a certain age.

band The smallest unit of political organization, consisting of only a few families and no formal leadership positions. Typically, they have a population of less than 100, are a nomadic society, are hunter-gathers, and have an egalitarian social system.

burial analysis The process of studying human remains, burial practices, and grave goods to establish a possible rank and status of the individual.

cache Collection of tools and/or materials stored for future use.

chiefdom Large political units involving multiple communities in which a permanent chief, who usually is determined by heredity, holds a formal position of authority. Typically, they are a sedentary, ranked society with large populations and practice horticulture or agriculture.

class Social groups with unequal access to wealth, power, and prestige.

closed-class society The division of society into hierarchical levels; one's position is determined by birth and remains fixed for life. A characteristic of a *caste system*.

egalitarian society Societies in which there is no great difference in status or power between individuals. Foragers, horticulturalists, and pastoralists are typically egalitarian societies.

ethnicity The degree to which a person identifies with and feels an attachment to a particular group based on shared cultural characteristics and ancestry

gender roles The set of expectations about tasks, attitudes, and behaviors that are culturally assigned based on biological sex and gender.

kipu Knotted strings used for collecting data, record keeping, and government management. Also spelled *quipu*.

open class society The division of society into hierarchical levels in which individuals have social ability and can move between classes, either into a higher or lower class.

potlatch A gift-giving ceremony of the Northwest Pacific Coast Native Americans in which distribution of gifts affirms or reaffirms an individual's status in the community.

power the ability to exercise one's will over others; often making others do things they do not want to do, such as slave labor.

prestige Particular honor or respect; approval for acts, deeds, or qualities considered exemplary.

ranked society Societies in which there is unequal access to prestige but little difference in wealth and power; prestige was gained through a demonstration of generosity. Typically, ranked societies practice horticulture or agriculture.

seasonal round Patterns of movement from one resource to another in an annual cycle.

settlement analysis The study of settlement patterns and the use of the landscape.

social leveling mechanisms Practices that ensure an individual does not gain more power than others such as ridiculing, teasing, and shunning.

social stratification Individuals have unequal access to resources, positions of power, and/or prestige. Associated with state-level societies.

state The most complex form of political organization characterized by a central government that has formal power and authority. They are autonomous units that link and govern many communities in a territory. They are typically stratified societies that rely on intensive agriculture.

tribe Political units organized around family ties that have fluid or shifting systems of temporary or part-time leadership and living in semi-permanent or permanent settlements with a population in the hundreds. Typically, they are an egalitarian society that practices horticulture and/or pastoralism.

wealth Things that are considered valuable in a culture, such as land, tools, money, goods, and wealth; a person's material assets.

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CHAPTER OVERVIEW

11: Legal Considerations and CRM

Learning Objectives

- Explain cultural heritage
- Characterize the legal protections for cultural heritage sites and the limitations of those protections
- Describe the role of archaeological codes of ethics
- Articulate how bias can enter archaeological interpretations and its effects
- Explain the importance of Cultural Resource Management (CRM)
- Describe the phases of investigation in CRM archaeology.

[11.1: Legal and Ethical Considerations](#)

[11.2: Cultural Resource Management](#)

[11.3: Chapter Eleven Review](#)

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11.1: Legal and Ethical Considerations

LEGAL CONSIDERATIONS

In many countries, warfare destroys archaeological artifacts and current cultural sites by damaging and destroying important monuments as well as leaving museums and archaeological sites unprotected from looters. Globally, people generally agree that national and regional governments have a responsibility to protect cultural heritage sites and artifacts from being destroyed. The **1954 Hague Convention for the Protection of Cultural Property in the Event of an Armed Conflict** was intended to protect and potentially prevent such destruction globally. While it took over 50 years, the United States finally signed onto the 1954 Hague Convention on March 13, 2009.

The United States and the Protection of Cultural Heritage

The United States has enacted several laws designed to allow for the protection of cultural artifacts, as you can see in the following table. However, the laws mostly do not establish any process for preservation and protection and, therefore, provide no clear consequences when resources are damaged or destroyed.

Legislation for Protection of Cultural Heritage

U.S. legislation	Acronym	Brief explanation	Other notes
Antiquities Act (1906)	none	Authorized the president to declare historic landmarks, historic and prehistoric structures, and other objects of scientific interest as national monuments, explicitly establishing the importance of archaeological sites on public land in the U.S. legal code.	
National Historic Preservation Act (1966)	NHPA	Intended to preserve historic and archaeological sites on public lands.	Section 106: Main provisions for archaeology, basically stating that when any money for a project comes from the federal government, builders and developers must determine if old things (archaeological) are present at the building site. When archaeological remains are found, they must do something about them (survey, inventory, and/or preserve) to retain federal funding for the project. Section 110: Individuals who work for federal agencies are responsible for checking for, evaluating, and protecting historic remains on the land they manage.

U.S. legislation	Acronym	Brief explanation	Other notes
National Environmental Protection Act (1969)	NEPA	A national policy of protecting the environment that requires proposed actions funded by the federal government to evaluate both natural and cultural resources.	
Archaeological Resources Protection Act (197n and R9)	ARPA	Enacted after the Antiquities Act of 1906 was determined to be unconstitutionally vague and requires that archaeological sites be protected.	Governs excavation of archaeological sites on federal and Native American lands, including requiring permits that protect cultural and historic resources, and prohibits interstate and international sales of artifacts.
Native American Grave Protection and Repatriation Act (1990)	NAGPRA	Established precise rules and responsibilities when Native American burials and other items associated with a Native American burial are found through excavation and are housed in museum and university collections.	

ETHICAL CONSIDERATIONS

In addition to numerous laws they must follow, archaeologists face many ethical dilemmas in their work. A **code of ethics** is a written statement of ethical guidelines for groups, organizations, and individuals in their professional occupations. The field of archaeology has established three primary levels of codes of ethics that have unique benefits and limitations. The highest-level codes are the ones adopted by professional organizations such as the Register of Professional Archaeologists (RPA). The RPA's standards of conduct provide for a grievance process and clear ways of enforcing those standards within its ranks, including censure. The weakest level of codes are general statements of goals, principles, and responsibilities adopted by organizations such as the Society for American Archaeology (SAA). SAA has drafted sweeping principles of desired behavior by archaeologists that include things such as accountability and stewardship but do not establish consequences for individuals who do not follow the guidelines.

Want to learn more?

To learn more about the archaeological code of ethics, you can visit the following websites.

[Register of the Professional Archaeologists \(RPA\) Code & Standards](#)

[Society for American Archaeology \(SAA\) Principles of Archaeological Ethics](#)

code of ethics

A written statement of ethical guidelines for groups, organizations, and individuals in their professional occupations.

OTHER CONSIDERATIONS

As you've learned through this course, archaeology is more than just digging holes and looking at the treasure discovered. An archaeologist's job is to uncover patterns of human behavior by excavating and analyzing the archaeological record. Their explanations of these patterns of human behavior are strongly influenced by the paradigm under which they operate. Think of a paradigm as a pair of sunglasses you put on. Sunglasses cut through glare, making some areas easier to see, but also dim the light

coming through the lenses, making other areas more difficult to see. Paradigms operate the same way—effectively dimming some aspects of a group and its culture while bringing others into focus.

Fundamental to all scientific work, and to archaeology in particular, is our innate tendency to be biased by our culture, knowledge, training, and experiences. **Bias**, whether conscious or unconscious, occurs when our perspectives prejudice or favor one explanation over another. We touched on bias briefly in our discussion of the history of archaeology; early on, for example, archaeologists from Europe presumed that all societies developed as theirs had and tried to apply the three-age system of stone, bronze, and iron to cultures that did not follow that line of development. They were influenced by their culture, limited knowledge of other cultures, training in the archaeological paradigm of the time, and experience. Archaeologists are now aware of the drawbacks and risks associated with their biases, but they still must actively work to avoid letting those innate tendencies influence their work.

bias

In archaeology, to favor one explanation over another based on personal culture and/or training.

Colleges and universities generally train their archaeology students in a particular paradigm, and that paradigm, while providing a useful framework for study, is also often a strong source of bias in that paradigms frame one's research, including what qualifies as an acceptable explanation. Archaeologists don't explicitly describe the paradigms that guide their work, but other archaeologists can usually figure this out based on the focus of their work, the types of research questions they ask, and the types of conclusions they draw.

Other sources of bias include the archaeologist's age, biological sex, gender, nationality, ethnicity, and personal experiences, which have shaped who they are and, most importantly, how they see the world. This worldview influences all aspects of their lives, including their work. Education and training also bias research. Most scientists are strongly influenced by their faculty mentors and professors, especially in graduate degree programs. It is often quite easy to trace scientists' influences back to their mentors, not unlike building a family tree, based on how they approach their work.

Cultural and current events can also bias scientific explanations. In the 1960s, for example, many archaeological explanations of people's movements and the failure of societies were centered on warfare because of U.S. involvement in the Vietnam conflict and what it suggested about cultures around the world. By the 1970s, explanations of social problems had shifted to ecological and environmental explanations in response to the environmental movement.

Finally, it is important to realize that the archaeological record is biased by what past people left behind and by which of those things were preserved. It seems like stone tools and ceramics played a dominant role in past human cultures based on the surviving evidence. It is important to remember that there likely were many other types of tools used by past cultures that did not survive.

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11.2: Cultural Resource Management

VANISHING ARCHAEOLOGY

As a result of land development, intensive agriculture, deforestation, and tourism among others, we are continually destroying archaeological remains and **cultural heritage**. In North America, as in other countries around the world, the dominant form of archaeological investigations are a result of **Cultural Resource Management (CRM)** projects. This type of archaeology is important in the effort to protect the remaining archaeological sites that are quickly vanishing.

cultural heritage

An expression of the ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions, and values (Science Direct).

Cultural Resource Management (CRM)

The conservation and management of cultural resources including archaeological sites and artifacts as a means to preserve the past (Fagan, 2006).

NATIONAL PARK SERVICE

In **Chapter 5 of the Management Policies**, the United State's National Park Service (NPS) states, "The National Park Service will protect, preserve, and foster appreciation of the cultural resources in its custody and demonstrate its respect for the peoples traditionally associated with those resources through appropriate programs of research, planning, and stewardship" (National Park Service, 2006). The legislation discussed in the previous section of this textbook provides guidance as well as gives authority and responsibility to the National Park Service for managing and preserving the cultural resources that are located within the public lands and properties of the national park system (National Park Service, 2006). These **cultural resources** include all archeological resources, cultural landscapes, ethnographic resources, historic and prehistoric structures, and museum collections.

cultural resources

Any evidence of past human activities, prehistoric or historic, including artifacts, sites, structures, landscapes, and objects of importance to a culture or community.

The three primary responsibilities of the park service's cultural resource management program are (National Park Service, 2006):

- **Research** - Identify, evaluate, document, register, and establish basic information about all cultural resources and traditionally associated peoples;
- **Planning** - Ensure that management processes for making decisions and setting priorities integrate information about cultural resources and provide for consultation and collaboration with outside entities; and
- **Stewardship** - Ensure that cultural resources are preserved and protected, receive appropriate treatments (including maintenance) to achieve desired conditions, and are made available for public understanding and enjoyment.

PENNSYLVANIA AND CULTURAL RESOURCE MANAGEMENT

When it comes to construction and land development projects at the state level, developers and contractors need to ensure that they are in **compliance** with federal as well as state legal requirements. To do this, they will contract with engineering and CRM consulting firms who conduct the research to assess the impact on cultural resources and the environment. Before any construction project begins, the site must be evaluated for the presence of any known archaeological sites. The **State Historical Preservation Office (SHPO)** plays a critical role in this process of assessing and ensuring compliance.

compliance

In CRM, the process of ensuring that legal requirements surrounding archaeological resources are fulfilled (Fagan, 2006).

As part of the Pennsylvania Historical and Museum Commission (PHMC), SHPO is authorized and has the responsibility to manage the cultural resources in the commonwealth. As a part of that responsibility, they consult with the applicants, federal and other state agencies in accordance with the [Pennsylvania History Code](#), Pennsylvania Historic District Act, and Section 106 of the National Historic Preservation Act (PHMC, 2021). All construction projects, whether it is a large building, a parking lot, a major highway development, a small road improvement, or a pipeline, the first step is to assess the site for possible impact on environmental and cultural resource.

Guidelines for Archaeological Investigations in Pennsylvania

The State Historical Preservation Office (formally the Bureau for Historic Preservation) provides guidelines for archaeological investigations and the evaluation of proposed construction and potential impact on archaeological sites. The evaluation includes two processes. First, it is evaluated for its effect on standing historical structures; and, second, it is reviewed for its effect on prehistoric and historic archaeological resources (Bureau for Historic Preservation, 1991).

Review Process

1. Submission of project documentation information about the agency seeking to undertake the project, the location, and a description of the project.
2. SHPO reviews the documentation and responds with an opinion on the potential effect on cultural resources and one of three determinations.
 - No recorded sites and none were expected.
 - Recorded sites are present and unrecorded sites may exist.
 - No recorded sites are present but the area has not been surveyed and there is a high probability that sites exist.
3. SHPO will recommend action to be taken. If the opinion was that there are no sites or that the nature of the project will not have an impact on any sites identified, no further investigation will be recommended. However, if during the construction archaeological evidence is discovered, construction must stop until SHPO is notified and a course of action to be taken in order to protect any resources (Bureau for Historic Preservation, 1991).

Recommended Action

If the opinion is that cultural resources may be affected by the project, an archaeological investigation will be recommended. However, there is a phased approach to resource identification and evaluation. Each phase corresponds to the level of investigation necessary to meet the required tasks of data recovery for inventory, evaluation, and mitigation (Bureau for Historic Preservation, 1991).

Phase I Investigations

A Phase I archaeological investigation includes background research (historical documentation and local informant interviews), surface surveys, and subsurface testing such as shovel test pits and probing). However, a Phase I investigation is not limited to methods and techniques. The findings are then summarized and submitted to SHPO for review. If no sites were discovered, no further investigation will be recommended. However, if sites were identified, a Phase II investigation will likely be recommended in order to determine the site's significance.

significance

An archaeological or historical site that has the potential to contribute significant data to our understanding of past cultural behavior (Bureau for Historic Preservation, 1991).

Phase II Investigations

Only significant sites are protected under federal and state law. Therefore, the purpose of a Phase II investigation is to recover the data necessary to determine the significance of the site and establish its eligibility for the [National Register of Historic Places](#) (Bureau of Historic Preservation, 1991). As such, the methods and techniques used in the archaeological survey will be selected based on the goals of a Phase II investigation, which include: *defining the boundaries of the site, determining the presence of features, identifying artifact distribution, identifying stratigraphy information, and identifying dates associated with the site*. Flora and fauna information can also provide clues about the environment, diet, and subsistence practices of the people associated with the site.

Once the investigation is complete, another report summarizing the findings is submitted to SHPO for review. At that time, a determination will be made as to the significance of the site. If the site is not eligible for the National Register, no further investigations will be required. However, if the site is eligible for the National Register and will be adversely affected by the project the recommendation may be to avoid the site if all or part of its significance is derived from its location, setting, or context (Bureau of Historic Preservation, 1991).

In most cases, the significance of an archaeological site lies in the data that can be recovered and does not necessarily need to be preserved in place. If partial or complete destruction of the site can not be avoided, a mitigation agreement is developed that will provide a public benefit that, in some way, balances the loss of the site (Callahan, 2020). A Phase III investigation will be a part of the **mitigation strategy**, which could include additional projects as well. Some examples of mitigation projects include providing funding to the [Seneca Nation of Indians](#) for continued cultural heritage projects, the development of SHPO's cultural resource data management system [PA-SHARE](#), and assisting communities with the development of their own cultural resources management plans (Callahan, 2020).

mitigation strategies

Steps taken to reduce the adverse effects of disturbing or destroying an archaeological or historic site.

Phase III

As a part of the mitigation process, the Phase III investigation focuses on data recovery through excavation, usually large-scale excavations. The goal is "to recover the significant data contained by a site through archaeological excavation as a mitigation alternative prior to the total or partial destruction of a site" (Bureau of Historic Preservation, 1991). Data recovery includes in-depth research and artifact analysis. At the conclusion of the investigation, a final report is submitted for approval. In addition to the final report, a Phase III study is responsible for producing a scholarly written work disseminating the results of their findings as well as plans to share the results with the public, which can be through publications, slide shows, videos, and exhibits.

NATIVE AMERICANS AND CULTURAL RESOURCES

When conducting research, it is important to consider the people who are affected by the investigation. Any federally-funded project must comply with Section 106 (National Historic Preservation Act of 1966) and the Native American Graves Protection and Repatriation Act. As a result, archaeologists must consult tribal authorities when conducting investigations that have the potential of disturbing Native American sites. Many Native Americans have their own cultural resource management programs such as the [Navajo Nation](#), [Cherokee Nation](#), and [Seneca Nation](#) who not only consult on excavations but conduct their own investigations as well. A recent development is **indigenous archaeology** in which the research design is approached using indigenous knowledge, values, and goals as the foundation of the research.

indigenous archaeology

Archaeological research using indigenous knowledge, values, and goals as the foundation of the research (What is Indigenous Archaeology—and What Does It Mean for Crow Canyon?, 2019). The archaeologists conducting the research can be both indigenous or non-indigenous.

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11.3: Chapter Eleven Review

Test Your Knowledge

1. Describe what archaeologists refer to as cultural heritage. What legal protections exist to safeguard cultural heritage in the United States and internationally?
2. Are you surprised by the current level of protection of cultural heritage artifacts and sites? Are there additional legal protections you would like to see enacted for archaeological sites?
3. What type of code of ethics seems most effective to you? Why?
4. Identify some biases you might bring to archaeological interpretation. Describe each bias and the potential impact it could have on your archaeological work.

Terms You Should Know

Antiquities Act Authorizes the president to declare historic landmarks, historic and prehistoric structures, and other objects of scientific interest as national monuments, explicitly establishing the importance of archaeological sites on public land in the U.S. legal code.

Archaeological Resources Protection Act (ARPA) Enacted after the Antiquities Act of 1906 was determined to be unconstitutionally vague and requires that archaeological sites be protected.

bias In archaeology, to favor one explanation over another based on personal culture and/or training.

code of ethics A written statement of ethical guidelines for groups, organizations, and individuals in their professional occupations.

compliance In CRM, the process of ensuring that legal requirements surrounding archaeological resources are fulfilled

cultural heritage An expression of the ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions, and values

Cultural Resource Management (CRM) The conservation and management of cultural resources including archaeological sites and artifacts as a means to preserve the past.

cultural resources Any evidence of past human activities, prehistoric or historic, including artifacts, sites, structures, landscapes, and objects of importance to a culture or community.

Hague Convention for the Protection of Cultural Property in the Event of an Armed Conflict An international treaty that focuses exclusively on the protection of cultural property in armed conflict.

indigenous archaeology Archaeological research using indigenous knowledge, values, and goals as the foundation of the research. The archaeologists conducting the research can be both indigenous or non-indigenous.

mitigation strategies Steps taken to reduce the adverse effects of disturbing or destroying an archaeological or historic site.

National Environmental Protection Act (NEPA) A national policy of protecting the environment that requires proposed actions funded by the federal government to evaluate both natural and cultural resources.

National Historic Preservation Act (NHPA) Intended to preserve historic and archaeological sites on public lands.

Native American Grave Protection and Repatriation Act (NAGPRA) Established precise rules and responsibilities when Native American burials and other items associated with a Native American burial are found through excavation and are housed in museum and university collections.

significance An archaeological or historical site that has the potential to contribute significant data to our understanding of past cultural behavior.

A derivative work from

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CHAPTER OVERVIEW

12: Archaeology of the Future

Learning Objectives

- Describe the role of historical archaeology and the unique opportunities associated with it
- Identify the types of evidence used by historical archaeologists
- Provide examples of how historical archaeology “checks” the historical record and provides a nuanced and sometimes contradictory interpretation of the past
- Identify pseudoarchaeology and explain why it is so damaging to the real work archaeologists do
- Characterize the ways in which archaeologists share what they have learned with the public
- Describe some emerging applications of archaeological research

[12.1: Historical Archaeology](#)

[12.2: New Frontiers in Archaeology](#)

[12.3: Chapter Twelve Review](#)

Image: Archaeologists help preserve the past, link to the future. Carved stones on Portugues Dam construction site in Ponce, Puerto Rico. (2009). By JaxStrong under [CC BY](#) via flickr.

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12.1: Historical Archaeology

ARCHAEOLOGY AND THE HISTORICAL RECORD

Much of this textbook has focused on identifying prehistoric archaeological sites and reconstructing the environment and lifeways of past societies. However, there is much to learn from historical sites as well. Archaeological research can discover stories of people who have been lost to history or not represented or misrepresented in historical records.

Historical archaeology uses archaeological techniques to investigate relatively recent societies that kept and preserved historical records. Historical records include newspapers, census documents, diaries, property deeds, taxation records, and birth, marriage, and death certificates and registers. The point at which such record-keeping developed varies, of course. In Europe, the earliest historical records date from the emergence of city-states such as Greece and Rome. For other parts of the world, the historic period has typically been set as beginning with colonization, although historical documents were produced by Mayan and Aztec civilizations prior to contact.

historical archaeology

The study of past human societies that have a written historical record.

Methods, Techniques, and Analysis

The methods used to find historical archaeological sites and field techniques used to survey and excavate them do not vary much from the methods and techniques used by archaeologists who study prehistoric sites. However, it is important not to understate the usefulness of historical documents in archaeological analyses. Documents can lead archaeologists to sites and allow them to refine their research questions based on demographic information regarding past occupants and use. Furthermore, the archaeological analysis can often extend far beyond a basic understanding of the site and its uses.

When historical documentation is available, one can sometimes identify an individual's behaviors—where, for example, a person worked, slept, ate, and even what the person ate in some cases. In San Francisco, California, a woman conducting construction on her home discovered an early-1900s burial of a child in a glass coffin. Archaeologists combined relatively new archaeological techniques and extensive research of historical documents to positively identify the young girl and tell her story. She had originally been buried in a cemetery in the 1870s. Later, the cemetery was relocated but her coffin had been unintentionally left behind. Through analysis, it was discovered that she had suffered from malnutrition likely caused by a disease.

Similar work was done in Sacramento, California, investigating a store owned by several individuals and families for decades. Archaeologists used original advertisements of the shop to identify how its inventory and focus had changed over time from goods for miners headed to the gold fields to a junk shop in its later days. By analyzing the remains of food at the site, they determined that a Jewish family and a Chinese family had once owned the store based on the types and cuts of meat. The archaeologists examined the zooarchaeological evidence (determining whether the meat was beef, pork, or chicken, for example) and researched the types of meat cuts sold at the time. The frequency of occurrences of certain types of meat and meat cuts relative to remains of meat at sites nearby revealed the ethnicity of the owners.

So historical archaeologists often dig up stories of people who were previously lost to history or were not represented in history books. It is important to remember that most of those books were written by colonizers, the “winners” in historical conflicts, and that many groups, including indigenous communities, immigrants, the poor, slaves, and other colonized populations generally were left out of those books or misrepresented because of bias.

Correcting the Historical Record

Archaeologists acknowledge the bias inherent in historical documents, especially diaries, newspapers, and reports from colonizers, and can test the accuracy of those types of documents by comparing them to archaeological remains. It is common for their excavations to reveal that many historical accounts of people's behaviors and practices are inaccurate. Artifacts found during ongoing excavations at Jamestown, Virginia, for example, have been rewriting the history of the first British settlers in what would later become the United States. Extensive excavations, led in part by the National Park Service, have uncovered millions of artifacts that represent the daily lives of the people who lived and worshiped at Jamestown. Through their research, archaeologists have tested numerous “eyewitness” accounts from the 1600s and proven that the fort was not actually located where it was described. They have also uncovered evidence of the first Africans to arrive in the new world in 1619. Perhaps most surprising was their discovery of a skeleton of a young girl among bones from various animals. Her bones showed signs of extreme mutilation,

likely as a result of cannibalism during a particularly rough winter. Work is ongoing at the site, and new information is constantly coming to light that adds to and changes the existing narrative about the original inhabitants of Jamestown.

Another example of the effect of historical archaeology involves rewriting the story of the Donner Party, the infamous western settlers who got caught in the Sierra Nevada Mountains in Nevada and California during winter and were said to have survived, barely, by eating the remains of their fellow travelers who had perished. Historical archaeologists have been studying the supposed area of the Donner Party's winter encampment to determine the accuracy of the many stories surrounding it. These tales had led many, including employees of the National Park Service, to believe that a particular tree in a meadow was the camp's location. Later excavations revealed, however, that no one had camped near that tree in the mid-1800s. More recently, historical archaeologists have been looking at the types of bones found at confirmed Donner Party camps. Most of those bones were tiny and difficult to analyze, but bones large enough to positively identify were not human; they came from horses, oxen, deer, dogs, rabbits, and rodents. While this evidence does not rule out cannibalism, it does indicate that their food sources were varied and that they had not subsisted entirely on human flesh as sometimes said. Stories passed down to Native American inhabitants of the area also do not refer to cannibalism by the Donners.

Historical archaeology is often more accessible to the public than prehistoric archaeology, and they can more easily identify with people who are relatively similar to themselves. It is also exciting to learn about specific people from their communities' pasts. While historical archaeology presents unique challenges, it also offers many fascinating topics for research.

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12.2: New Frontiers in Archaeology

THE FUTURE OF ARCHAEOLOGY

While archaeology is the study of the material culture of past peoples, modern issues such as immigration, warfare, and homelessness can be addressed and studied through the lens of archaeological research as well. As archaeology looks toward the future, the work of the archaeologists will include putting down the shovels and focusing on contemporary issues, such as correcting misinterpretations of their discipline, demonstrating how archaeology is relevant to modern issues, and actively promoting the science as a way to investigate complex issues.

Though protecting the archaeological record and informing the public about the past has long been a major goal of archaeology, archaeologists as a group are really terrible at it! In the United States, archaeological work is not a common feature of the evening news or frequently printed in newspapers. When new finds are brought up by mainstream news outlets, they tend to be either barely noted or exaggerated and sensationalized. Sites representing day-to-day life tend not to be picked up by the media, which would rather focus on sites with lots of spectacular artifacts or that can be interpreted in a multitude of ways, many of which are not scientific. Some networks have tried to present good science TV (e.g., The Discovery Channel, National Geographic Channel) but have ended up hyping the science to excite viewers and gain ratings. Consequently, some archaeologists have taken a more active role by announcing new finds and holding open houses and public displays of artifacts. Even then, they sometimes have been motivated as much by attracting funding as by educating the public.

Pseudoarchaeology and Misinformation

Most people know what they know about archaeology from watching and reading stories in the media, and many of those stories have promoted incorrect and even alternative explanations that are pseudoarchaeological. **Pseudoarchaeology**, literally translated as "false archaeology", uses selective bits of archaeological evidence to promote non-scientific, false accounts of the past. Examples include the films "National Treasure" and "The Da Vinci Code," which promoted false stories about real archaeological data. Other areas in which pseudoarchaeological stories have confused the truth include the idea that crop circles and megalith sites such as Stonehenge, a Druid worship site, were constructed by aliens. Another example is the lost city of Atlantis, an amazingly advanced society that supposedly vanished overnight according to Plato's story in the fifth century BC. Atlantis continues to pop up in fake archaeology stories despite the fact that there is absolutely no archaeological evidence to support its existence.

pseudoarchaeology

Explanations and interpretations of the past from outside the archaeological science community. They are not based on the scientific method and reject the data gathering and analytical methods of the discipline.

While archaeologists have a duty to share legitimate finds with the public and need to expose pseudoarchaeological stories, the public also has an important part to play! We need to be smarter consumers of archaeology in popular media and take a default position of skepticism. Naturally, archaeologists want the public to join them in being excited about their research. With the trove of genuine archaeological resources available online, members of the public can research what they have seen and read to verify its accuracy. They also can support real archaeologists at work by attending their public lectures and museum exhibits and by donating to archaeological work at local colleges and universities. Archaeologists want everyone to be involved in real archaeology!

Archaeology As Shared Information

Perhaps the most common way members of the public become engaged with archaeology is by visiting archaeological sites such as the Colosseum in Rome and Mayan ruins in Central America. As tourists, we are enthralled by the creations of past people but rarely think about our impact on the archaeological sites. What damage is caused by thousands of people visiting the site? What about misinformation and stereotypes that are shared by turning the site and the past peoples who occupied it into commodities? These are important things to think about as you consume archaeological information.

For example, archaeologists excavating a site in California during the 1970s and 1980s held an open-house event to give the public an opportunity to share in their finds and to ask questions about actual archaeological work. The event was publicized in the newspaper and on local television broadcasts. The night before the event, looters broke into the site, stole numerous artifacts, and aimlessly dug into already open pits looking for more treasures to sell. The project lost important artifacts, including some that were extremely rare for the time period and location, and, worse, archaeologists lost their faith in entrusting access to the public.

That project is ongoing, but the archaeologists working it are much more cautious about sharing information, and their collection is contained in an unmarked laboratory that is relatively unknown even to other campus staff members.

Archaeology and You

Some archaeologists have begun to monitor archaeological sites to prevent looting and to record damage done as a result of looting. Dr. Sarah Parcak, a professor of archaeology at the University of Alabama at Birmingham, has used satellite imaging to identify potential archaeological sites across the globe. The \$1 million she received for winning a TED prize allowed her to create an online portal called **GlobalXplorer** that trains anyone interested in how to identify potential looting activity in satellite images. After a six-minute training, these individuals are allowed to view small sections of actual satellite images to look for potential signs of looting. Images flagged by several reviewers are passed on to archaeologists to confirm the reviewers' suspicions.

In 2018, the project completed its first expedition in Peru. Over 70,000 volunteers from more than 100 countries reviewed 14,620,932 individual satellite images that covered 150,000 kilometers of Peru (GlobalXplorer, 2018). As a result, 19,084 features of archaeological interest were identified dating back from Caral, the oldest civilization in Peru c. 3200 BCE, to the fall of the Incan Empire in 1572 CE. Of those features, 342 sites were high interest because they are potentially large and important settlements (GlobalXplorer, 2018). In the process, the volunteers also positively identified evidence of potential looting, which Peruvian authorities will use to protect the sites and monitor for ongoing looting (GlobalXplorer, 2018).

GlobalXplorer



TED. (2016, September 8). Hunting for Peru's lost civilizations -- with satellites | Sarah Parcak. [YouTube]. Retrieved from <https://youtu.be/Dh5sPiuaO9Y>.

Archaeology and Activism

Dr. Monica Hanna, head of the Cultural Heritage Unit and associate dean of the Arab Academy for Science, Technology, and Maritime Transport in Aswan, Egypt, is an important activist for protection of archaeological resources in her home country of Egypt and globally. She documents looting events by photographing them and posting the photographs to social media. Her goal is for everyone to understand the irreparable damage done to archaeological sites by looting.

Other archaeologists are developing new lines of inquiry that demonstrate how archaeology can be used to explore some of today's major problems. For example, Dr. Craig Lee from the University of Colorado is an ice-patch archaeologist. He is studying the edges of glacial ice as it melts in response to warming global temperatures. His study area, centered in the Rocky Mountains, has largely been under ice for thousands of years. As that ice begins to melt, previously undiscovered archaeological sites are being revealed. In addition to documenting past living habits and patterns of behavior denoted by the artifacts, he is documenting the rate of melt of high-altitude ice.

Immigration

Archaeologists are also looking at how their unique training can give a voice to groups of people who have been disenfranchised or even treated as invisible. Archaeologists are trained to examine material remains and infer patterns of behavior from them. Now, they are beginning to use those skills to tackle current issues, including strongly disputed political questions, to provide a new perspective. For example, Dr. Jason de Leon, professor of anthropology and Chicana/o studies at UCLA, runs the **Undocumented Migration Project**. He is using his archaeological training and ethnographic observations to study people crossing the U.S./Mexico border from northern Mexico into Arizona. He studies the artifacts they leave behind, including water bottles, backpacks, and clothing. Dr. de Leon and his team pieced together how the artifacts were specifically used (e.g., the water bottles were filled from stagnant pools and livestock watering tanks) and discarded and, ultimately, have been able to tell a detailed story of their difficult migration and dangerous border crossing.

The Homeless

Another example is the work of Dr. Larry Zimmerman, a retired professor at Indiana University – Purdue University, Indiana, who used his archeological training to study people living in homeless encampments around St. Paul, Minnesota, and Indianapolis, Indiana. He noted evidence of alcohol consumption at all of the encampments but found no evidence of drug paraphernalia, directly contradicting the common stereotype that all homeless people are drunks and “druggies.” He also noted numerous unopened and unused sample-sized bottles of hygiene products such as shampoo and conditioner that are commonly given to the homeless. He realized that these items are not terribly useful for people who do not have reliable access to water and that other types of goods would be more useful and appreciated by individuals who are homeless.

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12.3: Chapter Twelve Review

Test Your Knowledge

- How is historical archaeology similar to prehistoric archaeology? How is it different?
- In what ways can historical archaeology evaluate, supplement, and even change what has been accepted as fact?
- What is pseudoarchaeology? Why is its popularity problematic?
- How are some archaeologists taking an activist role to protect archaeological sites?
- How are modern technological developments and crowdsourcing being used to support archaeology?
- How has climate change altered the field of archaeology?
- Describe one of the ways in which archaeologists are using their unique skills to give a voice to populations frequently overlooked and ignored in our culture?
- Imagine a friend tells you about a recent post on social media describing “research” on aliens and Atlantis. Explain what you could tell your friend about such research’s reliability. What actual new archaeological frontier could you share with your friend?

Terms You Should Know

historical archaeology The study of past human societies that have a written historical record.

pseudoarchaeology Explanations and interpretations of the past from outside the archaeological science community. They are not based on the scientific method and reject the data gathering and analytical methods of the discipline.

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