

TRACES - AN OPEN INTRODUCTION TO ARCHAEOLOGY



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Society for Anthropology in Community
Colleges

Traces: An Open Introduction to Archaeology

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John A. Donahue Eds.

Society for Anthropology in Community Colleges (SACC)

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Detailed Licensing

Licensing

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Preface

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Introducing *Traces*

Welcome! *Traces: An Open Invitation to Archaeology* is part of a series of no cost high quality anthropology textbooks including the award-winning *Perspectives* introducing cultural anthropology and *Explorations* for introductory courses in Biological Anthropology. The open access series is a project of the national Society for Anthropology in Community Colleges (SACC) to provide quality peer reviewed course materials for introductory anthropology college courses in an open access format.

As anthropologists, we (the editors) firmly believe in raising awareness on diverse topics and perspectives. As educators, we are keenly aware of the costs of higher education and have invested countless volunteer hours in putting this volume together so students and instructors everywhere can freely access the course materials needed for an introduction to archaeology. Our hope is that this collection of instructional works and ancillary materials will help alleviate some of the inequalities in higher learning.

As with other volumes in this series, the textbook is freely available in an online or e-book format. The advantages of this, particularly in our post-pandemic world, is that most students are now familiar with these types of content, and instructors are much more likely to adopt electronic resources and even embed them into their learning management systems. Another great advantage is that online formats can also contribute to accessibility requirements providing alternate text and headings for voice readers to capture, adequate contrast, and the ability to enlarge the text, among other tools. Yet another advantage is that the work itself can be modified and updated with greater ease than print editions. Having said that, students who require a printed version of the book have the option to purchase an inexpensive hard copy through a third party.

How to Use this Book

For Instructors

The past decade has seen significant shifts in pedagogy and in the standards and norms within anthropology itself with an increased emphasis on diversity, inclusion, anti-racism, and equity. Archaeology in particular deals with ethical issues that involve descendant communities, and the shift within this field has been toward decolonization and collaboration with Indigenous peoples and other groups whose heritage is affected by new discoveries and knowledge. The rapid pace of technology has also affected research methods and practices in the discipline, as noted by some of the volume's contributors. These changes mean that archaeology is now involved in ethical and legal challenges affecting people in the present. Archaeological scientific methods can be used to research current social structures, and our understanding of the practices of past societies affect the lived experience of present-day communities.

The book itself has been divided into two general areas: *Why We Do Archaeology* and *How We Do Archaeology*. The first section addresses these connections from the past to the present and the changing tides in the discipline, both theoretically and thematically. The authors of these chapters discuss the ethical challenges of archaeology in the twenty-first century. These chapters also showcase how archaeology embodies applied anthropology and its collaborative nature across disciplinary and subfield lines. The second section provides the different methods and tools used by archaeologists today to contribute to the study of human societies and our origins. A final third section, *Case Studies in World Archaeology*, is still being developed. Please contact us at archaeologyoer@gmail.com if you are interested in contributing something!

You, as the instructor, will be able to choose and curate the material you will teach according to the needs of your curriculum and the makeup of your students, as well as on your class format and delivery methods. Thank you for choosing to adopt this textbook which has been written, peer reviewed, and edited by anthropology instructors such as yourself. The [Creative Commons License](#) under which *Traces* is published, unlike a traditional textbook, provides the freedom for you to modify, supplement or add to this textbook as you see fit.

For students

This book was specifically written for students in introductory archaeology courses, such as yourself. The editors and authors of the different chapters all share an enthusiasm for archaeology as well as a love of teaching and learning. Over the years it took to compile the chapters in this text, students in different classes piloted adopting the book, gave suggestions, commented on the accessibility and readability of the content, as well as on the format of the book. We have taken these suggestions into account and will continue to do so. More importantly, the book is available to you for free! We hope you find at least some of the content useful and interesting.

Whether you read part of a chapter out of interest in one of the many fascinating topics in archaeology, whether you are an instructor assigning some of these texts to your students, or whether you are a student exploring archaeology with this textbook, we welcome you and are delighted you are joining us in this journey through the traces of the past.

Warmly,

Traces Editors:

Isabel M. Scarborough, Jennifer M. Johnson Zovar, Ian S. Ray, and John A. Donahue

Note: This book was prepared by the editors in their personal capacity. The opinions expressed in this chapter are the author's own and do not reflect the view of their institutions, the Centers for Disease Control and Prevention, the Department of Health and Human Services, or the United States government.

Dedication

The editors would like to thank our families and colleagues who patiently put up with a very lengthy editorial process. We dedicate this volume to them and to all anthropology students and educators.

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The book will be adopted by Introduction to Archaeology courses nationwide as this textbook is part of the series created by the national [Society for Anthropology in Community Colleges \(SACC\)](#), a division of the [American Anthropological Association](#). SACC provided the seed money to start the project and pay for the cover graphics. We also wish to thank Whatcom Community College, which houses the textbook in its Pressbooks account. Whatcom Community College also supported Jennifer Zovar's Fall 2021 sabbatical to work on the project full-time.

Contributors

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All the chapters in *Traces* are original and were written for this first edition of the textbook with an introductory college level audience in mind. We wish to especially thank all the authors who contributed with their intellectual production in different areas of expertise to make the teaching and learning of archaeology more accessible.

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CHAPTER OVERVIEW

1: What's the Point?- Why do we do archaeology?

- 1.1: Introducing Archaeology- Traces of the Past
- 1.2: Social Impact- Archaeology Isn't Just About the Past
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Thumbnail: Machu Picchu, Cusco - Perú (Unsplash License; [Eddie Kiszka](#) via [Unsplash](#))

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1.1: Introducing Archaeology- Traces of the Past

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**This chapter was prepared by Ian S. Ray, Ph.D., in his personal capacity. The opinions expressed in this chapter are the author's own and do not reflect the view of the Centers for Disease Control and Prevention, the Department of Health and Human Services, or the United States government.*

Learning Objectives

- Define archaeology and explain how it fits into anthropology
- Describe the different kinds of work that archaeologists can do
- Discuss some of the misconceptions of what archaeologists do and what archaeologists have found
- Discuss the relevance of archaeological methods for the modern world

Introduction: Anthropology and Archaeology

When you think of an archaeologist, whom do you picture? One of this chapter's authors, Jennifer Zovar, notes that in her classes the most popular answer is "Indiana Jones" (Figure 1). However, you would probably not be surprised to hear that most archaeologists are more likely to carry a clipboard and a trowel than a pistol and a whip (Figure 2).



Figure 1 – "LEGO Indiana Jones in Jungle" by Rob Young is licensed under CC BY 2.0.

So, what is archaeology? What do archaeologists do? How does archaeology fit into the broader discipline of anthropology? Anthropology is the study of humankind. Anthropologists are attempting to answer the question of what it is that makes us uniquely human, or what sets us apart from other species. The word "anthropology" actually comes from the Greek words *anthropos* (human beings) and *logia* (the study of), so "anthropology" literally means "the study of human beings." This is an incredibly broad topic! Anthropologists can study anything that people are doing or have done at any time and in any place.



Figure 2 – Jennifer Zovar in Bolivia with the field team. Dr. Zovar is highlighted in yellow.

What is it then that makes anthropology different from any other academic discipline that studies people? One major difference is that anthropology looks at humanity from a holistic perspective. Think for a minute of a hologram like the one shown in the picture

here. A hologram is a picture in 3D that you can walk around and study from all sides (Figure 3). Hologram and holistic both share the same Greek root *holos*, which means “whole.” Holograms show the whole image of an object by projecting the image from all possible angles. Anthropology is holistic because, as with the hologram, we aim to research a question by examining it from all possible angles. We treat issues in-depth, and examine these problems in a three-dimensional way, using multiple methods and theoretical perspectives. So, while economics focuses on the economy, political science focuses on political organization, and human biology focuses on people as biological organisms, anthropology considers all of these topics (and more) and looks at how they interrelate. Moreover, anthropology is inherently cross-cultural and comparative. We do not just consider the economy, politics, biology, etc. of people in our own society, but we look at how these themes are represented in different cultures across the world. Anthropologists also compare similarities and differences in the way people live, both in space (geographically) and time (temporality). Because anthropology is so broad, it is often subdivided into four major subfields: biological anthropology, archaeology, linguistic anthropology, and cultural anthropology. Archaeology is part of the broader discipline of anthropology. As you know, the focus of this textbook is archaeology, but it is still important to know something about the other subfields, especially as they overlap with archaeology.

The Four Fields of Anthropology

In the United States, anthropology is divided into four fields, or distinct specializations. Anthropologists look at humans as biocultural creatures where our physical needs (biology) and our shared, learned social behaviors (culture) equally contribute to our complexity and diversity. Often there are ways that all four subfields of anthropology are used – applied – in the real world outside of an academic environment, to help address real-world issues. This is what we refer to as applied anthropology. Later in this chapter, you will read about examples of archaeology as applied anthropology!

The following examples are taken from Jennifer Zovar’s fieldwork in Bolivia and illustrate how the four fields work together in a holistic fashion.



Figure 3 – A hologram of *Paranthropus boisei*. *NHM vien Human Evolution* by Chiara Tesi via Wikimedia is licensed under [CC BY 4.0](#).

Cultural anthropology is the study of modern peoples across the world today. The image below is from a community festival in a village in highland Bolivia, where Dr. Zovar lived when she was conducting her research (Figure 4). Cultural anthropologists might study family dynamics, religion, politics, economy, social organization, or festival events like this one. Cultural anthropology most overlaps with archaeology through the study of ethnoarchaeology. Ethnoarchaeologists study modern populations to better interpret the material remains of past civilizations. For example, an ethnoarchaeologist might study the trash that is left behind after a large community festival like this one and see if she could identify patterns that look similar to those found at an archaeological site. This could help her to potentially identify the remains of an ancient community festival. Quality research will not only make these connections between past and present but is open to reinterpretation by later researchers. Thus, other archaeologists and anthropologists interested in community festival practices could draw from this work to contribute to our understanding of these social behaviors.



Figure 4 – A community festival in a village in highland Bolivia (Jennifer Zovar, personal photo)

Linguistic anthropology is the study of the interaction between language and culture. Indigenous populations in highland Bolivia, for example, Aymara and Spanish. Aymara is the Indigenous language of the region, while Spanish is a result of European colonization. The population of the region, however, remains mostly Indigenous. Aymara is spoken at home, while Spanish is the language of the government and the public schools. Linguistic anthropology most overlaps with archaeology in the study of epigraphy, or ancient written languages. In Figure 5, the men are communicating via a combination of written materials, physical gestures, and spoken Spanish and/or Aymara.



Figure 5 – Bolivian men communicating (Jennifer Zovar, personal photo)

Biological anthropology is the study of humans as biological organisms. Biological anthropologists study human evolution as well as modern human variation. The subfield overlaps most with archaeology in the study of skeletal and fossil material. Bioarchaeologists combine the study of biological anthropology and archaeology with their analysis of organic remains found in archaeological contexts. Bioarchaeologists working in Bolivia, for example, may study issues like cranial modification, where individuals' skulls were shaped as an infants to mark ethnicity.

*Figure 6 – Anthropology has four subfields—archaeology, cultural anthropology, biological anthropology, and linguistic anthropology. Each subfield has applied aspects to it. We sometimes refer to applied anthropology as a “fifth field.” (Credit: Subdisciplines of anthropology (Figure 1.8), original to *Explorations: An Open Invitation to Biological Anthropology* by Mary Nelson, is under a CC BY-NC 4.0 License.)*

What Is Archaeology and What Does It Study?

Last, but certainly not least, we come to the final of the four fields and focus of this text: archaeology. Put simply, archaeology is the study of the human past through the analyses of material remains—the “stuff” people leave behind. Archaeologists only study human history, which is what makes them different from paleontologists (who study prehistoric animals, including dinosaurs), contrary to the popular belief that excavations search only for fossils. Archaeology differs from history in that history focuses on written records while, as noted before, archaeology relies more on the material objects left behind. This allows archaeologists to address a much longer time frame than historians; our human species has been around for at least 200,000 years, and the oldest writing (cuneiform, shown in the tablet below) only dates back to about 5,500 years ago.



Figure 7 – A private letter in cuneiform script (1,632 BCE, Babylonian culture, Syria). (Unnamed Babylonian, U.S. public domain via Metropolitan Museum of Art.)

In addition, a focus on material objects means that archaeologists are not constrained by the point of view of the writer of a text. Remember, in most societies, it’s the people in charge who are writing the histories and not everyone’s story is told. To revisit our hologram analogy, this means that only one perspective is represented. Archaeologists try to fill in the missing perspectives and tell a story by looking at the objects and material people left behind. With the passage of time, most of what we find buried in the ground is what was discarded or thrown away. Specifically, archaeologists investigate three kinds of materials:

- Artifacts are portable items that were made and used by humans. This may include ceramic pots, stone and bone tools, metal objects, etc. In 100 years, the computer used to type this text will be considered an “artifact.”
- Ecofacts are natural objects that have been used or moved by humans. This might include the bones of animals that were eaten or the remains of trees that were planted in a garden. The banana peel you might throw in the trash could be an ecofact, as could the bulb of the tulips in people’s yards. Both are natural but would not have gotten where they are without human activity.
- Features are larger, non-portable human creations. A house or other structure could be a feature, but so could a firepit. We can learn about past human activity by looking at the creation and placement of that firepit, but we can’t take this feature back to the lab for further analysis without destroying it.

What Kind of Work Does an Archaeologist Do?

Archaeologists spend their time immersed in survey (looking for sites), excavation (digging at sites), and analysis (investigating the artifacts, ecofacts, and features they recover).



Figure 8 – The Bolivian landscape (Jennifer Zovar, personal photo)

Archaeologists who work in colleges and universities generally seek grants to fund research projects that are intended to answer specific research questions about the past. The examples we used to illustrate the four fields of anthropology earlier in this chapter are from a research project that Jennifer Zovar carried out with grant funds at the archaeological site of Pukara de Khonkho, in highland Bolivia (Figure 8). Her work contributes to our understanding of how communities formed in this region following the collapse of the Tiwanaku, a large Andean polity that predates the Inca in South America.

Cultural Resource Management (CRM)

It is more common, however, for archaeologists to work in cultural resource management (CRM). Most professional archaeologists in the U.S. are employed in CRM. Archaeologists working in CRM are hired to survey construction sites before work begins as this work is mandated by state and federal law. This ensures that no important cultural materials will be destroyed without being recorded. Archaeologists working in CRM can work surveying military bases in New York, road expansions in Wisconsin, wind farm construction projects in Illinois, and proposed condo developments in Tennessee, among other projects. This work is less glamorous than in more exotic locations, but nonetheless helps us understand the history that is (literally) under our feet. See the chapter on “Cultural Resource Management and Archaeology: Conserving Heritage” in this text for a detailed discussion of the process involved in practicing archaeology in an applied context.

Museums

Museums are another venue for archaeologists to work with tribal governments. Archaeologists and other anthropologists at one time collected artifacts to fill museums with specimens to display. Those days are not too far in the past. Anthropologists and other scientists are working with museum curators today to undo the damage of decades of collections—modern material culture, ancient artifacts, and even human remains—often taken without consent from the peoples that they belonged to. Today, archaeologists and museums in many countries work with Indigenous groups both domestically and internationally to return cultural and human remains that were taken from them. Several of your authors in this text discuss the Native American Graves Protection and Repatriation Act (1990), or NAGPRA, and how it legally requires museums to work with Indigenous peoples in the United States to repatriate remains to them. In addition, archaeologists work in museums to maintain archaeological and anthropological collections. This includes curating them to keep them in a safe condition, studying them to gain knowledge about the peoples that created them, and creating exhibits to display them for the general public. Museums are also important places for education in many ways, from displays of fragile artifacts and reconstructions of ancient settings to highly interactive exhibits. Archaeologists often create living-history presentations to educate the public and reconstruct ancient structures and tools that the public can handle. In addition, archaeologists can also work with museums to give the public a taste of what archaeologists actually do! This includes excavation, identification, and curation. See the chapter on “Public Outreach and Archaeology” in this text for several examples of how archaeologists at museums make the past accessible to the public.

Reconstructions and [Pre]historic Preservation:

Reconstruction in archaeology is the re-creation or building of an ancient artifact or feature to improve our understanding of past societies. Reconstructions can be partial, meaning that they add to an existing structure, or can be made whole cloth. Whether partial or whole, they are based on the partial remains, written records, oral histories, or images of the object that is built. A good example of a reconstruction is the Woodhenge circle at Cahokia Mounds in Southern Illinois. Over a thousand years in the past, the Native people who inhabited the area built a metropolis whose more than 20,000 inhabitants practiced agriculture and traded with people as far south as the Gulf of Mexico (Pauketat and Stone Bernard, 2004). Archaeologists in the early 20th century were struck

by the massive earthen mounds on the site, but no less dramatic was the discovery of three large circles where remains show a series of evenly spaced wooden poles had been set to mark the seasons.



Figure 9 – Woodhenge at Cahokia. The original circle of 48 evenly spaced cedar posts would have covered a diameter of 410 feet. Each post would have stood about 20 feet high. [Cahokia Woodhenge and Monks Mound](#) by James Q. Jacobs via Wikimedia Commons is licensed under [CC BY-SA 3.0](#).

Reconstructions are often part of museum or community exhibits and are preferred by audiences as they provide tangible representations of a culture. Visitors to the Cahokia Mounds and the nearby museum today can meet at the reconstruction site at the Winter and Summer Solstice each year and see how the rising sun lines with some of the poles. In archaeology, reconstructions are used to provide context in museums or at archaeological sites but can also be used by researchers to help them visualize an activity or a space that is gone.

One of the benefits of archaeology is the way we are able to use the scientific method to test hypotheses about the past. This allows us to explore questions that would be impossible through historical research alone. Without archaeology, there would be no other way to learn about humanity in the time before written records.

Archaeology's focus on materiality can also help us to better understand the lives of those who lived more recently, but who didn't make it into the history books.

What Archaeologists Don't Do—Pseudoarchaeology

Let's return to our question at the beginning of the chapter: What comes to your mind when you think of an archaeologist? Popular culture has portrayed "archaeology" as something done by treasure hunters or tomb raiders—again, Indiana Jones or Lara Croft. By now, you know they don't truly represent what we do. Likewise, we often get inaccurate images of peoples of the ancient past. Even archaeologists have been guilty of this on occasion. The book *Motel of the Mysteries* by David Macauley (1979) makes fun of how the first archaeologists had these kinds of misconceptions, using the excavation of an ancient 20th-century motel many years in our future. But for many years, people have come up with implausible assumptions about ancient sites and artifacts and who created them. Some of the people you might see on TV today suggest that the famous Pyramids at Giza in Egypt or Chichén Itzá in Mexico weren't even built by inhabitants of our planet!

By and large, these people are not archaeologists and don't apply the scientific method, spreading pseudoscience (specifically pseudoarchaeology). Pseudoarchaeologists usually attribute ancient remains to space aliens, giants, or magical creatures. Space aliens are often used to explain the construction of large stone monuments in England and on Easter Island, the Nazca lines in Peru, and the aforementioned pyramids in Egypt and Mexico (Bond 2018). All of your authors, including David Anderson (the author of our chapter "Understanding Ancient Mysteries: Archaeology, Pseudoarchaeology, and the Importance of Archaeological Heritage"), want to point out that space aliens did not build any of these things. We want to emphasize that ancient peoples were just as capable, creative, and intelligent as modern people—just living in different times and cultures.

Many theories in pseudoarchaeology are based on racist, white supremacist assumptions. In many cases, colonizers from powerful countries in Western Europe tried to explain large sites in the Americas, Africa, and the Pacific as proof that white, European explorers—or outsiders from other parts of the world, for example the Lost Tribes of Israel—had to have previously occupied the areas before their current inhabitants came. In fact, these sites were all created by the ancestors of the Indigenous peoples from these areas.

The large site of Great Zimbabwe is just one example. Built by the ancestors of the Bantu-speaking Shona people in southeastern Zimbabwe, the site was a major city in the area between the 11th and 15th centuries CE. Archaeologists have found evidence that Great Zimbabwe traded extensively throughout the Indian Ocean with peoples as far away as China, Arabia, and Persia (Jarvis

2017; UNESCO). But British colonizers and other European explorers in the 19th century dismissed any notion of Great Zimbabwe's African origins. Instead, they theorized (incorrectly) that white Europeans must have originally built the site (Koutonin 2016). Zimbabwean archaeologists are still trying to undo this damage today (*The Economist* 2021).



Figure 10 – An aerial view of Great Zimbabwe. [Great Zimbabwe – aerial view](#) by Ari Alpert via Wikimedia Commons is licensed under CC BY-SA 2.0.

Archaeology of the Modern World

Likewise, the techniques of archaeology can also be useful in researching the modern world. Even though we are living through it, we do not always have the most objective understanding of our own experiences. There are still many parts of society whose stories are not being told. One great advantage of studying the objects people use is that while people may sometimes be untruthful (intentionally or not) about their activities when asked about them, the artifacts themselves do not lie. Earlier we mentioned that most of the materials archaeologists find are those that were discarded. In the following section we will explore a case of how the study of garbage in our own communities—using archaeological methods—can help us better understand 21st-century cultural patterns. This case illustrates how archaeology is an important tool for understanding contemporary refuse disposal and its connections to broader issues such as climate change and the environment. (See this video for an example: [Garbage Doesn't Lie](#)).

The archaeologist Bill Rathje (1945–2012) initiated the garbology program at the University of Arizona. Although trained as a Mayan archaeologist, he became interested in garbage when he asked students to conduct research on modern material culture. He realized that it was a great opportunity to get students to practice archaeological methodologies. After starting this project, he began to realize it also had much to teach broader society—and some of it was pretty surprising. For example, during a beef shortage in 1973, more meat was wasted than during other times, probably because people overbought and then did not use what they had purchased before it went bad. Similarly, he found that people with more varied cuisines tended to waste more food than people who ate the same sorts of food on a regular basis. These discoveries have helped influence changes in food services and in waste management (Rathje & Murphy 1993).



Figure 11 – Students participating in the Whatcom Garbology project (Jennifer Zovar, personal picture)

Students at Whatcom Community College (WCC) in Washington State have conducted Garbology Projects on their campus to see what the garbage they produce can teach about their community. What this means is that the custodians are asked to collect all of the garbage heading to the landfill from a given day. (This is not counting waste that is put in recycling or compost bins.) The waste is deposited on a lawn on campus and archaeology students (as shown in the picture here) sort it into piles—paper, glass, plastic, aluminum, etc. It's fun (but messy!) work.

The goal is to see how much waste is being deposited into the landfill that could otherwise be recycled or composted. In addition, students usually keep notes of items that can tell a little more about the life of community college students, faculty, and staff. For example, a lot of coffee is consumed on campus, and Taco Bell is a pretty popular snack!

As you can see from the graph below, in terms of recycling, the campus community does pretty well. Of the waste that was going to the landfill in the 2019 trash audit, only 8% (by weight) was recyclable glass, plastic, aluminum, or paper. Trash bags, film plastic, and landfill waste—all of which should have been going to the landfill—made up another 34%. Unfortunately, the remainder was made up of food compost (37%), paper towels (15%), and liquid (6%), all of which should have been composted rather than thrown in the trash. Collecting this information helps WCC to see whether or not it is the green, sustainable campus that students and staff want it to be—and can show where improvement is needed.

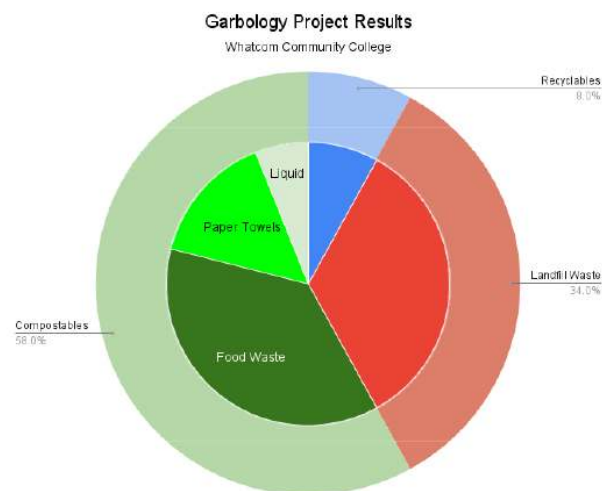


Figure 12 – The results of the Whatcom Garbology Project (Ian S. Ray, personal photo)

Another project that the archaeology class usually does each fall is to take a look at WCC's waste in a different way. Instead of looking at what is thrown away, the study looks at what is littered. The archaeology class is divided into six groups and surveys

different quadrants of the campus (shown below). If you are interested in trying this on your own campus, the activity is published at [Curriculum for the Bioregion – Campus Garbage Project](#).

In the Campus Garbage Project, litter across campus is mapped and categorized. The most common litter type is cigarette butts—which are found in many places other than those that are designated for smoking. Otherwise, the majority of the litter is small pieces of food waste, although there are always some surprises. One year, a student found his own math homework from a previous quarter. It was found that litter was more common in areas where there were fewer garbage cans, with the exception of cigarettes, which still were found on the ground in high concentrations even right next to a garbage bin. Together, these studies are helping to address waste management practices.

However, the information we can learn from modern garbage goes far beyond waste management issues. We can think about ways in which the methods of archaeology can help us to address many issues of social importance in the United States today—a type of applied anthropology. For example, Anthony Graesch worked with his students to study smoking behavior through the analysis of cigarette butts (Patel, 2015). Likewise, Jason de Leon has investigated the dangers of border crossing by looking at waste left by migrants crossing the southern border of the United States (National Geographic, 2013).

What to Expect From This Book

This text is arranged into two major sections: chapters that discuss the “why” of what we do in the field, and chapters that talk about the “how” of what we do in the field. We are also collecting a series of case studies from different parts of the world. These will serve as examples to illustrate the theories and methods you will read about throughout the text. Keep in mind that your instructor might not use all of the chapters in this book in order—and might not even use all of them! But whatever your instructor chooses to do, we and our authors have provided what we hope is a thorough introduction to the science of archaeology.

What’s the Point?: Why Do We Study Archaeology?

The first section of this textbook explores the theories and ideologies behind what we do in the field. We have talked about theories that guide archaeologists earlier in this chapter, and we will address them in later chapters. In addition, we look at some of the modern realities of archaeology and how it guides us in everyday practice. A few chapters look at the impacts of our work on society and the public at large. Much of what archaeologists do involves public outreach with local leaders and communities. Our research also contributes not just to our greater understanding of humanity, but to those same local communities’ understandings of their own histories! While much of this archaeological research happens through academia, a lot of it is also completed by governments and private companies—cultural resource management, which you have read about earlier in this chapter. Archaeologists also have to deal with the misinformation of pseudoarchaeology, as you’ve read about above, and correct it accordingly.

Getting in the Dirt: How Do We Study Archaeology?

The second section of this textbook gets into the methodologies that archaeologists use before conducting their fieldwork, while they are in the field, and what they do afterward, once they have collected their data. The methodology of archaeology is much more than just digging things up; even after we’ve systematically collected and recorded our findings in the field, we have to figure out what to do with our data after we leave! Archaeologists have many techniques for figuring out the ages of artifacts, how they were created and used (for example, experimental archaeology and ethnoarchaeology), and the circumstances of dealing with botanical and zoological remains that are part of the archaeological record. We also examine technologies that help us record and map what we have found in the field.

A Tour Through Time: Case Study to World Archaeology

As we complete the first edition of this text, there is only one case study in this section. However, we are hoping to collect additional case studies for future editions. If you are an archaeologist with a story you would like to share, please get in touch with the editors. This is an open-access textbook, which means that it is a perpetual work in progress. The intent is for it to be continually updated, changing along with the discipline of archaeology. If you are reading the print version of the book, you may want to check the online version for important major updates. Enjoy your exploration of *Traces*!

Discussion Questions

1. What are the subfields of anthropology, and how does archaeology relate to them?
2. What are some false narratives about the ancient world, and why are they problematic?
3. Give some examples of how archaeology can be applied to the “real” world.

4. Give some examples of careers a person could have in archaeology.
5. Describe how your instructor is using this book.

About the Authors



Jennifer Zovar is a Professor of Anthropology at Whatcom Community College in Bellingham, Washington. Her academic research has focused in the Bolivian Andes, where she investigated an archaeological site that was occupied just before the Inca came into the region (and after the collapse of the earlier Tiwanaku polity). In addition to her experience in Bolivia, she has also worked on archaeological projects in Guatemala and across the United States. When she is not researching or teaching anthropology, she loves camping and exploring with her kids and a series of loyal dogs – Chica, Hank, and Sierra.



John A. Donahue is a Professor of Anthropology and Sociology at Harford Community College in Bel Air, MD. He has a Master's of Arts in Anthropology from the University of California, Riverside, where he studied the archaeology of music and dance in Classic and Post-Classic Mesoamerica. His current research interests lean towards cultural anthropology and ethnomusicology, where he is examining cultural norms and community among LGBTQIA+ men's choruses. He also has a Master's of Arts in Teaching from Towson University. In his spare time, he is involved with the Baltimore Frontrunners and the Baltimore Men's Chorus, and spends time with his cat.

Isabel Scarborough is Professor of Anthropology and Chair of the Department of Arts, Media, and Social Sciences at Parkland College. Her main professional interest is teaching and community outreach with anthropology. Her research work focuses on archaeological cultural heritage, nation building, and spiritual imagined communities in the Andes, which she has worked on as a Mellon/American Academy of Learned Societies Fellow. As part of her goal to help make educational materials accessible to all she is a Contributing Editor to the Library of Congress' Handbook of Latin American Studies, and co-edited *Traces*. She enjoys volunteering and collaborating with other community college colleagues in the state of Illinois.



Ian S. Ray received his PhD in Research Methods and Applied Statistics from the University of Denver and his MA in Anthropology from Ball State University. His work has covered a range of anthropological topics, from reproductive healthcare

access to cultural resource management and primate ecology. Most recently, he worked as a Health Education Specialist at the Centers for Disease Control and Prevention, supporting the Public Health Emergency Preparedness program.

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Supplementary Resources

Video: [A Day in the Life: Archaeologist](#)

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1.2: Social Impact- Archaeology Isn't Just About the Past

Christopher L. Hernandez, PhD., Loyola University Chicago

Learning Objectives

- Describe archaeological contributions to knowledge that are relevant to contemporary society.
- Identify how the process of archaeological research affects people today.
- Compare and contrast the role of archaeology in creating ideas of nationhood in the United States and Latin America.
- Assess the role archaeologists have in shaping future U.S. social life.

Is archaeology relevant for contemporary society? Many in the United States many would probably say no. After all, haven't archaeologists found everything already? Discovering King Tut's tomb was really cool, but why should governments and private groups contribute money that might be better spent elsewhere? These are just some of the comments about my profession I have heard over the years from friends, acquaintances, and strangers. Unlike countries in many other parts of the world, such as Latin America, in the United States, archaeology is often seen as superfluous or irrelevant. As a subfield of anthropology, archaeology has gained a public image as the study of exotic others. Although many archaeologists investigate pre-Columbian, colonial, and U.S. history, the popular appeal of archaeology tends to lie in the ooohs and ahhs of making spectacular finds about foreign and exotic peoples (Schiffer, 2017; Smith et al., 2012). This public profile easily lends the field to critique from people who are unfamiliar with or skeptical about archaeologists. The skeptics include powerful figures, such as members of Congress who can influence the federal distribution of research funds (Mervis, 2014; Smith, 2017). Hence, over the past few decades, many prominent scholars have turned to writing works for popular consumption on how archaeology is important and perhaps even necessary (Fagan & Durrani, 2019; Joyce, 2016; Sabloff, 2008; Schiffer, 2017; see also in this textbook the chapters by Hendrick, Anderson, and Casper-Denman).

In this chapter, I examine how the process of archaeological inquiry contributes to and challenges aspects of contemporary U.S. society. To build my claims, I have divided this chapter into three parts. The first part focuses on the traditional role of archaeologists in society, which is to provide insights about the past and to illuminate the course of the human experience. Part 2 highlights how the process of creating knowledge has important ramifications for contemporary people. The work of archaeologists is an inherently cultural process that has political, economic, and social consequences. I examine how in some cases learning about the past has been oppressive for descendant communities. I also discuss steps that archaeologists are taking to address this downside of their work. Last, to really understand how archaeology is socially relevant, in Part 3, I reflect on U.S. culture and history. I use a comparative perspective to highlight the role of archaeology in the United States and Mexico and demonstrate how the issue of settler colonialism contributes to the trivialization of the field. I argue that archaeology in the United States has not achieved as much prominence as in Mexico because the field is not tied to the creation of a national identity. Instead, studying the human experience beyond the first European settlers of North America threatens to expose a project of elimination that was foundational to the building of a nation. If you are a visual learner or would like to preview of some of the major themes in this chapter, these 15-minute videos will provide good context for you:

One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://pb.libretexts.org/tracesarchaeology/?p=46#oembed-1>

One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://pb.libretexts.org/tracesarchaeology/?p=46#oembed-2>

Part 1: Contributions of Archaeological Knowledge to Society

By thinking about stuff, or the material world we live with and leave behind, archaeologists can provide a long-term perspective for understanding the human experience in any part of the world. This unique outlook allows us to ask questions whose answers have a profound impact on how people go about their lives. (For more on how this long-term perspective was established and why it is important, see Special Topics: Establishing Deep Time, below.) Part of this power lies in the use of science. Archaeologists have long used the scientific principles of geology to understand the human experience (see Appendix A). Other examples of archaeology as a science include radiocarbon dating to determine calendar dates for organic materials, chemistry to geographically pinpoint the sources of raw materials, genetics to understand genealogies, and computer modeling of satellite data to understand human movement (Brown & Brown, 2013; Parcak, 2019; Schiffer, 2017). Building from these and many other breakthroughs in the discipline, Michael Smith and colleagues (2012) highlight that archaeology has greatly progressed as a social science. Researchers

have compiled a global database of finds that allow for rigorous examination of a range of questions about the human experience (e.g., Fagan & Durrani, 2019; Flannery & Marcus, 2012; Kintigh et al., 2014). Common themes of investigation include the development of urbanism, the origins of socially stratified societies, how institutionalized leadership positions developed, and societal resilience.

Special Topics: Establishing Deep Time

One of the biggest shocks to cultures across the globe, especially those in Europe, was the establishment of deep time, or what is often referred to as prehistory (Gamble & Kruszynski, 2009). This classic tale of archaeological impact involved the application of systematic, scientific methods to refute creationist conceptions of time. An often-recognized example of a creationist timeline is James Ussher's creation date of October 23, 4004 BCE (before the Common Era). Ussher was an Irish scholar and a member of the clergy who carefully examined Biblical texts and other documentary records to calculate his particular date for the origins of existence. In the 1800s, many people in Europe and the United States accepted Ussher's timeline for creation. However, in 1859, two works sparked a major shift in Western European and U.S. thought. In that year, Charles Darwin published *On the Origin of Species* and Joseph Prestwich and John Evans documented the presence of human stone tools in the same geologic layers as extinct mammals.

Darwin's book established the framework for a theory of evolution through natural selection. His argument that species adapt over time to achieve reproductive success in a given environment has been supported by archaeological finds of extinct animal fossils that include human ancestors such as *Homo erectus*, *Homo habilis*, and members of the Australopithecine family (Schiffer, 2017; Shook et al., 2019). Paving the way for these major discoveries in human evolution, John Evans and Joseph Prestwich made the important step of establishing that people existed prior to events recorded in the Bible.

In an 1896 American Geologist obituary written for Joseph Prestwich, the author notes that "prejudices, which stood in the way of acceptance of the evidence of man's geologic antiquity, can scarcely be understood at the present time, though less than forty years have passed since those now forgotten controversies" (W.U., 1896, p. 134). The lack of controversy is a testament to the work of Prestwich, his colleague John Evans, and subsequent archaeologists. Today, few in the United States would argue that humans and the Earth are only 6,000 years old. Most would accept that we once coexisted with the mammoth, the saber-toothed tiger, and other extinct Ice Age (Pleistocene) creatures. Yet, as the quote above highlights, these ideas were far from conventional in 1859. Although many geologists at the time argued that Earth was more than 5,683 years old and that not all human existence was accounted for in the Bible, they still had to develop a case for an alternative perspective to that of Ussher and to other creationist conceptions of time. Perhaps the key lay in the archeological record.

Evans and Prestwich were not the first to claim evidence for the association of human artifacts with extinct mammals. Their key contribution is the application of geological science with systematic documentation to provide convincing evidence that countered creationist timelines. They gathered critical data at Saint-Acheul, near Amiens in the Somme Valley of France. Evans and Prestwich traveled to the Somme in the spring of 1859 in the hope of finding in situ artifacts or objects that had been relatively undisturbed since they were deposited in the soil (Gamble & Kruszynski, 2009). Through careful analysis of geologic layers (i.e., stratigraphic analysis), they had to establish that any artifacts associated with extinct mammals were not placed there by more recent human activity (i.e., fraud) or moved across geologic layers due to disturbances in the soil. In April 1859, construction workers in the Somme made a promising find. With a team of scientists and a photographer, Evans and Prestwich traveled to Saint-Acheul to document a stone hand axe that had been uncovered deep beneath the surface (see <https://blog.geolsoc.org.uk/2020/04/27/photographs-from-the-drift/> for more information). The additional scientists bore witness to the discovery and the photographer provided what was then a relatively innovative documentation technique.

In the field, Evans and Prestwich recorded depth measurements and a detailed description of the artifact. They analyzed the soil context that contained the axe and found no disturbances. To support their finds at Saint-Acheul, Prestwich and Evans excavated a similar set of hand axes in Hoxne, England. During a business trip, Evans noticed hand axes in a collector's case reminiscent of the one found in Saint-Acheul (Gamble & Kruszynski, 2009). He traced the provenance of the artifacts in the case back to Hoxne. In England, Evans and Prestwich excavated more hand axes that were in the same soil context as extinct mammals. Together, the finds at Hoxne and Saint-Acheul provided the necessary artifacts and geologic evidence to prove that humans had lived in a previous geologic era with animals that are now extinct. This era of human existence, which is not accounted for in written records, provided a major counterclaim to creationist timelines. Today it is known as prehistory or deep time.

To demonstrate how the findings of archaeologists are relevant for contemporary society, I provide three case studies: (a) human-environment relationships, (b) human diseases in archaeological perspective, and (c) scrutinizing histories. The case studies are just a small sample of how archaeologists' findings are relevant for contemporary society. For further discussion, see the works by Brian Fagan and Nadia Durrani (2019), Kenneth Feder (2017), Barbara J. Little (2016), Jeremy A. Sabloff (2008), and Michael Brian Schiffer (2017) (see also Appendix A for a classic example of archaeological contributions to knowledge).

Human-Environment Relationships



Figure 1. Armando Valenzuela Gómez, a Maya descendant, taking part in the investigation of an ancient Maya site. Photo by the author.

Archaeologists have long thought about human-environment relationships, but today they are increasingly concerned with understanding the conditions that led to the growth, decline, and resilience of societies across the globe (Chase & Scarborough, 2014; Fagan & Durrani, 2019; Kirch, 2005; McAnany & Yoffee, 2009; Rick & Sandweiss, 2020; Tainter, 2006). Work in Mesoamerica has demonstrated that a series of major droughts coincided with an episode commonly referred to as the Maya “collapse.” I say collapse in quotes because contrary to popular belief, the Maya peoples who created the towering temples and vast jungle cities of the Yucatán Peninsula, Guatemala, Belize, and parts of Honduras and El Salvador did not disappear (Figures 1 and 2). Millions of Maya descendants continue to live on the land of their ancestors and other parts of the globe, including the United States. Studies of Maya resilience are often tied to researchers observing a pattern in the archaeological record that dates to over a thousand years ago.



Figure 2. Temple pyramids of Tikal, Guatemala, rising above the rainforest canopy. Photo by the author.

When scholars discuss collapse in the Maya area, they are often referring to a process that occurred at the end of what is termed the Classic period (CE 200–900). That is when the southern lowland rainforests of the Maya area experienced their peak population levels (Figure 3). Divine rulers administered cities, formed alliances, and fought with rivals. However, around 700 CE, the power of Maya rulers and the growth of urban centers in this region of the world began to diminish. The archaeological record, which includes hieroglyphic texts (Figure 4), provides increased evidence of warfare and a general decline in monumental construction. The cities were largely depopulated by 900 CE, and over time they were incorporated back into the rainforest (Figure 1). What happened to the once-thriving Mayas?

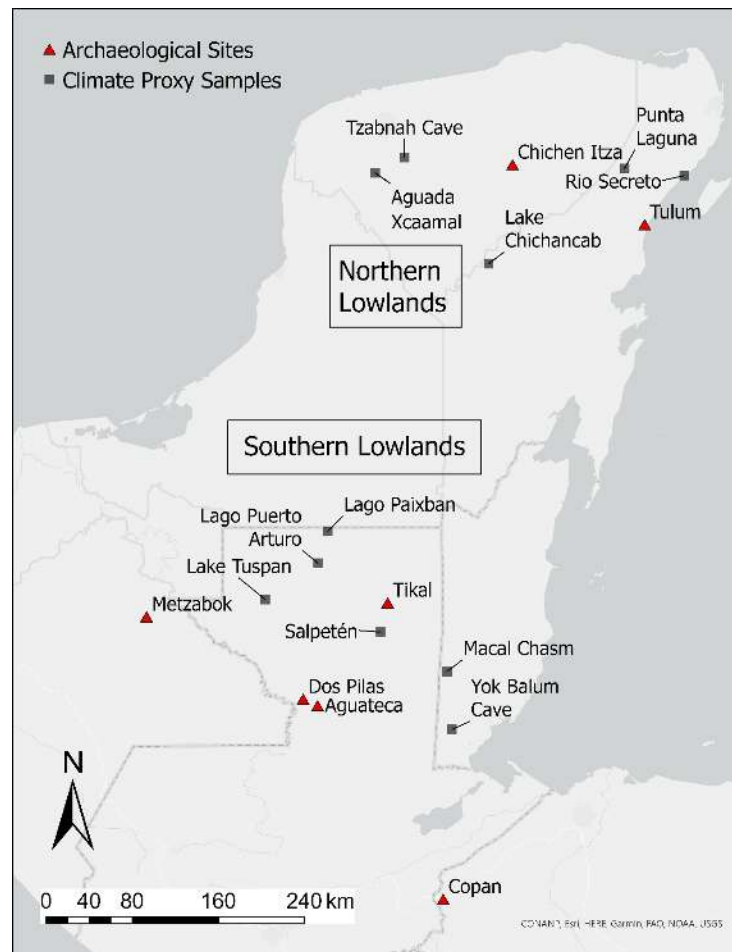


Figure 3. Map of Maya area with climate proxy samples and Maya archaeological sites mentioned in this chapter. Climate proxy samples were compiled from Hoggarth et al. (2017) and Ebert et al. (2019).

Sparked in large part by paleo-climatological research conducted in the 1990s (Hodell et al., 1995), today archaeologists are increasingly examining the role of drought in the collapse. Much of this research utilizes lake cores and other sources of ancient rainfall data from the northern part of the Maya lowlands (Figure 3). The most refined source of data is a stalagmite from Yok Balum cave in Belize. Through uranium-thorium dating, Douglas J. Kennett et al. (2012) were able to date sequences of stalagmite growth with an accuracy of plus or minus 17 years. In other words, the researchers were able to narrow down the age of the growth sequences to a window of dates spanning roughly 34 years. During the Terminal Classic (700 to 900 CE), or roughly the period of collapse, their plus or minus window was closer to five years or less. Most archaeologists are accustomed to radiometric dates with ranges in decades or centuries, and it is remarkable Kennett and colleagues were able to arrive at such a narrow time frame. By measuring oxygen isotopes ($\delta^{18}\text{O}$) in sequences of stalagmite growth, they were able to estimate annual rainfall. Based on the record of rainfall rates that could be dated with high precision and accuracy, Kennett and colleagues argue that episodes of droughts that lasted multiple decades led to a two-stage collapse. The first episode of multidecadal droughts occurred in the seventh century CE, which was followed by another episode of multiple multidecadal droughts that occurred from 820 to 870 CE. Overall, they found evidence of a drying trend that lasted from 640 to 1020 CE.



Figure 4. Monument with hieroglyphic writing from the site of Copán, Honduras. Photo by the author.

Prolonged droughts would have been destructive for Classic period lowland Maya communities because the large populations living in densely packed areas were dependent on agricultural production (Hoggarth et al., 2017; Iannone, 2014; Kennett et al., 2012). Before the multidecadal droughts, the surplus that farmers generated had allowed for a population boom and the formation of an elite strata that included divine rulers and scribes. Cross-cultural research suggests that a lack of agricultural production and the resulting societal stress may have contributed to higher levels of warfare toward the end of the Classic Period (LeBlanc & Register, 2003; Sabloff, 2008; Zhang et al., 2007). Greater social conflict might have had a cascading effect that led to the destruction and accelerated abandonment of communities, such as the sites of Dos Pilas and Aguateca in Guatemala. As drought was exerting pressure on agriculture and on population levels, Maya communities seem to have increasingly turned to warfare in an attempt to alleviate some of the stress. Others likely migrated out of the southern lowlands in search of a reprieve from the turmoil. Although much of the collapse scenario I outlined in this and previous paragraphs is plausible, further investigation is necessary to provide scientific evidence to support this theory.

If Maya agricultural output was severely affected by low rainfall, then it is up to researchers to provide the archaeological evidence that demonstrates that decreased farming yields coincided with the multidecadal droughts or the extended period of low rainfall or both. People can have a number of responses to drought, including developing new agricultural techniques that mitigate the effects of low rainfall and perhaps increase productivity (e.g., Boserup, 1965; Kirch & Zimmerer, 2011). A better understanding of the conditions that led to the collapse, which includes an analysis of how the Mayas reacted to a shifting climate, will allow archaeologists to utilize their findings to help us think about current conditions. If climate change led to low rainfall that triggered massive depopulation, might our societies be facing similar conditions as the earth's atmosphere and its oceans continue to warm? Or have we mitigated the major issues the ancient Mayas faced? More importantly, will we respond as a species to global climate change with a resiliency similar to that demonstrated by Maya peoples? If climate change did lead to the collapse, then Maya peoples endured through that turmoil only to face the horrors of colonization centuries later. Despite the challenges, Maya peoples have found ways to persist and in some cases to thrive into the present (e.g., Fischer & Brown, 1996; Menchú, 1984).

Human Infectious Diseases in Archaeological Perspective

The issue of human resilience is at the forefront of my thoughts because I began writing this chapter during a time that government officials were projecting would be the worst for the United States during the COVID-19 pandemic. It is now over a year after I wrote the previous sentence and by then the pandemic had only started to abate. In the face of grim daily disease and mortality numbers, it would have been easy to put archaeology aside and focus on other pursuits. Yet the examination of material remains can contribute important findings for epidemiologists and other health professionals. While biomedical researchers work to find proper treatments for COVID-19 and other illnesses, paleopathologists can provide a deeper understanding of the long-term human experience of infectious diseases.

Invasive, disease-causing organisms often affect soft tissue, such as the lungs or intestines, which preserve poorly over time. Consequently, archaeologists have primarily studied illnesses that cause bone modifications (e.g., Buikstra, 1981). Through skeletal analysis, bioarchaeologists and paleopathologists have provided evidence of past infectious diseases, such as tuberculosis, leprosy, brucellosis, and syphilis (Roberts & Manchester, 2010). Perhaps one of the most significant results from this work is the claim that the switch from a mobile, foraging lifestyle (i.e., hunting and gathering) to a sedentary lifestyle based on domesticated plants and animals (i.e., the Neolithic Revolution, also known as the Agricultural Revolution) about 12,000 years ago resulted in an overall decline in health for human populations (Barrett et al., 1998).

Through the analysis of osteological remains that pertain to the Neolithic Revolution in various parts of the world, researchers have observed increased bone lesions that indicate undernutrition and infectious disease (Barrett et al., 1998; Cohen, 1989; Cohen & Armelagos, 1984). Presumably, as the growth of human populations accelerated with the switch to a subsistence based primarily on domesticated plants and animals, we became increasingly concentrated in clusters of settlements. The formation of increasingly dense communities and living with domesticated animals provided more opportunity for infectious diseases to spread and thrive. It is important to note that a reliance on bone modification, which is a slow process, means that diseases that rapidly cause mortality are underrepresented in the archaeological record. For example, if future archaeologists excavate the graves of people who succumbed to COVID-19, they probably will not find skeletal modifications caused by the disease. Nevertheless, some of the detection issues can be overcome by using documentary and biomolecular analysis (Brown & Brown, 2013).

The Black Death in Europe (1347 to 1349 CE) has received considerable attention from investigators interested in the organism that caused the epidemic and in human reactions to the illness (McKinley, 2020). One of the most prominent case studies of the plague is a cemetery uncovered in East Smithfield, England. Documentary records were used to confirm that the Royal Mint cemetery of East Smithfield was an emergency burial ground for people who succumbed to the Black Death (Antoine, 2008). At the site, archaeologists have uncovered mass burials with the remains of several hundred plague victims. Researchers have utilized DNA sequences collected from the bones of the people interred there to examine whether or not the bacteria *Yersinia pestis*, which causes bubonic plague, was the organism that caused the illness known as the Black Death (Antoine, 2008; Bos et al., 2011). This genetic research has generated controversy, but ongoing advances in the study of ancient DNA have provided strong evidence that the Black Death was caused by *Yersinia pestis*. DNA research has also provided data that suggests that this bacterium may have been tied to an earlier epidemic known as the Plague of Justinian that occurred from 541 to 543 CE (Wagner et al., 2014).

Archaeologists may also contribute to the debate surrounding the role of rats in the transmission of the Black Death. Based on her extensive research, Antoine (2008) proposes the following:

*“The black rat (*Rattus rattus*) is regarded by some as the dominant reservoir of *Yersinia pestis* and this species may have eventually been displaced and succeeded throughout Europe by the bigger brown rat (*Rattus norvegicus*). As the brown rat is believed to be less likely to transmit the [plague-carrying] fleas to humans[,] . . . [c]hanges in rodent ecology may thus explain the complex patterns of eruption, disappearance and re-emergence of plague that continued in Europe over many centuries.”*

As this quote underscores, we cannot assume that humans have overcome past illnesses by developing immunity. Instead, the spread and eventual decline of certain diseases may have been caused by environmental changes that occurred through varying degrees of intentional and unintentional human intervention. Thus, as archaeologists continue to develop new methods of detection, we may be able to contribute a long-term understanding of human relationships with infectious organisms and disease transmitters that can help people address and perhaps even prevent future pandemics (e.g., Bos et al., 2011).

Scrutinizing Histories

The goal of many archaeologists is ultimately to learn about the past and enrich our understanding of humanity. One of our major contributions to this project is revealing hidden aspects of the past. This work is important because any account of the human experience will intentionally and/or unintentionally exclude information or contain biases (Brumfiel, 1993; Trouillot, 1995). For example, ancient written records, which are one among many sources of history (i.e., oral history, archaeology), tend to contain information about rulers and other members of the elite and ignore the everyday people who form the vast majority of a society's population. In patriarchal groups, the actions of women are often underrepresented or missing. Moreover, rulers can choose to rewrite history in a manner that pleases them. Once the biases and omissions of histories are understood, investigators can look to expand, fill in, or refute narratives about the past. For example, archaeologists have revealed a wealth of evidence about people whose lives were omitted from written records. The silenced voices, among many others, include Indigenous peoples and enslaved Africans (Blakey, 2020; Supernant, 2020). Thanks in part to archaeological finds, we have gained a deeper understanding of how marginalized groups actively shaped the formation of the United States.

The history of the United States is often told as one of expansion by triumphant European settlers. The English landed on the East Coast at Plymouth and Virginia and as part of a colonial project expanded westward until the country was united “from sea to shining sea.” Yet the lands European people were settling were not empty or barren. For thousands of years, Native American ancestors created their own histories and cultures associated with the places Europeans sought to control.

Hindsight tells us that the European-led colonizers eventually displaced most Native American groups, but this process of removal was not simple, universal, or inevitable. Researchers have repeatedly demonstrated that European successes in the Americas would not have been possible without the assistance of Indigenous groups (Dunbar-Ortiz, 2014; Restall & Asselbergs, 2007; Silverman, 2019). The sharing of knowledge and resources between the Wampanoag and the Pilgrims at the “First Thanksgiving” is a familiar, though highly mythologized, example. Examples abound for how Native American groups supported, directed, impeded, and even prevented efforts at domination and exploitation by Europeans. For example, the Anishinaabe peoples, who lived in the Straits of Mackinac region of Michigan, utilized their strategic position along Great Lakes trading routes to exert pressure on Europeans and rival Native American groups (McDonnell, 2015). The inhabitants of the Mackinac area, specifically the Odawa, created an extensive network of kinship alliances that enabled them to wield tremendous political, economic, and military might. With their extensive power, the Odawa were able to direct and even counter colonial efforts by playing on the fears and aspirations of the French and the English.

Working with the archaeological evidence and written records, investigators have sought to give voice back to groups, such as the Miami, who resisted the efforts of the U.S. government to force them to assimilate. The documentary record of the Miami in the early 19th century is biased toward the perspective of U.S. officials, such as President William Henry Harrison, who gave voice to pro-assimilation Native American leaders. Through careful analysis, Mann (1999) demonstrates how reading between the lines reveals clues into the lives and political views of anti-assimilation Miami. In 1803, Harrison, then governor of Indiana, was fully aware of rival factions. He stated, “When Wells [a U.S. Indian agent] speaks of the Miami Nation being of this or that opinion he must be understood as meaning no more than the Turtle [a pro-assimilation Miami leader] and himself” (qtd. in Esarey, 1922, pp. 76–77). Further clues of the intra-Miami dispute can be found at the Ehler site, one of several settlements located at the Maumee-Wabash portage of Indiana (Mann, 1999). Several Europeans traveled through and left accounts of the region, including Harrison, who burned Native homes and fields as part of his campaign in the War of 1812. However, the Ehler site is not mentioned in any known written history. The omission of the settlement from extant records could be due to bias against spreading the views of anti-assimilation groups and/or intentional effort on the part of this Native community to remain hidden. Excavations at the Ehler site have revealed an abundance of British-made gun flints. The presence of the weapon parts suggest that the British were engaging in illicit exchanges with the Miami before and likely in preparation for a war with the recently independent United States. Thus, the omission of the Ehler site from written records may be tied to political efforts on the part of multiple groups to obscure the presence and activities of anti-assimilation Miami. By harnessing the power of material remains and a long-term perspective of the human experience, archaeologists can shape how we think about the past and ourselves.

Part 2: Reflecting on How We Do Archaeology

The impact of archaeology lies in more than results or findings about the past. Although archaeologists have long reflected on how they do research, more recent work has emphasized how the process of learning about the past affects contemporary people. Doing archaeology has political, economic, and other ramifications that can benefit some and oppress others. Thus, careful consideration of how the practice of archaeology relates to various stakeholders is necessary.

The emphasis on self-reflection in U.S. archaeology grew along with similar trends in cultural anthropology. In the 1980s, cultural anthropologists placed greater attention on examining the societal implications of how they create knowledge and write about other groups of people. In tandem with this self-reflection in anthropology, archaeologists also began to place greater emphasis on how the researcher and their social context (i.e., cultural assumptions, politics, and economics) affect interpretation. For example, feminist scholars have demonstrated that archaeological interpretations of the past were and often continue to be riddled with gender bias that is tied to present-day cultural assumptions and ideologies (Brumfiel, 1993; Conkey & Spector, 1984; Moen, 2019). Models that present men as hunters and women as gatherers seemed to support the premise that men provided meat that was the primary source of food for the family. In this model, women, in addition to gathering some plant-based sustenance, supposedly stayed at home to process what the men acquired. The model neatly supported conservative U.S. gender ideals in which the man provides for the family by going to work and the wife tends the home. However, the claims of past gender roles were based primarily on ethnographic analogy with little support from the archaeological record. Distinguishing gendered activity in the deep human past requires careful analysis because stones rarely contain imprints of the gender that used them and never say “I was used by X gender(s).” Instead, researchers often rely on materials recovered from burials to determine how activities were patterned in the past.

Mortuary analysis, like most other fields of archaeological research, is subject to bias against women and other genders, such as in cases of researchers assuming that skeletal remains buried with weapons were men (Moen, 2019). Moreover, it cannot be assumed that sex and gender were equivalent categories in the past or in other cultures. Decades of anthropological and archaeological

research have revealed that gender in the past was dynamic, fluid, and varied across cultures (Mukhopadhyay et al., 2020). For example, if skeletal analysis reveals that an individual was male, we cannot assume that the person self-identified or was identified by others as a man in their society. With these issues in mind, it is important to note that over the last few decades, the sexing of skeletons via bioarchaeological and DNA analysis has revealed that males are not the only sex buried with swords and other weapons. Not all warriors are male! The push by feminists and other scholars for greater self-reflection and engagement with the contemporary power dynamics of doing research opened spaces for archaeologists to challenge existing scientific practices.

Since the 1980s, many new approaches to archaeology have arisen. For example, community and collaborative archaeologies have brought a radically new approach to the field (McAnany & Rowe, 2015; Wylie, 2015). Growing out of multiple strands of thought that were heavily influenced by Indigenous scholarship and efforts to engage the general public, community and collaborative archaeologists have stressed doing research in partnership with a variety of stakeholders. The stakeholders who have received the greatest attention are those who live near fieldwork sites and/or claim descent from the people who created the record studied by archaeologists.

In the United States, Native American scholars such as Vine Deloria Jr. (1988) have challenged researchers by demonstrating that archaeological investigation was generally conducted without the consent of descendants and that archaeologists desecrated sacred sites by disturbing the landscape and human remains and stripped Indigenous peoples of their heritage. The critiques of Native American scholars found reception among anthropologists and archaeologists who were reflecting on how their work perpetuated oppression. For example, Bruce G. Trigger (1984) demonstrates how archaeology has predominantly been practiced as part of imperialist, colonialist, and nationalist projects. The processes Trigger discussed can be seen throughout the history of Mexican heritage work.



Figure 5. Pyramid of the Sun, Teotihuacan, Mexico. Photo by Kristin Landau, used with permission for this book.

Similar to elites (i.e., politicians, intellectuals) in other Latin American nations, elites in Mexico City during the 1800s made a concerted effort to distance a recently independent Mexico from Spain by promoting a national identity with a claim to Indigenous roots. An important part of this project was the collection and display of Indigenous material remains (Bueno, 2016). For example, the consolidation of Teotihuacan's Pyramid of the Sun (Figure 5) was a centerpiece for Mexico's 100th anniversary celebration in 1921. As part of this nation-building effort, Porfirio Díaz, former long-term president of Mexico, proudly posed next to the Aztec Calendar Stone for a picture intended to display the glory of Mexico's ancient past and proclaim that the country had established itself as a modern nation because it could protect its own heritage (Figure 6).



Figure 6. Porfirio Díaz with the Aztec Calendar Stone (A. Carrillo, public domain via Wikimedia Commons).

Yet this process of nation-building generally oppressed Indigenous descendants. Contemporary Indigenous descendants, such as the Mayas, have often had little say in what the Mexican or other federal governments did with their heritage. Ancient Maya sites, such as Chichén Itzá and Tulúm, were transformed by foreign investors, politicians, and archaeologists into tourism hot spots (Breglia, 2006; Castañeda, 1996). As tourist attractions, archaeological sites in Mexico generate billions in income, but very little of that money reaches the hands of the Mayas and other descendant communities, who generally live in poverty. To address the oppressive

nationalist and colonialist legacies of archaeology, recent movements toward collaborative research with descendant communities have begun to fundamentally transform the archaeological process. The core goal of this reshaping is to develop projects that are conducted with, by, and for Indigenous and descendant groups.



Figure 7. Puerto Bello Metzabok, Chiapas, Mexico. Photo by the author.

I recently participated in one such initiative. As part of the Mensäbäk Archaeological Project, I work with the community of Puerto Bello Metzabok in Chiapas, Mexico. The town is home to about 150 Lacandón and Tzeltal Mayas and is within the Nahá-Metzabok Biosphere Reserve (Figure 7), part of the UNESCO World Network of Biosphere Reserves. All archaeological investigation in the biosphere is conducted with the permission of the Puerto Bello Metzabok community government. Locals fulfill various roles on the project, including as supervisors, excavators, mappers, and laboratory personnel. Through a collaborative research program, the Mensäbäk Archaeological Project provides a temporary stream of income and builds local capacity in technical skills and archaeological science, such as digital mapping, sampling methods, stratigraphy, and radiocarbon dating. In the process, we fulfill requests from the people of Metzabok to share our knowledge and assist their impoverished community financially.

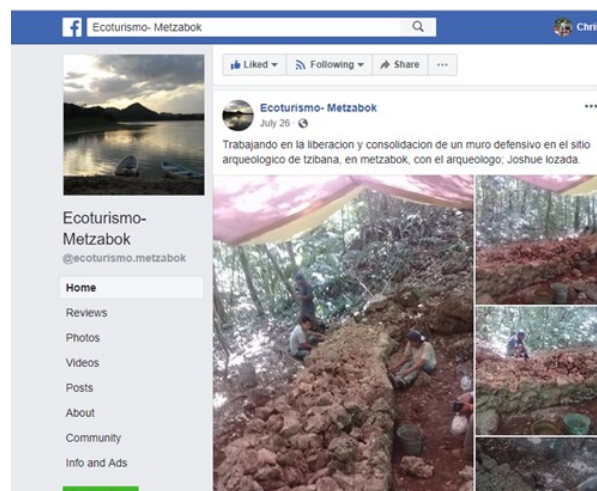


Figure 8. Images of fortification consolidation from the Ecoturismo-Metzabok Facebook page.

Building from our collaborative partnership, in the summer of 2018, I worked with Metzabok community members and a Mexican colleague from the National Institute of Anthropology and History (INAH) to consolidate a small ancient fortification (Figure 8). Over the course of several weeks, we systematically excavated and dismantled the remains of a stone wall to understand what it would have looked like in the past. Next, we began the task of reconstructing the fortification to resemble its appearance from over 500 years ago. This process can be strenuous, but we livened the atmosphere through open conservation. Our discussion topics ranged from the latest gossip to the identification of artifacts. For example, we often debated whether finds of stone fragments were the remains of stone tool production (i.e., flakes). Locals found it hilarious when a fragment I thought was a stone tool turned out to be a naturally broken rock. The final say in these conversations often rested with local elders who in the past had engaged in lithic production. Their experience gave them some authority to settle debates, but many Metzabok community members were not afraid to challenge authoritative arguments. Overall, via collaborative archaeology that includes open conversation, we prepared a tourist attraction that is managed by and for the benefit of locals.

When archaeologists partner with Indigenous communities to actively confront the legacies of nationalist, colonialist, and imperialist oppression, they are working to promote social justice. We did this in Metzabok by developing an archaeological project that was done with, by, and for an Indigenous descendant community. Our work in Metzabok is just one example of many projects that are striving to address legacies of oppression (e.g., Atalay et al., 2016; Battle-Baptiste, 2011; Landau, 2019; McAnany, 2016;

McGuire, 2008; Silliman, 2008). To their credit, some Latin American governments have implemented initiatives to support Indigenous groups, such as the National Institute of Indigenous Peoples (INPI) in Mexico. Yet the legacies of imperialist, nationalist, and colonialist projects continue to affect Indigenous communities all over the world.

Part 3: Why Is the Issue of Relevance So Prominent in the United States?

After reading about the many forms of impact archaeologists have had and are having on contemporary life, you may be wondering why archaeology is so underappreciated in the United States. To address core aspects of this question, I will use the classic anthropological technique of comparison. By critically reflecting on United States and Mexican cultures, I aim to highlight key differences and deeply ingrained assumptions about the role of archaeology in the United States.

Above I discussed how archaeology plays a fundamental role in many Latin American countries in building a national identity and economies based on tourism. The center of the Mexican flag is inspired by the Aztec symbol for the pre-Columbian city of Tenochtitlan, and the national soccer stadium is called the Estadio Azteca, or Aztec Stadium. The country even derives its name from the word “Mexico,” which is the name of the Aztec group that controlled Tenochtitlan (now Mexico City); they are the group the pre-Columbian empire the Spaniards encountered. A symbolic past anchored in archaeological remains is also important for attracting tourists. Foreign and domestic visitors flock to Mexico City to see the remains of the Templo Mayor and the Aztec Calendar Stone. Millions of travelers to archaeological sites, such as Teotihuacan and Chichen Itza, lead to the influx and circulation of billions of pesos in the Mexican economy. In fact, tourism accounted for 8.7% of Mexico’s gross domestic product in 2018 (INEGI, 2019). Because Mexico’s tourism economy experienced severe declines during the COVID-19 pandemic, the federal government has invested the equivalent of billions in U.S. dollars to create Tren Maya, or Maya Train. The train project is designed to increase access to archaeological sites and other sites of cultural tourism in southern Mexico and thereby promote economic development for the nation.

The United States, in contrast, places much less emphasis on archaeological tourism or the pre-Columbian past. Although tourism did account for 2.9% of the gross domestic product of the United States in 2018, archaeology tends to take a back seat in this aspect of the economy (Franks & Osborne, 2019). Collectively, archaeological sites such as Chaco Canyon (NPS Stats, 2024), Cahokia (Winkeler, 2021), Plymouth Rock (See Plymouth Massachusetts, 2021), and Colonial Williamsburg (Yes Williamsburg, 2021) receive millions of visitors every year, but those visitor figures pale in comparison to those for Disney World (Jordan, 2019), Yellowstone National Park (National Park Service, 2019), or the National Mall and other national parks in Washington, D.C. (National Park Service, 2023). Although Yellowstone does contain archaeological sites, a quick Google search will reveal that they are generally not the main attraction. The low visitor figures for archaeological tourism in the United States are due in large part to marketing and to national conceptions of the past.



Figure 9. Monks Mound, Cahokia, Illinois. For scale, note the people standing at the top of the stairs

For some reason, Native American earthen mounds tend to not have the same ooh and ahh factor as the pyramids in Egypt or Stonehenge in England. Monks Mound at the Mississippian site of Cahokia, Illinois, is massive on a scale that is comparable to the Egyptian pyramids and the Roman Colosseum (Kehoe, 2002, p. 250) (Figure 9). Native American effigy mounds are large-scale creative efforts that are testament to the history of Indigenous peoples who had been creating monumental earthworks for more than 5,000 years (e.g., Milner, 2021; Sassaman, 2005). But perhaps in the eyes of many tourists, they are not appealing because

they are not built of stone. Perhaps earthworks are not grandiose in a manner that fits cultural ideas of what monuments are derived from Old World cultures. The Cahokia mounds and other earthen mounds in the U.S. South and Midwest are not like as the Great Wall of China, the Taj Mahal in India, or the Gothic cathedrals of Europe. Yet differing cultural ideas about what a monument is address only part of the problem. The stone walls of Pueblo Bonito and other settlements in Chaco Canyon, New Mexico, are massive on a scale that would rival many heavily visited Old World archaeological sites, such as Stonehenge or Masada in Israel (Figure 10). And still those constructions are not appreciated in the United States as a significant accomplishment and as significant part of our cultural history. Thus, the prevalence of earthen constructions and preferences for European-based ideas about what constitutes a significant construction are only a few pieces in the puzzle of why archaeology is so undervalued in U.S. national culture.

Another issue with many archaeological sites in the United States is that they highlight tragedies and contradictions in the national past. Though the issue is little discussed in school textbooks, the history of the United States is defined by settler colonialism, a mindset in which Native Americans posed a crucial problem: they lived on the land craved first by British and later by U.S. settlers. When Old World settlers, primarily Europeans and their descendants, arrived in the Americas, they had to take land from Native Americans.

A logic of elimination accompanied this process of dispossession. The elimination of Native Americans took many forms, including removal, assimilation (i.e., ethnocide), and efforts at outright genocide (Wolfe, 1999; Sturm, 2017). Removal could entail the physical movement of people, which infamously occurred during the Trail of Tears of 1830–1850, when thousands of Native Americans died as they were forced to relocate from the southeastern United States to lands west of the Mississippi River. This forced migration was just one of many that resulted from the Indian Removal Act that was signed into federal law in 1830. Elimination also included removing signs of Native American presence on the landscape. Settlers removed thousands of mounds, which formed the archaeological record of Indigenous peoples, so they could create fields, homes, businesses, and many other types of constructions.

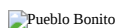


Figure 10. Pueblo Bonito, New Mexico (James Q. Jacobs, [CC BY-SA 3.0](#), via Wikimedia Commons)

People of European descent often explained away Monks Mound at Cahokia and other monumental earthworks as natural phenomena. Others created myths about the Mound Builders that denied Native Americans their history and heritage (e.g., that the mounds were so old that they predated Indigenous Indian people, that Indians were too primitive to have constructed the mounds, or false claims that artifacts or tablets were found in the mounds that pointed to other groups as the builders) (Feder, 2017). (See the Introduction chapter and Anderson’s Pseudoarchaeology chapter in this text for more information about how pseudoarchaeology is often based in racism and settler colonialism.)

In addition to being removed, many Native Americans were placed into assimilation programs. The most infamous attempts at assimilation were Indian boarding schools, which were educational institutions designed to remove Native American children from their reservations in order to “kill the Indian in him, and save the man” (Pratt, 1892, p. 46). In this mindset, salvation meant adopting US settler culture. When assimilation and removal were not sufficient, some people turned to genocide. General William Tecumseh Sherman, famous for his “march to the sea” during the US Civil War, wrote in an 1866 telegram to General Ulysses S. Grant, “We must act with vindictive earnestness against the Sioux, even to their extermination, men, women, and children” (qtd. in Yimon, 1988, p. 422). In the settler colonialism mindset, no Native Americans means no original inhabitants to make land claims that might undermine the project of building a nation and its myths.

Roxanne Dunbar-Ortiz (2014, p. 12) argues that “according to the origin narrative, the United States was born of rebellion against oppression—against empire—and thus is the product of the first anticolonial revolution for national liberation.” People use this official origin story as a springboard for telling the history of the country as one of “broadening and deepening democracy” to bring world order (p. 12). The United States is argued to be exceptional in part because it promotes the progress of humanity by advancing freedom. But what is often missing in this narrative of freedom and progress is a big contradiction: as people of European descent occupied land, most sought to eliminate the Indigenous population.

However, some efforts have been made to integrate Native American culture and history into the official national narrative. Similar to Latin American stories of nationhood that reach back to the history of Maya and Aztec peoples, the most common method of incorporating Indigenous people into the official U.S. national narrative is to treat them as the first Americans (e.g., Pringle, 2012; Struever and Holton, 1979). However, these efforts at integration have found a somewhat limited reception. Groups such as the Anishnaabe, the Pueblo, and many others have fought hard to maintain their sovereignty and cultural identity. Reservations are a testament to the bitter struggles for land and autonomy Indigenous peoples faced (Treur, 2012). Consequently, many Native Americans reject being incorporated into the official U.S. national narrative because it represents another attempt at assimilation that seeks to undermine their sovereignty.

For U.S. archaeologists, the issue of relevance is complex. Their lack of relevance in the national narrative is the result of multiple factors that include nationalism, settler colonialism, economics, and tastes based on Old World cultural preferences. In the United States, the official story of the nation perpetuates a logic of elimination that sought to facilitate invading land Native Americans occupied and taking it from them. Although many Native American peoples have been forced to relocate to new lands, Indigenous material remains provide an enduring, tangible reminder of this history of dispossession. Thus, archaeological investigation of the land now called the United States can threaten the status quo by shedding new light on a history the national project has sought to erase.

Settler colonialism, which requires a logic of elimination, factors into the devaluing of archaeology in the United States. Native American history and cultures do not form foundational aspects of how the official story of the nation is told. There are no broadly accepted claims that Cahokia or Pueblo Bonito are places of origin for the United States. Instead, when a Native American past is mentioned in school textbooks and other media, it is typically done with subtle hints or short discussions about the peoples who lived on the land before the settlers. The official history of the United States begins on the East Coast and spreads westward. Consequently, most of the archaeological record in North America is treated as foreign or exotic. As something that relates to the other, archaeology can be interesting, but it is not treated as fundamental to promoting the national interest. In contrast, in Latin American countries such as Mexico, governments tend to devote resources and labor to promoting archaeological finds and heritage. Doing so heightens the national narrative and bolsters the tourism sector of the economy. Prior to the pandemic, income from tourism formed a larger proportion of the GDP for many Latin American countries than in the United States. Tourism numbers only rebounded to pre-pandemic levels as of 2023 according to the World Bank (2024). In addition to economics and nationalism, towering stone temples in the jungle and mountain cities seem to fit the tastes of tourists that are generally molded from Old World preferences.

So does archeology matter? It does. However, claims to relevance in the United States face opposition that requires further analysis. At the top of the list for future discussion are gender, race, religion, class, sexuality, and how other important aspects of identity factor into settler colonialism.

Conclusion

In a three-part scheme, I have sought to establish a case for the contemporary relevance of archaeology. First, I examined how the findings of archaeologists have reshaped how people think about the past and themselves. In Part 1, I also provided insights that may help us plan for the future. By examining human-environment relationships across cultures and time, we can better evaluate and address the contemporary issue of global climate change. The same applies to studying infectious diseases in long-term perspectives. People learn by critically reflecting on experience. However, epidemics and societal collapse cannot be replicated in real-world experiments. Thus, it is necessary to investigate the past via the archaeological record and learn from the experiences of our ancestors to gain insights on how to deal with some of today's most pressing issues.

In Part 2, I examined how the process of learning about the past can benefit some and oppress others. The practice of archaeology has political, economic, and many other types of consequences for contemporary people that must be addressed if the field is to remain vital and continue growing. Archaeologists have already taken steps to promote greater inclusion of women and Indigenous peoples. However, more work remains to be done. For example, the #MeToo movement has demonstrated that the archaeological process is far from equitable (Heath-Stout, 2020; Voss, 2021a, 2021b).

In Part 3, I compared the role of archaeology in Mexico and the United States. My analysis revealed how nation-building, settler colonialism, economics, and taste contribute to the trivialization of the field. The past is relevant for who we are and what we do today. However, in the United States, deep interrogations of the past threaten to reveal the logic of elimination that supported the process of settler colonialism. My third-grade teacher once said in class, "There is no history here [i.e., in the Americas], it's all in Europe." Her statement bothers me to this day, and after years of reflection, I finally have the tools to confidently state that there is

a long history in the Americas. However, this history is obscured and trivialized in large part due to settler colonialism. I hope I have convinced you that archaeology isn't just about the past. The work of archaeologists matters, both for today and for planning a better tomorrow.

Discussion Questions

1. Pretend you are talking to a relative about classes you are taking. When they hear you are studying archaeology, they laugh and call it a waste of time. How might you convince your relative that archaeology can contribute knowledge that is relevant for contemporary society?
2. Drawing on one or more examples from this chapter, explain how the process of archaeological research may affect people today.
3. In this chapter, Dr. Hernandez outlines a stark difference in the way archaeology is viewed in the United States and Latin America. What is the difference and what are some possible reasons for it? Can you think of examples of archaeological research from Africa, Asia, Europe, and/or the Pacific Islands? Is the perception of archaeology in the region you are thinking of more like that in Latin America or the United States? Why might this be?
4. How might archaeology help shape future social life in the United States and in other countries?

About the Author



Dr. Christopher Hernandez (Twitter: @profclh) is an anthropological archaeologist whose research focuses on warfare, social conflict, ethics, praxis, and inequality. He is an assistant professor in the Department of Anthropology at Loyola University Chicago. To address questions about the past, Hernandez collaborates in the archaeological process with a diversity of stakeholders, including local and descendant communities in Chiapas, Mexico. In addition to publishing in academic venues, he engages in public-facing scholarship, such as hosting a podcast titled Decolonizing Discovery, participating in Skype a Scientist, and creating YouTube content.

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1.3: Understanding Ancient Mysteries- Archaeology, Pseudoarchaeology, and the Importance of Archaeological Heritage

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Learning Objectives

- Distinguish pseudoarchaeological approaches from archaeological approaches
- Analyze the influences that drive people to support pseudoarchaeological claims

The stonemasons of the Inka Empire built some of the most remarkable architecture in human history. The walls at the famous fortress of Saksaywaman stand two to three times as tall as a human being and stretch for hundreds of meters.^[1] Even more remarkable than the size of the walls are the blocks used to build them. Instead of using rectangular blocks like those found in most architectural traditions around the globe, the blocks of Saksaywaman often have five, six, seven, or even more facets and fit tightly together without mortar. More astonishing still is the fact that this level of precision was achieved with massive blocks far exceeding what one person or even a group of people could easily lift.



Figure 1: The Walls of Saksaywaman, Wikimedia Commons

In the modern era, many curious travelers have made the pilgrimage to Saksaywaman so they could marvel at this feat of human engineering. Among these travelers, there have been some visitors who questioned whether the Inka masons could have truly built these massive walls. After all, construction workers today resort to cranes and other mechanized methods to move similar-sized objects. But if these walls were not built by the Inka, who could have built them? Our doubtful visitors have provided many speculative answers to this question, ranging from the descendants of the lost continent of Atlantis to visiting space aliens who saw fit to offer humanity a helping hand.

There is a notable problem with these alternative answers. Despite the enormity of the walls, archaeologists have been able to demonstrate how the Inka masons built them by examining data from a variety of Inka settlements. Many stone blocks at these other sites exhibit similar patterns of construction, although on a less monumental scale. At some of these sites, a few blocks retain small stone protrusions. These protrusions were used in combination with wooden poles to create the simplest of machines, a lever, to raise and lower the blocks until the perfect fit had been achieved (Protzen, 1993). Ideally, these protrusions should have been removed from the blocks when the wall was finished, but the Inka Empire came to a tragic end when Spanish colonizers arrived (as I will further address below) and some building projects were left unfinished. While it may seem remarkable that the blocks of Saksaywaman were lifted with wooden poles, any modern engineer can attest to the remarkable power of levers.

Alternative claims in archaeology, like those put forward for the building of the walls of Saksaywaman, have enjoyed great popularity over the years. They have been featured as plot points in Hollywood blockbusters such as *Indiana Jones and the Kingdom of the Crystal Skull*, hit videogames such as *Assassin's Creed*, and the *Stargate SG-1* television series. They have been found in bestselling books like *1421: The Year China Discovered the World* by Gavin Menses and *Fingerprints of the Gods* by Graham Hancock. Television producers have created infotainment documentaries alleging a variety of spurious claims about the human past, including Netflix's *Ancient Apocalypse* and the History Channel's *Ancient Aliens*. In the face of this rising tide, many archaeologists have spoken out against these claims, yet their voices seem to have had little effect.

Some may ask, "What is the harm in a few entertaining speculations about the past?" For one, our collective reputation for human achievement is at stake. By denying the Inka stonemasons credit for their work building the walls of Saksaywaman, we are denying the brilliance and innovative skill of human ancestors. Furthermore, all too often these "entertaining speculations" are made primarily in reference to structures built by Indigenous peoples, and as a result these speculations become targeted prejudice that questions the achievements of non-Western peoples. In addition, alternative claims represent an assault on critical thinking. In most cases, alternative claims about archaeology can be debunked with surprisingly little effort. Yet new believers are drawn in on a

regular basis. A survey conducted by Chapman University (2018) found that 41% of Americans professed a belief that archaeological evidence supported the claim of ancient alien visitors. That number had doubled since 2015. In the same survey, 57% of Americans claimed that Atlantis, or something like it, was a real place. Both of these claims have been debunked repeatedly (Colavito, 2005; Kershaw, 2018). The fact that people are so easily seduced by blatantly false claims should be a matter of great concern to us all.

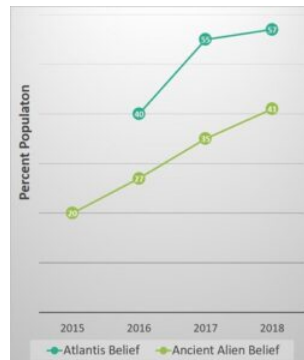


Figure 2. Results from the Chapman University Survey of American Fears

The purpose of this chapter is to engage with these alternative claims in archaeology instead of brushing them aside. Many archaeologists who have attempted to address these issues have focused on debunking claims; that is, proving why particular alternative claims about the human past are incorrect. This is important work, but with the continuing rise in popularity of alternative claims, it is apparent that debunking is not enough. To combat this misinformation, we need to understand what drives these claims and what the history is behind them. We need to understand the difference between archaeology and pseudoarchaeology.

What Is Pseudoarchaeology?

Pseudoarchaeology can be a difficult concept to define. It is a subject that includes not only claims for Atlantis and ancient alien contact but also claims that Indigenous Americans did not build Serpent Mound in Ohio, USA, or that Stonehenge in England was built by magic or giants. Pseudoarchaeological claims misrepresent the archaeological record and archaeological methods in order to support predetermined conclusions. Yet when an archaeologist dismisses pseudoarchaeological claims on these grounds, people often perceive the archaeologist as an authority figure who is defending the establishment. Pseudoarchaeologists have capitalized on dismissals of their claims by claiming that archaeologists are close-minded and bound by the paradigms of their discipline. It has even been alleged that archaeologists actively conspire to conceal humanity's true past. As a result, proponents of pseudoarchaeology are able to present themselves as a group of rebel outsiders who are discriminated against for their beliefs but who nonetheless fight for the truth. That is a powerful position from which to attract new followers.

The characterization of archaeologists as inflexible and blinded by tradition is demonstrably untrue. The very nature of archaeological discourse involves debate, argument, and revision in the face of new data. Archaeology does not exist without change. For example, archaeologists once insisted that the remains of the Clovis culture represented the earliest human settlers in the Americas. For a period, this claim was unassailable and anyone who suggested they had found older archaeological remains in the Americas faced skeptical and disbelieving colleagues. Slowly, however, archaeological evidence for an earlier occupation mounted with excavations at sites like Monte Verde in Chile, the Meadowcroft rock shelter in Pennsylvania, USA, and, most recently, White Sands in New Mexico, USA. The Clovis First proponents did not give up their position easily, but by the 1990s the weight of evidence had begun to convince the archaeological community that a new understanding of the earliest inhabitants of the Americas was needed (Meltzer, 2021).

For another example we can look to the Norse legends that implied that Vikings crossed the Atlantic Ocean and explored the North American coastline. With no physical proof, archaeologists were happy to assign these tales to the category of myth, but when excavations at L'Anse aux Meadows in Newfoundland, Canada, uncovered clear examples of a Norse settlement (Ingstad & Ingstad, 2001), archaeologists rapidly changed their opinions about the veracity of these tales. The idea that interpretations of the past can and will change when new data is discovered is inherent to archaeology.

Yet the divide between archaeology and pseudoarchaeology remains and we have trouble defining pseudoarchaeology without resorting to an "I'm right and you're wrong!" mindset. Ultimately, the difference between these two approaches can be best defined through epistemology, a word that I first learned while reading an early edition of Ken Feder's book *Frauds, Myths, and Mysteries*:

Science and Pseudoscience in Archaeology (2019). Epistemology refers broadly to the study of knowledge, but we can simplify this concept to “how you know what you know.” For example, you know that the sun rises in the East not only because you read it in a book (a secondary source) but because you have watched it happen (a primary source). Modern archaeologists rely on an epistemology rooted in the scientific method, which requires analysis of empirical data analysis and a focus on the context in which data is embedded. An ancient pot is just a pot, but when we know whether it was found in a royal palace or alongside a humble hearth, we can learn much more about the people who made it. Archaeological interpretations must be based on the observation of all available data points in relation to their context instead of by looking at a single data point in isolation.

The epistemological difference between archaeology and pseudoarchaeology can be illustrated with a classic example: the Kensington Runestone. In 1898, a Norwegian American farmer named Olaf Ohman found a stone slab on his farm outside of Kensington, Minnesota. The slab was covered with an inscription written in medieval Scandinavian runes. Ohman brought the stone into Kensington and its existence was reported in the local newspaper. As Minnesota was home to many Norwegian immigrants in the 19th century, it was not long before someone was found who could read the script. The inscription told the story of a group of wandering Vikings who had made it all the way to Minnesota in the 14th century CE. Advocates for the authenticity of the runestone adopted a pseudoarchaeological epistemology, proclaiming that this one solitary artifact demonstrated the existence of an expansive Viking exploration program that reached into the heart of North America.

In contrast, archaeologists have asked what other data points are available. As the runestone was found in an empty field, there is no immediate context to compare it to; that is, no other Viking-style artifacts or structures were found. Hundreds of archaeological sites have been excavated throughout Minnesota and no other sites show signs of Viking visitors. Instead, only Native American artifacts have been found in contexts that date before the 16th century CE. If archaeologists have proven anything about human nature, it is that humans are messy. Either through deliberate or accidental action, we leave trails of objects behind us wherever we go. No matter how fastidious the Kensington Viking explorers might have been, they would have left something else behind. Take for example the legacy left by European explorer James Cook. Today the South Pacific is littered with artifacts that Cook and his sailors left behind. The same can be said of other European explorers, including Christopher Columbus, Hernando de Soto, and even the actual Viking explorers who founded the village at the L’Anse aux Meadows mentioned above. The idea that a group of explorers would leave behind a single runestone describing their voyage and nothing else should inspire a great deal of skepticism.

The nail in the coffin of the Kensington Runestone came not from archaeological evidence, since there is no contextual evidence, but from an analysis of the inscription. Linguist Henrik Williams (2012) has shown that both the runes and the language used in the Kensington Runestone are inconsistent with a 14th-century Norse inscription. For example, the inscription uses the phrase *opthagelse farth*, meaning “journey of exploration,” but that phrase did not come into widespread usage until the 16th century. Viking explorers in the 14th century, like those alleged in the Kensington Runestone, would have used different terms and written different runes. Given the lack of supporting archaeological evidence and the critical analysis of the text, most archaeologists believe that the Kensington runestone represents the work of 19th-century forgers.

Pseudoarchaeology is frequently characterized by an epistemology that privileges solitary or anomalous data points instead of the plethora of consistent and reinforcing data points that archaeologists favor. There is an undeniable glamour in the pseudoarchaeology approach. It fosters the idea that one thoughtful individual may uncover the long-overlooked artifact that will overturn centuries of dry and dusty academic opinion. A traditional archaeological epistemology, however, provides a greater degree of confidence in our interpretations by incorporating not just a single artifact but all surrounding artifacts and their associated context.

Thus, pseudoarchaeology is characterized by a misrepresentation of mainstream archaeology and by privileging singular data points and ignoring their context. Nevertheless, people are often drawn to pseudoarchaeological claims. Despite the clear and evident problems with the Kensington runestone, many people today continue to believe that it is an authentic Viking artifact. Among the most ardent proponents of the stone’s authenticity are the inhabitants of the town of Kensington. Pride in a community and in the accomplishments of ancestors can be powerful motivating factors that lead people to accept controversial claims as true. Other pseudoarchaeological claims, however, have more complicated histories and thus have more complicated reasons for attracting adherents. Below we will look at two famous pseudoarchaeological claims, where they come from, and why their claims have been so enduring.

The Lost Continent of Atlantis

The lost continent of Atlantis has a particularly seductive charm that has kept the story alive in the subconscious of Westerners for more than 2,000 years. Today, it is a notably popular pseudoarchaeological topic; a new “explorer” claims to have found the ruins

of Atlantis almost every year. Regrettably, these claims of discovery are often picked up by major news networks and run as a break between more serious stories. Because approximately half of Americans believe that Atlantis could be a real place, it is worth stepping back and looking at where the story originates and why it has such sweeping popularity.

The original account of Atlantis comes from the writings of the Classical Greek philosopher Plato, who described Atlantis in his books *Timaeus* and *Critias*. It is important to keep in mind that Plato was not a historian or a collector of myths; he was a philosopher who wrote dialogues between various characters to debate complex moral and ontological problems. Plato's character Critias tells the story of Atlantis, a city that existed 9,000 years ago, beyond the Pillars of Hercules (i.e., the Straits of Gibraltar). The city was located in the center of a continent larger than Libya and Asia combined (i.e., larger than North Africa and Southwest Asia) and was built in a series of concentric circles defined by alternating canals and artificial islands, each topped with elaborate architecture and walls of gold and silver. At the center of the city there was a beautiful temple built to honor the god Poseidon. Plato also said that this magnificent city was the capital of a tyrannical empire bent on invading Europe, but the tiny village of Athens (Plato's hometown) bravely stood fast against the invaders and saved Greece—and all of Europe—from enslavement. After the invasion failed, the gods destroyed Atlantis for its hubris.

While this description is intriguing, it is clear that the story is not literal history. As a philosopher, Plato regularly incorporated hypothetical examples to illustrate his point, the most famous of which is the allegory of the cave, which appears in his book *The Republic*. In *Timaeus* and *Critias*, Plato emphasized the allegorical nature of Atlantis by placing it 9,000 years before his time and beyond the Pillars of Hercules; in other words, “a long time ago in a place far, far, away.” Furthermore, Plato described Atlantis as looking like the Greek city-states of his lifetime. If the city had existed 9,000 years before Plato's time, tremendous cultural differences would have existed between Atlantis and Classical Greece (think, for example, of the vast differences between contemporary England and England under Roman occupation just 2,000 years ago). Finally, Plato alleged not just that Atlantis existed 9,000 years earlier but also that Athens existed that far in the past. Despite more than a century of archaeological investigation and study of the Athenian acropolis, no evidence of a 9,000-year-old Athens has ever been found.

Plato's story of Atlantis was intended as a parable to warn the citizens of Athens not to succumb to the dangers of hubris, a sense of overwhelming pride. As the rulers of a great empire and the children of Poseidon, the leaders of Atlantis saw themselves as better than their fellow human beings and even on par with the gods themselves. In the parable, as a result of this vanity, the gods destroyed Atlantis forever, sinking it beneath the ocean. The intent of this story for Plato's audience, the citizens of Athens, was crystal clear: one should live a humble and pious life, always honoring the gods. Plato thought the Athenians, residents of an influential city in the Classical Greek world, needed to hear this lesson.

Plato's moral parable was little known outside of scholarly circles until 1882 when a former Minnesota Congressman, Ignatius Donnelly, published a book titled *Atlantis: The Antediluvian World* (1882). Donnelly had decided that Plato's Atlantis was not the moral parable that it appeared to be on the surface, but instead represented a hidden chapter in humanity's ancient past representing the origin of all Western civilization. To prove his claim, Donnelly turned to the archaeological record. While Atlantis itself was beyond his reach beneath the Atlantic Ocean, he attempted to identify the refugees of the sunken city by looking for similarities in the archaeological record around the world.

The principle on which Donnelly was working has become known as diffusionism among archaeologists. Diffusionism is based on the idea that a particular technology (such as metallurgy) or a stylistic tradition (such as Doric columns) was developed first in one location and then later spread to neighboring regions due to the effectiveness of the technology or the popularity of the style. This is a reasonable explanation, and it was widely used by archaeologists in the 19th and early 20th-century.

Using this approach, Donnelly focused his argument on the ancient Egyptian and ancient Maya cultures and claimed that they had so many similarities that the only possible explanation was that both cultures had derived from refugees from Atlantis. To prove his point, Donnelly pointed to superficial similarities such as the fact that both cultures had writing systems and upright stone monuments. However, he ignored significant differences in technology, style, language, political structure, and even chronology. The Classic Maya cities hit their greatest florescence almost 1,000 years after the last Egyptian pharaoh sat on the throne. Ultimately, Donnelly argued, the majority of the complex cultures of the ancient world were in fact composed of descendants of refugees from Atlanta.

Despite the obvious problems with his argument, Donnelly's work found notable popularity and succeeded in lodging the dream of Atlantis in the public consciousness. Two main reasons can be identified for Donnelly's success. First, while the existence of ancient Maya culture was widely known in the United States, thanks in large part to the travel narratives of diplomat John Stephens, very little was actually known about the Maya. Thus, when Donnelly compared the Egyptians to the Maya, very few people knew enough about the Maya to recognize whether the comparisons were valid. The second and perhaps more compelling

reason for Donnelly's success lay in the archaeological work of his contemporary, Heinrich Schliemann. In the 1870s, shortly before Donnelly published his book, Schliemann was widely hailed as the discoverer of the legendary city of Troy that Homer described in ancient Greek epic poems. The public was dazzled by the discovery of one legendary Greek city; why would it not be easily convinced that claims of the discovery of a second were legitimate? Yet despite the mutual origins of Plato's philosophical dialogues and Homer's epic poems in Greek literature, there are notable differences between them. Plato composed his dialogues and the hypothetical allegories in them with a deliberate intent to deliver a moral commentary on society, while Homer's poems represent the final written form of a tradition of oral history that was centuries long and very likely was inspired by real events. In addition, Schliemann actually excavated an archaeological site (although his methods were not up to modern standards), while Donnelly's claims were based purely on speculation.

The long-standing popularity of Atlantis, however, lies in how Donnelly transformed Plato's parable. Instead of serving as an example of tyranny and hubris, Donnelly's Atlantis presented a source for the world's ancient civilizations, a source not acknowledged by the emerging academic field of archaeology. Donnelly is a classic example of an outsider who believes they alone have uncovered what the professionals have missed, but he was so consumed with proving his predetermined conclusion that he would accept anything as evidence of Atlantis. Rogue outsiders continue to dominate the hunt for Atlantis, and they trumpet their "success" on infotainment documentaries and in YouTube videos in attempts to claim that the establishment will not listen to their evidence. The quest to find Atlantis is less about archaeology and more about our desire to believe a lone outsider can upset centuries of academic research.

Ancient Alien Visitors

The pseudoarchaeological claims of ancient alien visitors have not endured the test of time in the same way as Plato's Atlantis has, but if possible, these claims have aroused even more ardent supporters. While this topic incorporates a variety of claims, the general argument is that alien beings visited our planet in the ancient past and that the archaeological record includes evidence of these visits. Typically, these claims make use of sites and artifacts that span thousands of years from cultures all over the globe and that pay little attention to their original context.

One of the most famous examples of such a claim comes from the Classic Maya city of Palenque. Ancient-alien theorists have argued that the carved relief found on the sarcophagus lid of K'inich Janaab' Pakal, one of the city's most influential rulers, represents a man flying a rocket ship. Yet if we compare this image to other examples of contemporaneous Maya art, we find that elements found in the image were commonly used in other carvings and that this image depicts the ruler falling into the underworld (Schele & Miller, 1986). Thus, the mystery is easily solved by placing the image in its context instead of by looking at the image in isolation.



Figure 3. Line drawing of the sarcophagus lid from the tomb of K'inich Janaab' Pakal, Chiapas, Mexico. (Wikimedia Commons)

The story behind the claims of ancient alien visitors is a convoluted tale incorporating many colorful characters. The most influential person in this story is Erich von Däniken, who skyrocketed to global fame when his book *Chariots of the Gods?* (1968) became an international publishing phenomenon. Von Daniken wrote the book to raise curious questions about humanity's ancient past, but it only hinted at possible answers to those questions (thus offering von Däniken a neat escape route whenever he was cornered on a particular detail). Despite this evasive writing strategy, the central theme of his book is clear; von Däniken advocates that our planet was visited by alien astronauts and that these beings influenced the development of our species, both culturally and biologically.

Today, most people are familiar with von Däniken's claims through the History Channel's show *Ancient Aliens*. One of the driving forces for the television show is co-executive producer Giorgio Tsoukalos, who frequently appears on the show. Tsoukalos, a protégé of von Däniken, proposed *Ancient Aliens* as a four-part homage to his mentor. After the tremendous success of the first series, which aired in 2010, the show was renewed and began to incorporate yet more claims about ancient aliens.

The popularity of von Däniken's *Chariots of the Gods?* is relatively easy to understand when we consider that it was published in 1968 at the height of the Space Race. The public was never more interested in the stars above and the mysteries they might contain. *Chariots of the Gods?* brought the stars down to Earth, and it flew off the shelves. Yet we cannot explain the popularity of the *Ancient Aliens* television show in the same way as the original book; space is no longer quite so mysterious. To understand the popularity of the ancient aliens theory, we need to look at how this idea developed over time.

Von Däniken was not the first author to write about ancient alien contact. When writing *Chariots of the Gods?* he copied from earlier pseudoarchaeology authors so egregiously that he was sued for plagiarism. He relied in particular on *Morning of the Magicians*, by Louis Pauwels and Jacques Bergier (1960). Pauwels and Bergier, however, were more interested in esoteric spiritualism than in archaeology. In their book, they claimed that their understanding of ancient alien spirits came from an obscure occult book known as "The Book of Dzian." Specifically they claimed that "The Book of Dzian speaks of 'superior beings of dazzling aspect' who abandoned the Earth, depriving the impure human race of its knowledge and effacing by disintegration all traces of their passage" (Pauwels & Bergier, 1960, pp. 154–155). Pauwels and Bergier interpreted these "superior beings" to be alien spirits who came to Earth to aid humanity's development and then departed suddenly. Notably, von Däniken also references "The Book of Dzian," describing it as an ancient Tibetan text many thousands of years old.

The possible existence of an ancient Tibetan esoteric text is intriguing! But, we must ask, why don't conventional historians and archaeologist make reference to "The Book of Dzian? The oldest known references to "The Book of Dzian" come from a modern esoteric book titled *The Secret Doctrine*, written by Helena Blavatsky (1888). Blavatsky was born in Ukraine to an aristocratic Russian family in 1831 and spent much of her youth traveling throughout Europe, absorbing its cultural and spiritual traditions. In

the early 1870s, she emigrated to the United States, where she subsequently founded the Theosophical Society, a cornerstone of the present-day New Age spiritualism movement. The society's goals were to investigate the "hidden mysteries of nature and the [psychic] powers latent in the individual" (Gomes, 2016, p. 250). The popularity of theosophy quickly grew as the technological advances of the industrial revolution led many people to seek new ways to understand their newly complex world.

The Secret Doctrine, in which Blavatsky explained her spiritual perspective, relied heavily on "The Book of Dzyan." A large portion of *The Secret Doctrine* is taken up with commentaries on the seven stanzas of "The Book of Dzyan." In these commentaries, Blavatsky wrote that alien spirits had been visiting our planet and influencing the development of humankind since our earliest days. In particular, she claimed that these alien forces led humanity out of Atlantis and Lemuria (another questionable lost continent) and became the earliest rulers of ancient Egypt, the Maya, and other civilizations around the world. The problem with Blavatsky's treatment of this ancient text, however, is that no copy of "The Book of Dzyan" has ever been found. Blavatsky said that she gained access to the book through her psychic abilities. Thus, belief in "The Book of Dzyan" and Blavatsky's commentaries come down to an act of spiritual faith, not history or archaeology.

The History Channel's *Ancient Aliens* program speaks of these extraterrestrials as physical beings who flew UFOs, not spiritual apparitions. We might ask, then, how this work of spiritualism came to serve as a significant source in *Morning of the Magicians* and in turn in von Däniken's work. For the answer to this question, we are indebted to the research Jason Colavito did for his book *The Cult of Alien Gods* (2005). Colavito demonstrates a connection between ancient alien theorists, "The Book of Dzyan," and the famed pulp fiction horror writer H. P. Lovecraft. To make his stories more realistic and thus more frightening, Lovecraft regularly incorporated elements from the real world. In particular, he incorporated theosophical beliefs into his stories about fictional occult mysteries. Thus, we find the following in his short story "The Diary of Alonzo Typer":

The genesis of the world, and of previous worlds, unfolded itself before my eyes, I learned of the city of Shamballa, built by the Lemurians fifty million years ago, yet inviolate still behind its wall of psychic force in the eastern desert. I learned of the Book of Dzyan, whose first six chapters antedate the Earth, and which was old when the lords of Venus came through space in their ships to civilize our planet.

It should be noted that Lovecraft was not a believer in the occult or in ancient aliens, for that matter. Lovecraft incorporated these elements into his stories as a deliberately ironic commentary on what he saw as the absurd things people would believe (Poole, 2016). Nevertheless, some individuals have believed that Lovecraft was writing truth in the only way that he could, by disguising it as fiction. Among this group were Pauwels and Bergier, the authors of *Morning of the Magicians*. As Colavito uncovered, Pauwels and Bergier were directly responsible for the translation and publication of Lovecraft's work in France. They also went on to edit a journal devoted in equal parts to spiritualism and Lovecraft, blurring the lines between truth and fiction. Thus, we find a direct chain of thought connecting Blavatsky's alien spirits and von Däniken's alien astronauts recorded by the non-existent "Book of Dzyan."

The story behind the concept of ancient alien contact is not one of archaeological evidence; it is a story of a counterculture movement whose members sought to find their own path by denying mainstream beliefs. Blavatsky's Theosophical Society attracted members who felt lost in the newly industrialized world of the 19th century, just as today the television show *Ancient Aliens* attracts viewers who reject the academic establishment and its elite discourse. Truth be told, archaeologists in the past have done a poor job of communicating the excitement of their discoveries. As a result, many members of the public have turned to what they perceive as more exciting narratives of ancient alien visitors. For this reason, and others, archaeologists today pay careful attention to the field of public archaeology (you can read more in the [Public Outreach and Archaeology](#) chapter).

The Importance of Understanding Pseudoarchaeology

Claims that the massive walls of the Inka fortress at Saksaywaman were the work of Atlanteans or ancient alien visitors are based on the assertion that the walls look too complicated for them to have been made by Indigenous Inka stonemasons. Yet a review of the archaeological context shows that the Inka regularly and repeatedly built walls of similar composition. The success of pseudoarchaeology is not rooted in the persuasiveness of its evidence but in a desire for those claims to be true despite the evidence. The inhabitants of Kensington, Minnesota, want the runestone to be an authentic Viking artifact because it brings great pride of place to Kensington and its modern Nordic descendants. Similarly, pseudoarchaeologists who visit Saksaywaman want to see the glories of a bygone golden age or the mysteries of a denied history in the giant walls before them.

Yet we do not need Atlantis or aliens to accomplish this. The walls of Saksaywaman actually represent a bygone golden age and a denied history. The Inka Empire was a vast and powerful state that ruled over the Andean mountains of South America. The citizens of the empire created great works of art and architecture, built vast cities, and even made historical records using an intricate system of knots and string (Kolata, 2013). Western historians have long claimed that the Inka Empire fell to the guns and steel swords of Francisco Pizarro and a few hundred Spanish soldiers, but that is far from what really happened.

Years before Pizarro landed on the coast of Peru, the entire region experienced a deadly wave of epidemic disease. The earliest European explorers brought both measles and smallpox to the Americas, where populations had no inherited resistance to them. As the epidemic spread, both the Inka emperor and his chosen successor perished and the empire descended into civil war. When Pizarro arrived on the shores of Peru, it was after years of infighting there. Pizarro found a once-great empire decimated by war and epidemic disease. Pizarro did not so much conquer the Inka Empire as witness its last dying breath. With the help of archaeological research, the achievements of the Inka Empire and its people have been slowly pieced back together, recovering a legacy of human achievement that had been all but lost. Yet even as those achievements are recovered, they are once again threatened as pseudoarchaeological claims attempt to give credit for the walls of Saksaywaman to Atlanteans or alien visitors. Pseudoarchaeology represents a direct threat to archaeological heritage because it attempts to deny the remarkable achievements of humanity. In addition, a preponderance of pseudoarchaeological claims attempt to specifically deny the achievements of Indigenous peoples, thus continuing to propagate colonial racial prejudice (Halmhofer, 2021). Because of this, we should not simply dismiss claims of ancient alien contact or Atlantean empires as preposterous but should actively oppose them and speak out against them.

Pseudoarchaeology not only represents a threat to our collective heritage, it also represents a threat to our own skills as critical thinkers and observers of the world around us. The past presents real puzzles, all of which deserve to be examined, poked, and prodded from all directions. Archaeology is in desperate need of new thinkers who have not been steeped in decades of established tradition, but we cannot allow ourselves to be beguiled by the glamour of a pseudoarchaeological epistemology where we pick and choose the points of data that interest us while ignoring everything else. If we want to mitigate the effects of pseudoarchaeology, we need to understand why people are attracted to these claims. Only then can we begin to save the legacy of the stonemasons who built the walls of Saksaywaman.

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Discussion Questions

1. How does a pseudoarchaeology epistemology differ from an archaeological epistemology?
2. In your opinion, why do pseudoarchaeological claims thrive on television shows and in infotainment documentaries?
3. What influences caused people to enthusiastically embrace the idea of Atlantis as a real place?
4. How did theosophical spiritual claims become part of belief in ancient alien contact?

About the Author

David S. Anderson received his PhD in Anthropology from Tulane University with a concentration on the archaeology of the ancient Maya. His fieldwork has focused on studying the development of Maya sociopolitical complexity and cultural institutions during the Preclassic period. This work has involved investigating the origins and growth of political power in a pre-state environment as well as a critical examination of the role the Maya ballgame played in the development of community identity. When public interest grew around the Maya calendar in 2012, Anderson became increasingly involved in speaking out against false claims in archaeology. Today, his work examines the public perception of archaeology outside academia by studying how the ancient world is depicted in pop culture and how popular audiences conceive of archaeology and archaeologists.

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1. This chapter uses the preferred Quechua spellings "Inka" and "Saksaywaman" instead of the conventional Spanish spellings "Inca" and "Sacsayhuamán".
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1.4: Public Outreach and Archaeology

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Learning Objectives

- Describe the importance of public outreach in archaeology
- Identify the major methods of public outreach and indicate situations where specific methods may be better suited for a particular archaeological project
- Create your own research-based public archaeology project

Introduction

When I tell someone that I'm an archaeologist, I'm generally met with one of four different responses:

- "What's your favorite dinosaur?"
- "A real-life Indiana Jones!"
- "Oh, wow, you must find all sorts of cool treasures!"
- "I always wanted to be an archaeologist, but it just wasn't feasible. I'd love to start the hobby when I retire, though!"

These four responses tell me that many people confuse archaeologists with paleontologists, an error that leads to awkward laughter and my admission that the only dinosaur I know is the *T. rex*. They also tell me that most of what people know about archaeology comes from popular media, namely the Indiana Jones franchise, which presents archaeological objects as treasure instead of considering their cultural significance. The search for treasure then becomes more of a hobby rather than an actual profession. People assume that what archaeologists do is dig around in remote areas of the world to find pretty items that will line the shelves of museums and private collections or be sold. Shows like *American Digger* and movies like those in the Indiana Jones franchise emphasize the monetary benefits of artifacts (Pagán, 2015), which can lead to the destruction and unlawful looting of archaeological sites. It is rare that members of the public know what it is that archaeologists actually do and how they impact our day-to-day lives with the important research they conduct.

Even when people don't actually know what archaeology is, they still tend to think of it in a vague way as a "cool" profession. However, if someone were interested enough to read the research about archaeological discoveries, they would not likely understand what they read. Research papers use so much jargon that sometimes even archaeologists can't understand a research article outside their area of interest (Fagan, 2010). Public outreach is a practice of translation. Archaeologists need to communicate with the public in terms they understand because they want to learn. If archaeologists don't help them, either they will become discouraged and their interest will wane or they will misunderstand the research, which could lead to negative consequences (which I discuss below).

People are interested in understanding their place in the world, and archaeology can provide them with some of that context. The public is particularly interested in evolution because people are searching for the healthiest ways to live or are looking for justification for poor behavior (i.e., violence or sexual aggression; see McCaughey, 2008 or Zuk, 2013). However, once they grab hold of an idea—such as the paleo diet—they tend to run with it, ignoring the fact that scientific discoveries are made every day that change our understanding of what we know. For example, although the paleo diet considers ingesting grain products to be blasphemous, recent evidence shows that hunter-gatherers of the Paleolithic were making bread-like products around 14,000 years ago (Zeldovich, 2018).

It is unfortunate that most evolutionary scientists have done nothing to correct popular misconceptions about nutrition. Instead, they respond with disgust and condemnation to public understandings of the paleo diet, despite the fact that some practitioners of that diet have reached out to scientists in an attempt to better understand their food practices and make sure they're being scientifically up to date (Chang and Nowell, 2016). Robb Wolf, a prominent member of the paleo diet community, laments this response from anthropologists: "What I have sensed from the anthropology community is an almost . . . annoyance that upstarts from outside that Guild have the temerity to talk about this stuff and try to apply it in an actionable way. . . . If I could wave a magic wand, I'd hope for a bit less prickliness on the part of the medical anthropology community on this topic. . . . If we could get them to understand just how important their understanding of the past is, we might have a much better future" (quoted in Chang and Nowell, 2016, p. 230). Like other anthropologists, archaeologists know that their understanding of the past is important, so why aren't they leaning into that, especially when others see the value of the information in their studies? People are interested in

what archaeologists do and study, and they have an obligation to engage them in their work, especially when members of the public reach out to them.

Archaeologists need to engage in rigorous public outreach to correct misinterpretations of their field. How is anyone outside the field supposed to know what archaeologists do if they do not tell them in language a member of the public can understand? In this chapter, I will define public outreach, provide examples of how archaeologists practice public outreach, and explain why it's important and needs to be done.

Some Considerations

There are many ethical considerations to keep in mind when creating outreach materials—you want to make sure you're doing things in a good way. Here are two of the most important considerations:

1. Keep sensitive cultural material hidden.

- You may receive personal anecdotes from community members you work with, and while they add a human touch to the story you're trying to tell, they may be too personally or culturally sensitive to share with a wider audience. To accurately determine what is or is not appropriate to share, collaborate closely with the local community to get their feedback.

2. Focus on the people who created or used the material culture you're sharing with the public.

- A sole focus on the material culture of a site disconnects the artifacts from the community that produced them and conceals the community's "relationship to their broader environment" (Budwa and McCreary, 2013, p. 196).
- Focusing on material culture out of context risks creating a spectacle (Simpson, 2011). Reducing people to their material culture relegates the ancestors to the past instead of acknowledging their active participation in the world today. The material objects become the face of the people who settled in the area you're discussing. This interpretive practice risks sensationalizing the objects so they become "native-art-as-usual" (Townsend-Gault, 2011). Sensationalized objects become static symbols of the past.

Bottom line: Be respectful in what you say and how you say or portray it, and collaborate with the community whose ancestors created material objects when possible.

For more information, see [Archaeological Ethics and World Heritage: Protecting and Preserving Cultural Resources](#)

The Society for American Archaeology does not have a single definition of public outreach. Instead, it recognizes it as a collection of methods archaeologists use to engage the public in archaeological research and to create general public awareness of the field (Society for American Archaeology, n.d.). Public archaeology is a term that means the same thing as public outreach. Public archaeology was once understood to be a means of applying archaeology to the real world via cultural resource management (CRM), contract archaeology, public education, historic preservation, and museology (White et al., 2004). Today, four different approaches to public archaeology have been identified: educational, public relations, pluralist, and critical (Matsuda, 2016).

The educational and public relations approaches are based more on practice, and the pluralist and critical approaches are more theoretical. The **educational approach** aims to facilitate people's learning of the past via archaeological thinking and methods. The **public relations approach** works "to increase the recognition, popularity, and support of archaeology in contemporary society" by forming connections between archaeology and individuals and/or social groups (Matsuda 2016: 41–42). The pluralist and critical approaches are more theoretical.



Figure 1. Elementary school children taking part in excavating “treasure” from bowls of soil through public outreach by students from the Undergraduate Anthropology Organization at the State University of New York at Binghamton.

Archaeological education can occur both on and off site. Some organizations, like the Alexandria Archaeology Museum in Virginia, offer public dig days when members of the community can participate in an ongoing excavation (White, 2019, p. 37), thus getting hands-on experience in archaeological thinking and methods. For years, members of the Undergraduate Anthropology Organization at the State University of New York at Binghamton took boxes full of “treasure” strewn in stratified soil, sand, and pebbles to elementary schools and taught students how to excavate and interpret their findings. These physical experiences not only create strong memories, they also “improve concentration, increase student engagement, and make learning (and teaching) fun” (Yezzi-Woodley et al., 2019, p. 50).

The public relations approach aligns with the push for archaeological stewardship. In this approach, the wider community, not just archaeologists, participate in knowledge production and in protecting and showing reverence for a site. (Listen to the podcast Dig This for more information on the importance of archaeological stewardship and how archaeologists can better support it in communities.). This takes the educational approach a step farther by fostering a stronger connection to and sense of responsibility for the site. Uncovering artifacts at a public dig adds to the knowledge we have about the site, but true knowledge production requires us to ask questions about and interpret the evidence.

For example, Science and Social Studies Adventures, an organization that takes archaeology to classrooms as a way of enhancing science and social studies lessons, took physics and social studies students to a field that was about to become a park. The students were taught how to use ground-penetrating radar (GPR) technology to map the underground features of the property to determine whether or not an excavation would be necessary (Yezzi-Woodley et al., 2019). The students got not only the hands-on experience of mapping an area with GPR, they also participated in knowledge production by interpreting the map they created and participating in determining the future of the site. They now have a sense of responsibility about something tangible and relevant to their community. Similarly, Nina Simon of the OF/BY/FOR ALL organization encourages participating museums to actively engage their communities in designing projects and exhibits (Kluge-Pinsker and Stauffer, 2021). These projects foster a sense of responsibility and pride about the community’s past.

The **pluralist approach** attempts to understand different types of relationships between material culture and different members of the public, which essentially means understanding who your public is and where they’re coming from ideologically (Matsuda, 2016, p. 42). Finally, the **critical approach** works to unsettle interpretations of the past as told by socially dominant groups, who typically have ulterior motives that socially subjugate another group by distorting narratives about the past (Matsuda, 2016, p. 42). Both the pluralist and critical approaches view the public as a group that has “its own agency and interacts with the past according to its beliefs, interests, and agendas” (Matsuda, 2016, p. 43).

Kluge-Pinsker and Stauffer (2021) have taken a pluralist approach to museum visitors. One German study they evaluated revealed that museumgoers tend to be highly educated, satisfied with life, and open to new experiences and to have high cultural capital (Kluge-Pinsker and Stauffer, 2021). The American Alliance of Museums (AAM) found that only 9% of museum visitors are from minority populations (Kluge-Pinsker and Stauffer, 2021). The AAM did a demographic study in 2010 that revealed a number of barriers for African American and Latino visitors. Historically, museums have felt intimidating and exclusionary to them. Some members of those two communities feel that museums require specialized knowledge and cultivated aesthetic taste. Sometimes members of these communities did not have the experience of visiting museums in childhood. Finally, social networks in these communities influence whether its members choose visiting museums as a leisure activity (Kluge-Pinsker and Stauffer, 2021).

With this nuanced understanding of how people relate to museums, cultural institutions can better relate to a broader audience. They can choose communication methods that their target audience is comfortable with, they can offer content that the broader

community (especially minority populations) can connect with, they can provide a welcoming atmosphere, and they can ensure that their spaces are comfortable and pleasing both visually and physically (Kluge-Pinsker and Stauffer, 2021).

Evolutionary anthropology has largely taken a critical approach since the end of World War II, when it finally became clear that scientific support for ideas about race were extremely harmful to people of color. Until then, both scientists and the general public posited that race was a biological fact and that a person's intelligence, capabilities, and worth were determined by their race. Now we know that the variation in human skin color is nothing more than a reflection of millions of years of adaptation to changing environments (Echo-Hawk and Zimmerman, 2006, p. 471). A study published in 2007 completely unsettled the interpretation of an evolutionary past in which white people first settled Europe. That study found that the gene associated with light skin didn't evolve until 12,000 to 6,000 years ago (Gibbons, 2007, p. 364). Another study published in 2018 provides information about what the first Britons looked like that unsettles evolutionary assumptions about race (Brace et al. 2018).

The educational and public relations approaches have long been established in archaeology, but the pluralist and critical approaches did not begin to gain traction until after the 1990s (Matsuda, 2016, p. 42). These changes in approaches to archaeology are still new for a field that has been rooted in colonialism for over a century. Archaeologists are still learning how to effectively conduct public archaeology and outreach.

Public archaeology is often viewed as a subfield of archaeology. However, public outreach in some form or another informs and underlies all archaeology, whether it be in terms of where funding comes from, where and how an archaeologist is expected to conduct their fieldwork, how to manage the cultural site, how to treat archaeological finds, or what kinds of impacts archaeological research generates (Matsuda, 2016, p. 41). All of these issues require communication with some sort of outside source, and public outreach thus happens before, during, and after the archaeological research is done. Community members can help inform the objectives of an archaeological research project, assist in the excavation process as early in a project as the survey and as late as cleaning and labeling the artifacts, or be a part of a post-research activity or lecture presented by the researchers. Public outreach does not have to be attached to an archaeological project; it can focus on a general understanding of archaeology through hands-on activities in schools or community events. Public archaeology outreach can occur any time and anywhere in any number of forms.

Community Archaeology

“Community archaeology” is the term we use to describe the active participation of non-archaeologists in the archaeological research process. Ideally, community archaeology includes seven components that involve the community:

- devising research questions or areas of interest
- setting up a project
- field practices
- collecting data
- analyzing data
- storing objects
- presenting research findings to the public (Marshall, 2002, p. 211)

This means that the community has some level of control at each step of a project. Arguably two of the most important aspects of community archaeology are ensuring that the management of the cultural heritage remains with the community and that research findings are presented to the public. Allowing communities to make critical decisions about the direction and implementation of research may seem like a terrifying loss of control to archaeologists, but it actually provides a depth to research that would otherwise be impossible to achieve (Marshall, 2002, pp. 212, 215, 218).

By this point you're probably wondering who this elusive “community” is. Two types of communities tend to show up for public presentations of archaeological projects: people who live locally and people who trace their descent from the people who once lived at or near the archaeological site.

To see community archaeology in action, let's take a look at Ozette, a late prehistoric/early historic whaling village at Neah Bay in the state of Washington (Marshall, 2002, pp. 212–13). A mudslide in 1970 exposed substantial house timbers and other organic artifacts. (This was highly unusual because organic artifacts typically decompose). This prompted the Makah Tribal Council to contact an archaeologist, and together they set in motion a huge excavation program that took place from 1970 through 1981. The Makah community provided direction throughout the entire project and opened the site to visitors; up to 60,000 people visited each year. The community stored and displayed excavated materials at the newly created Makah Cultural Research Center and a host of publications about the site were published. The close collaboration between the archaeologists and Makah residents; the control Makah people maintained over the project; the retention of the excavated materials by the

Makah community for the purposes of preservation, storage, and display; and the extensive publications about the site exemplify the goals of community archaeology (Marshall, 2002).

Why Is Public Outreach Important?

The fact is, archaeological sites around the world are in danger. This is important because cultural patrimony (the ongoing cultural importance of an artifact) and heritage tell us who we are and where we come from. This knowledge affects our world views and how we act, thus impacting both our present and our future. Read chapter 3 on the social impact of archaeology for more detail on this topic. As natural resources decrease, scientists are increasingly looking toward the ocean for the mining of precious and non-precious metals, extracting aggregates, and producing marine-zone nonrenewable energy. All of these things put underwater archaeological sites at risk of destruction (Flatman, 2009). On coasts, archaeological sites are threatened by rising sea levels, increasingly powerful storms caused by global warming, and anthropogenic transformations such as development, mining, and dredging (Fitzpatrick and Braje, 2019). In war zones, cultural heritage is destroyed through bombing, the intentional destruction of cultural items in an attempt to wipe away an enemy's culture, and the creation of defensive structures such as trenches. Two of the most prominent examples of destruction of archaeological heritage during war are the recent wars in Iraq and Afghanistan. Approximately 2,500 objects and sculptures were destroyed, defaced, or stolen from the National Museum of Afghanistan in 1996 to 2001. In Iraq, military bases were established at Babylon and near Ur of the Chaldees. The associated trenches, imported gravel, and fuel spills damaged the archaeological record there. Looting, which was rampant during this period, was another harm to the archaeological record in Iraq (Cunliffe et al., 2011).

While the topic doesn't get much popular press, national and international cultural sites also face threats due to political decisions. In 2020, President Trump threatened to bomb 52 Iranian cultural sites "very fast and very hard" as retribution for 52 American hostages who had been taken years earlier (Jacobson 2020). In 2017, Trump reversed the protection of massive amounts of land in Grand Staircase-Escalante and Bears Ears National Monuments under the Antiquities Act. This action put at risk 100,000 archaeological and cultural sites in Bears Ears National Monument alone, including Cedar Mesa, which has one of the highest densities of cultural sites in America at several hundred sites per square mile, all to make way for coal mining, irresponsible and damaging motorized recreation, uranium mining, and oil and gas leasing (Southern Utah Wilderness Alliance, n.d.). This is devastating for the local Native American tribes, including the Hopi tribe, the Navajo Nation, the Pueblo of Zuni, the Ute Indian Tribe, and the Ute Mountain Ute tribe. Trump regarded the ancestral material culture of these groups, which provides grounding and pride in their ancestors, as "not unique" or "not of significant scientific or historic interest" and thus as disposable (Biber et al., 2017). Unfortunately, there are many more threats and sites at risk.

The loss of archaeological sites can cause irreparable damage to communities around the world and needs to be stopped. Without archaeological sites, oppressed peoples can be separated from their history and culture. History can be rewritten by the victor and groups may never learn the truth of where they came from. Such a loss can negatively impact the way people think about themselves. The loss of archaeological heritage can damage communities in many other ways. To exemplify the importance of archaeology and the need for public outreach, I will provide some examples of how the public communication of archaeology can significantly impact communities. I will discuss how learning from our past, telling stories, and correcting harmful narratives all contribute to the communities where archaeologists conduct their work.

Learn from Our Past

We can learn a surprising amount of things about past human actions that can help inform how we behave today. In particular, we can look to the past to determine how to create a sustainable future. From 1987 to 1995, archaeologists of the Garbage Project at the University of Arizona systematically excavated 15 landfills across North America. They found that in the 1950s, paper occupied the most landfill space because it biodegraded very slowly, contrary to what people believed. Shortly after the excavation reports came out, governments and individual communities began pushing for curbside recycling (Rathje, 2008, p. 37) and now we have many types of recycled paper products at our disposal.

In August 2020, NPR posted an article entitled "To Manage Wildfire, California Looks to What Tribes Have Known All Along" (Sommer, 2020). This article explains how banning the controlled burning practices of local Native American groups in California has led to increased vegetation that dries out every summer and acts as kindling for the state's notorious fires. California's state government has recently come to trust in the oral histories of the local tribes and the archaeological record, which argue that

controlled burning was a successful way to manage wildfire risk. According to archaeological finds, controlled burning was used in many places over a long period of time (Bowman, 1998; Heckenberger et al., 2007; Mason, 2000). This archaeological evidence points a way forward in wildfire prevention as a means of reducing global warming.

Sharing Untold Stories

Archaeology has a long history of focusing on the stories of rich, able-bodied white men in their prime. For many decades, the equally important histories of ethnic minorities, other genders, other age groups, and people with disabilities have been left out of the stories we tell about the past. This is problematic, because the exclusion of a group's past can lead to that group's subjugation by a dominant group. Today we realize that archaeology can be a useful way to challenge problematic narratives about the past.

Let's think about the Man the Hunter model of human evolution. You probably envision men running toward a mammoth with their spears held high, ready for another successful kill. But what do you know about women in the Paleolithic? You probably imagine that women just stayed home with their babies and hoped a cave lion wouldn't come kill them while their big, strong husbands were off catching dinner. Note that I say "imagine," because women's roles are often entirely left out of the story. The narrative we have been told is that the first anatomically modern humans focused on subsistence activities that are attributed to men's behaviors; men are the only actors we really hear about when people talk about the Paleolithic.

Do you know how we can tell it was men who did all of those activities? Well, we actually can't tell that at all. When archaeological research into the Paleolithic began, archaeologists of the time were just copying and pasting modern-day gender roles onto the past. For many years, archaeological theory all but ignored gender roles in the deep past (Conkey and Spector, 1984). However, recent research suggests that *women* were hunters, at least in Peru 9,000 years ago (Wei-Haas, 2020). Archaeologists came across a burial in the Andes Mountains in which the skeletal remains were accompanied by 24 tools for hunting big game. The archaeologists at first assumed that the remains were those of an important male hunter. However, further analysis showed that the remains were biologically female. This discovery spurred the reevaluation of a number of similar burials throughout the Americas. It turns out that evidence from grave goods shows that from 30 to 50% of the big-game hunters in those regions were biologically female. When we ignore women's roles in the past, we risk perpetuating a view of men as the drivers of human evolution and success and women as good only for their birthing capabilities. Sharing the stories this evidence presents is a way to refute the assumption that the gender roles of today are "the way it's always been."

Dr. Diane Wallman of the University of South Florida has worked on a public archaeology project at the Gamble Plantation Historic Site for a number of years. Originally established as a sugar plantation by Robert H. Gamble in the mid-19th century, the property was later inhabited by the Judah P. Benjamin, the secretary of state of the confederacy, and later by an attorney. Although there is clear respect for the confederate official, as shown by the large memorial erected to him, Dr. Wallman is interested in exploring the lives of the enslaved laborers who lived and worked on this plantation and whose stories have not been given the recognition or respect they deserve. To share these stories, Dr. Wallman has given public lectures and provided her expertise as a guest on podcasts (such as the Anthro Alert podcast). Excavations at Gamble Plantation are done only during archaeological field schools and members of the public are welcome to participate in the dig. In 2019, one of Dr. Wallman's master's degree students used information from archives, remote sensing, and archaeological investigation to construct a detailed narrative about the lives of enslaved peoples on this plantation with the goal of engaging descendant communities in future archaeological research on the site (Litteral, 2019).

Sharing stories that have long been untold can help generate pride in a descendant community. Archaeology that gives underrepresented groups a tangible connection to their ancestors can go a long way toward building pride in those communities. Getting that message to a broader public beyond the descendant community can go even farther toward valuing the importance of the minority heritage.

Correcting Harmful Narratives

Unfortunately, for many decades, archaeology perpetuated harmful narratives about minority groups. Harmful narratives refer to stories that are told and are argued to be based on science, typically about how or why a minority group was subjugated or why people act a certain way. New archaeological research and the reevaluation of archaeological evidence can work to correct these harmful narratives. Getting these corrected stories out to the public can begin to change how people think about themselves and their place in the world.

Based on narratives in popular media and their own life experiences, many people believe that violence is an inherent human trait. Furthermore, many believe that violence was the driving factor of the evolution of our species. This narrative says that if it hadn't been for our tendency toward violence, anatomically modern humans would not have been able to compete with other groups or

animals and would not have been able to outlive the Neanderthals. However, the DNA of most people today is 1–4% Neanderthal (Green et al., 2010), which means that there had to have been a relatively high amount of sexual relations between Neanderthals and anatomically modern humans. When I was doing research for my master's thesis, all of my interview participants were extremely confident about stating that we humans would have met Neanderthals with nothing but violence. The belief that violence is an inherent and long-lasting evolutionary human trait provides justification for wars and other harmful acts. However, there is very little evidence of violence in the deep past. People are making assumptions about the deep past based on their lived experience and the archaeological research on the topic is not being adequately shared with the public.

Another example is the psudeoarchaeological claims on shows such as *Ancient Aliens* and *In Search of Aliens* (read the chapter on [Pseudoarchaeology](#) for more details). These shows “explain” why it was not possible for Indigenous communities to have built monumental structures many centuries ago. To explain the existence of such structures, the storyline is that the cultures surrounding them must have been created by aliens. Whether or not it is the intent of the shows' creators, these messages work to portray Indigenous communities as technologically and socially inferior. Outreach based on archaeological evidence that tells the public about the ingenious mathematical and engineering skills Indigenous communities used to create monumental architecture could go a long way toward proving that many cultures in the deep past had advanced skills and knowledge systems.

Improving the Quality of Archaeological Research

In order to begin their research, archaeologists need to get funding. Archaeology departments in universities often do not have internal funding, which means that individual researchers need to look elsewhere. If people at fellowship and granting agencies are unfamiliar with an archaeologist's field or they work, they will be unlikely to support it with funding when there are more pressing projects with more evident real-world impacts. It is necessary to write funding requests in such a way that the reader can understand the project, because they won't necessarily have an archaeological background. This means that archaeological researchers need to know how to write for a particular audience. In addition to grants and fellowships, funding or volunteer labor may come from community organizations, so it is important for archaeologists to reach out to local communities and get them excited about the project as well. Strong community relations can also lead to input about how the project should be carried out or what research questions are important. Community relations are especially important when project sites are located on the land of the descendant community.

Archaeologists are specialized—they are lithics specialists, pottery specialists, biological archaeologists, zooarchaeologists, and so forth. In this field, researchers must draw on numerous other specialists and fields to get a full picture of what a site tells them. Archaeologists draw on the expertise of chemists, geologists, geneticists, geographers, and botanists, among many others (Yezzi-Woodley et al., 2019). By communicating with an audience that is broader than those who read archaeological journals or attend archaeological conferences, archaeologists build teams of varied researchers who can all learn and benefit from each other.

I have shown how public outreach is important for educating the public because it improves the quality of the archaeological research by making it easier to get funding and because it leads to collaboration with people from other disciplines. The following sections describe the methods archaeologists use to reach the public.

Methods of Public Outreach

Today, the ways archaeologists can engage with the public can be divided into three categories: traditional media (print, audio, and visual forms), online digital content, and interpersonal or interactive learning experiences (Erdman, 2019). Archaeologists must keep in mind what kind of demographic they want to reach when they choose which method of communication is best suited for their project. Furthermore, each of these categories of communication has different levels of accuracy, access, and effectiveness that need to be taken into account when planning public outreach. In this section, I will describe some specific avenues of communication within each broad communication category and discuss some considerations, limitations, and benefits of each method.

Traditional Media

Print media, including books, newspapers, and magazines, have historically been the primary means of conveying scientific information (Harding, 2007, p. 120). These are often viewed as the most credible forms of scientific communication because of the rigorous editing and peer-review process they often go through (Erdman, 2019, p. 5). The survey participants for my master's thesis research considered books to be their most valued source of scientific information (Hendrick, 2021). However, our understanding of the past is continually changing and the information in these supposedly accurate sources often becomes outdated quite quickly (Erdman, 2019, p. 5). Today, the results of archaeological researchers' work is often digitized or published in online journals. At

this time, because many academic journals are kept behind expensive paywalls, the likelihood that a curious member of the public will read their content is low. Who wants to pay to wade through jargon they might not even understand? To combat this obstacle to public outreach, researchers who are interested in widely disseminating their research use websites that make journal articles more accessible, such as Academia.edu and ResearchGate (Erdman, 2019). However, the resources available on these sites still have the potential obstacle of archaeological jargon.

Each form of print publication provides a different level of insight. For example, “A short newspaper article offers highlights; a magazine...offers a more contextualized account of a site, artifact, or culture; and a book or professional journal may address a specific topic more in-depth” (Erdman, 2019, p. 6). The benefit of print communication is that there is a type of print source that will fit everyone’s pace and depth of interest.

Examples of archaeology in print media

- *Frauds, Myths, and Mysteries: Science and Pseudoscience in Archaeology*, by Kenneth Feder
- *Sapiens*, by Noah Yuval Harari (an example of a popular book about archaeology that uses poor science)
- *Paleofantasy: What Evolution Really Tells Us About Sex, Diet, and How We Live*, by Marlene Zuk

Television shapes many people’s perceptions of the world (Pagán, 2015, p. 16), which means that it is an effective format for educational purposes. That is because visual representations offer a physical point of reference for the audience that makes it easier for them to understand and connect with the material instead of having to parse written texts that are abstract and full of jargon (Erdman, 2019, p. 7). Research has shown that audiovisual materials (such as film or television clips and song or speech clips) are effective learning devices and that students are increasingly becoming visual learners (Hoover, 2006).

Well-constructed and appealing educational television shows can reach a far larger audience than most archaeological books do (Pagán, 2015). Online streaming services, such as Hulu, Netflix, and Amazon Prime, have made television more widely accessible than ever before (so long as you have internet access and another \$10 or so to spend each month). The downside to this is that many more shows are available now that compete with educational television. Viewers have to actively seek archaeology programs.

Audio and visual media such as radio, podcasts, film, and television have a varying level of accuracy. Some of this content promotes a fantastical, sensationalized account that uses archaeology only as a starting point for their fantasy (Erdman, 2019, p. 6). Although television used to be a popular platform for communicating science, television producers today consider lecture series and educational television to be too dry for their audiences (Harding, 2007, p. 120). Archaeologists often communicate information about archaeological finds and sites in dry and unexciting ways, and news editors and television producers tend to insist on packaging hard archaeological facts using sensationalism and catchy headlines (Harding, 2007, p. 124). However, sensationalism can produce misunderstandings and misrepresentations of the data or contribute to common tropes. The stories that get picked up on the radio, in podcasts, on film, and on television tend to center on “sexy” topics such as sex and drugs. This is not to say that good educational television does not exist; indeed, shows like PBS’s documentary series *NOVA* typically feature engaging stories about recent archaeological discoveries. However, people tend to be more familiar with *Ancient Aliens* than with *NOVA*.

Recently there has been an increase in archaeological podcasts hosted by archaeologists who are turning dry and unexciting information into funny and thought-provoking conversations that cater to both novices and professionals (check out the [Archaeology Podcast Network](#) for a wide variety of archaeological podcasts). Although the consumer has to look for podcasts with archaeological content, it is encouraging to see archaeologists in all stages of their careers using this increasingly popular medium.

Examples of podcasts

- *The Dirt* (method, theory, and thematic episodes with humor; appropriate for non-archaeologists and archaeologists alike)
- *Ologies* (this covers all sorts of science, but there are a number of episodes related to archaeology and anthropology; the premise is “asking smart people stupid questions,” so no previous knowledge is needed)
- *Dig This* (how archaeologists can decolonize their work; more appropriate for professional archaeologists)

Hard Archaeological Fiction

The primary drawbacks of traditional media are the difficult technical language archaeologists use and dry presentation of the material. To counteract these difficulties, some archaeologists have argued for an increase in hard archaeological fiction (Hendrick, 2016, 2021; Terrell, 1990; Spector, 1991, 1993; Fagan, 2010; Holtorf, 2010; Mickel, 2012; Messenger, 2019). One of the most

popular examples of hard archaeological fiction is Jean Auel's account of human life in the Paleolithic. The Earth's Children series sold over 15 million copies worldwide by 2010 (Penguin Random House, 2010). You may recognize *Clan of the Cave Bear*, the first title in the series. Auel did an incredible amount of research on life in the Paleolithic and based two of her main characters, Iza and Creb, on Neanderthal remains found in the archaeological cave site known as Shanidar (Penguin Random House, 2010). While Auel's portrayal of gender relations fed into negative stereotypes (see Hendrick, 2021), she imagined what no other scholar was willing to consider at the time: that Neanderthals and anatomically modern humans procreated together. Eventually it came to light that yes, these two groups of *Homo sapiens* had indeed mated. Auel's creative imagination was able to conjure up images of the past that people had not yet begun to think of. This skill is especially important for archaeologists to hone if they are to portray the past accurately. By that I mean that we actually have very little idea about what exactly the past—especially the long-ago past—looked like in terms of social organization, but we can be sure that it wasn't necessarily a mirror image of our own society. Thus, we must use our imaginations to envision worlds that are vastly different from our own.

Fiction is a way to escape our biases. According to Wiley (1981), as Conkey and Spector (1984, p. 21) noted, what hinders our knowledge of the past is not the fragmentary and often "invisible" nature of archaeological data but rather our knowledge systems. Therefore, the use of imagination or fiction is a valuable methodological skill for archaeologists to practice and is a much more interesting and accessible way to disseminate archaeological data than traditional archaeological writing. Additionally, fiction communicates to the reader that archaeological interpretations are fluid, that they change based on emerging discoveries, theories, and interpretations that change the story. One of the main difficulties in disseminating scientific knowledge is that public broadcasts typically ignore the fact that scientific knowledge includes "ifs" and "buts." Content creators who aren't archaeologists tend to be uncomfortable with this uncertainty. They tend to misrepresent research by making the data sound definitive. This leads to mistrust of scientists when research findings change (Harding, 2007). The presence of diverse hard archaeological fiction will emulate the varying archaeological interpretations and "ifs" and "buts" that permeate archaeological literature. Hard archaeological fiction also promotes cross-cultural empathy and an appreciation for the work archaeologists do (Messenger 2019).

Examples of hard evolutionary fiction (different stories = different archaeological interpretations)

- *Clan of the Cave Bear* by Jean Auel
- *Reindeer Moon* by Elizabeth Marshall Thomas
- *The Inheritors* by William Golding
- *Dance of the Tiger* by Björn Kurtén

Online Digital Content

Digital content refers to content designed specifically for the internet. Because this content uses elements of traditional media, it has the same benefits and drawbacks. One of the biggest benefits of online digital content is that it "bring[s] the world of higher education to people who could not otherwise access it" (Harding, 2007, p. 121). This includes both the level of information on the internet and the fact that it is possible to learn about people and places all over the world instead of being limited by the local contexts that are often taught in schools and museums. In addition, the research and ideas are up to date because digital information can easily be edited and answers to questions in online forums and webinars can be provided quickly (Erdman, 2019). This opens up much more opportunity for direct engagement with a larger audience than archaeological books and articles do.

Social media is an excellent way to educate people by sharing the process of a research project in real time and providing information about upcoming outreach events or exciting sites to visit. The X platform facilitates public engagement with the topic of archaeology because hashtags make it easy to follow a general topic and the platform is widely used to get up-to-date news by following a variety of users. Facebook is more oriented toward groups, so a user has to be a member of an archaeology-related group to get current information about archaeological research. In addition, posts about archaeology are featured on a user's newsfeed only if they are a member of one of those groups or are friends with someone who is (Huvila, 2013). Because of these limitations, engagement with archaeology on Facebook is relatively limited.

Two major problems with digital content are seemingly unlimited sources of content and unequal access to the internet. Because there are so many blogs, websites, articles, and social media platforms, a user has to actively search for information on a particular subject and then put the effort into doing a credibility check. Additionally, there are still many people who cannot access digital content due to the lack of a computer or reliable access to the internet. This problem became particularly visible during the COVID-19 pandemic, when it became apparent that many families did not have the internet access required for students to participate in distance learning.

Examples of online digital content

- [Sapiens](#): an online anthropology magazine
- [Information about Human Evolution from the Smithsonian National Museum of History](#): provides content about archaeology at many levels, from the basics of human evolution to lesson plans for teachers
- [Bones, Stones, and Books](#): a blog by Stefanie Halmhofer that provides information about pseudoarchaeology, the reality of practicing archaeology, and advice for archaeology students

Interpersonal and Interactive Learning

One of the best ways to engage the public is through community involvement in archaeological projects because it provides a tangible link to the past (Erdman, 2019) and gives participants a role in the knowledge-production process. This generates a sense of ownership of that knowledge that can arouse further interest in the topic and foster interest in historical preservation (Harding, 2007). It also makes the field more “real”; most people don’t know what archaeology is, much less know an archaeologist. People who engage with an archaeologist become more interested in the field. In essence, community involvement is any kind of direct interaction archaeologists have with nonspecialists, such as through community archaeology projects, museum and outreach programs, public lectures, and getting involved with a school (Erdman, 2019).

An example of interactive public outreach is the Passport in Time program of the USDA Forest Service, which enlists the help of nonspecialist volunteers to do cultural heritage management activities at sites on public land across the country, including survey and excavation, restoration, archival research, and gathering oral histories (USDA Forest Service n.d.). Professional archaeologists, historians, and preservationists are the hosts, guides, and coworkers of the volunteers during their experience. This form of active learning ensures that accurate and contemporary information is being shared.

A limitation of interpersonal and interactive learning is that it involves being somewhere in person, which means that this type of outreach primarily occurs in contexts close to museums or universities, and traveling to participate in programs in other towns or cities isn’t possible for everyone (Erdman, 2019). So while these programs have an amazing impact on people who are lucky enough to participate, the archaeological information that is conveyed reaches a limited number of people.

The Bottom Line

No matter what format an archaeologist chooses, they need to create a story. People become more engaged in archaeological information if it is relatable and easy to follow. Making the information relatable is by far the most important part of public outreach. People find it easier to connect when archaeologists share human case studies (Pobiner, 2021). That is why it is important to bring the human element into any discussion of material culture. This can be accomplished in a vignette based on archaeological evidence (Spector, 1991) or by making the archaeologist the main character—taking nonspecialists on the journey of discovery and interpretation with the archaeologist. Each method—traditional media, online digital content, and interpersonal/interactive learning—has pros and cons and each needs to be tailored to a particular audience. Regardless of which method the archaeologist chooses, using a story format is a great way to engage nonspecialists.

How Do I Know Which Method to Use?

Archaeologists ask the following questions to figure out where they should begin with an outreach project. Once they decide whether they want to write a book, star in a television show, start a social media account, or invite the local third graders to come dig at their archaeological site, they begin the process of figuring out the information they want to convey to the public audience they will reach.

What’s My Goal?

To answer this questions, archaeologists consider why they do public archaeology and identify the reason that aligns best with their site. They consider what the data tells them (Does it contradict a long-held belief? Does it tell us something about sustainability?) and what the descendant community wants (Do they want this knowledge to be shared widely or do they want to keep it within their community?). Another consideration when considering goals is how many people the archaeologist wants to reach with their project.

What Are My Strengths?

Archaeologists doing public outreach can incorporate whatever skills they are good at into their project. An archaeologist who is a computer geek could start a website or build a video game. Someone who is good at creative writing could write hard

archaeological fiction. Someone who is good at public speaking could do a lecture series. An archaeologist can also learn how to use a new technology or gain a new skill if time permits.

Whom Do I Know?

For interpersonal or interactive learning, an archaeologist will likely have to team up with another individual or organization. Connecting at the individual level is often more efficient (White, 2019; Yezzi-Woodley et al., 2019; Reetz et al., 2019). For example, they could ask a teacher if they want to participate in an archaeology-related activity because most teachers don't have a background in archaeology and may feel too overwhelmed or have too little free time to learn enough to be confident about teaching it. It's essential to find someone who is enthusiastic about this fun learning experience.

Who Is Your Audience?

The audience affects the level of language archaeologists use in public outreach. It is important to avoid jargon unless it is explained properly and in a way that is easy to understand. It is also important to keep language age appropriate. The [Gunning Fog Index](#) is a useful tool for calibrating language to a particular grade level; it determines how many years of education someone would need to understand a text. The size of your audience will also affect your outreach project, as explained above.

What if I Want to Learn, Not Create?

Maybe you're more interested in learning about archaeology than in communicating archaeological findings to the public. That's okay! Knowing about the pros and cons of the various formats of public communication will help you find what method will be most engaging for you as well as what drawbacks they may have.

It is important to assess the validity of what you've learned about archaeology in the public sphere. Did you hear about it from news articles, on television, in movies, or on podcasts? Did those sources of information use evidence-based language or did they use sensationalist language? How much evidence did they provide for each claim? Did they confirm your biases or did they make you think about issues in new ways?

Frauds, Myths, and Mysteries: Science and Psuedoscience in Archaeology provides a "Quick Start Guide" to assessing the validity of a claim (Feder, 2011, pp. xviii–xix). Here are some of the main points that guide makes:

- Where is the claim presented? Is it in a peer-reviewed journal, a science-based magazine, an anonymous website, or a chat group? The objectivity of a claim varies based on where it is presented and finding an accurate source of information about archaeology is important.
- Who is making the claim? Is it a trained archaeologist, a trained scientist in a different field, or a news broadcaster? Each of these people will have different levels of understanding of the material and may or may not relay the information properly.
- How does the person making the claim know the information they are presenting? Most important, did they follow the scientific method? The claim must be based on observation and it must be tested. Intuition, beliefs, and prejudices are not archaeological evidence.
- Were other experts consulted and if so, how did they evaluate the claim? If most other scientists in the field are skeptical or no other scientific support is given, then the claim probably isn't based on evidence.
- Is enough information given for you to make an informed decision about the legitimacy of the claim or are you left with questions?

These questions will help you evaluate all sources and claims, not just archaeological ones. They are also great guiding questions to help you craft your own valid arguments in whatever field you pursue.

Case Study

The following case study breaks down a public outreach project I did into specific steps. I'll take you through the guiding questions to show how I arrived at my project idea, but you'll notice that I had to ask myself a lot of additional questions as well. Each archaeological site is different, so in addition to the four guiding questions above (What is my goal?, What are my strengths?, Who do I know?, and Who is my audience?), it is important to listen to what the site and the research participants are telling you they need.

Context/Goal

During a land development project in Duncan, British Columbia, an archaeological site now known as Ye'yumnuts was discovered. Ye'yumnuts is a habitation site that was populated by the ancestors of the Cowichan tribe over three occupation periods. At the time of excavation, many amazing artifacts and features were found, including the imprint of a structure, a pile of fire-cracked rocks 10 cm deep and 5 m wide, and a jade adze that originated hundreds of kilometers away in the Fraser Canyon.

It took two decades of legal battles to protect this ancestral site, and now that it once again belongs to the Cowichan, they wanted to share the site as a source of inspiration for their youth and a source of education for the broader community of Duncan. In particular, the Cowichan tribe wanted school curriculum about the site so that local schools could study local ancient history as opposed to the history of faraway, out-of-context places, such as Egypt. A key element of this goal involved getting children excited about the archaeological findings, thus stimulating an appreciation for their peoples' deep history. Whatever project I created would be featured on the website [Commemorating Ye'yumnuts](#).

As I began considering my public outreach strategy, I could answer a few guiding questions:

- *What is my goal?* Inspire Cowichan youth, educate the broader community of Duncan, British Columbia, and get people excited about archaeology.
- *Whom do I know?* Cowichan tribal members, administrators of a local school district, and my professor, who had been involved in the archaeology of the site.
- *Who is my audience?* Settler and Cowichan community members of all ages, with special attention to students.
- *What has already been done/what topics have already been covered?* When I looked at the website about the archaeological site, I saw that there were activities related to artifacts, the history of the site since the beginning of time, legal battles, and analysis of news coverage, among other topics.



Figure 2. Image from the virtual reality tour for the website [Commemorating Ye'yumnuts](#). This image shows an artist's depiction of Feature B1 (a structure) in the area where the feature was located.

One of the gaps I found in the topics in the curricular material that was already available was lack of information about the features on the site. No one had talked about any of the features yet, which was incredible because there were so many and they pose a lot of questions about how the site functioned. The problem with getting people excited about the archaeology of this site, especially the features, is that you can no longer see the archaeology on the land. Once excavations were completed, the site was filled in. Now it is a grassy area surrounded by a protective fence with interpretive signage. How could I get people excited about something abstract, something they couldn't even see? The issue of invisibility told me I had to do something visual regarding the site's features; I had to bring the site alive for my audience.

- *What are my strengths?* Unfortunately, nothing visual—my main strengths lie in creative writing. However, I'm a quick learner and I was determined to produce something unique and exciting for my student viewers. So I decided to create a tool for students to use before their field trip to introduce them to the site. I sat down at my laptop to start learning how to use Google Tour Creator. It was time to make [a virtual reality tour](#).

Knowledge Production

This outreach project was being done in collaboration with a local Indigenous group, so it was essential that I include their knowledge and interpretations of the site's archaeological features in my virtual reality tour. Considerable research has been done about the benefits of a landed methodology, which means actually being on the land when doing archaeological work instead of being an armchair anthropologist because it gives a deeper, more embodied understanding. For example, at one of our visits to Ye'yumnuts, our professor brought some of the artifacts back to the site, and as I stood there holding a jade adze in my hand I was overwhelmed by how connected I felt to the site and to the people who had occupied it. That experience increased my drive to produce a quality outreach tool to get people as emotionally invested as I was.

I decided to use Severin Fowles's (2010) "comparative or cross-cultural phenomenological methodology" of collaboration. In this method, the anthropologist walks the land with Indigenous community members. The Cowichan elder I was working with, Luschiim, was physically unable to walk the land with me, so in lieu of the physical experience I showed him photos of the archaeological features and recorded his interpretations and related stories. However, I was able to walk the site with the lead archaeologist, Eric McLay, who provided rich archaeological data for me.

FEATURE A: LARGE FIRE CRACKED ROCK FEATURE

Archaeological Finds: This feature is a semi circular single layer of rocks about 10cm deep with a 5m diameter. The rocks vary in size, from as small as 2cm to as big as a boulder. Some of the rocks have fractures from thermal stress, which we refer to as **fire altered rock**, and there is also charcoal strewn throughout the rocks. There is no pit underneath the rocks, though, nor any evidence of burning **in situ** (in that exact location) or plant remains, so archaeologists don't think this was used as a subsistence feature (such as for pit cooking).



Interpretations: Eric thinks this was where people dumped their leftover rocks when they were done using them in their own fires. Because the rocks come from elsewhere, Luschiim believes this was an important feature and used as a place to either **spread out canoes with hot water and steam (wika'ut)** or prepare for feasts for important events; if people had been going to the trouble of bringing heavy rocks to the site, it must have been for a good reason. He even says it's possible that while spreading out the canoe they would boil water inside and prepare food inside the canoe while it was steaming. He believes that if we extended the excavation area we would find the source of the fires, where the rocks would be heated and then placed into the canoe. The smallest canoes are just under 5m, so it would probably just fit on this rock feature.

Figure 3. Page from the virtual reality teacher pamphlet Commemorating Ye'yumnuts, showing an archaeological feature in Ye'yumnuts' land and how archaeologists interpret it.

Google Tour Creator allows you to include one minute of audio, one photo, and up to 300 characters of text for each point of interest (in this case, each archaeological feature). The photos were either of an actual archaeological feature or an archaeological reconstruction of what it might have looked like in use, and I used the audio and the text to blend local conceptions of history with the archaeological evidence I gathered from my interviews. When possible, I included commentary from both Luschiim and Eric in the same audio clip. When there was just too much good information from both of them to fit it into one minute, I tended to privilege audio clips of Luschiim and present the archaeological data in the text portion. I made this decision because I was conducting this project on behalf of the Cowichan tribe and this was their story to tell. Because the amount of information you can include in the virtual reality tour is so limited, I also made an informational booklet for schoolteachers so they would have more background information to inform their lessons and help them answer the questions of curious students.

Benefits of Virtual Reality

Virtual reality can be a powerful tool. It is perfect for making the invisible visible—in this case, hidden archaeological features. It also mimics place-based learning, since the whole concept is about making you feel like you're somewhere you're not. This makes it a great tool for familiarizing students with the site before they arrive. It also makes the site accessible to everyone everywhere, and it fosters a deeper emotional connection with the site. Virtual reality is also accessible in terms of cost; all you need is a

smartphone and a cardboard virtual reality viewer. The cardboard virtual reality viewers from Google cost less than \$10. That price point makes virtual reality a feasible classroom activity. Finally, virtual reality is very interactive; it is an engaging and effective method of learning.

Discussion Questions

1. Consider the reasons listed above about why archaeologists do public archaeology. Which one do you feel is particularly important? Why?
2. This chapter lists many ways to conduct public outreach in archaeology. What are two or three ways that stand out to you? Think of a way that you could use them to reach out to the public. What talents or skills could you bring to a public archaeology project about the archaeological past?
3. Can you think of a way that public archaeologists have helped you understand the archaeological past? What were some of the ways they did this? Did they use interactive exhibits at a site or museum? Did they use virtual reality, blogs, or videos?

Additional Exercises

Activity: *Create Your Own Public Outreach Materials*

1. Choose one archaeological site from the following list
 - Çatalhöyük, Turkey
 - Stonehenge, Britain
 - Sutton Hoo, Britain
 - Mausoleum of the First Qin Emperor, Xi'an
 - Peyre Blanque, France
 - Ye'yunuts, British Columbia
 - Colonial Williamsburg, Virginia
2. After gathering background research on the site, consider how public outreach may come into play. What about this site is so important that the public needs to know about it? What has already been said or done? Identify your reason for pursuing public outreach.
3. Once you've identified your reason, consider your method. Think through the guiding questions provided in the Methods section of this chapter to help answer these questions.
4. Use peer-reviewed papers and/or the archaeological assessment reports for your site to supplement your outreach materials with factual information.

Get creating!

About the Author



Jenna Hendrick received her BA in anthropology and English from SUNY Binghamton and her MA in anthropology from the University of Victoria. Currently, Jenna is both the producer of *The Dirt*—a podcast about archaeology, anthropology, and our shared human past—and the assistant archaeologist for Curtin Archaeological Consulting. Before working in cultural resource management, Jenna excavated at Peyre Blanque, a Magdalenian open-air site in France, and dabbled in archaeological conservation. Her research interests include human evolution/human life in the Paleolithic, people's perceptions of the deep past and the "nature" of people of the past, and communicating archaeology.

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1.5: Descendant Community Voices

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Learning Objectives

- Describe the benefits of working with descendant communities from the perspectives of both archaeologists and community members
- Discuss examples of archaeological projects working with Indigenous communities, descendants of the African Diaspora, Anglo-European descent communities, European-immigrant descent communities, Asian descent communities, and Hispanic descent communities
- Discuss examples of contemporary archaeology, including archaeologies of migration and transience

There are a wide variety of resources for archaeologists to use to understand the past (Harrington 1955; Little 2007), and one of the most important is descendant communities. While historical events can change in the memory of individuals over their lives, the interplay between archaeology and historical memory ensures that archaeologists who analyze such sites be cognizant of their position in the eyes of a public that may have multiple, possibly contradictory, narratives regarding archaeological events and sites (Blakey 2008). In North America, this means expanding the number of voices at the table by acknowledging and consulting the many communities impacted by archaeological excavation and study. In this chapter, we explore how myriad descendant communities are involved in these endeavors and how their interests are part of archaeological practice.

Archaeology is very useful for understanding localized production and groups of people by its focus on a particular place or community. This allows us to look at how small groups of people shared, or did not share, power. We can study how these smaller groups of people have power over other groups, whether locally or in a national context. We can also use them to explore the questions particular communities have for their own places or histories to understand the endurance of their community in the area. Potential research themes include: revisions of the historical record (Blanton 2000), community-based research questions (Blakey 2008), and the archaeology of confinement (Kamp-Whittaker and Clark 2019).



Figure 1 – The New York African Burial Ground. Plaque reads “For all those who were lost; For all those who were stolen; For all those who were left behind; For all those who were not forgotten.” (Photo by Alexandra Martin)

Examining questions at the local scale for archaeology is important because it gives us more detail on the history of a particular community. For example, the African Burial Ground (Figure 1) gives us a glimpse of the health impacts of enslavement overall (Barrett and Blakey 2011) but it also tells the story of one of the first African American communities in North America. Their story is specific to their place, which is why it’s important on projects like that to involve descendant communities and to help them to understand their own history. The same can be said of the importance of descendant and still living Japanese-American communities (Fujita 2018). Using archaeological methods, specific details about life at the internment camps were revealed but this information is made more useful and important by involving the communities who lived through or are impacted by that struggle today. Additionally, these stories are important because they are not recorded anywhere except in the archaeological record. Historically, those writing history in the United States focused on their own lives. The stories of common people, such as later European immigrants, enslaved Africans, and Asian-descent North Americans, have been considered not important to the narrative of the continent, even if they were.

Although questions about historical archaeology at the local scale have created robust datasets for many areas, there are more developing avenues. One of these is archaeologists' interest in combating localized problems, such as housing insecurity (Zimmerman et al. 2010). While an issue in many parts of North America, each population's geography, specific history, and the economy of their area impact what a successful solution would look like and archaeological methods help to craft that unique solution.

Indigenous Communities

Native North American communities are integral to many archaeological projects. In New England, a number of collaborative projects have made important contributions to understanding Indigenous history by examining reservations in New England, for example among the Eastern Pequot, the Mashantucket Pequot, the Mohegan, and the Narragansett Tribes (e.g., Cipolla and Quinn 2016; Jones and McBride 2006; McBride 1990; Robinson et al. 2002; Silliman 2009).

One example of a positive relationship among archaeologists, Tribal officials, and descendant community members is the recent Mohegan Archaeological Field School series in southern Connecticut, led by field school director Craig Cipolla and Mohegan THPO (Tribal Historic Preservation Officer) and Archaeology Program Manager James Quinn, the first Mohegan Tribal member to serve as the Tribe's THPO. The field school is run under the authority of the Mohegan Council of Elders, and with the support of Tribal leadership. Cipolla and Quinn write that their fieldwork "takes shape from current Tribal needs and research interests" (Cipolla and Quinn 2016, p. 120). For example, one recent field season focused on a study of a 19th-century English farmhouse that once stood next to Cochegan Rock, a large boulder that was a 17th-century Tribal council meeting spot, according to Mohegan oral histories (Fawcett 2000). Training in archaeology for descendant community members is considered to be beneficial to the promotion of Tribal heritage preservation in Connecticut, as well as to understanding and maintaining the Mohegan cultural landscape (Cipolla and Quinn 2016: 120–122). The field school staff also advocate for the preservation of Tribal cultural features "for future generations" (Cipolla and Quinn 2016: 124).

Also in Connecticut, the [Eastern Pequot Archaeological Field School](#) began in 2003 at the invitation of the Eastern Pequot Tribal Nation. It is a collaborative effort among Tribal members, professional archaeologists, and University of Massachusetts Boston students (Silliman 2008). Importantly, Silliman's collaborative research has shown that artifacts on reservation sites, even if European-made, like glass bottles, ceramic vessels, or metal buttons, should be considered Indigenous (rather than Euro-American) artifacts (Silliman 2009). On the Mashantucket (Western) Pequot reservation, former [Mashantucket Pequot Museum and Research Center](#) Director Kevin McBride has worked with tribal members on surveys funded by the National Park Service's [American Battlefield Protection Program](#) in an effort to interpret and protect the sites of historic battles (see McBride and Naumec 2009; McBride et al. 2016). Building on their research, McBride also worked with the Narragansett Indian Tribal Historic Preservation Office to survey the landscape known as Nipsachuck in northern Rhode Island, where battles unfolded during King Philip's War in the late 17th century (Harris and Robinson 2015).

 Rock engraved with "1620."

Figure 2 – Plymouth Rock is a landmark commemorating the arrival of the Pilgrims to the Americas ([Plymouth Rock](#) by Raime is licensed under [CC BY-SA 3.0](#))

In 1620, when the Mayflower reached the coast of what is today New England (Figure 2), English settlers encountered the Wampanoag people. Several recent seasons of archaeological field schools have excavated in Plymouth, Massachusetts, as part of "Project 400: The Plymouth Colony Archaeological Survey," a research program in advance of the 2020 quadricentennial of New England's first permanent English settlement (see Beranek et al. 2015). The commemoration of the Plymouth Colony offers us an opportunity to reevaluate the effects of multicultural interactions on the British colonies and ultimately, the founding of the United States. In 1959, Jim Deetz established an archaeology program at [Plymouth Patuxet](#) (a living history museum and research center). Plantation archaeologists investigated six 17th-century sites in the mid-late 20th century, including tavern and house sites (Deetz and Deetz 2000: 219), and the artifact assemblages from these excavations have produced most of the museum's archaeological collection (Bowers 2015). Recent research by a graduate of the UMass Boston Historical Archaeology program has reexamined these assemblages to contextualize artifacts of Indigenous origin in the Plymouth collection, broadening from a focus on Pilgrims

to include “Native ways of life throughout colonization and the strategic motivations behind the actions of both Native groups and European settlers as they created and navigated the colonial landscape” (Bowers 2015, p. 11).

On the American West Coast, there are also various projects and archaeologists working with descendant communities. For example, the [Pimu Catalina Island Archaeology Project](#), codirected by Wendy Teeter, Desireé Martinez, and Karimah Kennedy-Richardson, is a collaborative project among the Catalina Island Conservancy, the University of Southern California, and the Gabriellino (Tongva) Nation. The project examines “how the connections between various communities of Tongva...were constructed and maintained” during the historic era (at the time of European contact by Juan Cabrillo in 1542) (Martinez et al. 2014, p. 201). Influenced by “the emotional reactions of Native American community members as they have viewed museum collections,” the codirectors made a commitment to working with community members and to the principles of Indigenous archaeology (Martinez et al. 2014, p. 201-202). Importantly, all field school “students are introduced to the cultural beliefs and deep history of the Tongva” (Martinez et al. 2014, p. 203).

In northern California, the Kashaya Pomo Interpretive Trail Project (KPITP) began in 2004 as a collaboration among the California Department of Parks and Recreation, CALTRANS, University of California Berkeley archaeologists, and the Kashaya Pomo Tribe. On the historic lands of what is today the [Fort Ross State Historic Park](#), the project’s goal was to combine archaeological data and Tribal narratives to tell the history of the Kashaya Pomo people “and their encounters with the Russian mercantile enterprise of Colony Ross” in the early 19th century (Lightfoot et al. 2004, p. 179). Today the trail highlights Kashaya Pomo heritage “from time immemorial to the present. The interpretive program is also designed as a cultural program for tribal members, and especially tribal youth, to reconnect with their homeland” (Gonzales 2016, p. 538). The cultivation of respect “was the primary mechanism for integrating Kashaya values and cultural protocols into both the research design of KPITP and the methods it uses to document and represent tribal heritage within the park” (Gonzales 2016, p. 534). More recently, project member Sara Gonzales has also been a codirector of the [Field Methods in Indigenous Archaeology](#) (FMIA) program, a community-based field school, alongside the Confederated Tribes of Grand Ronde’s Tribal Historic Preservation Office. Projects like these that bring Tribal members on board and that honor Tribal leadership are important examples of Indigenous archaeology in practice.

Residential Institutions

Canada, Mexico, and the United States governments all utilized education to assimilate Indigenous peoples (Dawson 2012), and the investigation of those institutions’ archaeology has only recently been explored (Gonzalez et al. 2018; Lindauer 2009; Surface-Evans 2016). Academic work supports that, of the three nations, the Mexican government system was the least destructive, beginning only in 1926 and assimilating Indigenous students through the application of the same educational curricula as they used for non-Indigenous students (Dawson 2012). This system, because of its shorter duration, being closer in time to the present, and within major metropolitan areas; has received no archaeological investigation at this time. More expansive research of the federal boarding school system of the United States, and the Residential School System, of Canada, demonstrate programs that disempowered Indigenous groups in an attempt to assimilate them into a white, European-descent, national identity (Surface-Evans 2016) at a genocidal level (Milloy 2017). Archaeology at these institutions exposes the ways that assimilation by the governments of Canada and the United States regularly fell short of their own stated goals and illustrates the ways that students rebelled against school norms (Lindauer 2009).

Archaeology allows us to explore the experiences of the people who lived at such institutions through their material culture. While many have legacies stretching back into the 19th century (Lindauer 2009; Przystupa 2018), many of the materials excavated from such schools in the United States date to the [20th century](#). After Phoenix Indian School closed as a school amid a decline in attendance, it was excavated in the 1990s (Lindauer 2009). Owen Lindauer’s work at the property focused on the ways that students of the past had used objects found in present-day trash mounds to reject the process of assimilation. A similar theme has been found by Sarah Surface-Evans (2016), who excavated the Mount Pleasant Indian Industrial School. Their work uses a landscape perspective and applies Spencer-Wood’s (2016) heterarchical models of power to explore gender and rebellion at the school, exploring the spaces girls and boys were allowed to inhabit. These works help us to understand the daily lives of students at these boarding schools as they negotiated retaining their own culture and assimilating or resisting white American culture. More recent collaborative work on Native American boarding schools includes that undertaken at Steward Indian School in Nevada (Cowie et al, 2019). Those excavations worked alongside tribal members to develop a research plan for and recover materials that were part of life at the school.

As part of an ongoing reconciliation process, the archaeology of residential schools in Canada is ongoing with initial excavations in the 2010s guided by those who controlled the former school lands. One of these earlier projects was at the Mohawk Institute, a boarding school that began operating in the 19th century (Milloy 2017). The investigations of the residential school, which was in

use until 1970, were under the direction of [Paul Racher](#) (Andrew-Gee 2018). They examined the Institute building itself, such as dated graffiti, and some of the materials found during a renovation, hidden behind or inside walls, to examine the feelings of the students who attended school and lived there. It's part of a professional move to reexamine archaeology in Canada to include the values of First Nations people in their work and as part of a national reconciliation process between the Canadian Government and First Nations people (Andrew-Gee 2018). Other continuing work focuses on using noninvasive archaeological techniques such as ground-penetrating radar to locate the remains and graves of the generation of Indigenous children who the residential schools killed (Wadsworth et al. 2021).

The Descendants of the African Diaspora

Another important community to involve is the descendants of the African Diaspora. While historical archaeology is important for understanding the lives of enslaved peoples (Battle-Baptiste 2011), not all projects began with positive relationships among archaeologists and the descendants of enslaved Africans. One example is the African Burial Ground in New York City, which was on land owned by the federal government (LaRoche and Blakey 1997). Unfortunately, the local African American community became aware of the site only after fieldwork was underway (McGowan and LaRoche 1996). This caused tensions among African Americans, archaeologists, and project proponents, and created a media storm surrounding the site (LaRoche and Blakey 1997; Mack and Blakey 2004; McGowan and LaRoche 1996).

While not necessarily the direct genetic descendants of those buried at the African Burial Ground (see Barrett and Blakey 2011), the African American community members of New York City are the cultural and spiritual descendants of those individuals. Because of the public scrutiny surrounding this project, it has become emblematic of tensions among archaeologists, bioarchaeologists, and descendant communities (LaRoche and Blakey 1997). While the initial excavation and research had been based on the needs of the federal project proponents, there were many unanswered questions posed by descendant groups and other affiliates.

Michael Blakey, an African American bioarchaeologist, took over the direction of the project and asked the descendant community to be involved in shaping the direction of future research at the African Burial Ground. African American community members asked Blakey and his team what historical archaeology could reveal about four topics: the origins of the African population buried in Manhattan, the construction of an African American identity, the quality of life as enslaved individuals, and the instances of resistance (Blakey 2008, p. 21; Barrett and Blakey 2011). These lines of questioning have helped to better color and contextualize the lives of those buried at the African Burial Ground. Since the excavation at this site happened almost 20 years ago, the African American community has become much more involved in the stewardship of the remains, helping to guide the research goals of the project and their ancestors (Blakey 2008). By focusing on the interests and desires of the African American descendant community, this project significantly changed the nature of historical archaeology, scholarly engagement, and the archaeology of the African Diaspora.

 A building on top of a hill.

Figure 3 – Montpelier was the home of President James Madison as well as numerous enslaved individuals ([James Madison's Montpelier](#) by Wally Gobetz is licensed under [CC BY-NC-ND 2.0](#))

At [James Madison's Montpelier](#) (Figure 3), the Archaeology Department offers a direct way for community members to be involved in the direction of the museum's research. The [African American Descendants' Project](#) “seeks to identify and create bridges to living descendants of the African American women and men who were enslaved at Montpelier and elsewhere.” Descendant community members may be involved in documentary research or participate in archaeological excavation. Because collaborative research is often reciprocal, Montpelier's archaeological staff have found that the community members are also a source of valuable advice and information. For example, the Montpelier descendant community members are knowledgeable about the possible spiritual meanings of some artifacts. In 2011, Montpelier archaeologists uncovered a [quartz crystal](#) during the excavation of a former slave quarter (Montpelier 2015). Based on input from the descendant community, the staff interpreted the quartz as a marker of spiritual protection for the household against sickness and malevolent spirits (Montpelier 2015). In 2015, a group of descendants who had been involved in the excavation returned to Montpelier to [place a representative quartz crystal](#) in the

foundation of a reconstruction of one of Montpelier's slave quarters. As this work continues, we have to investigate parts of the historical record in new and diverse ways to incorporate diverse perspectives, theories, and abilities to better understand the past. This is one of the great things about the [Digital Archaeological Archive of Comparative Slavery](#). It aggregates archaeological data to allow researchers to examine how the enslavement of African people in North America varied over space and time.

Anglo-European Descent Communities

One of the earliest undertakings of historical archaeology of North America has been understanding the Anglo-American communities on the continent, and none have been more important than the discovery of the archaeological remains of Jamestown (Noël Hume 1979). Although now there is archaeological evidence for Vikings at L'Anse aux Meadows (Davis et al. 1988), historical evidence for the Roanoke colony (Straube 2013), and archaeological evidence for a Spanish Fort in the same area (Mallios 2006), Jamestown continues to fascinate American archaeologists in particular because of the importance it holds in the national narrative of the United States and the English colonization of the continent (Horning 2009). Specifically, the preservation of these early settlement sites perpetuates cultural mythologies as a shrine to the United States' roots (Horning 2006), encouraging patriotic fervor. However, this interest in continued research uncovers evidence of more complex histories that do not always support those same mythologies (Straube 2014, p. 78).

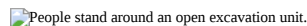
 People stand around an open excavation unit.

Figure 4 – Archaeological Excavations at Jamestown, Colonial National Historical Park (Archaeological Site, Historic Jamestowne by Ken Lund is licensed under [CC BY-SA 2.0](#))

Specifically at Jamestown, archaeology initially helped to bolster ideas of individuality and the Protestant work ethic as the historically documented settlement was uncovered and located. However, as excavation continued, the evidence suggested that the survival of Jamestown was far from secured on the power of Anglo hard work alone. Evidence of starvation (Blanton 2000), cannibalism (Horn et al. 2013), and documents that suggested constant replenishment of supplies from British ships demonstrated that “hard work” in the face of extreme conditions and a powerful Native American population was not enough. Instead, there is evidence that the copper plates obtained from Europe were used as bartering materials with the Algonquian-speaking people of the area, where copper was an important prestige item (Mallios and Emmett 2004). This research suggests that the enduring establishment of the colony rested in the hands of the Native American population rather than being built on the labor of hard working Anglo-Europeans. This interpretation of the colony challenges the Nationalist origins that this site is supposed to uphold and demonstrates how descendant communities can influence the interpretation of a site.

European Immigrant-Descent Communities

In the 19th century, the growth of industrial capitalism in the United States meant new growth in cities, which offers archaeologists the opportunity to investigate technological innovation, profit-making, and the living conditions of workers through material culture (see Beaudry, 1987, p. 14). The development of new industrial technologies and transportation methods, including the construction of the Transcontinental Railroad, changed the American market economy.

The construction of the American railroad started around 1830 with the Baltimore and Ohio Railroad. The passage of the Pacific Railroad Act in 1862 led to the completion of the Transcontinental Railroad in 1869, with its famous “Last Spike” in Promontory, Utah (see Baram 2011). The railroad had a lasting effect on the American economy, as well as the displacement of Indigenous people in the American West. Small independent production slowly declined as mass produced goods became more accessible. Consumers were now able to purchase ready-made goods, such as clothing or shoes, that would have once been manufactured locally to meet customers' needs. Researchers have studied the archaeology of transportation and the changing cultural landscape (see Baram 2011) as well as the archaeology of transient workers (see Paullin 2007; Voss 2018; Walker 2011). Many immigrants, particularly the Irish and the Chinese, worked as laborers on the American railroads or public works projects (see Voss 2018). Aside from demonstrating a better understanding of the daily life and conditions of the workers (e.g., Paullin 2007), the artifacts recovered from railroad work camps also demonstrate workers' efforts to take care of themselves (see Voss 2018). For example, the

material suggests an interest in “respectable masculinity” among skilled railroad workers, including hairbrushes, combs, and dental care items (Walker 2011, p. 5).

The Five Points neighborhood in Manhattan was an area of booming industry and population expansion in the 19th century. African American and Euro-American workers were joined by late 19th-century immigrants from Ireland and Germany (Yamin 2001). Although the neighborhood had a reputation as a slum, it was also a vibrant, multiracial, multiethnic community that contributed to the diversity and vibrancy of New York City. In fact, the archaeology of Five Points tells “a story of New York becoming itself” (Yamin 2001, p. 1). Archaeologists in the late 1990s sought to investigate the relationships among the residents of two city blocks and to learn what life was like among working-class populations (Yamin 2001). Evidence of a Jewish kosher home using edge-decorated dishes for meat and Willow-pattern plates was uncovered in the excavation of the Goldberg family’s privy (Yamin 1998, p. 75), and during excavation at an Irish tenement, archaeologists found tea sets, pig bones, and ale and whiskey bottles (Yamin 1998, p. 80). At a Five Points brothel, archaeologists found that multiple working German families lived alongside sex workers, whose material culture included dishes for entertaining as well as personal effects such as nursing shields and glass female urinals (Yamin 1998, p. 82). This research has helped enhance our understanding of the daily lives of 19th-century immigrants to the United States.

In the 19th century, there were several new waves of European immigrants, including from Ireland, Italy, and Eastern Europe. For example, between 1881 and 1900, 675,000 Jews came to the United States, and between 1901 and 1914, the number increased to 1,346,000 (Dwork 1986, p. 102). New arrivals often planned to reunite with relatives who had arrived earlier and written to their family back home (Sherman, 1998 p. 6). This was the case in Portsmouth, New Hampshire, as well. For example in the Shapiro family, Shepsel Millhandler emigrated from Ukraine in 1898 and was followed by his four brothers in the next five years (Pinello and McKernan 1999, p. 7). They changed their surname from Millhandler to Shapiro and they became respected leaders in the Jewish community (Pinello and McKernan 1999).

At [Strawbery Banke Museum](#) in Portsmouth, a 1790s home was opened to the public in 1997 as the Shapiro House, interpreting the daily life in 1919 of a Jewish family from Ukraine. Archaeological excavations carried out at the property in 1995, 1996, and 1997 were intended to investigate the material evidence left behind during the Shapiro occupation of the house, between 1909 and 1928 (Pinello and McKernan 1999). Data were used to select objects for the household furnishing plan and for the placement of certain landscape features, like pathways, gardens, and fences (Pinello and McKernan 1999). Furthermore, the grandchild and other relatives of the Shapiros played a significant role in the interpretive plan of the house, providing oral testimony and material records (e.g., photographs) that informed the role players’ presentation to museum visitors.

 A sketch and image of the mikveh.

Figure 5 – The mikveh discovered at Strawberry Banke (graphic and photo by Alexandra Martin)

In 2014, archaeologists at Strawberry Banke continued to explore the Jewish history of the neighborhood. A community mikveh, a bath used for ritual immersion, was described in some oral histories with descendant community members, collected before the opening of the Shapiro House (Martin 2022). Strawberry Banke staff found that a nearby synagogue, Temple Israel, once owned the *mikveh* and the house it was built in, which was used as a home for the rabbi. The house was later sold and no longer accessible by the Jewish community. Some scholars have found that changing standards within the Jewish community meant that *mikveh* use declined after the first generation of immigrants (Lightstone 2011). After the house was torn down during Urban Renewal in the mid-20th century, the *mikveh* was nearly forgotten. During the museum’s annual field school, students, staff, and volunteers uncovered the mikveh floor (Figure 5) and hundreds of fragments of the white glazed bricks with which it was built (Martin 2022). This excavation provided material evidence of an important historic practice and has proved to be meaningful to the local descendant community, including the current Temple Israel congregation (Martin 2022).

Asian Descent Communities

While often ignored in the history of North America, Asian descent communities have been on the continent since the 16th century (Gomez Borah 1995; Lee 2016). Archaeologists have investigated a broad range of populations and their research greatly benefits from the voices of descendant communities and even firsthand accounts. These voices personalize the history of a group, make

archaeology more relevant, informing archaeological analysis, strengthening our understanding of the past, and increasing community support for archaeological projects (Voss 2018).

Japanese Internment

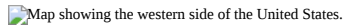
Map showing the western side of the United States.

Figure 6 – Map showing exclusion zones and site locations (from Kamp-Whittaker, 2020, p. 57)

The bombing of Pearl Harbor was used as a catalyst for the forced removal of individuals of Japanese descent from areas along the West Coast of the United States (Figure 6) and British Columbia in Canada (Burton et al. 1999; Ng 2002; Thiesmeyer 1995). They were removed to several different sites which ranged from temporary detention centers to work camps which were primarily for males, while whole families were held at internment centers, which are more correctly called concentration camps (Linke 2014; Himel 2015; Japanese American Citizens League 2013). Members of the Japanese American community remained incarcerated from 1942 until 1945 or 1946, while Japanese Canadians were not allowed to return to coastal areas until 1949.

The ongoing [Amache Community Archaeology Project](#) serves as an excellent example of incorporating and valuing descendant voices (Fujita 2018). Every two years a group of faculty from several universities works with the National Park Service to hold an archaeological field school at Amache, the site of Colorado's WWII Japanese incarceration camp. During the field school, volunteers, which include former internees and descendants, work alongside students and provide firsthand accounts, invaluable memories, and unique perspectives that help the archaeologists and students better understand the incarceration experience (Ono 2008; Smith 2018). The field school also includes community open house days that encourage members of the descendant community to tour the site, learn about the archaeology, and share their stories.

In turn, investigating the internment experience through archaeology helps former internees and descendants understand their past from a different perspective, oftentimes revealing new information. For many years after the War, first generation Japanese immigrants did not speak about their time in confinement. Because of this, many details of the experience were lost over the generations. Archaeologists are able to help the Japanese descendant community fill in missing pieces of their past. This symbiotic relationship between archaeologists and a descendant community serves to enrich the project, informing archaeologists of what is important to the community, guiding research, and helping to develop new questions while also continually providing answers (Fujita, 2018).

During the 20th century, World War I and II were drivers of social change that focused on ideas of national identity. In Europe, archaeology has focused on both battlefields and prison camps. The physical impact of these wars is less visible archaeologically in North America and as such more research has been focused on the existence of government-run confinement centers for both foreign nationals and American citizens, especially the incarceration of Japanese Americans. The confinement of individuals of Japanese ancestry was driven not just by fears of wartime espionage but by underlying racism and the concept of American identity (Burton et al. 1999).

Excavations at Japanese Incarceration/Concentration centers in Canada and the U.S. use archaeological data along with oral histories and archival material to focus on three broad research themes; understanding what life was like within these institutions, examining how cultural identities were expressed through the use of material artifacts, and modifications to the landscape. Internee communities responded to their forced incarceration through the development of social organizations and modifications to the landscape (Clark 2017; Garrison 2015; Wegars 2010). Archaeologists working at internment sites have used the concept of landscape, or place, to understand the lived experience of the internees. Excavations at the [Amache Internment Center](#) and [Manzanar National Historic Site](#) have found extensive gardens and landscape features that use found objects, materials scavenged from construction areas that often blend traditional Japanese with Western styles (Beckworth 2013; Clark 2020). These gardens helped transform barren and often desert landscapes and demonstrate a coping mechanism used to mitigate the effects of incarceration (Chiang 2010). Evidence of cooking and the use of cultural items, like rice bowls, indicate how the incarcerated

navigated the institutional setting to demonstrate and maintain their ethnic identities (Camp 2016; Shew 2010; Skiles and Clark 2010; Starke 2015). Conversely, the presence of American cultural icons, like a Mickey Mouse toy, show the American identities of the incarcerated (Kamp-Whittaker 2010) and indicate the complexity of national identity. Combining larger studies of the landscape with artifact analysis helped reconstruct how the incarcerated navigated daily life as their American-ness was contested.

Hispanic Descent Communities

At this point in time, there are few projects that focus on the historical archaeology of Latinx, Chicanx, and Hispanic communities as separate from their Spanish ancestors (Gonzalez 2015). While there has been a lot of work on Spanish Missionization and colonization, archaeologists are only beginning to investigate this heritage alongside descent communities. These draw on the previous decade's developments in community archaeology to consult and include descendants in the research. Many of these projects, like ongoing research in Hispanic communities in New Mexico, include local community members in excavation and survey as well as respond to requests from the community for aid to investigate particular topics (Jones 2015; Sunseri 2018). Archaeologists working in these communities hold regular town hall meetings or presentations for the community to get feedback about research design and the interpretation of their findings but these outreach events also require input on how to store and curate archaeological data so that the information that archaeologists produce benefits those communities.

There is significant diversity in the history of Hispanic communities in North America as these communities have been divided into populations in Mexico and the United States with each nation-state bringing their own complications. Additionally, the history of Spanish colonization in the continent endured for so long over such long distances that current communities' relationships to the past and to their heritage are closely tied to specific contexts and may not be similar to each other. Therefore, moving forward it is part of the work of archaeology to understand these regional formations through material evidence, and to compare and contrast the diversity of Spanish colonial heritage in North America.

20th- and 21st-Century Communities

The technical definition of archaeological resources in the United States includes “material remains of human life or activities which are at least 100 years of age” (King 1998, p. 252); however, the entire 20th century was transformative for the people of North America and the archaeological record. War, changing economies, and migrations altered the material and social landscape of the continent. Large-scale transportation networks and the mass production of consumer goods changed the way people understood the landscape and material culture (O'Donovan and Carroll 2011) and conversations about identity at regional and national scales coalesced. These mass movements allow historical archaeology to look at the marginalized groups who tested these ideas of national identity. Specifically, archaeology has allowed us to explore the changing lives of Native American children and Japanese citizens interned during the Second World War through their use of material culture and the archaeology of transportation has allowed us to explore the alteration of our national landscape almost to the present.

Modern Migration

In North America, one of the most important ongoing archaeological projects concerning immigration is the [Undocumented Migration Project](#). Project director Jason De León and his collaborators are examining the material culture of undocumented migrants from Northern Mexico into Southern Arizona (De León 2012; De León 2013; De León and Wells 2015). While some may dismiss such studies as “garbology” rather than “archaeology,” studies of undocumented migration, and particularly their material culture, allows archaeological methods to remain relevant and tied to current issues regarding economics and migration. Archaeology has allowed us to explore not only the pathways that illegal immigrants take, but also the folk beliefs that rise out of the process of crossing the desert and the community economies that are built upon this industry (De León 2012).

With the creation of strict border controls, the United States has prioritized removing undocumented migrants from the country and using the desert as a deterrent to migration as a terrestrial route (De León 2012). Unfortunately, this method has not done much to stop the movement of migrant peoples. A unique disposable material culture has evolved in Mexico specifically to serve those trying to cross the desert. This industry has standardized the materials migrants carry with them across the desert, which embody the various folk beliefs that have sprung up regarding successfully traversing the desert (De León 2012). Beyond allowing us to specifically identify migrants from their material culture, De León's work is an excellent case study of how folk beliefs influence the form of material culture. Many of the items associated with the uniform or standard tool kit of the migrant objectively make them easier to spot in the desert or negatively impact their ability to complete the journey, demonstrating how form and function are not always executed to be most efficient for the task at hand (De León 2013). This project effectively demonstrates that the principles of historical archaeology may be useful even in examining contemporaneous material culture, and contributes significantly to broader political and national conversations concerning migration.

Figure 7 – Burning Man from the air (*Burning Man 2012* by Steve Jurvetson is licensed under [CC BY 2.0](#))

While archaeology of the 21st century does not fall within the legal definition of archaeology in most countries (see King 1998, p. 252), this has not prevented archaeologists from exploring the material culture left behind during this century using anthropological theory. It is also sometimes referred to as contemporary archaeology because of legal definitions that specify what is historical and archaeological for preservation purposes (Chenowith 2017). Some of these projects include the “man camps” of North Dakota that sprang up in relation to the oil boom and bust (Caraher et al. 2017; Gannon 2016). These looked at the social networks and modifications made to temporary dwellings such as RVs to make them feel more like homes established in permanent dwellings (Caraher et al. 2017). Another project investigates [Burning Man](#), a temporary but annually constructed city about 100 miles outside of Reno, Nevada (Figure 7). There, temporary venues including small homes and stages are built and are best studied during the event and may provide insights into similarly used ancient sites (White 2013; 2022). Another is the archaeology of homelessness, which examines the material culture of current populations who are without housing. As homelessness is increasingly a problem in urban areas, understanding these populations through archaeology may help to find unique solutions to the problem (Zimmerman et al. 2010; Zimmerman 2016). Of these recent projects, one of the largest and most well-known archaeological endeavors is the examination of undocumented migration, as introduced in the section on modern migration. This system affects Mexico, the United States, and Canada, and archaeology has helped us understand the cultures surrounding the industry, evaluate particular deterrents, as well as explore the routes that migrants take to enter their chosen nation, particularly between the United States and Mexico.

Intersectional Theory and the Future of Engaged Archaeology

These projects created more theoretically robust frameworks for archaeology and allowed the field to explore the everyday lives of a variety of people. However, while these works investigated diverse peoples, serious collaboration with descendant communities have only recently become integral to our study, and the field remains largely dominated by white voices in North America.

While archaeology has always been interested in understanding all people in the past, a greater focus on the lives of queer folk and other marginalized people in the past is ascendant. As archaeology becomes more open and diverse through the inclusion of Black, Indigenous, and other people of color in the discipline, as well as other minority groups such as disabled people and members of the LGBTQIA2S community, a history of North America that is told with the diversity that has always been present on the continent will come to be the known narrative.

Race and ethnicity have also become major research areas for archaeologists. Specifically, historical archaeologists have developed theories and models for understanding what happens when multiple cultural groups come into contact with one another in colonial situations. How did European arrivals in the Americas influence the material culture of Indigenous peoples? How were isolated European populations affected by the culture and practices of surrounding Native groups?

Archaeologists also turned these questions toward African American populations, asking how diverse enslaved African peoples brought to the Americas adapted their customs, beliefs, and practices in polyethnic plantation and domestic settings (Ferguson 1992). Intersectional frameworks that account for a variety of types of theory involving cultural contact have developed in recent years. These include creolization (Dawdy 2000), hybridity (Liebmann 2008; Silliman 2013), metissage (Nassaney 2008), and ethnogenesis (Voss 2008). These frameworks are meant to explicitly deal with the North American historical context and the plethora of cultures that influenced the material culture record in a variety of places across the continent.

Additionally, Indigenous archaeology as a topic of study and as a theoretical framework expanded its use in archaeology in the 21st century. As people Indigenous to North America do not recognize the divide between historic and prehistoric, using the framework of Indigenous archaeology means applying similar explanatory methods to historic and nonhistorical sites and interrogating why we think of history and prehistory as separate (Lightfoot 1995). This is part of an ongoing effort to decolonize the practice of archaeology in general, which involves acknowledging the power that archaeologists have over Indigenous groups because of colonialism and the ways that the discipline prioritized Western ways of knowing over Indigenous ways (Atalay 2006). To do this

requires non-Indigenous archaeologists to think about the role of archaeology in maintaining existing power structures and to actively collaborate with Indigenous groups on archaeological projects to dismantle oppression.

Finally, Whitney Battle-Baptiste's (2011) book, [Black Feminist Archaeology](#), represents a theoretical perspective built on previous eras, namely the feminist framework, and acknowledges how archaeologists themselves are part of the construction of archaeological narratives. Her work is explicitly intersectional, laying out the theoretical framework she intends to create and then applies. She also explores how the background of the archaeologist impacts the research. This self-reflection, to include the archaeologist as a maker and creator of interpretation, is a vital new aspect of intersectional perspectives in archaeology that seek to acknowledge how who we are as archaeologists influences the questions we ask, how we understand the world, and what we know.

Case Study: The Chickasaw Explorers and Charity Hall

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Matthew P. Rooney, Ph.D., Arkansas Archeological Survey

Charity Hall was an Indigenous boarding school run by Presbyterian missionaries within the Chickasaw Nation between 1820 and 1830 (Rooney et al. 2022). This was one of many schools established by missionaries during the 1820s using funding from the Civilization Fund Act of 1819, which made a provision for the annual distribution of \$10,000 to Christian denominations, to be supervised by the Indian Office of the War Department of the United States, to “educational” missions. Chickasaw Nation, between 1818 and 1832, controlled much of what is today north Mississippi and northwest Alabama, and Chickasaw leaders allowed six schools, including Charity Hall, to be established in their sovereign territory during this time. The Chickasaws also supplemented federal funding by providing thousands of dollars annually to construct the schools and pay for operating expenses. Over a period of 10 years, Charity Hall served a total of 61 Indigenous students, many of whom became prominent leaders as adults in Oklahoma following Indian Removal.

The Charity Hall research project consisted of three seasons of fieldwork (2018–2020) at the site in collaboration between professional archaeologists at the Florida Museum of Natural History and the Chickasaw Nation itself. The Chickasaw Nation funded excavations in 2018 and 2019 and sent [Chickasaw Explorers](#) to the site to assist with excavations in 2019. The Chickasaw Explorers program arranges for groups of college students who are members of Chickasaw Nation to visit the ancestral homelands from which their people were forcibly removed and develop a direct relationship with the important places in the lives of their ancestors. Here follow two accounts written by individuals involved with the project. The first is written by Riley Freeman, a member of Chickasaw Nation who participated in the Charity Hall excavations in 2019 and who is now pursuing a graduate degree in anthropology. The second is written by Matthew Rooney, the professional archaeologist and primary investigator who initiated the research project during his time at the Florida Museum of Natural History.

Riley Freeman

Unifying Chickasaw students with their ancestral homelands and heritage is the main purpose for the Chickasaw Explorers archaeological training program. For two weeks, these students cultivate their Chickasaw identities; bond with fellow Chickasaws; immerse themselves into history, language, and culture; and, lastly, learn about archaeology along the way. Many of these students, including myself, did not grow up within Chickasaw Nation boundaries. We missed out on the cultural and communal events like the Annual Meeting and Festival, the art exhibits, and stickball games that foster a sense of belonging. Even though Chickasaw Nation provides numerous services for citizens outside of the boundaries, we still never felt like we were a part of a community and identity larger than our own immediate families.

The Chickasaw Explorers program was a transformative experience for me. Unsure of what to do with my B.A. in anthropology, and unable to afford any archaeological field schools, I decided to apply for Explorers after stumbling across an ad for it in the Chickasaw newspaper. To say the least, I quickly fell in love with archaeology and the homelands. We visited historical sites, heard centuries-old stories about the land, acquired several new Chickasaw words, and helped excavate an ancestral site. I will never forget the first time I held a shard of Chickasaw pottery. I met colleagues, made friends, connected to my identity as a Chickasaw woman, and for the first time in my life, knew exactly what I wanted to do with it—become an Indigenous anthropologist and archaeologist.

I returned to the program the next summer and assisted in the Charity Hall excavations. While none of my ancestors attended Charity Hall, they were sent to similar schools and faced the same task: to fit into a world that was foreign, dangerous, and built to erase their Chickasaw identity. Among the Explorers were a few Charity Hall descendants, and they felt such joy when

they got to hold artifacts from a school that their family member attended. Ultimately, we all encountered the remnants of a place where our families struggled and fought for a better life, a better future for us.

For most of us Explorers, interacting with our ancestral homelands is an experience unlike any other. The winding creeks, lush prairies, and rushing rivers are the backdrop to our sacred stories. All characteristics that define the Chickasaw—foodways, celebrations, dances, and handicrafts—are entangled with the homelands. Since the beginning of our history, the homelands transformed us just as much as we transformed them. Even after going through colonization, assimilation, and forced removal, the Chickasaw's connection to the homelands remains unconquerable. Indigenous archaeology and Indigenous peoples contributing to archaeology promotes mutual respect and trust between tribes and researchers, encourages inclusive and decolonized archaeology, and promotes the prosperity of Indigenous peoples. Places like Charity Hall focused on “civilizing” and erasing Chickasaw identity, but programs like Chickasaw Explorers create hope for the reclamation of these stories and the connections to the homelands.

Matthew P. Rooney

I had the pleasure and fortune of being able to participate in the Chickasaw Explorer program as a professional archaeologist throughout my time as a doctoral student. During the summer of 2017 we performed excavations around a Mississippian mound site in eastern Mississippi, where I got to work with a rotating crew of young Chickasaws excavating test units and finding features associated with what was probably one of their ancestral houses. I literally got in the trenches with the Chickasaws and listened to their thoughts about what we were doing—what was important to them and what kind of questions they had about their past. The experience was so formative for me that I decided to develop my own project in the area with the Chickasaws in mind as collaborators from the beginning.

Director of Chickasaw Archaeology Brad Lieb had already been eyeing Charity Hall as a potential site for research and came out with me to the site during the following summer to perform some initial reconnaissance survey. During that summer of 2018 the Chickasaw Explorers were excavating another Mississippian site in their homelands, so I got to work alongside another group of Chickasaw participants, including Riley Freeman, as they handled the objects of their ancestors. Every summer they invited us to their dormitory to prepare for us some of their traditional foods to be enjoyed along with prayers and discussion of the work. In a small way, all of us archaeologists were putting cultural anthropologist hats on while being among the Chickasaws.

After my initial reconnaissance of Charity Hall, I put together my research design and submitted it to Chickasaw Nation to get feedback and approval to do more concentrated fieldwork with the Chickasaw Explorers at the site in 2019. I have since learned that it is uncommon for Indigenous peoples to have a say in research-based archaeology before it is actually performed. One particular tribal member with whom I collaborate told me that he had never before been approached to collaborate on a research-based project that addressed that member's own questions and interests. During my archival research phase, I found a list of the students who had attended Charity Hall, and I was able to provide this list to the new crop of Chickasaw Explorers who took part in the excavations in 2019. As Riley writes above, some of the participants found that they were direct descendants of children who attended the school two centuries earlier, which made for a very spiritual experience for us all.

Due to my participation in the Chickasaw Explorer program as a professional archaeologist, I had all of those participants in my mind through every step of the research process—writing research design, excavating material culture, performing artifact analysis, presenting at conferences, and publishing my results. I organized a symposium at the 2019 Southeastern Archaeological Conference on Chickasaw archaeology, and I was able to invite Chickasaw Nation Executive Historic Preservation Officer Kirk Perry to be a discussant. He spoke about how special it was for them to be connected to their homelands through the material culture we were handling, and he also gave me some polite criticism about one of my conceptions that I was able to apply to my later writings on Charity Hall.

When it came time to publish my scholarship, I did so in collaboration with Dr. Brad Lieb (Rooney et al. 2022), and we decided to add another layer of review to the normal review process by submitting our manuscript to Chickasaw Nation for commentary and feedback. We decided to adopt Chickasaw Nation's preferred pronouns throughout our article—terms such as First American and Southeastern Indian—with an author's note explaining why.

My feeling coming out of the Chickasaw Explorer collaborative experience is that all archaeologists should do their best to be good cultural anthropologists who also work in the present. I think we all understand that the past has a tremendous impact on the present and is never dead and gone. The same goes for Indigenous ancestors. I believe it is vital that researchers collaborate and communicate with Indigenous peoples at every step of their research process, and consider from the beginning whether

their project is even worthy of being performed. Before I even start a project now, I ask myself: Would the descendants even want this done? If so, how can we do it together?

Tribal Archaeologies: A Personal Reflection

James Harrison Macrae, M.A., Assistant State Archaeologist; Washington State Department of Archaeology and Historic Preservation

My journey in tribal archaeologies began 12 years ago when I was working with Craig Eagleshield and Larkin Chandler from the Standing Rock Sioux and Crow tribes, as archaeological and cultural monitors on a gas pipeline project in eastern Montana during the fall and winter of 2010. I was, to be honest, feeling burned-out with corporate CRM, but I greatly enjoyed working with and learning from Craig and Larkin during that project. Now, over a decade later, I can attest that working with living Indigenous communities offers an alternatively rich experience in professional archaeology, making friends that can last a lifetime.

At some point, I had the fundamental realization that all the amazing precontact artifacts and sites, which I had had the opportunity to work with during fieldwork in Tennessee, Texas, New Mexico, Arizona, and Washington, were not simply archaeological and scientific resources; but instead, the cultural patrimony and heritage of living tribal communities and people. I also realized that it is our duty as archaeologists to reconnect those communities with the archeological heritage that is theirs fundamentally. I have learned that living tribal families and communities are directly and indirectly affected by damages to sites, archaeological landscapes, hunting, gathering, and ceremonial places. The destruction of archaeological resources and related tribal heritage is just one of several postcolonial challenges that are affecting tribal communities today. Working as a tribal archaeologist gives one the wonderful chance to serve a traditionally underserved community directly and in a hands-on way.

My career has involved developing Indigenous-led and -staffed archaeological programs at the Spokane and Swinomish Tribes. If you are approaching Indigenous Archaeology from a non-Indigenous background, you have to be prepared to examine your own bias and get “woke” to some of the colonial, paternalistic, racist, and genocidal facts of American history that have affected your host community and that you have likely never heard of. This must be approached in a kind, open, honest, healing and restorative process, and it is not easy. One of my first teachings, by Bill Matt, was to understand Indian Humor and how it is a subtle way of coping with terrible events.

It is much more important to listen and learn than it is to instruct. It is essential to follow and incorporate the teachings you receive directly into your archaeological practice. Oftentimes serendipity and the spiritual must be incorporated into the scientific method. Every tribe is different. This is not for everyone, but for those with the right spirit, with an open mind and a calling for this role, it can lead to a rich, and rewarding career as a professional tribal archaeologist. Indigenous archaeology means employing the four-field approach (archaeology, cultural anthropology, osteology, and linguistics) as tools to rigorously protect and document Indigenous history and landscapes. The goal is to decolonize archaeology and to serve tribal communities using an Indigenous point of view and ethical framework, as directed by cultural elders in your host community.

It is unfortunate that much interpretation and discourse in anthropology, history, and the CRM gray literature is based in racial bias, directly targeting Indigenous communities. Indigenous Archaeology involves critically analyzing these narratives and rewriting them to better reflect Indigenous perspectives, worldview, and values, while giving voice and serving the indigenous community you may be working with. This involves (to borrow a metaphor) going “across the creek,” to a new country, going to learn and embrace Indigenous ways, to find a rich culture and power that is still thriving there, on reservations and tribal communities across the United States, that are unseen, unknown, and unknowable to much of the larger modern American culture.

Today, many Indian Nations have Tribal Historic Preservation Offices and cultural heritage programs, employing thousands of people across the U.S. For the tribal members reading this, thank you for studying anthropology and archaeology. This is a wonderful way to earn a degree and to serve your home community (or another tribe) as a THPO or other related staff earning a good salary. For the non-Indigenous people reading this, Indian communities need professional staff like you, and the work typically comes with good pay and good benefits. If you have the intrepid spirit of an anthropologist and a strong heart and mind, I would recommend considering a career working for an Indian Tribe or Nation. If not, wherever you find yourself employed, fully embrace the spirit of tribal consultation, community involvement, and other ethical and Indigenous best practices throughout your precontact archaeological work. This is good work that feels good to do. Take it upon yourself to

learn the tribal land acknowledgement where you live, work, or are conducting field studies. Visit the tribes as appropriate, attend publicly open tribal events, and support tribal enterprises.

Sincerely,

James Harrison Macrae, M.A.

Owner: Falcon Cultural Resources Institute

Bow, Washington

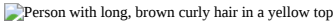
Discussion Questions

1. What are some of the benefits of working with descendant communities for archaeologists? What are some of the benefits of working with archaeologists for members of descendant communities? Can you think of any drawbacks?
2. This chapter describes a number of examples of archaeological research in different communities. Compare and contrast the goals of two different projects.
3. This chapter describes some examples of contemporary archaeology. What role can archaeology play in these projects that may not be addressed through other research methods? Can you think of some other examples?
4. What do you think is the future of engaged archaeology? Where would you like to see the discipline go?

About the Authors



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Dana Ogo Shew is an archaeologist, oral historian, and interpretive specialist at the Anthropological Studies Center at Sonoma State University. Ms. Shew has 15 years of experience in cultural resource management, specializing in WWII Japanese American incarceration research, oral history collection, and public interpretation, particularly in collaboration with descendant and Tribal communities. She holds an M.A. in Archaeology and is a Certified Interpretive Planner.

(with case studies by Riley Freeman, M.A., Matthew P. Rooney, Ph.D., and James Macrae, M.A.)

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Further Exploration

This list includes publicly available resources referenced in or relevant to this chapter, which may be of interest to readers who want to learn more. The URLs are typed out below as a courtesy for those who are reading a print version of the text. Please keep in mind that links may break over time and may not be immediately updated. Instructors should use discretion when assigning materials from this list. While the chapter itself has been checked for web accessibility, the editors do not vouch for the accessibility of all supplementary linked resources.

20th Century – Celena McPeak “Our Children Are Our Future: An Archaeology of Childhood on the Grand Ronde Reservation” – <https://x.com/potatokitty/status/997588262578405376/photo/1>

African American Descendants’ Project – <https://www.montpelier.org/descendants-project/>

Amache Community Archaeology Project – <https://www.amachearchaeology.com/>

Amache Internment Center – <https://amache.org/>

American Battlefield Protection Program – <https://www.nps.gov/orgs/2287/index.htm>

Black Feminist Archaeology – <https://www.routledge.com/Black-Feminist-Archaeology/Battle-Baptiste/p/book/9781598743791>

Burning Man – <https://burningman.org/>

Chickasaw Explorers – Chickasaw Explorers Program – <https://www.chickasaw.net/Services/Culture/Chickasaw-Explorers-Program.aspx>

Digital Archaeological Archive of Comparative Slavery – <https://www.daacs.org/>

Eastern Pequot Archaeological Field School – Stephen W. Silliman, Ph.D. Research – https://www.faculty.umb.edu/stephen_silliman/html/northeast.html

Field Methods in Indigenous Archaeology – Gonzalsa Blog – <https://sites.uw.edu/gonzalsa/fmia/>

Fort Ross State Historic Park – Fort Ross – <https://www.fortross.org/>

James Madison’s Montpelier – <https://www.montpelier.org/>

Manzanar National Historic Site – <https://www.nps.gov/manz/index.htm>

Mashantucket Pequot Museum and Research Center – <https://www.pequotmuseum.org/>

Paul Racher – Eric Andrew-Gee “Excavating Canada’s Past with a Newly Critical Eye” – <https://web.archive.org/web/20180123211809/https://www.theglobeandmail.com/news/national/excavating-canadas-past-with-a-newly-critical-eye/article37682921/>

Pimu Catalina Island Archaeology Project – Pimu Catalina Island Archaeological Field School – <https://pimu.weebly.com/>

Place a representative quartz crystal – “Quartz Crystal Placement” video – <https://www.youtube.com/watch?v=xWq29gyJ7Zs>

Plimoth Patuxet – <https://plimoth.org/>

Quartz Crystal – <https://bronzevillearchives.com/wp-content/uploads/2015/09/montpelier-crystal-from-slave-dwelling-excavation.jpg?w=816>

Strawbery Banke Museum – <https://www.strawberybanke.org/>

Undocumented Migration Project – <https://www.undocumentedmigrationproject.org/>

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1.6: Archaeological Ethics and World Heritage- Protecting and Preserving Cultural Resources

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Learning Objectives

- Explain how archaeologists protect cultural patrimony and define cultural patrimony
- Describe different threats to archaeological sites and cultural heritage
- Explain the role of ethics in international archaeological research and historic preservation

Why Should We Protect the Human Past?

As discussed in the chapter ‘[Cultural Resource Management and Archaeology](#),’ Cultural Resource Management (CRM) relies on an understanding of what makes culture important and distinct from one human community to another. Archaeology relies on excavation and other scientific methods to understand the culture of ancient societies and answer questions about contemporary societies. As technology advances, archaeologists are not relying as much on excavation as we can also use less invasive methods to study sites and reduce site destruction. The National Park Service uses a term known as Traditional Cultural Properties (TCP), indicating areas that are places of great cultural importance such as village or burial sites. (See [Traditional Cultural Places and Indian Sacred Sites](#) to learn more about TCP.) When we know the locations of these TCP, we can avoid them out of respect. That is, archaeologists can decide not to excavate an area to protect ancestral remains and culturally significant artifacts (objects used and made by humans) from destructive forces. Unfortunately, not everyone shares this belief in the importance of preservations and some sites are destroyed intentionally through looting (illegally removing objects from sites) by people hoping to find economically valuable artifacts. This is in addition to natural forces that cause damage to these sites, for instance, erosion due to wind and rain. In this chapter, we will examine some of the major techniques of Cultural Resource Management and archaeology so you can understand how science works to preserve ancient cultures in contemporary times and, more importantly, why we should protect the human past.

Back in the mid 1990s, archaeologists at the national Society for American Archaeology (SAA) created and adopted a series of “9 Principles of Archaeological Ethics” that guide our actions throughout our research, including at field sites. This seven-page document is updated periodically and reminds us of our responsibilities as scientists and as protectors of the land and culture. (Here is the document if you would like to learn all the details of these principles: [Principles of Archaeological Ethics](#).) For this chapter, we will focus on the first three principles from this document. Principle 1 is about stewardship and helps us focus on preservation and protection of the human past, remembering that the accurate interpretation of the archaeological record relies on a respectful relationship with the descent communities. These are the people most directly related to the ancestors we uncover in our research. Principle 2 notes that archaeologists are accountable. That is they need to make every reasonable effort to actively consult and work with descent groups, ensuring clear lines of communication throughout the process so that there are no misunderstandings or mistrust. Lastly, Principle 3 focuses on commercialization, or the use of the artifacts that are found as commodities that can be sold for profit or personal enjoyment. The market for these artifacts, which is often illegal, has resulted in the destruction of archaeological sites and of the information that the context of these sites can provide to better understand these societies. Looting believes in the idea of “finders keepers,” which is the opposite of the scientific research carried out by archaeologists that is based on preservation and education (Society for American Archaeology 2024).

As archaeologists, we rely on knowing a wide variety of natural environments as well as the peoples who lived and sometimes still live in a location. We need to know where we are, or are NOT, allowed to work and study within archaeological sites which requires getting permits and establishing collaborations with local institutions and communities. Before we begin looking at how archaeologists work at these sites to promote the principles of stewardship, accountability, and protection from commercialization that we noted in the previous paragraph, we need to go back and learn about how the first scientists who practiced archaeology created this field. For much of the history of archaeology, and anthropology more broadly, we focused on collecting and collections with an emphasis on salvage ethnography. The idea of salvage ethnography is that field anthropologists would interview members of a descent community. The goal was to gather as many personal histories, myths or sacred stories, and linguistic notes as possible before the Indigenous communities or earliest-known civilizations in a specific locale disappeared. Salvage archaeologists, for their part in these investigations, focused on obtaining the cultural materials from the descendant communities as well as from

archaeological excavations. Most anthropologists received proper training and gathered all the necessary information to keep the materials intact, such as the name of the owner, the materials, and perhaps even the process of creating the object. Some salvage archaeologists systematically gathered data which is still available for reference today. This combination of well-trained anthropologists and careful data collection help us to figure out the cultural patrimony which refers to all the aspects of culture a community owns, which is built on that community's past, whether it is through written records, material culture, or oral histories.

Cultural patrimony can be difficult when it comes to nonmaterial culture such as stories, songs, and performances, but identifying material culture as belonging to just one society can also be challenging. Many nations who lived close to one another shared raw materials and conducted economic trade of finished goods. Additionally, as people moved, techniques traveled from one community to another through intermarriage, which reminds us that there are many ways for artifacts to move among communities. New types of technologies are providing clues in the creation of the objects that help us to narrow down a projectile point, such as an arrowhead, to the Pacific Northwest, the Great Lakes region, or the Southwest. Ancient trade routes, such as the Silk Road through Asia, offer enormous amounts of evidence of the sharing of goods and ideas that took place 2,000 years in the past. (See Bower 2017, [Oldest Evidence of Patterned Silk Loom Found in China](#).) Two thousand years before that, there is evidence of trade between Ireland and the UK based on Cornish gold. (See [Archaeologists Discover Evidence of Prehistoric Gold Trade Route](#) to read more.)

While the concept of protecting these objects of cultural patrimony goes back to the early 1900s, the use of the term CRM shows up for the first time in the early 1970s. Archaeologists in the United States historically worked for the government or for research institutions such as museums or universities, but an increasing number of these archaeologists founded their own firms, working alongside construction companies and for transportation organizations as contract archaeologists. Instead of working for the Department of the Interior or the Bureau of Land Management, the archaeologists of the 1970s began to create their own projects and train their students to do the same. To learn more about the early history of CRM in the United States, please check out [A Qualitative History of Cultural Resource Management](#) (Giacinto 2011).

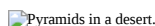


Figure 1 – The pyramids of Giza are recognized by UNESCO as a World Heritage Site. (“005 pyramids-13900183772WD” by Alain Van den Hende is licensed under CC BY-NC-SA 2.0)

Most international protections of archaeological sites and artifacts are administrated through UNESCO, the United Nations Educational, Scientific, and Cultural Organization. The relevant legislation is the UNESCO Convention of 1970 on the Means of Prohibiting and Preventing the Illicit Import, Export, and Transfer of Ownership of Cultural Property. This is an international treaty, which regulates the import and export of cultural objects. Two years later, in 1972, the Convention Concerning the Protection of Cultural and Natural Heritage first created World Heritage Sites. A World Heritage Site is recognized by UNESCO as having cultural, historical, and/or scientific significance to humanity as a whole, and is protected by international treaty. To access some wonderful resources through the United Nations Educational, Scientific, and Cultural Organization (UNESCO), please go to this website, where you'll have access to four PDFs to explain practical ways to manage World Heritage Sites: [Managing Disaster Risks for World Heritage](#). This will help you better understand the practices in places such as Machu Picchu, the Parthenon in Athens, the pyramids of Giza, and ancient temples throughout Southeast Asia (Figure 1).

Early archaeologists relied on paper maps and local knowledge of important locations. Now that we have advanced technologies like GPS and satellite maps of the surface of the Earth, we can anticipate and proactively protect ancient Indigenous sites like Mesa Verde in Southwestern Colorado. We will focus on Mesa Verde National Park as a case study (one specific research example) to help us understand the terminology in the next few paragraphs. There are no Indigenous populations living in this National Park today, and archaeologists are still unsure as to the exact reason that the sites were abandoned in the past.

Figure 2 – The cliff dwellings at Mesa Verde are accessible to tourists, and are now protected as a National Park. (“Mesa Verde NP” by *shell game* is licensed under [CC BY-NC-ND 2.0](#))

When the National Park first opened in 1906, long before it became a protected site in 1978 thanks to UNESCO, people helped themselves to artifacts and wandered all over the property, doing irreparable harm during this looting. That damage means we have lost archaeological knowledge forever, and descent communities have lost their physical links to their ancestors. Now, both tourist and scientific access is limited, and any artifacts discovered are claimed by the museum on-site. There is a timeline from the 1700s to the present to learn about Mesa Verde’s history: [Important Events in the Development and Preservation of Mesa Verde National Park](#) (National Park Service 2024). To learn about the descendant communities associated with Mesa Verde who are related to the Ancestral Puebloan Nations who left over 700 years ago, see [The Archaeological Survey of Wetherill Mesa: A Prologue to the Project](#) (Osborne 2007).

As we learned earlier in this chapter, natural processes can uncover previously hidden archaeological sites. In the early 2000s, a wildfire in the National Park exposed some living sites previously unknown to archaeologists (To learn more about those fires and the aftermath at Mesa Verde from a nonscientific point of view, please see [After the Fires](#), Gaug 2001.) Since these sites had not previously been examined, CRM specialists came in to investigate, which were the sacred (religiously important to a culture and/or its descent community) sites and which were the secular (everyday, nonsacred) portions. In the next paragraph, we will begin to delve into the differences in approach between secular and sacred sites.

Scientific and Humanistic Approaches to CRM

In anthropology, we separate our research approaches into two major categories: the scientific approach and the humanistic approach. As you might imagine, the scientific approach is very data-driven, where we emphasize statistics and categorization. At a site like Mesa Verde, how many lithic (tools made of stone) points are there? How many of these points are from the area compared to the number of those traded from other locations? How many of these points show wear patterns? What do those wear patterns indicate about their use? To answer some of these questions, we rely on experimental archaeology which allows us to reconstruct the technological past; the goal is to create an idea of the past of the specific culture we are studying which helps us to track secular information. For those of you who are interested in experimental archaeology, please read the “Ancient Technologies” chapter for more examples and details!

How do we use the humanistic approach properly in archaeology? After all, if archaeology is the study of the human past, we need to include the specific humanity of the population and focus on learning everything we can about their culture (the behaviors that are shared and learned). We need to discover their demography (their population statistics such as adult vs. juvenile; healthy vs. sick; etc.) as well as their behavioral patterns, such as how they processed and stored their food, with whom they traded, etc. While demography offers data-driven, research-based information about cultures, we cannot learn as much as we would like about individual lives of people within a population. The main exception to this is when there are precise written records available from primary sources (evidence left by the people at the time such as documents and other artifacts).

Just because someone follows the traditions of a specific religion, does not mean that they practice their faith the same way every other member of that religion does. Faith is personal in practice and belief. Sacred sites mean that for a culture, specific areas were treated differently by the community. Some sacred sites were used every day while others were used just for special purposes, such as initiation ceremonies (changing social status within a group from outsider to insider or child to adult). Some were private and inside buildings while others were meant to be accessible to everyone in the community. How do we know from studying these sites that they are sacred, and why does this matter to Cultural Heritage?

Sacred sites are the most important locations for a society, as they offer cohesion for the social system, especially in times of stress. Sacred sites will be apart, both physically and emotionally, from the secular parts of life. We do not, for example, find middens (trash piles) in the middle of the holiest part of a site, but we might find burials, objects of special value, and even ways to protect the sacred space from accidental discovery (hidden behind several sets of doors, for example).

Secular sites, while important to a community, can be easily rebuilt. If there is a house fire, another house can be constructed with the knowledge from the builders of the original building. However, it is much more challenging to re-create the place of the origin of a culture (ethnogenesis), because once it is destroyed, it can never be formed again. The biggest challenge is that we need to know which sites, or parts of sites, are the most important to the descent group before we perform analysis, and if that community has been gone for generations or centuries, the challenge to identify the sacred spaces might be too large for us to tackle. Read the Indigenous Archaeologies chapters for further case studies.

Even if a culture no longer lives in their original homeland, they might still have descendants whose rights and beliefs need to be respected. It is important to keep the humanistic approach in mind when collecting data since every discovery is potentially part of someone's life, whether we know the descent community or not. I get a lot of questions about who has the right to say whether archaeologists should work with descendant communities or if we should stay away. Each community knows what they want to accomplish, and if they are looking for an archaeologist to set up a CRM program for a Nation, there will be a job posting. Keep in mind the layers of laws you will need to be familiar with, from local jurisdictions as well as international mandates. Ethics are just the beginning of the challenge.

While there are many private CRM firms across the country, working usually with construction companies, one of the largest employers of archaeologists in the State of California is the State itself. The two biggest employees for CRM specialists include CalTrans, through the California Department of Transportation. You can learn more at [CalTrans: Environmental Analysis](#) (CalTrans n.d.). (Information specifically about the relationship between the California Department of Fire and archaeologists can be found at [CalFire: Suggestions for Preparing Archaeological Site Records and Site Maps](#), Betts 2001.)

One of the major reasons that CalTrans hires so many archaeologists is that the state is constantly building and upgrading the roads and highways, leading sometimes to the accidental excavation of Native and other historic sites. The more we know ahead of time which societies lived in which specific areas, the better our chances of either avoiding starting construction in that location, or we can form a plan to excavate and move materials from sites if necessary. If artifacts need to be removed, there are several components to this relocation: who on the crew will excavate the actual artifacts and ancestral remains, and where will all the finds go at the end of the project? Each project has its own mitigation plan. Sonoma State faculty and students helped with work in downtown San Francisco in the middle of the business district, where they learned about the lives of Gold Rush residents. Based on a combination of historical maps and a wide variety of artifacts, archaeologists determined details of the lives of individual families. The David A. Fredrickson Archaeological Collections Facility at Sonoma State houses those objects, including children's toys. To learn more, see [41 Tehama Street, San Francisco](#) (Stewart, et al. 2018).

CalFire, of course, is interested in mitigating damage done by fires as well as avoiding them in the first place. While the emphasis is on the protection of human life, CalFire also is tasked with making sure properties are safe. If employees can work with archaeologists and descent communities to identify and protect archaeological sites well in advance of fire season, then firefighters can focus on keeping destruction to a minimum if burns begin. CalFire creates maps of places most likely to burn based on past events such as previous years' fires, but they also need to track fast-moving wildfires spurred on by winds. It benefits the departments to have people trained in the identification and protection of archaeological sites so firefighters can focus instead on the crisis at hand. CalFire offers training for people interested in assisting professional archaeologists at sites. To learn about the mapping process with GIS, go to [CalFire: GIS Data](#) as well as the chapter titled Survey/GIS in this OER text.

 A valley view of Yosemite, with water, grass, trees, and distant peaks.

Figure 3 – Native nations have used fire to manage the landscape of Yosemite, which has been managed by fire since time immemorial. (“Valley View Yosemite” by King of Hearts is licensed under CC BY-SA 3.0.)

The more human activity spreads out into geographic locations that are not sustainable for year-round water and food resources, the more difficult it is to reach those communities in times of disasters. The more we can plan ahead of time which archaeological sites need protection (and which should be left alone), the more CalFire can focus time on action plans. It is important to keep in mind that Indigenous peoples throughout the world relied on fire technology long before European contact. In fact, the reason that places like Yosemite ended up so lush is that the local Native Nations (Paiute, Miwok, and Ahwahnechee) used traditional methods to

keep plants, trees, and grasses from overgrowing. Understanding the time of year and the proper conditions required for a successful burn meant that Native peoples maintained the parklike surroundings we still experience in Yosemite. You can learn more about these challenges in the Ancient Landscapes/Ancient Environments chapter and in [How John Muir's Brand of Conservation Led to the Decline of Yosemite](#) (Johnson 2014).

One major challenge with creating these maps of sacred spaces is once the map is published, it usually becomes public. More often those maps end up as PDFs online for people to search and print. That means absolutely anyone, from construction crews to vandals, knows where important archaeological sites are. As you can imagine, that leads to increased challenges with protecting these sites from destruction. We are in a catch-22: if we do not have the maps, in cases of emergencies, we cannot know where to focus our attention; however, having the maps means everyone knows everything about a specific locale. One possible solution is to draw up the maps and provide them only to emergency services.

Another challenge in reading an archaeological site is the introduction of invasive species (species introduced intentionally or otherwise that take over an ecosystem), which do not act in the same ways as the original landscape. California is packed with eucalyptus trees from Australia which are incredibly flammable. Eucalyptus come in, as do fig trees, take over an ecosystem, and then their roots crowd out the native plants, the burn patterns change (especially with the eucalyptus oil being so flammable), and it changes the landscape of archaeological sites in California. Experts like professor Dr. Don Hankins from California State University Chico continue to practice Indigenous burning techniques today, modeling them for the next generations and helping CalFire better perform controlled burns. Here is a link to Dr. Hankins's work from 2014 with traditional burning in California: [Lighting Cultural Fires](#).

Similar projects exist in areas of Australia and Canada. In Australia, since it is such a large continent with hundreds of different Aboriginal Nations, there were different techniques for using traditional fire management that encouraged wildlife to return as well as plants to drop open seeds for germination. To learn more about the methodology still used today, check out this webpage on [Fire Management](#) from Bush Heritage Australia. We may not think of Canada as having similar challenges as California or Australia, but as another country with widely varied ecosystems, the reliance on Traditional Ecological Knowledge (TEK) helps to save lives every year. Working with descent communities to restore "buffalo jumps" similar to ones used by the ancestors means burning grasses to bring back new growth to encourage buffalo to feed near hunting places. To learn more about the variety of ways First Nations (the Indigenous Nations of Canada) continue to use their burning technology in British Columbia, see [Indigenous Fire Management and Traditional Knowledge](#) (2019).

What if we do have some sort of natural disaster headed our way: typhoon, volcano, earthquake, forest fire (hopefully not all the above)? Step one: Archaeologists are not going to remain in the field trying to save a site. We are amazing, no doubt about that, but we cannot protect sites from disasters of any size. We might have spent time removing materials from a natural disaster previously just to deal with this all over again. For example, there was a small volcanic situation at a site known as Pompeii in Italy. Archaeologists needed to make the decision of whether to excavate the entire city (not happening) and what to do with what had already been uncovered. Why would an archaeologist make the decision not to excavate? Remember that as soon as material is exposed, it breaks down much faster than if skeletons, for example, remain in an anaerobic (without oxygen) environment. Think about how much time and money it takes to excavate an entire city and all its contents. Sometimes it makes more sense to stop, even when it is tempting to complete an entire project. You can find a link to a virtual dig of Pompeii at [Archaeology's Interactive Dig: Pompeii Tour](#) (2003).

Ethical Display

We found a city at Pompeii, but that was not a complicated task since the ancient world knew exactly where it was thanks to trade routes and city planners; historical records indicated exactly when Mount Vesuvius erupted and covered much of the surrounding area. There were even maps of the city itself, as you can check out at [Archaeology's Interactive Dig: Pompeii Maps](#). That means that we know the exact location of the different homes, businesses, and roads in the city. The problem is that we do not know the exact use of every artifact found within the walls of Pompeii. We can make interpretations based on other objects from other cities, and that is the biggest clue.

The bigger question is how do we treat the ancestral remains with respect? What did the ancient Pompeians believe about the afterlife and human remains compared to contemporary Italian cultural norms? The predominant religion is Roman Catholicism which widely displays relics (personal items, including bodies, of religious people) in public. Is it permissible to have bodies on display since these people died naturally and were not buried? I would argue that this is completely the decision of the local

populations. If the people in Southern Italy encourage tourists and archaeologists alike to visit Herculaneum and Pompeii, take photos of the dead, and leave the casts and molds in situ (in their original location) then that is their decision (Figure 4).



Figure 4 – A plaster cast of one of the victims of the eruption of Mt. Vesuvius at Pompeii. (“*Cast Sitting Victim Pompeii*” by *Jebulon* is licensed under [CC0 1.0](#).)

Naturally occurring mummies can happen under ideal conditions around the world: tannin-filled peat bogs in Ireland as well as high altitude sites in the Andes. In 2018, I traveled to Dublin to the National Museum of Ireland: Archaeology (there are three others: Decorative Arts; Country Life; and Natural History) and discovered several bog bodies on display. As an anthropologist, I am always filled with awe that nature has the perfect combination of tannins to preserve the ancestral remains and some of the artifacts, but I am also trying to be sensitive that not everyone would like to see human bodies on display. The museum set up the exhibits brilliantly where, if you wanted to just read the signs and learn about the artifacts and ancestors, you could. However, you would have to move off the main path to reach the actual bodies and could not accidentally come across them. For more information on natural preservation of human remains, check out the chapters on Bioarchaeology and Ancient Environments.

It is fantastic to realize that many of our archaeological finds are pure coincidence: Many stories begin with farmers preparing their land and finding arrowheads/pottery/gold hoards/human remains (not all in the same place). If we are lucky, the farmers stop, call the local law enforcement (especially if there are human remains) so that all the evidence is *in situ*. However, this is not always the case. Sometimes the peat farmers only have part of a body since they were cutting up large chunks of peat for fuel. In any case, we would like everything to remain where it was so that when we show up so we can systematically excavate. The best museums may even set up their display to mimic the original provenience (the location of everything at a site) so that visitors experience an authentic reproduction of the site. To learn more about the bog bodies in the museum in Dublin, check out [Kingship and Sacrifice](#) (National Museum of Ireland, n.d.). (WARNING: There are photographs of ancestral remains.)

In the Andes, finding the mummies requires more effort and luck than plowing a field. It might mean climbing up mountains and dealing with strong winds, mud, and altitude sickness, as well as language and cultural barriers. In some cases, local descent populations know exactly where these sacrifices were made but not necessarily how long ago. What will you discover about these people?

They are primarily young women of good health and high status. How do we know that? We can tell their high status socioeconomically from the artifacts surrounding them: the quality of their clothing and the quantity of the jewelry they are wearing are straightforward indicators of their family’s wealth.

We can tell their high status biologically from the wear on their teeth, the lack of multiple fractures on their long bones as well as general health of the skeletal materials compared with other ancestors from that period. We will rely on forensic archaeology (learning from skeletons both their life and death stories) to estimate approximate age at death as well as health, height, and cause of death in some cases. We are especially lucky with high-altitude finds since that lack of oxygen leads to more organic materials remaining intact, including stomach content. Search the Bioarchaeology chapter for more examples.

Here is where the story becomes more complicated: we know that the women ingested large amounts of narcotics before they died, because the evidence remains in their system, but did they take this willingly or were they forced or coerced into taking the chemicals? When did they understand they would become a sacrifice to protect their entire population? How much fear did they have, and were they scared enough to try to run away? Perhaps some people think this is not scientific. Some people may think there is too much speculation involved at this point. This is your choice as an archaeologist how much cultural interpretation you want to include, but the facts show that there are levels of coca in her system that date back one year before her death as well as alcohol. Based on the large quantity of both alcohol and coca in her body at the time of death, she probably did not feel pain as she slipped away. To learn more about these women, check out this article from Nature: [Incan Child Mummies Show Evidence of Sacrificial Rituals](#). (Check Hayden 2013) (WARNING: There are photographs of ancestral remains.)

You learned in the Introduction to this textbook about the scientific and humanistic approaches to archaeology. We can add to that processualism and post-processualism. Processualism is the scientific approach in which we catalog the approximate age, approximate health, the biological sex based on the skeleton, the number of artifacts, and the approximate year the victim died. Post-processualism would give a humanistic approach to these Andean mummies, telling us about the victims personally, which helps outsiders to connect with their stories, but those details are not guaranteed to be as accurate. To learn more about both sides to this story, check out this National Geographic article from 2013 about Andean natural mummies: [Inca Child Sacrifice Victims were Drugged](#). (WARNING: There are photographs of ancestral remains.)

In both of these cases, Ireland and the Andes, even though their landscapes may be completely geologically different, CRM practitioners would have parallel training in how to identify and preserve these culturally significant sites. The reality is that when mummies are involved, as with any ancestral remains, we are most likely going to remove them for safekeeping until they can be returned to their descendant group or protected in a museum. These will be the same challenges for archaeologists working with Native sites in the United States.

NAGPRA and the Protection of Cultural Heritage in the U.S.

Finally, for me, one of the most important pieces of legislation in my research as an anthropologist and ethnohistorian is the 1990 ruling for the Native American Graves Protection and Repatriation Act (NAGPRA), which you can also read about in the CRM and Bioarchaeology chapters. The main purpose is this: When you know that what you have discovered is Indigenous, stop. Do not touch anything. Contact the local authorities, especially when there are ancestral remains, and protect the site. Our desires to do science do not matter. These are someone else's relatives, and under the law and under our code of ethics, we have no right to study them. If we cannot deal with this, we need to work in a museum with artifacts or to go to the hundreds of countries who are happy to have our help, such as Greece, Thailand, or Rwanda. It is not that forensic anthropologists cannot work with Native ancestral remains; it is simply that it is up to Native Nations to ask for our help. If they need trained forensic archaeologists to identify their ancestors, then we help. Non-Indigenous scientists do not get to decide what is appropriate and what is not.

This is a very difficult Act since it does not have mechanisms to punish those who break the laws. As with other federal laws, the strength of the Act is in its enforcement. This applies to museums, colleges and universities, and other public institutions. Another challenge is that this Act only applies to federally recognized Nations (any Native Nation who terminated in the 1950s or later would lose all rights under NAGPRA). Furthermore, NAGPRA only applies to materials found on public land and not private property. Inventories are maintained by all organizations who receive federal funding, including museums, colleges, and universities. Keep in mind, NAGPRA only applies to the United States; each nation has its own sets of regulations to protect their Indigenous ancestors and cultural materials.

Here is a brief overview of NAGPRA from the United States Bureau of Reclamation:

"The Native American Graves Protection and Repatriation Act of 1990 and the regulations (43 CFR Part 10) that allow for its implementation address the rights of lineal descendants, Indian tribes, and Native Hawaiian organizations (parties with standing) to Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony (cultural items). The statute requires Federal agencies and museums to provide information about Native American cultural items to parties with standing and, upon presentation of a valid claim, ensure the item(s) undergo disposition or repatriation

"NAGPRA requires that Reclamation complete a number of reports and submit them to tribes and the Department of the Interior through the [National NAGPRA Program](#). Reclamation submitted a single Reclamation Summary Report in 1993. All five regions within Reclamation submitted region specific inventories by the statutory deadline in 1995. Several inadvertent discoveries and intentional excavations of NAGPRA cultural items have occurred on Reclamation lands or because of its actions on tribal lands since 1990." ([Native American Graves Protection and Repatriation Act, Bureau of Reclamation](#))

It is important that archaeologists learn the four major categories of protection under this law so that when excavating, we pay special attention to the following: 1) We must protect graves with Native American ancestral remains (in some cases, this might mean the respectful removal of the ancestors to another location); 2) We consider the grave goods (materials buried with the dead) to be sacred and to be protected as well; 3) We must protect items of cultural patrimony (objects that belong to a culture and are specific to them such as pottery or worked obsidian); and finally 4) We must ensure that sacred sites are protected, like the ground surrounding the burials, which we would refer to as cemeteries when they are grouped. The idea is to protect the materials still in the ground, and by law, repatriate (return) any of the items that have already been excavated. Here is a link to the law from the National Parks Services for NAGPRA: [National NAGPRA Program](#).

Despite the best intentions of the legislators who enacted NAGPRA in 1990, there are some serious restrictions. For example, if the land or the stakeholders who have possession of the ancestral remains are privately owned and not under federal jurisdiction, there is no protection under NAGPRA. If the Native Nation is not federally recognized, or the materials are in Canada, Mexico, or overseas, NAGPRA cannot directly protect the remains or objects. We would need to rely on other laws, local or international, to help preserve the materials for repatriation.

Since NAGPRA was enacted in 1990, archaeologists have been incredibly careful in their excavations and research to avoid disturbing Native sites. That is why partnerships such as with CalTrans and CalFire are so important, because once those maps are created to indicate sacred and other important spaces, those maps can be shared with archaeologists and construction firms. A combination of working closely with tribal councils and an increased number of Native archaeologists has reduced the damage we have done to Indigenous cultural and ancestral remains.

Each Native Nation creates a taskforce or working group where all members are trained in the details of NAGPRA as well as local laws in addition to their tribal laws. The goal is to create a handbook that lists exactly what steps need to happen when someone calls to alert the task force that something might have been discovered. Some of these groups also train site monitors to work at construction or archaeological sites, so that a team member already knows the proper procedures to follow. Failure to follow the law can end up with a construction firm losing their license or an archaeological team to be censured. This is a small enough community that word gets out quickly when someone is unethical.

How do museums, colleges, and universities repatriate what is already in their possession? Much like the Native Nations, each college and university with a museum or other type of collection must also be aware of the rules of NAGPRA and the consequences for not following the letter and the spirit of the law. One of the biggest challenges for repatriating the ancestral remains or the sacred objects is a lack of paperwork. When there is a donation or addition to a museum, the intake paperwork is supposed to include all the significant information. For anything Native, that should include the name of the Native Nation and the exact location of the original find. When archaeologists retire from a college or university, if they do not leave a copy of their fieldwork notes behind, there may be no way for their colleagues to know the details. When we find handwritten notes that say, “Northern Alaska” or “Plains,” then this information is too broad to allow us to initiate a consultation with the correct Nation. However, we at least have a clue of where to begin. Remember that the Department of the Interior maintains the national NAGPRA database online.

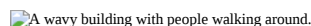
A wavy building with people walking around.

Figure 5 – The National Museum of the American Indian in Washington D.C. (“National Museum of the American Indian” by Thomson200 is licensed under CC0 1.0.)

Since the Smithsonian is a collection of museums, how have Native Nations worked with the anthropologists to repatriate materials respectfully? The best way to focus on the Smithsonian is to emphasize the collections of the National Museum of the American Indian (NMAI) which opened in Washington, D.C., on the Capitol Mall in 2004 (Figure 5). It helps both Native Nations and anthropologists that the board of directors includes Native leaders from across the continent who know NAGPRA and other related legislation. The NMAI exists in three separate locations (New York, Maryland, and Washington, D.C.), but only the Maryland facility housed ancestral remains. Before the D.C. location opened to the public, the Smithsonian held a series of consultations with tribal leaders who were invited to look at their portion of the collection. The goal was two-fold: to make sure that everything was legal under NAGPRA, as well as to ensure objects with special cultural limitations were housed properly (objects that could be seen by men only, women only, initiated members only, etc.) To learn more about the Smithsonian and NAGPRA consultation, see [National Museum of the American Indian: Cultural Resources Center](#) (National Museum of the American Indian, n.d.). You can also learn more about the repatriation process at [National Museum of the American Indian: Repatriation](#) (National Museum of the American Indian, n.d.).

Protecting Ancestors Outside the United States

What are the laws in places like Australia that might parallel NAGPRA? The remains found in Kow Swamp give us an indication of how Australian archaeologists treated ancestral remains in the past compared to the repatriation process that recently occurred. It

is important for us to remember that much like Indigenous Nations in the United States, there are hundreds of Australian Aboriginal Nations who are the descendant communities from a specific area. There are not always clear delineations of territorial lines, especially for Nations who moved seasonally such as the Tasmanian Aboriginal Nations of Australia. To help you understand the enormity of Aboriginal land, here is a map created by the Australian Institute of Aboriginal and Torres Strait Islander Studies: [Map of Indigenous Australia](#). Each descent community knows their own funeral rites through personal experience, but what about ancestral remains from tens of thousands of years ago?

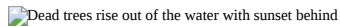
 Dead trees rise out of the water with sunset behind

Figure 6 – Kow Swamp, Australia (“Kow Swamp” by [Indigo Skies Photography](#) is licensed under [CC BY-NC-ND 2.0](#).)

Kow Swamp, located in southeastern Australia, became archaeologically significant in 1974 with the discovery of an ancestor known now as Mungo Man. Immediately people wanted to know how long ago he lived, and while that information is never exactly precise, archaeologists discovered he is tens of thousands of years old. There is no consensus, however, whether he lived 40kya or 60kya, due to differences in chronometric dating results. He matters to archaeology, because to date, he is the oldest human from Australia. To Indigenous Nations of Australia, he is significant because he is an ancestor to his people. Like many other important discoveries, this find was unexpected and welcomed by the scientific community. It makes sense, of course, to search near freshwater areas since that would be an important resource for survival. To find someone so old and so intact is largely due to the way his people buried him, protecting his remains for millennia.

He was not the first individual found in that area. Archaeologists discovered the cremains (cremated remains) of Mungo Lady in the late 1960s, but for some reason, her repatriation took place in 1991 while scientists waited to return Mungo Man to the closest descendant population in 2017. You can learn more about their discovery and, more importantly, their repatriation in the British Broadcasting Company’s article [Mungo Man: Australia’s Oldest Remains Taken to Ancestral Home](#) (2017).

What about identifying and repatriating the recent war dead in places like the Philippines during WW2 or Rwanda during its Civil War? The Japanese military maintained a Prisoner of War (POW) camp in Cabanatuan Prison Camp on the main island of Luzon. While there are maps of the camps and the surroundings, there are still prisoners who have not yet been identified after all these decades. You can learn more about the prison camp in [Challenges to Identifications of the Cabanatuan Prison Camp Cemetery Remains](#) (Megyesi 2018).

Rather than outsiders, Rwanda turned on its own people in the Civil War from 1990 to 1994, when the Hutu and the Tutsi killed each other in a horrible genocide where there were more similarities among the peoples than differences. As in the Philippines during WW2, Rwanda had to deal with admixture (when multiple human remains are mixed), which led to challenges in repatriating the dead. What do we do about mass graves (places where multiple sets of remains have been buried or covered) and what we find there? The approach to removing the dead in Rwanda needed to be systematically scientific since prosecutors needed all the possible pieces of evidence to bring charges against the perpetrators from the 1994 Civil War. Then the victims might be able to be returned to their families based on personal effects and DNA if anyone alive was left in the country to receive their remains. To learn more about the history of the Rwandan genocide (WARNING: this link includes some photographs of the ancestral skeletons as well as some ancestors wrapped in shrouds), go to the British Broadcasting Corporation’s website: [Rwanda Genocide: 100 days of slaughter](#) (2019).

In places like the Philippines where thousands died on battlefields, historians know exactly who began battles, so the point is to return remains to families where possible. Typhoons and earthquakes can accidentally unearth those who died and were buried on the battlefields. In those cases, we may not find entire skeletons or enough of the skeleton to return them to their closest relatives. In places like the Philippines, Malaysia, Papua New Guinea, and Vietnam, the combination of tropical storms, jungle settings for warfare, and decades since the time of burial combine to destroy many of the skeletons long before recovery is possible. To learn about recovering the war dead, here is a link from the University of Queensland (Australia) that offers case studies about the specific challenges of retrieving these bodies: [Body of Evidence](#) (2017).

Archaeology is not an easy science. No science guarantees outcomes, and many times we end up with more questions than answers. I like to think of archaeology as a jigsaw puzzle where there is no reference picture, no known number of pieces, and no way of knowing if you have completed the challenge. However, it is an amazing holistic (interconnected) field with opportunities

for people who are also interested in: linguistics, ethnomusicology, ethnobotany, archaeoastronomy, architecture, art, food, healing...pretty much every major you can think of is related, somehow originally, to archaeology. That is why it is so important for us to act ethically at all stages of our archaeological work, from making connections with descent communities before we begin projects (and maintaining those relationships throughout the work) to publishing thoughtful, accurate information that can impact generations to come.

Discussion Questions

1. What are the three principles of archaeological ethics that are focused on in this chapter, and why are they important?
2. What are some of the major threats to archaeological sites and cultural heritage discussed in this chapter? Can you think of any other examples?
3. What are some of the U.S. and international legal protections and ethical standards that affect cultural heritage worldwide?
4. How do scientific versus humanistic (or processual vs post-processual) approaches to archaeology affect how cultural heritage is presented and/or understood?
5. How have archaeologists, museums, and tourist destinations approached the display and collection of human remains? What do you think is the most ethical approach?

About the Author

 Woman with glasses and a purple scarf.

Kristina Casper-Denman teaches Anthropology at American River College in Sacramento. Her career began in primatology with fieldwork in Costa Rica and chimpanzee sanctuary work and continued in Native American Studies with an emphasis on educational sovereignty. While she was involved with Neanderthal fieldwork in southeastern Spain, her primary archaeology emphasis has been with repatriation of NAGPRA collections in Arizona and California. Her life goal is to visit as many natural history and archaeology museums as possible, especially if someone else will fund those trips.

Further Exploration

41 Tehama Street, San Francisco, by Suzanne Stewart and other contributors: <http://asc.sonoma.edu/projects/41-tehama-street-san-francisco>

After the Fires: Mesa Verde National Park, by Maryann Gaug: https://cyberwest.com/mesa_verde_fires/

The Archaeological Survey of Wetherill Mesa: A Prologue to the Project, by Douglas Osborne: <http://npshistory.com/series/archeology/7a/prologue1.htm>

Archaeologists Discover Evidence of Prehistoric Gold Trade Route, University of Southampton: <https://phys.org/news/2015-06-archaeologists-evidence-prehistoric-gold-route.html>

Archaeology's Interactive Dig: Pompeii Maps: <https://interactive.archaeology.org/pompeii/maps.html>

Archaeology's Interactive Dig: Pompeii Tour: <https://interactive.archaeology.org/pompeii/tour.html>

Body of Evidence: <https://shorthand.uq.edu.au/contact-magazine/summer-2017/body-of-evidence/>

CalFire: Suggestions for Preparing Archaeological Site Records and Site Maps: <https://www.fire.ca.gov/programs/resource-management/resource-protection-improvement/environmental-protection-program/cultural-resources-management-program/suggestions-for-preparing-archaeological-site-records-and-site-maps/>

CalTrans: Environmental Analysis: <https://dot.ca.gov/programs/environmental-analysis>

Challenges to Identifications of the Cabanatuan Prison Camp Cemetery Remains, by Mary Megyesi: <http://journals.upress.ufl.edu/fa/article/view/834/1016>

Fire Management, from Bush Heritage, Australia: <https://www.bushheritage.org.au/what...anagement/fire>

Hiking Mesa Verde: <https://www.nps.gov/meve/planyourvisit/hiking.htm>

How John Muir's Brand of Conservation Led to the Decline of Yosemite, by Eric Michael Johnson: <https://blogs.scientificamerican.com/primate-diaries/how-john-muir-s-brand-of-conservation-led-to-the-decline-of-yosemite/>

Important Events in the Development and Preservation of Mesa Verde National Park: <https://www.nps.gov/meve/learn/historyculture/stories.htm>

“Inca Child Sacrifice Victims Were Drugged,” by Brian Handwerk: <https://www.nationalgeographic.com/culture/article/130729-inca-mummy-maiden-sacrifice-coca-alcohol-drug-mountain-andes-children>

“Incan Child Mummies Show Evidence of Sacrificial Rituals,” by Erika Check Hayden: <https://www.nature.com/articles/nature.2013.13461>

Indigenous Fire Management and Traditional Knowledge: <https://www.ictinc.ca/blog/indigenous-fire-management-and-traditional-knowledge>

Kingship and Sacrifice, National Museum of Ireland: <https://www.museum.ie/en-IE/Museums/Archaeology/Exhibitions/Kingship-and-Sacrifice>

Lighting Cultural Fires, by Mary Ellen Hannibal: <https://boomcalifornia.org/2014/09/24/lighting-cultural-fires/>

Map of Indigenous Australia: <https://aiatsis.gov.au/explore/map-indigenous-australia>

Mungo Man: Australia’s Oldest Remains Taken to Ancestral Home: <https://www.bbc.com/news/world-australia-42020675>

National NAGPRA Program: <https://www.nps.gov/orgs/1335/index.htm>

National Museum of the American Indian: Cultural Resource Center: <https://americanindian.si.edu/explore/collections/crc>

National Museum of the American Indian: Repatriation: <https://americanindian.si.edu/explore/repatriation>

Native American Grave Protection and Repatriation Act, Bureau of Reclamation: <https://www.usbr.gov/nagpra/>

Oldest Evidence of Patterned Silk Loom Found in China, by Bruce Bower: <https://www.sciencenews.org/article/oldest-evidence-patterned-silk-loom-found-china>

Principles of Archaeological Ethics, Society for American Archaeology: https://documents.saa.org/container/docs/default-source/doc-careerpractice/saa_ethics.pdf?sfvrsn=75f1b83b_4

A Qualitative History of “Cultural Resource” Management, by Adam Giacinto: <http://www.anthropologiesproject.org/2011/05/qualitative-history-of-cultural.html>

Rwanda Genocide: 100 Days of Slaughter: <https://www.bbc.com/news/world-africa-26875506>

Traditional Cultural Places and Indian Sacred Sites, from the U.S. Bureau for Land Management: <https://www.ntc.blm.gov/krc/uploads/646/GuidetoTCPs&SacredSites.pdf>

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1.7: Cultural Resource Management and Archaeology- Conserving Heritage

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Learning Objectives

- Define cultural resource management and explain its role in archaeology
- Describe major pieces of historic preservation legislation and their importance
- Analyze implementation of cultural resource management (CRM)
- Determine how to treat a site that is eligible for the National Register of Historic Places
- Discuss specific career paths in cultural resource management (CRM)

Historic preservation laws and regulations, especially since the passage of the National Historic Preservation Act in 1966, have contributed to the expansion of archaeology and its role in public discourse on the past. Through a case study, readers will learn both about the laws and how they are implemented, through a case study. The conditions that drive the archaeological review process are easily understood as is the three-phase approach typical of most archaeological projects. Career prospects, discussed at the end of the chapter, may surprise those who are unacquainted with the field.

Introduction

For those close to me—grandparents and parents, aunts and uncles, siblings and cousins—family history has been an oral tradition, shared among ourselves at gatherings and with partners and close friends. Mine is a small family—barely two dozen living persons whom I consider family and with whom I share an intimate history. There are scattered family photographs in our homes, but photograph albums seldom are produced anymore and home movies are rarely viewed. We have little need for objects to remind us of who we are and what we share. Like many families, when we want to recognize and celebrate our common experience, we do so through food and drink: the tray of manicotti, irregularly broken bits of homemade Scottish shortbread, and mason jars of high-octane homemade eggnog (stiffly beaten egg whites, whole milk and cream, lots of rum and rye, very little sugar, and a hint of freshly microplaned nutmeg).

Writers, pundits, and film-makers often refer to communities—neighborhoods, parishes and counties; states and provinces; nations; and the whole of humanity—as families, but they do so metaphorically. Our larger social allegiances lack the intimacy of natal clutches and the breadth of experience is far wider than even a large extended family could ever embrace. The larger and more complex a network of social relations becomes, the more varied the range of experiences of its members are, and the greater the need to find a means of expressing connections that are not limited by direct interaction. Never has our need been greater to establish the precedents for those connections: the need to establish and reflect upon a common past, a history.

Consider the mosques of Timbuktu, Mali, of the 15th and 16th centuries CE (Common Era); the city of Chan Chan in Peru in the 15th century; and the Nan Madol ceremonial center of eastern Micronesia in the 13th through 16th centuries. The communities of those places created those monuments in part as expressions of solidarity and to distinguish themselves from other communities. Today, heritage professionals hope that as World Heritage Sites, these and other sites will foster universal identity, enabling us to recognize our common humanity and “family” ties. There is an unbounded—I’m tempted to say infinite—number of sites around the world that may not rise to the level of global importance but still function as important reminders of shared pasts at the local, regional, and national levels. They also are sources from which archaeologists extract data that can be used to explore the human past and achieve understandings of who we are and how we became the peoples we are at present. Archaeologists hope that sharing those insights will foster better citizenship and better decision-making informed by science at every level of society, from the remote village to the village of nations. Archaeology is a science, but it has its share of romance: the chance to hold something made centuries earlier that has been lying unperceived in the earth ever since; to gain novel insight into practices and events that have not yet been documented, much less understood; to find in the past the same passions, fears, and optimism we all share today. However, illuminating and identifying common heritage are at the core of cultural resource management. Let’s begin with a couple of definitions.

Definitions

Cultural resources are material manifestations of a people, past or present, that can be investigated and interpreted in the service of a society, regardless of whether or not a historical link exists between the societies that produced those material manifestations

and the society that studies them. The National Park Service of the US Department of the Interior (1997) identifies types of cultural resources. Here are some examples:

1. **Landscapes** such as Little Big Horn Battlefield, where researchers can evaluate competing contemporary explanations (those of Native Americans and the US Army) of what occurred in June 1876 and visitors to the National Historic Monument can experience the setting of this important historical event and reflect on the nation's troubled past and present in the relations between the peoples and governments of the United States and nations of Native Americans. Another example is Devil's Tower in Wyoming. It was the first place designated as a National Monument under the American Antiquities Act of 1906 for its natural beauty, but it also is a landscape that is important to a number of Native American groups, a **Traditional Cultural Property** (TCP) (TCP) in the language of the law. It isn't an artifact (an object created by people), and it isn't a feature (an artifact such as a hearth or cellar hole that cannot be collected because it is part of the landscape). It is a place that is significant to the cultural practices and belief systems of one or more groups of people, in this case the Arapaho, Cheyenne, Lakota, Crow, and Shoshone.^[1] TCPs are not necessarily landscapes, and they are not exclusively Native American sites.
2. **Structures** such as the Brooklyn Bridge, which links Manhattan with Brooklyn. The bridge is a monument to the following things: the nation's technological prowess; contributions of immigrants to the national culture and economy (the engineer and promoter for the project, John A. Roebling, was a German immigrant); and the emergence of a national culture made possible by developments in the nation's infrastructure. The Brooklyn Bridge is a National Historic Landmark, a Historic Civil Engineering Landmark, and a New York City Landmark, all legal designations that provide protection and eligibility for certain kinds of funding. The bridge continues to accrue significance as a landmark feature in plays, movies, novels, and the arts.
3. **Buildings** such as the cathedral of Notre-Dame de Paris, France (14th century CE), and George Washington's home at Mount Vernon, Virginia (18th century CE), which provide insights into ideas (ecclesiastical and political) and values (about aesthetics, spirituality, and democracy) that resonate into the present.
4. **Sites** such as the 1620 village of Plymouth, Massachusetts, which long has been investigated archaeologically and interpreted through the nonprofit organization Plimoth Plantation. Another example is an obscure aboriginal site in the uplands of Charles County, Maryland, that dates back some 4,000 years and is known only to a handful of archaeologists but not necessarily to the descendants of its Indigenous occupants. There are also multicomponent sites, such as the prehistoric Nassawango Site in Worcester County, Maryland, which spans from the Paleoindian period through the Late Woodland period. Consider also a several-block area of downtown Tucson, Arizona, that constituted a "Chinatown" in the late 19th and early 20th centuries but which now survives only in archaeological collections, field notes, and reports. And the copper-mining sites in the mountains south of Tucson consisting of the remains of tent platforms, children's shoes, and enormous numbers of tin cans left by mining families who emigrated from Europe, Asia, and elsewhere in the Americas in the first half of the 20th century.
5. **Artifacts** are individual objects created and used by people, including documents, such as the United States Declaration of Independence or the Navajo (Diné) Treaty of 1868, that provide emotional touchstones with historically meaningful pasts, even if relatively few people have seen these documents in person or touched them. Other artifacts such as the waste flakes produced in making a stone tool or discarded pottery sherds offer less definite links with specific past events and derive their importance through their relationships with other artifacts and the remains of houses, shops, mines, temples, and the like that once were parts of living, vibrant cultures.

Cultural resource management (CRM) is the *process* by which historically significant landscapes, structures, buildings, sites, and artifacts are identified, assessed, and cared for to ensure their continued existence for scientific research and personal edification, reflection, and enjoyment. CRM practitioners in the United States often refer to the preservation of these tangibles, but conservation may be a preferable term because it suggests wise use instead of emphasizing the arrest of decay. These two words are best seen as points on a continuum. The choice of one word over the other can have significant policy and practice implications, but both terms imply that these manifestations of past cultures are also meaningful parts of living cultures.

For the purposes of this chapter, let's focus on archaeological **sites** and standing structures. **Artifacts** such as stone knives, pottery, and the debris around a blacksmith's forge are essential elements of an archaeological site, but typically they are not considered significant in isolation; they are seen only as parts of a site that includes other artifacts and features. Dwellings and bridges could be considered as assemblages of individual artifacts and even as landscape features, but historic preservationists typically assign them to the class of buildings and structures. Of course, all of these terms are heuristics (tools that foster communication and decision-making), but the distinctions are not rigid. They are categories that we, as humans, impose on our surroundings.

Cultural Resource Management: The Process

Imagine a meeting held in one of those windowless conference rooms off the main hallway in a busy government office building for the purpose of deciding whether a group must obtain a permit to have archaeological work conducted at a site they are responsible for. Representatives from one or more government agencies are in attendance, as are the permit applicants, their attorney, and their archaeologist. Much of the discussion deals with the specifics of a proposed project and how it might have an adverse effect on (we can translate that as damage to) an archaeological site. The words or phrases each of the parties use at the meeting betray their different interests: the agency archaeologist and other government representatives refer to “the resource,” the commercial archaeologist working for the permit applicant talks about “the site,” and the permit applicants may refer to the “damned #@%\$^&!”—the feature or structure or resource on their property that will cost them time and money, either because they will have to design around it or pay the costs of salvaging a cultural resource before their proposed project can continue. The attorney, depending on their temperament and experience with such matters, will be concerned less with the linguistics and more with the agency’s legal justification for requiring consideration of the project’s effect on the physical manifestation of a past society and how the applicants can best navigate the process with as little expense of time and money as can be negotiated.

The terms each of meeting participants use do not indicate mutually exclusive interests: the commercial archaeologist must look to the needs of both the clients and the representatives of the government agencies plus any particular research interests he or she may have in the site. The agency representatives must comply with one or more law, regulation, policy, or protocol to fulfill their role of protecting resources, but they are not immune to the allure of a rich, new avenue for exploring the past. For that matter, neither are many permit applicants and their attorneys. And for all parties, some features or structures or cultural resources can be perceived as very inconvenient because they just aren’t that interesting or appealing. But everyone must adhere to the laws that regulate the process of determining their meaningfulness in order to ensure transparency, fairness, and due respect to the needs of our present society and those of future generations. (Anticipating the diverse and competing needs and interests of the present offers challenges enough for practitioners today; trying to predict those of an undefined future seems hopelessly difficult. We’ll focus on the present.) And all parties must consider others who aren’t necessarily part of these discussions but who will make their concerns known during public hearings.



Figure 1. A petroglyph (18AN1395) that is regarded locally as evidence of a “bush church” organized in the 19th or early 20th centuries by the African American residents of Solley in Anne Arundel County, Maryland. Photo courtesy of the author.

A parcel surveyed by an archaeologist may yield no artifacts or other evidence of past use apart from, say, farming or lumbering. But it may have meaningful associations for a Native American group who traditionally used a portion of the land for individual reflection or group purification rituals. Enslaved ancestors of an African American community may have congregated for religious services around a small boulder on the property before emancipation—a “bush church” (Figure 1). Determining what is historically significant is a complex process that goes well beyond small meetings in conference rooms. It involves such questions as: Historically significant to whom? Who has consultation rights? How do we determine if and when one party’s interests carry greater weight in decision-making? There may be no final answers to these and other historic preservation questions. Perhaps there shouldn’t be, as the act of asking them illuminates who we are and who we want to be.

Let’s leave this meeting and philosophizing for the moment and, through flashback, recount the general and specific events that led to both the meeting and the archaeological philosophies that shaped it.

Historic Preservation Legislation

In the United States, private property is one of the cornerstones of our society, protected by the US Constitution. No government entity can seize private property without compensation based on a market evaluation of the property and what might be lost by such a seizure. (To be accurate, “rights in land” refers to acquisitions made after the ratification of the US Constitution. The National Museum of the American Indian has a large collection of treaties in which the US government, created by that Constitution, failed to honor Native American claims to the lands that now make up the United States.) Numerous judicial rulings, however, have established that different levels of government—local, state, and federal—can impose restrictions on the use of property. Zoning regulations, for example, bar the construction of skyscrapers and pig farms in the midst of most suburban subdivisions in order to protect the interests of neighboring property owners and to better manage public interests in transportation, sanitation, and other matters. Without denying new generations of law students the prospect of overturning legal precedent or ambitious politicians the dream of repealing legislation in order to create an unencumbered right to do what one wishes with one’s property, let’s accept that historic preservation legislation is firmly based in accepted law and precedent. Let’s further assume that in any given situation, the agencies charged with applying the law do so in good faith and in full knowledge of what the law allows and what it does not.

General laws protecting the historic and scientific values of resources date to the **Antiquities Act** of 1906 (Public Law 59–209, 34 Statute 225, 54 U.S.C. §§ 320301 – 320303; you can also find the text at the National Park Service website at <https://www.nps.gov/subjects/archeology/antiquities-act.htm>), which President Theodore Roosevelt signed into law. It is designed to protect historic sites on federal lands from vandalism and theft. The law allows a US president to designate federal lands and resources as historic landmarks without congressional approval. Subsequent federal laws directly addressed archaeology on federal lands (e.g., the Historic Sites Act of 1935 and the Reservoir Salvage Act of 1960) or as one of many considerations in federal undertakings (e.g., the Federal Highway Act of 1966 and the National Environmental Policy Act of 1970). All of these, of course, refer to federal actions, to undertakings that require federal lands, permits, or funds. The landmark federal law, however, is the **National Historic Preservation Act** of 1966, which has been amended over the years (you can find the text at the National Park Service website at <https://www.nps.gov/subjects/archeology/national-historic-preservation-act.htm>). Passed in the face of a rapidly expanding American economy and rapidly expanding population and infrastructure and in the time of massive urban renewal projects, this law recognized how valuable the past is for the present. Thomas Jefferson once observed that history helps make good citizens, and this law established the national government as a leader in historic preservation.

The National Historic Preservation Act (NHPA) established State Historic Preservation Offices (SHPOs) and Tribal Historic Preservation Offices (THPOs). Federal agencies coordinate historic preservation efforts through these offices, and they are the places where people in states can consult with government officials to express their needs regarding federal undertakings. The NHPA requires federal agencies to ascertain the potential effects of projects on historically significant cultural resources. For example, will the use of federal highway funds, the expansion of a National Park Service parking lot, or the issuance of a wetlands permit by the US Army Corps of Engineers destroy a significant building or landscape, or destroy archaeological sites? Buildings and landscapes are relatively easy to deal with because they usually are readily visible, although intensive research may be necessary to understand their historical significance. Most archaeological sites, however, lie below the surface of the ground and cannot be found without systematic survey. Buildings and landscapes also tend to accrue their own constituencies—individuals and groups committed to recording data about them and protecting them. Because most archaeological sites are hidden from view, they are less likely to have advocates outside the field of archaeology. We can easily see the demolition of a building or a landscape. But without archaeological surveys, sites could remain unidentified and be lost to construction and natural disasters without us even knowing of their existence, much less understanding what we have lost by their destruction. The NHPA assures us that although we cannot save all archaeological sites, at least we will know what we are losing to federal undertakings because the NHPA requires federal agencies to inventory and assess the value of archaeological sites that may be adversely affected.

Another law with nearly as great an influence as the NHPA is the **Native American Graves Protection and Repatriation Act** (NAGPRA) of 1990 (you can also find the text at the National Park Service website at <https://www.nps.gov/subjects/nagpra/index.htm>). NAGPRA was created largely in response to the accumulating grievances of Native Americans over the exhumation of ancestors and funerary objects and other objects significant to Native American and Native Hawaiian groups. It imposes conditions on the removal and treatment of human remains and associated objects from Native American and federal lands and human remains and associated objects held in institutions (largely museums and universities) that are receiving or have received federal funds. In many cases, institutions have been required to inventory such materials in their collections, inform lineal descendants of the peoples those materials represent, and return those materials to the appropriate peoples. Upon their return, materials may be reburied, curated, or managed in other ways as members of the descendant community see fit. NAGPRA has had a significant effect not just on the practice of archaeology but on the ways archaeologists see themselves

and their work vis-à-vis descendant communities of Indigenous groups, African American rural communities, residents of Hispanic barrios, and residents of mining towns of largely second- and third-generation European immigrants. NAGPRA has fostered a sense among scientists that those outside the scientific community may also have a claim on the landscapes, structures, buildings, sites, and artifacts of their predecessors. This understanding of the role of scientists was not well developed before the act was passed. Indeed, the NHPA gives individuals and groups that might not otherwise have standing under general law status as consulting parties to proposed federal undertakings, which means that they have ready access to project-related documents and meetings and can voice their concerns and have those concerns become part of the public record.

To be clear, these and other federal laws apply only to federal undertakings (actions involving federal lands, permits, or funds) and it is the responsibility of federal agencies to comply with the terms of the NHPA. As the drafters of that law anticipated, however, some US municipalities and states have taken their lead from the NHPA and have codified many of the principles and practices established in the NHPA, using two of the more important provisions of the act as historic preservation tools: the standards and guidelines issued and periodically revised by the secretary of the Department of the Interior ([US Department of the Interior, National Park Service 1983](#)); and the National Register of Historic Places, often referred to simply as “the Register” (US Department of the Interior, National Park Service 1997). The former provide clear guidance on who is qualified to undertake investigations required by the NHPA and the manner in which that work should be done and reported. The National Register establishes guidelines for determining the historical significance of a cultural resource, whether it is eligible for listing on the Register, and—most important from an operational perspective—the criteria for determining significance. The National Register Bulletin titled “How to apply the National Register criteria for evaluation,” outlined these four criteria:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- 1. that are associated with events that have made a significant contribution to the broad patterns of our history; or*
- 2. that are associated with the lives of significant persons in our past; or*
- 3. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity the components of which may lack individual distinction; or*

D. that have yielded, or may be likely to yield, information important in history or prehistory. ([US Department of the Interior, National Park Service, 1997](#), p. 2)

In practice, Criterion D has been critical in assessing the historical significance of archaeological sites. However, all four criteria should be addressed in any evaluation of a building, landscape, or site for listing on the National Register.

Other criteria stipulate the conditions under which a resource would not be eligible for listing on the Register. Municipal and state agencies devise their own standards and guidelines and, in some cases, their own assessments of what is historically significant and what is not. Criterion D is particularly accommodating in this regard: whether a site has “information important in history or prehistory” depends on the scale at which the site is evaluated. For example, the site of an 1860s rural cheese factory may hold significant information on the history (social, economic, and environmental) of New York State but remain of relatively little significance to national history. The cheese factory may be eligible for special recognition and protections at the local level as long as those protections do not interfere with project approval at the federal level.

As a practicing commercial archaeologist (a professional archaeologist operating as a business that supplies consulting services to permit applicants), I help clients comply with federal, state, or local historic preservation laws, particularly the state of Maryland’s version of Section 106 of the NHPA and the subdivision regulations that require archaeological review in Anne Arundel, Charles, and Prince George’s Counties in Maryland as well as preservation regulations in adjacent states. And that brings us back to how all of this actually works.^[2]

Implementation

At the meeting in the government office I mentioned above, the participants were discussing an archaeological site. But what site? What kind of site? How did we learn about it? Before we can discuss the fate of this site, we need to learn how we got to the point where it became a subject of discussion. A case study—the Mill Branch Crossing project—that involves three levels of government suits our needs.

In 2006, Gibraltar Real Estate & Development proposed the construction of a shopping plaza on a 90-acre parcel in Prince George's County, Maryland, 10 miles or so east of Washington, DC. The project required permits from the US Army Corps of Engineers, and the issuance of those permits were subject to the terms of the NHPA. As a consulting party under the NHPA and the lead historic preservation agency in any state undertaking, Maryland's State Historic Preservation Office became part of the process. In addition, the year before, Prince George's County had enacted its own subdivision regulations that required archaeological review. Under the NHPA, the Army Corps of Engineers was required to comply with the law, not the applicant. However, the onus for actually complying with the NHPA fell upon the applicant in this case because the county regulation places responsibility for compliance on the applicant. Gibraltar Real Estate & Development commissioned Applied Archaeology and History Associates, Inc. (AAHA), which exceeds the qualifications required under the guidelines of the secretary of the interior, to conduct a Phase I archaeological site identification survey.

AAHA conducted the Phase I surface reconnaissance of the entire parcel, noting the locations and types of artifacts visible on the plowed surface. Because the fields had been plowed, a shovel test survey was not appropriate for this site. In a shovel test survey, archaeologists excavate holes about 16 inches in diameter and a foot or more in depth, then screen the soil for artifacts, describe the soils, and fill the holes back up. Shovel tests are arrayed on a 50-foot orthogonal grid. At Mill Branch, however, shovel testing was limited to four archaeological sites identified through surface reconnaissance. In this particular case, shovel testing was used largely to collect information on the depths and soils of the site.

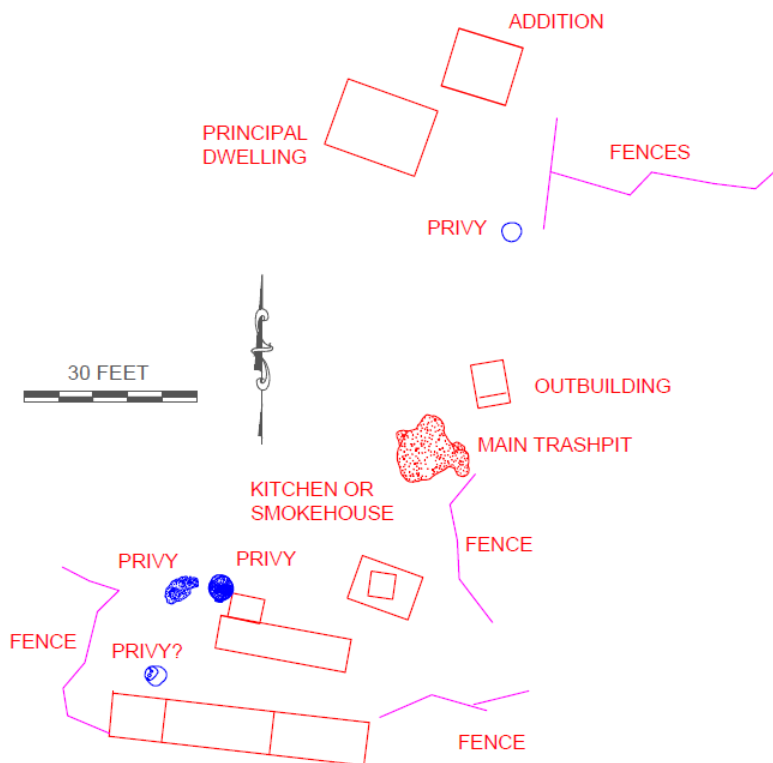


Figure 2. Schematic map of William and Mary Goe's plantation house lot, occupied ca. 1720 to 1780. Diagram courtesy of the author.

Of the four sites identified, one was a mid-20th-century ranch house (labeled 18PR858 using the Smithsonian trinomial system, wherein 18 represents Maryland as the eighteenth state in alphabetical order, PR represents Prince George's County, and 858 represents the next consecutive registration number assigned by the state to the site for the county). By consensus among the parties who eventually attended that meeting in the government office building, 18PR858 did not meet the National Register criteria for

listing and warranted no further attention. Site 18PR859, which was initially characterized as a gristmill or sawmill site, proved to be a relatively recent flood control or flood monitoring device that did not meet criteria for historical significance. Site 18PR856 is a small scatter of ceramic sherds and vessel-glass sherds and brick fragments that could be of 18th-century vintage but appeared to lack information potential, perhaps because the site was lost to plowing and erosion. Considered in isolation, 18PR856 did not meet criteria for listing on the Register. Site 18PR857 yielded a large number of 18th-century ceramics, vessel-glass sherds, and handmade brick indicative of an intact 18th-century dwelling site, likely part of a plantation. Archival research failed to definitively identify the family who lived there, but the site clearly predated the American Revolutionary War. Initial surface finds and the results of shovel testing, suggested that 18PR857 would meet National Register criteria, and the Phase I report included a recommendation for additional investigation.

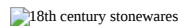
 18th century stonewares

Figure 3 – Examples of the kinds of ceramic vessels recovered from William and Mary Goe’s plantation house, including a British Brown stoneware mug (Vessel 73), a Westerwald stoneware mug (V44), a British Brown stoneware demijohn rim and neck (V62), a Nottingham stoneware vessel (V17), and a British Brown stoneware bottle or jug (V55). Photo courtesy of the author.

The permit applicant commissioned AAHA to conduct a **Phase II** site examination of 18PR857 to assess the size, depth, and integrity of archaeological deposits and the date of occupation. The AAHA team excavated 19 square units, each one meter (approximately three feet) on a side, in the portions of the site that had concentrations of artifacts. The Phase II study confirmed the dates of occupation (all were in the 18th century) and demonstrated that subsurface features survived intact. Several square units exposed the tops of postholes, trash-filled pits, and a possible masonry foundation, all of which are potentially rich sources of information that could answer research questions about the colonial period in this part of Maryland and in the greater Chesapeake Bay region. The Phase II consultants recommended eligibility for listing on the National Register of Historic Places under Criterion D, asserting that 18PR857 could yield important information on how planters in the uplands of coastal Maryland organized their house sites, implemented strategies of food and commodity production, and altered the local ecosystem through intensive cultivation and animal husbandry. The true value of the information would come from comparing the analysis of this site to the results of data analyses conducted on contemporary sites in the region. That comparison would reveal both patterns of common practices and variations in practices that had ramifications throughout the subsequent history of the region.

Consensus on the importance of 18PR857, and particularly the fact that it met Criterion D (but not Criteria A or B [associated with historically significant events or persons] but possibly meeting Criterion C [design and/or construction techniques characteristic of the period]), brings us back to the meeting.

Determining Treatment for the National Register-Eligible Site 18PR857

What brought together the federal, state, and county agency representatives, the client, the client’s attorney, and archaeologists was the necessity of discussing one issue: What do we do with 18PR857? As de facto custodians of our common heritage, agency archaeologists tend to support the preservation of sites for investigation at a future time when questions about the past, methods for exploring the past, and tools for collecting data may be more sophisticated. The permit applicants wanted the site to be excavated to remove an encumbrance on their planned development, and their attorney supported their interests. As a commercial archaeologist, I had my own interests to consider, as well as those of both my clients and the archaeologists employed by government agencies. Excavating an entire site would be a large, lucrative contract for an archaeological agency, and AAHA’s findings indicated that the site would yield useful data for my own research into colonial-era subsistence practices in the Chesapeake region.

The negotiation was protracted and at times, contentious. Preserving a half-acre site in the middle of a shopping plaza posed expensive engineering and aesthetic design challenges and likely would reduce future profits on the development. In-situ (in place) preservation of the site would effectively remove it from scientific investigation. The lead government agencies had the legal power to authorize the investigation of the site at some future date, but only portions of the site. However, there were no protocols in place that specified the conditions and limits of such permission or even guidelines as to what constitutes “the future.” Insistence on in-situ preservation, in my opinion, also failed to consider another cultural resource: the funds that the permit applicants would provide for the research. Those funds would not be available if the site were preserved in place. But excavation, especially in this

context because the entire site would be excavated, would preclude future investigations by more capable investigators with superior questions, methods, and tools. And of course, scientific questions, methods, and tools develop during archaeological projects as new data and unforeseen circumstances arise during the course of the investigation. Preserving a site does not advance science, and preservation could result in a site remaining unexcavated, essentially eliminating it from research beyond the small amount of data collected during its initial identification and assessment.

Decisions about the fate of 18PR857 did not occur solely within a social vacuum. Public meetings of the county's Historic Preservation Commission and Planning Board were held. These quasi-governmental entities consist of appointed community members, usually people with some connection to urban planning, environmental conservation, historic preservation, history, archaeology, or architectural history. The meetings are staffed by county employees, including an attorney and the county's historic preservation staff, which includes an archaeologist. Anybody has the right to speak at these meetings and there are procedures and rules for doing so. There was a great deal of public comment on this project, some of it quite animated. The concern was not about the archaeological site, the existence of which was unknown prior to its discovery by AAHA. The concern was about developing land on a farm that was adjacent to a zone in which the county had placed restrictions on development and was located along a highway that was already handling traffic loads exceeding capacity; developing the land would only increase the traffic load on that highway. Preserving the site was a means of stopping the proposed development, or at least scaling it down. As 18PR857 is not a Native American site, there was no basis for consultations with state-recognized Native American groups. (There are no federally recognized Native American tribes or nations in Maryland and, in any case, there is no clear federal process for consulting with Native American groups for most kinds of archaeological sites. It is only Native American burial sites that would necessitate consultation.)

Eventually, the parties reached a consensus: the applicants could commission a **Phase III** data recovery (also called impact mitigation) at 18PR857, approving a research design that I had prepared. The research design posed several nontrivial questions that could be addressed given the kinds of data already produced by the Phase I and II investigations. It also detailed the field, laboratory, and analytical methods that would be used to answer those questions. The work began in November 2019 and the fieldwork ended on June 1, 2020. Analyses and a draft report were completed in April 2021. The products include a detailed report; a large collection of objects, records, and data for use by future scholars; public and academic presentations; a projected book on colonial-era dietary practices and the ecological consequences of that diet; and, in a small way, this chapter.

The fieldwork by the crew revealed the remains of a dwelling, probably a log structure on a partial stone foundation with a brick chimney, that was occupied by a planter family: William Goe (a Scotsman), his wife Mary Boyd (the daughter of the John and Mary Boyd, who settled this parcel in the late 17th century), and their children (Figure 2). Thirty feet from the dwelling was a privy and another 50 feet to the south were two long, narrow buildings built on wooden posts set into the ground and two privies, one of which replaced the other over time. These buildings likely accommodated the people—free or enslaved, or perhaps both—who worked for the Goes. A large pit that appears to have been used by all to discard bones, broken vessels, and other trash occupied the middle ground between the dwellings of the planters and the workers. We also found remnants of fencelines that divided the houselot along north-south and west-east axes.

Documents and archaeologically recovered artifacts suggest that the Goes were a family of modest means. They occupied 100 acres of Mary's parents' land, a 650-acre tract that they called Amptill Grange. Other Boyd children occupied their shares of the estate with their spouses and their children. William and Mary Goe owned some tablewares, including decorated earthenwares and porcelains (Figure 3), but there was no evidence of large, matched sets and the crew did not recover any significant evidence of other household furnishings. The recovery of large numbers of nonhuman bone and carbonized plant materials (burning being the primary means by which plants survive archaeologically) revealed a diet that consisted largely of meats from domesticated species (cows, pigs, sheep, and some poultry), a number of hunted species (deer, rabbits, squirrels, mallards, and Canada geese), and locally caught catfish and white perch. Some oysters and nonlocal fish (rockfish and porgy) probably were procured through others, possibly by way of family-owned businesses in the nearby hamlet of Queen Anne. The comparison of food remains and architecture with those of other colonial-era sites in the region suggests that the Goes' diet was similar to those of other households, except for a greater reliance on poultry and wild species and a reduced dependence on beef cattle and pigs. The analyses continued, particularly comparisons to contemporary sites and biological (bones and burned plants) and artifact assemblages, but the resulting report and collections are the effective end products of the historic preservation process.^[3]

To be clear, this process did not begin and end in a single meeting in an office building. It required numerous meetings (both private and public), telephone calls, formal letters, and e-mails over many months. And, of course, it had at its core the scientific processes of research design development (the questions to be asked), methods development (the means of answering those

questions), data collection and processing (field and laboratory work), analysis, and report writing. The goal (which we achieved, I think), was to balance competing needs and interests and to ensure the best use of 18PR857 as a scientific resource; as a historical touchstone for the region's citizens, including descendants of the planters and enslaved people and servants; and as a source of material to foster discussions about race relations, the environmental consequences of intensive commercial agriculture, and other matters of current social concern (Gibb 2021). The work at 18PR857 (which is called the Goe Plantation, in recognition of the discovered connection of Scotsman William Goe and his wife Mary Boyd with the archaeological remains of their 1720s through 1770s plantation), from its original discovery and testing by the AHA team to the excavation and analysis of the current team, has proceeded in a thoughtful manner, adapting long-established methods to the specifics of the site

This work should not be confused with “rescue” or “salvage” archaeology, an ad hoc process of extracting whatever one can from an archaeological site that is in imminent danger of destruction from natural catastrophes (e.g., forest fires or shoreline erosion) or construction occurring outside of the archaeological review process. **Salvage archaeology** typically garners available (but usually insufficient) resources and uses methods that are adopted expediently, usually in the absence of specific research questions and with minimal or unsystematic documentation in the field. The purpose of salvage often is expressed as recovering material for future scholars without any specific nontrivial questions to inform what kinds of materials are recovered or how they are recovered and recorded. Under extraordinary circumstances, archaeologists might choose to salvage a site in the face of imminent destruction, but this is not the manner in which most archaeology is or should be done. It does not conform to generally accepted definitions of science.

Careers in CRM Archaeology

Reading about the process above, you might wonder what role you might play in it. Let's look at the employment prospects first and then consider volunteer participation. Real estate development and engineering are very much part of the process; they provide both the reason for implementing the process, funds for conducting archaeological research, and data archaeologists need (e.g., topographic maps of the subject parcels and control points that archaeologists use to accurately locate sites and test units on the surface of the earth).

In archaeology, there are three categories of employment. It is possible to move across these three categories, but in my experience it is uncommon. I exclude traditional academic or museum employment from consideration here because jobs in these spheres usually operate outside of CRM. However, university instructors and museum staffs occasionally conduct work in CRM. In doing so, they become commercial archaeologists for the duration of such contracts. I also omit the many specialties in archaeology (e.g., faunal analysis, palynology, or geophysics), as individuals generally are drawn to these after they are engaged in archaeology and most do so as private consultants or as employees of government agencies and museums.

Agency archaeologists are government employees. Generally they have advanced academic degrees (master's and/or a doctorate) in anthropology, archaeology (generally a subdiscipline of anthropology in the United States), history, or American studies. They specialize in historic preservation law, but they also have research interests that, ideally, their position benefits from and that they can satisfy through their official positions. Part-time, seasonal, and contract positions are not uncommon, but most agency archaeologists have full-time positions with benefits. Most might argue that their compensation is not commensurate with their levels of education and responsibility, especially in comparison with other professionals in government service, but their level of satisfaction in terms of what they contribute to their field might be higher than that of professionals in other fields.

Archaeological registrars are registrars and collections managers who are also employed by government agencies, but they are not typically involved directly in the legal compliance process. They oversee the management of data on archaeological sites, which includes collecting data provided by professional and avocational (unpaid) archaeologists. Registering archaeological sites and supplying associated data on artifacts, soil, topography, hydrology, property ownership, prior studies, and so forth are critical components of the process of complying with federal, state, and municipal historic preservation laws and ordinances. Data management requires both knowledge of the field, knowledge of relational database management, and, increasingly, knowledge of geographic information systems. Registrars are ideally placed to analyze data from across the jurisdiction of their agency and can achieve a perspective that goes well beyond the site focus.

Collections managers have the intimidating job of properly caring for the collections that come to a collections facility (which usually housed within a museum, often at the county or state level). The range of materials could include human remains, food remains (e.g., bone, carbonized plant remains, pollen samples), deteriorating iron, decaying wooden boats, stone tools, ceramics, and large quantities of mollusk valves, masonry rubble, and stone tools, to name a few. Some require conservation to ensure that they will not continue to deteriorate. Iron artifacts, for example, typically continue to rust, and the rate of that process accelerates

once the artifact is excavated and exposed to air. Even in a facility in which temperature and humidity are tightly controlled, a plastic resealable bag of iron artifacts can turn into a bag of dust in a few years if the contents are not stabilized and conserved through desalinization and other processes. Collections managers must have “intellectual control” over the materials in their care, which means they need to know where every item is, even those on loan to other institutions, and their general condition. The position lends itself to all kinds of personal research projects in addition to those the job demands.

Finally, there is the **commercial archaeologist**. Meeting the guidelines of the Secretary of the Interior requires an advanced degree in anthropology, archaeology, history, or American studies, but education does not—and cannot—end with formal classroom work. Unlike academic archaeologists, whose primary responsibility typically is teaching undergraduate and graduate students, commercial archaeologists cannot specialize and work in only one research area (e.g., early colonial-era plantation sites in the Middle Atlantic United States or early Holocene Paleoindian sites in the American Plains states). Conducting an archaeological survey of, say, a 100-acre parcel prior to redevelopment could lead to the discovery of Native American deposits dating back five centuries or five millennia, a late 18th-century enslaved peoples’ quarter, a Civil War infantry encampment, a late 19th-century blacksmith shop, and an early 20th-century poultry house—all on the same parcel of land. The competent, productive commercial archaeologist participates in professional conferences, reads widely, continually learns new skills, and researches types of sites new to his or her experience, recognizing that all sites and subjects potentially interest somebody and therefore require good-faith consideration. Some commercial archaeologists work from home and for themselves. Others work for small firms operating out of rented houses or storefront and still others work for moderately large firms, some of which operate as divisions within international engineering firms. Compensation varies depending on the archaeologist’s responsibilities, experience, and degree of business acumen, the latter of which helps perpetuate the firm, irrespective of size. Those working for larger firms often have the opportunity/responsibility (depending on one’s perspective) of traveling and working in different regions. Smaller operations tend to work within particular regions, states or provinces, if not specific counties or parishes. Many, like me, work for themselves, aided by staff technicians or contract workers, determining their own schedules and operating as small businesses. A flexible work schedule also allows self-employed agency archaeologists to do pro bono work with volunteers and to volunteer on colleagues’ projects. (There is a substantial literature on volunteerism in archaeology, and I have written on the subject of citizen science: volunteer participation in scientific research [Gibb 2018].)

To be clear, the positions I have sketched are career positions for people with advanced degrees. However, you don’t necessarily need an advanced degree to work in the field of archaeology. There are many jobs available in archaeology (such as field technician and lab technician jobs) for those with an undergraduate degree or without any degree at all. Some of those jobs are seasonal and some might last months or years or an entire working life. The usual route to such jobs is to take a field school in archaeology that is taught by an experienced, reputable archaeologist with the requisite credentials. These schools are typically offered during the summer through a college or university. A field school must last a minimum of six weeks to be recognized as such. Shorter classes are deemed “field experiences” and are valued but are considered less than a field school. That can be an issue if a position opening specifies successful completion of a field school. There are alternative routes; for example, sustained volunteer work with a reputable organization such as the Smithsonian Institution. Sometimes volunteers can get a wide range of experiences related to archaeology, making them more desirable employees. Volunteering also allows greater flexibility for those who cannot afford to commit to six weeks or more and pay the tuition for a field school. Regardless of the route, prospective participants should expect, indeed demand, that the principal investigator, or PI, and the host institution provide a safe environment: safe from outside threats, safe from bigotry, and safe from harassment. The PI and the host institution also should meet and preferably exceed the minimum standards for ethical behavior, details of which can be found in the principles espoused by national and international professional organizations (e.g., the [Society for American Archaeology](#)). The work should have scientific merit and the data collected should answer specific research questions, the results of which will be eventually shared through a variety of ways: technical reports, publications, websites, public lectures, or exhibitions. Every field school—every archaeological investigation—should develop around specific research questions and should employ methods suitable for answering those questions. A successful field school experience is a cherished lifelong memory, regardless of whether or not it leads to a career in archaeology.

While in the past, archaeology was a straight cisgender white man’s field, today it benefits from diverse perspectives and there are now almost as many women as men in the field. Women and transgender persons, as well as persons of all racial and ethnic backgrounds, are increasingly visible in the field and cisgender males likely occupy fewer than half the positions sketched above (that said, cisgender men—specifically white men—still dominate the most prestigious and higher salary levels of employment). There is room in archaeology, as in every field of human endeavor, for people of all abilities, and most of the frontline archaeological science is done by people driven by curiosity, the joy of discovery, and the camaraderie of a team working toward mutually agreed-upon goals. Personality, individual and family needs, interests, and other variables play the principal parts in such

decisions. For my part, I quote the writer/actor/producer Mel Brooks, who said in the film *History of the World, Part I*, “It’s good to be the king.” (*History of the World, Part 1*, 21st Century Fox, 1981). There is a lot to be said for working for oneself in a field one loves. The joy of approaching each day as an adventure more than balances the occasional financial uncertainty, the frustration with clients and agency colleagues, and the often physically demanding nature of the work. With nearly 50 years of fieldwork behind me, I don’t want to imagine another way of life.

Discussion Questions

1. Define cultural resource management in your own words. Why do you think it is important in the world today?
2. How do the Antiquities Act, the National Historic Preservation Act, and the Native American Graves Protection and Repatriation Act govern the practice of cultural resource management in the United States?
3. What are some of the different interests that had to be considered when determining the treatment for site 18PR857? Do you think these interests were balanced appropriately? What other interests might be considered at archaeological sites in different contexts?
- 4.
5. What are some of the different careers you might explore in cultural resource management? What sort of training/experience is necessary to enter the field?

About the Author

James G. Gibb majored in anthropology as an undergraduate at Stony Brook University. He earned his master’s degree and doctorate at Binghamton University and a certificate in computer-aided design and drafting at Anne Arundel Community College. He has worked in cultural resource management for 45 years, running his own consulting firm since 1989. Gibb also is the founder and director of the Smithsonian Environmental Archaeology Laboratory (SEAL) at Smithsonian’s Environmental Research Center in Edgewater, Maryland. The SEAL team consists entirely of citizen scientists, volunteers who instead of assisting a scientist are themselves the scientists, producing new science individually and in small groups under Gibb’s guidance and presenting results at professional conferences and publishing in professional journals. Gibb lives just outside of Annapolis, Maryland, with his wife Bonnie and three ill-behaved dogs.

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1. These are Anglicized French and Native American names. Online research may help us identify the names these Indigenous peoples apply to themselves in their own languages.
2. A number of names have been applied to this kind of work, none of which are satisfactory. “Cultural resource management archaeology” is a misnomer, as consultants like myself typically have little or nothing to do with actually managing resources. “Contract archaeology” is vague: any work involving funding involves a contract, whether the agreement is formal or verbal, including grant-funded research. “Compliance archaeology” is closer to the mark, although not all non-academic archaeology is undertaken to assist a permit applicant in complying with a law. “Commercial archaeology” seems most appropriate because while this kind of archaeological research contributes to larger scientific matters, it is conducted as a business. The

archaeologist undertakes the work in the expectation of earning a living and the business is driven by the needs of a client and not by an investigator's personal research interests. The clever commercial archaeologist satisfies both their financial needs and their research interests.

3. An archaeological assemblage is the totality of artifacts, ecofacts (human-collected and human-modified bone and plant remains, usually resulting from food preparation and consumption and—of course—the resulting human feces that are preserved in certain contexts), field notes, photographs, catalogues, and drawings. These are kept together as a collection and the assemblage can be compared to those of other sites that have been investigated using similar methodologies.

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CHAPTER OVERVIEW

2: Getting in the Dirt- How do we do archaeology?

- 2.1: The Archaeological Process
- 2.2: Archaeological Surveys and Remote Sensing
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Thumbnail: Tools are laying out on a piece of wood. (Unsplash License; [Tmava University](#) via [Unsplash](#))

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2.1: The Archaeological Process

B. Jacob Skousen, Ph.D., Illinois State Archaeological Survey

Learning Objectives

- Describe the process of archaeological projects from start to finish
- Describe how archaeologists plan, conduct, and complete archaeological projects by following the archaeological process
- Correct inaccurate and often romanticized views of archaeology by explaining how the archaeological process involves more than fieldwork in faraway places

The purpose of this chapter is to describe the archaeological process, defined here as a generalized series of steps or tasks an archaeologist takes to develop, conduct, and complete archaeological projects. The term “archaeological process,” however, is somewhat of a misnomer. The archaeological process is not a one-size-fits-all set of rules that can simply be applied to any archaeological project. Because each project is unique and has its own goals, requirements, and challenges, not every aspect of the archaeological process discussed below will be required for all projects (though, as will become evident, some steps are more important than others and will always be part of any project).

Another critical point is that the archaeological process is fluid. The steps in an archaeological project may not proceed in a simple, linear fashion. In many cases, the steps of the archaeological process and the order in which they occur depend on the context the project has arisen from as well as available time and money, ethical concerns, relevant laws and required permits, the needs and concerns of other people, institutional and financial delays, and more (see the Special Topics box for a real-life example). Additionally, sometimes certain steps of the archaeological process will bleed into or become intertwined with others. Still, this chapter will help those who want to better understand how archaeological projects are conducted and the steps archaeologists take to perform them properly and ethically.

Special Topics: Real-World Archaeological Project

This project shows that the archaeological process often does not always follow a prescribed series of steps as described in this chapter. Archaeologists often have to work with what they have, given constraints of time and money and other logistical issues. This example shows that projects can be successful even when there are constraints. In this case, a project has provided important information about the history of a little-known region in Illinois. Additionally, it has made and will continue to make a favorable impression on the landowner and his family and teach them a little about archaeology and its importance.

The author examining an eroding precontact roasting pit in southeastern Illinois.

Figure 1. The author examining an eroding precontact roasting pit in southeastern Illinois. (Photo courtesy of Robert McCullough.)

When the landowner and I met for the first time, he showed me some of the artifacts he had collected and took me around the farm to the areas where he had found the artifacts. During the tour, he showed me red-colored soil that was eroding out of a stream bank (Figure 1). When I took a closer look, I saw that this red-colored soil was part of a buried archaeological feature, likely a hearth or a firepit, and that it would be destroyed very soon given the torrential rainstorms the area experiences. I asked if he would allow me and a few of my colleagues to come back at another time and excavate this feature before it was destroyed. He agreed and was excited to see what the excavation might uncover.

Several colleagues and I returned a few weeks later (April 2019) and, with the landowner, spent the day excavating the feature. The feature turned out to be a thin, oval-shaped, 12-foot-long roasting pit, complete with rock lining and a layer of ash at the

base of the pit that likely dated to some time during the precontact period (before European contact, which in Illinois is generally viewed as the mid-17th century CE) (Figure 2). It was a long, exhausting day. My colleagues and I had gotten up early; made the three-hour drive to the site; uncovered, mapped, excavated, and photographed the feature in about six hours; recorded the control points with a high-accuracy GPS; backfilled the excavation hole by hand; and made the return trip all in the same day.

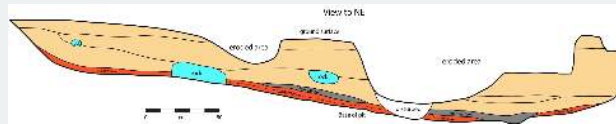


Figure 2. Soil profile of precontact roasting pit in southeastern Illinois. (Map courtesy of the author.)

The landowner was excited about the find and the possibility that there could be others like it on his property. Together we decided to conduct a magnetometry survey on some of the other sites on his property to get an idea of the number and density of subsurface archaeological features that may still exist. In December 2019, I applied for a small grant from a local historical society to pay for the survey. Unfortunately, I did not get the grant. But much to my surprise, in early 2020 the landowner made a generous donation to my employer with the understanding that I would conduct a pedestrian survey on his property to record any remaining archaeological sites and conduct a magnetometry survey on some of these sites.

After nailing down work schedules and working around the harvest season and COVID-19 restrictions and concerns, we met at his property in October 2020 to conduct the pedestrian survey. The landowner, his brother, one of my colleagues, and I performed the survey, which confirmed the location of the sites the landowner had already identified. Based on the artifacts collected, most sites had several occupations that spanned from the Archaic period (~8000–1200 BCE) to the Mississippian period (~1100–1500 CE).

The magnetometry survey took place in November 2020. The setup was complex. We first set up by hand a series of grids 20 x 20 meters in size over the sites we wanted to survey. Then I performed the survey with help from the landowner and my 15-year-old son. The results of the survey were excellent. Clusters of intact subsurface features were evident on several of the sites. We could not complete the magnetometer survey during this trip, but we returned a year and a half later (March 2022) and completed the survey.

Since then, I have completed a report on the results of the entire project (pedestrian survey, magnetometry survey, and excavations) for the landowner and the state archaeologist. I also wrote and submitted an article to the state archaeology journal about the project and what we learned about the overall history of the area. I will use the remaining money from the donation to pay for fees to permanently curate the recovered artifacts, geophysical survey data, and associated documents and photographs at the Illinois State Museum.

This project shows that the archaeological process does not always follow a prescribed series of steps similar to those described in this chapter. Archaeologists often have to work within time, money, and logistical constraints. But as this example shows, projects can be successful even with constraints. In this case, it has provided important information about the history of a little-known region in Illinois. Additionally, it has made and will continue to make a favorable impression on the landowner and his family and teach them a little about archaeology and its importance.

How Do Archaeological Projects Begin?

The vast majority of archaeological work that takes place in the United States (and in many other countries) is a result of either 1) research projects (often conducted by archaeologists who work at universities or research institutions); or, more commonly, 2) cultural resource management (CRM) projects. Archaeological research projects, as with research projects in other scientific disciplines, begin with a question or a problem. The question or problem usually depends on the researcher's interests and expertise. Some questions and problems are simple. For example, the question "What people or cultures lived in this area and when did they live here?" is commonly asked when minimal archaeological work has taken place in a particular area or region. This type of question must be answered before archaeologists can formulate other questions. Some research questions are more complex. A researcher may want to know, for instance, when a group of people became sedentary or how people at a particular settlement constructed a collective identity.

Beginning in the second half of the 20th century, an increasing number of archaeological projects were conducted under the umbrella of CRM archaeology. This was because of the increased need for infrastructure all over the world. As a result of this need, a formal effort was made to establish cultural resource laws to protect important places, landscapes, buildings, artifacts, and so on

from destruction during these infrastructure projects (Figure 3). Today, most archaeological work performed throughout the world takes place as CRM projects (for more information on the major cultural resource laws, see the chapter on [Cultural Resource Management](#)).

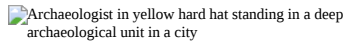


Figure 3 – Most archaeological work is done as part of Cultural Resource Management (CRM) projects. (“178/365 – Urban Archaeology” by ecospc is licensed under CC BY 2.0.)

Countries have their own versions of cultural resource laws. Each version provides varying levels of protection for archaeological sites, landscapes, materials, and data. In most cases, archaeologists hear of or are informed about infrastructure projects (e.g., roads, power lines, pipelines, power plants, housing developments, reservoirs) and are hired to perform archaeological work to comply with the applicable cultural resource laws. For example, the best-known federal cultural resource law in the United States, the National Historic Preservation Act, requires that any development or improvement project that occurs on federal land or is funded by federal money must evaluate the potential impacts of these projects on cultural resources (archaeological sites, landscapes, buildings, artifacts, and so on).

Based on the details of the planned infrastructure project, CRM archaeologists develop a plan to identify, evaluate, protect, and excavate the sites and/or resources that includes an estimate of how much money will be needed to perform these tasks. Because they do not choose what kinds of sites or time periods they investigate, CRM archaeologists investigate all sites, artifacts, buildings, monuments, landscapes, and so on within the project area and parameters and should always strive to make thoughtful, accurate recommendations to the developers about how to best conserve, record, or mitigate archaeological remains.

Some projects are more accurately called salvage archaeology, also known as rescue archaeology. This is when archaeologists conduct archaeological work at a site that was partially destroyed or damaged or is about to be destroyed or damaged due to development, erosion or other natural processes, natural disasters and extreme weather events, civic and economic unrest, war, neglect, or looting (Figure 4). These projects are often necessary because not all CRM laws are created equal—some only protect certain kinds of archaeological and historical sites or sites on certain types of land. Additionally, laws are often not enforced due to limited time and resources. Even when CRM laws are enforced, the penalties for breaking these laws are not always severe enough to compel developers to comply with them. In the United States, for instance, CRM laws in some states do not protect archaeological sites on private property. Thus, landowners can legally destroy sites and do not have to pay for archaeological evaluation or excavation before they make changes on their property. Fortunately, most states have laws that protect human remains and sites with human remains, regardless of who owns the land.



Figure 4. An archaeologist examining a profile of an unsanctioned landfill hole for intact archaeological features. (Photo courtesy of Michael Farkas.)

Salvage archaeology projects are challenging. More often than not, archaeologists hear about a site that is in danger and throw together whatever money, volunteers, and other resources they can in order to excavate, collect, and record any information before the site is destroyed. Thus, salvage jobs often have limited funding and labor, take place in poor weather conditions, do not always

employ ideal archaeological recovery and recording techniques, and can only document sites, features, and materials that are already compromised or have been partially destroyed (Figure 5). While such conditions are far from ideal, most archaeologists recognize that any work, even if it is incomplete and/or could not use ideal recovery and recording techniques, is better than nothing.



Figure 5. Salvage excavation of a precontact roasting pit that was eroding out of a creek bank in southeastern Illinois. (Photo courtesy of the author.)

Perhaps the most crucial (yet often overlooked) aspect of beginning an archaeological project is a discussion of ideas and possibilities with communities, individuals, and representatives who have an interest in or ties to the sites, objects, and time periods in question. In the United States, these communities and representatives include tribal historic preservation officers, historical societies or organizations, and communities or groups with ties to an archaeological site. Ideally, archaeologists should develop research questions and projects in collaboration with these communities and individuals so their interests, concerns, and interpretations are represented. Even CRM archaeologists, who generally do not choose where a project occurs or what sites are investigated, should actively reach out to interested parties, especially descendant communities, to inform them of the project and to get their perspective on what sites, objects, and landscapes are important to them and why (see the chapter on [Archaeological Ethics and World Heritage](#)). These discussions and collaborations should continue throughout all steps of the archaeological process, regardless of the order, to the extent that is possible.

In the rest of this chapter, I describe the eight steps of the archaeological process: background research; research design; obtaining funding; obtaining permission; conducting fieldwork; processing, analyzing, and interpreting data; curation; and dissemination. Archaeologists should consider these steps, though again not necessarily in that order, when developing and performing a project.

Background Research

In *Indiana Jones and the Last Crusade*, one of the most iconic archaeology movies of all time, Indiana Jones, when describing the purpose and process of archaeology to a group of college students, states that “70% of all archaeology is done in the library . . . research, reading.” This is one of the rare moments when Indiana Jones is correct. While the exact amount of time background research takes varies from project to project (it can be more or less than 70% of a project), it is a crucial and time-consuming part of both CRM and research archaeology projects.

After receiving a particular project or developing a research question, the next step for an archaeologist is to conduct background research. Many CRM archaeologists call this a literature review. At the very least, this step involves reading about the project area—about the local geology, plant and animal life, and environment; about previously identified archaeological sites in the area; about past excavations in the area; about past property owners; and about any human-made modifications to the landscape that might affect the integrity of archaeological deposits or an archaeological site. This information can be obtained from a variety of sources, including previous archaeological reports and publications, geological and environmental studies, recent and older maps of the area, local histories, newspapers, property leases, and census data. Often it is useful to talk to landowners, collectors, or individuals living in the area who know the history, local archaeology sites, and activities that took place in the area. This information can help archaeologists contextualize and interpret what they find and is included in reports and other publications.

An archaeologist conducting research for a project should learn about the same things as a CRM archaeologist—the environment, site history, modifications to the landscape or site in question, and other archaeological sites and projects in the area. In addition, an archaeologist should read about past research on the topic in question. If a researcher wants to conduct a project on farming practices during the Classic Maya period in the Maya Lowlands, for example, they should be familiar with publications that

describe the local rainfall and soils, the kinds of crops that were grown, the methods of farming used in the past, the tools used for farming, theories about plant domestication in the region, and the development and history of agriculture in the Maya Lowlands.

Perhaps most important, both research and CRM archaeologists should be familiar with literature pertaining to the group or groups they study. Archaeologists working on Indigenous sites, for instance, should be familiar with the culture, beliefs, and writings of the Indigenous groups there. Archaeologists working on African American sites in the United States should be familiar with African American history and appropriate readings in African American Studies that pertain to the particular project, site, or topic. Knowing this information provides further context and helps generate more informed, worthwhile questions and interpretations.

Developing Methods or a “Research Design”

Archaeological methods refer to the procedures, techniques, and instruments archaeologists use to complete an archaeological project (see the chapter on [Excavating Archaeological Sites](#)). There are all kinds of methods that are commonly used by all archaeologists. Some of the most basic field methods, for instance, include the pedestrian survey (aka, a surface survey or reconnaissance-level survey), shovel testing, and unit excavations made by hand. However, the specific ways these methods are performed vary widely and can depend on the project goals, the requirements of cultural resource laws, and the variety of specific techniques available. Remote sensing, for example, is a basic method that archaeologists regularly employ, but there are many different kinds of remote sensing techniques and the methods used for them vary. Each technique requires a specific body of knowledge, specific instruments and tools, walking in certain ways and at certain speeds, specific software packages to process the data, and more. The term research design refers to a formal statement of the project goals, an outline of the methods that will be used to reach the project goals, and the ideas and theories underlying the goals and methods. Many of the field methods typically used in archaeological projects—for example, surveys, GIS, remote sensing, and excavation—are described in the other chapters of this textbook.

For research projects, developing the research design depends on both the questions asked and the theories underlying the questions and topics. A researcher who is interested in determining the distribution and chronology of ancient settlements in a particular region, for example, should use methods to identify archaeological sites over a wide area and determine the chronology of these sites. The methods would almost certainly include pedestrian survey and perhaps shovel testing and remote sensing techniques to identify the number of sites within the area of interest. They would also include collecting diagnostic artifacts from sites to determine when each site was used or inhabited based on particular theories of how and why styles of objects and materials change over time. A researcher interested in changes in diet would perform excavations on sites where food preparation and consumption occurred.

The methods used for CRM projects depend on the scope of the job. The basic archaeological methods and techniques are the same regardless of whether the project is a CRM or research project. Phase I projects generally require literature reviews and pedestrian surveys, shovel testing, or geophysical surveys to determine whether archaeological sites exist, the size of the sites, and the integrity of the sites. Phase II projects often require more intensive testing such as test unit excavations. Phase III projects are even more intensive, sometimes involving the complete excavation of a particular area or site. In addition to fieldwork, CRM projects usually require at least basic analyses of the materials recovered in order to evaluate the type of sites that exist, their chronology, and their historical importance. The methods used to examine each type of material depend on the project goals and research questions.

The methods chosen also depend on the amount of money and time available for the project. This is why obtaining money for both CRM and research projects is a crucial step in the archaeological process. Archaeologists who have the necessary funds generally have no problem following the methods outlined in the research design in order to complete the project. Time also plays a significant role in the type of methods an archaeologist uses. For example, archaeologists often have limited time when performing salvage excavations, and this changes the methods they employ during the salvage work.

If the project requires fieldwork, it is important that the methods developed are the least destructive option but will still answer the research question or fulfill the project goals. For example, if a research question can be answered by examining collections from museums or curated repositories that were obtained during past archaeological projects, using those resources is better than performing additional fieldwork to gather more data. If excavating 10 test units 1 x 1 meter in size in carefully chosen locations of a particular site will provide enough information to answer the research question, then there is no need to conduct more extensive excavations. The archaeological record is finite and excavations are destructive and expensive, so archaeologists make every effort to minimize the impact their research will have on each site. However, if the site will be destroyed, complete excavation of a site may be necessary.

Collaboration with descendant communities is crucial when developing methods for a project. Some places, landscapes, monuments, buildings, and so on are important—in some cases sacred—to particular communities, and these communities may not want these places or things to be excavated or altered and would prefer that noninvasive techniques (e.g., remote sensing) be used instead. Thus, it is vital that archaeologists develop research projects and particularly the methods used in these projects in collaboration with descendant communities.

Obtaining Funding

Funding is a critical step in the archaeological process. CRM projects always involve funding of some kind. Traditionally, upon learning of a potential archaeological project, a CRM company submits an estimate of how much it will cost to complete the project. After reviewing the estimates that interested CRM companies have submitted, the employer hires the CRM company they have chosen to undertake the project based on that company's qualifications, reputation, and, more often than not, the cost estimate provided. Unfortunately, since employers are more likely to hire the CRM company that submits the lowest estimates, this often encourages CRM companies to submit the lowest possible estimate in order to get the job. This, in turn, can sometimes lead to shoddy or incomplete work.

Obtaining funding for research projects is a different process. In most cases, research projects are performed by archaeologists in academia (i.e., those who teach at colleges or universities), and they must obtain outside funds to conduct these projects, whether they be field-based, laboratory-based, or something else altogether. Funds can come from a variety of sources, but grants are the most common source. In the United States, some of the more popular federal funding sources are the [National Science Foundation](#) and the [National Endowment for the Humanities](#), whose funds come from taxpayer money. Funds can also come from anthropological or archaeological professional organizations, such as the [Archaeological Institute of America](#), the [National Geographic Society](#), or the [Wenner-Gren Foundation](#). Since professional organizations are generally nonprofit entities, their grant funds mostly come from fund-raisers and private donations. Each of these types of organizations fund archaeological and non-archaeological research projects from all over the world, which means that funding from them is very competitive and difficult to obtain.

The amount of funding required for a project depends on the goals of the project and the size of the entity or organization providing the funds. Small projects typically require less money, which means that an archaeologist can apply for smaller, less competitive grants from a local or state institution or group. For large projects that require more money, applying for larger, more competitive grants makes more sense. The type of work being conducted for a project also dictates where an archaeologist seeks funding. A project that involves large-scale excavations requires more money (excavation is time-consuming and expensive), but a project that involves a large-scale pedestrian survey would require less money, since pedestrian survey is far less expensive. Specialized analyses are often more expensive because particular resources are required to conduct the analysis and only a small number of people have the knowledge, skills, and facilities to do that work. Thus, archaeologists must carefully consider and calculate the amount of money needed to perform the required work based on the costs of field work or lab work, particular tests the project requires (e.g., radiocarbon dates), the specific kinds of analyses needed (e.g., lithic or ceramic analysis or more specialized analyses such as residue analysis), curation of the material and data produced during the project, and publication and dissemination of information about the project.

Obtaining Permission

This step is necessary for any archaeological project and generally occurs in tandem with obtaining funds. In most places around the world, cultural resource laws protect archaeological objects, collections, sites, monuments, and landscapes. Thus, archaeologists who wish to conduct research on a particular collection or at a particular site or area should know the cultural resource laws that apply and obtain permission from the government officials or agencies who oversee and enforce these laws. In most cases, obtaining permission requires that an archaeologist apply for a permit. An application for a permit usually requires a description of the project, a timeline, the methods the archaeologist plans to use, the archaeologist's qualifications, and the intended products. Such applications are required for both CRM and research or academic archaeology. In addition to protecting cultural resources, permits also ensure quality control because they are granted only to qualified and competent archaeologists. The time it takes to apply for and obtain permits varies. Since obtaining permits can be a long, drawn-out process, archaeologists should begin the permit application process early enough to ensure that they can meet project deadlines and goals.

If the proposed project will take place on private land, the archaeologist must also obtain permission from the landowner before conducting the work. Depending on the cultural resource laws in a particular area, an archaeologist may not always need to obtain a permit from a government organization to work on private land, but it is always necessary to obtain permission from the landowner.

This is often a less formal, more fluid, and sometimes more frustrating process. In some cases, landowners are very interested in archaeology and gladly allow archaeologists to perform work on their property. More often, however, landowners are hesitant about granting permission. Some owners are openly hostile to anyone who requests access to their property, including those with legitimate reasons to do so. Archaeologists should never assume that landowners will be open to or supportive of an archaeological project on their property and should plan accordingly.

One of the best ways an archaeologist can limit hesitancy or hostility among local populations and landowners is to establish relationships with residents in the regions where they work (Figure 6). Generally, people are more willing to have a conversation with and trust an archaeologist who is friendly and relaxed, understanding, and interested in the community's well-being (and not just the archaeology within the community) instead of being demanding. When communities and landowners know and have positive relationships with archaeologists, they are more willing to allow them to conduct work on their property. In the best-case scenarios, landowners become interested in and participate in the project and work to preserve the site. Building relationships of trust with local communities and individuals takes time, effort, and patience. For those who work exclusively in certain areas or regions, building these relationships is a career-long pursuit. Regardless of how one chooses how to build relationships of trust, it is important to factor the time, effort, and money this requires into project timelines.



Figure 6. Building relationships of trust with landowners is crucial in obtaining permission to conduct archaeological work on private property and an ethical obligation. (Photo courtesy of Madeleine Evans.)

For lab-based projects, an archaeologist must obtain permission and permits to perform the work. If an archaeologist is interested in analyzing a collection from a museum, for instance, they must first secure permission from museum curators and staff to examine the collection, which often requires applying for a permit, much like archaeologists performing field projects. The permit process is more complicated if analyses will cause damage to collection items. Examples of such analyses include radiocarbon dates on botanical samples, some techniques for analyzing pottery residue, and DNA studies on animal or human bone (for ethical issues on bioarchaeology work, see the [Bioarchaeology](#) chapter). In any lab-based project, descendant communities should be consulted about the goals, the methods used, and which materials and collections can be handled. Even if it is not specifically required by law, collaboration is the ethical thing to do.

Conducting Fieldwork

This is perhaps the most variable part of the archaeological process. It often, though not always, takes the least amount of time compared to other steps in the archaeological process. Archaeologists often call this step data collection. The way a project is conducted should follow the research design that was developed earlier in the project and was specified in permits and grant proposals. This is also the step that receives the most press. We've all watched documentaries and read popular articles that showcase events such as archaeologists unearthing the remains of a skeleton provisionally [identified as King Richard III](#), an identification that was later confirmed by DNA analysis; [X-raying Egyptian animal mummies](#); or [identifying Maya monumental architecture](#) in the jungles of Central America through remote sensing technology.

While fieldwork captures public attention, it also feeds into the widespread but problematic and overly romantic view that archaeology is all about uncovering "secrets" of past peoples and that archaeologists are rugged explorers who spend most of their time excavating in the field, often in dangerous conditions. Of course, many archaeologists, myself included, love being in the field. It allows us to visit places that are new to us, see interesting artifacts and features, and literally reconstruct history as it is being unearthed. And fieldwork can indeed be hazardous. (Cuts, bruises, sprained ankles, and heat-related maladies are very common, and I have had the misfortune of nearly being stampeded by an elk herd, struck by lightning, stung by scorpions, and arrested by a military police force in another country.) These issues should be considered and addressed in the research design of the project. The problem is that notions of discovery, danger, and adventure overshadow both the goal of fieldwork, which is to recover information that can be used to reconstruct and interpret the past, and the methodological, often mundane, techniques that

characterize fieldwork, such as writing detailed descriptions of contexts, making maps, taking photographs, describing soils, and bagging artifacts (see the Excavation chapter).

Additionally, field school courses can perpetuate the idea that fieldwork is the most important part of archaeology. Such courses are required for archaeology undergraduate students at many universities and are often viewed as the culmination of a person's archaeological training, a primary requirement for getting a first archaeology job, and part of becoming "a real archaeologist." While field-based courses are undoubtedly important and beginning archaeologists should participate in these courses if possible, they are overemphasized compared to other parts of the archaeological process. An overemphasis on fieldwork can lead to poor understanding among aspiring archaeologists and the general public that there is a process to archaeology, that only a small portion of that process occurs in the field, and that archaeology also involves other forms of hard work that take place in libraries, labs, and museums.

Processing, Analyzing, and Interpreting Data

After the data are collected during the fieldwork part of the project, they need to be processed, analyzed, and interpreted. In most cases, this step takes the most amount of time of all the steps of the archaeological process. A realistic estimate is that for every month in the field, it takes at least three months of work to process and analyze the information recovered. Of course, the exact amount of time for processing and analysis depends on the project, the type of data collected, and the types of analyses an archaeologist performs (for more information about the types of analyses archaeologists often do, see the chapters on [Ancient Technologies](#), [Ancient Foodways](#), and [Bioarchaeology](#)).

At a minimum, processing artifacts involves washing, sorting, and labeling each one with basic contextual information (such as the name of the site, the name of the feature where it was identified, and the level from which the artifact was recovered) (Figure 7). Artifacts are then re-bagged in curation-standard containers or bags, which are also labeled with provenience information. The types of bags and the information required on labels depend on cultural resource laws and/or the institution or facility curating the material. It is crucial for archaeologists to know the applicable cultural resource laws, to have a plan for curation, and to understand the requirements of storage facilities or museums. While the step of processing artifacts sometimes seems like a tedious task, it is often part of field schools or lab analysis classes and is often one of the first jobs a beginning archaeologist is tasked with. This is because processing artifacts is an excellent opportunity to learn how to identify and handle different artifact types, knowledge that is vital for field and lab work.



Figure 7. Processing data, which includes washing and sorting artifacts, is one of the steps in the archaeological process. (Photo courtesy of the author.)

Artifacts are not the only type of information that archaeologists collect during a project. Notes, maps, and other forms and paperwork are a standard part of most field projects (Figure 8). In such situations, an archaeologist must ensure that the physical documents, notes, maps, and so on are completed, checked, and rechecked for clarity and accuracy after data collection is completed. Then, these documents, notes, and maps should be scanned into a digital format. This is now common practice because digital data takes far less room and management than hard copies and they serve as a backup in case the hard copies are lost or destroyed. If other types of data are collected, they too must be processed. Remote sensing data, for example, must be organized, cleaned, and backed up; GIS data must be downloaded into appropriate GIS software programs and incorporated into both physical and digital maps; and results of a residue analysis on pottery must be tabulated, backed up, and rendered into graphs or charts for presentation and interpretation.



Figure 8. Notes, maps, and paperwork are important archaeological data and their long-term curation is part of the archaeological process. (Photo courtesy of the author.)

Next, the data must be analyzed. The analyses that archaeologists do depend on the goal of the project or the research questions being asked and the types of data that are collected (Figure 9). Most CRM projects involve, at minimum, determining the chronology of a site or artifact. This usually requires a basic analysis of potentially diagnostic artifacts such as pottery or lithic tools. This type of analysis is easier when certain artifact types and chronologies in a region or area have already been established by researchers. When no diagnostic artifacts are recovered, archaeologists often resort to absolute dating techniques, such as radiocarbon dating. When archaeologists lack the equipment and expertise for performing such analyses, they send appropriate samples to accredited labs that are equipped to perform those analyses. While some research projects require only basic analyses, others involve more targeted questions that require different types of analyses. Again, the types of analyses should already have been specified in the research design, grant applications, and permits for the project.

Finally, the data are interpreted. Interpretations address the original research question or goal of the project. This step always involves blending the archaeologist's theoretical approach and the data obtained during the project. Many archaeologists formulate hypotheses as part of their projects. Hypotheses are proposed explanations of something based on available evidence. They typically involve if-then statements that are attached to the project goal or research question. For instance, an archaeologist studying status differences between individuals in a particular ancient village could create the following hypothesis: if a structure excavated in the village was larger and better constructed than others and contained nonlocal materials and elaborately decorated objects not typically found in other structures, then this structure was the home of a person with high status (note the "if" and "then" components of this statement). Obviously, this hypothesis is based on certain theoretical assumptions—for example, it assumes that higher-status people had greater access to labor and nonlocal materials and that the artifacts found in the structure were associated with the residents of the structure—but it demonstrates how an archaeologist could use archaeological data to test their assumptions. When disseminating the results of the project, archaeologists tend to write or present the information in a narrative form and often do not directly state their hypotheses. But it is always the case that their interpretations rely on testing hypotheses and on melding questions, theory, and data.



Figure 9. Analyzing data, in this case botanical remains, is necessary to answer the research goals of an archaeological project. (Photo courtesy of the author.)

Curation

Curation is one of the most important but most underappreciated and neglected steps in the archaeological process. Curation is the practice of cataloging, preserving, storing, and caring for archaeological collections and data. Every archaeological project, regardless of the type, size, or scope, involves the production of some kind of data. These data can include physical remains (artifacts, samples, paperwork, and maps) and/or digital data (digital photographs, scanned paperwork, digital forms and data tables, GIS data, 3D scans of artifacts, and geophysical data). These data must be stored and preserved in appropriate curation facilities or museums to ensure that they are available to other archaeologists, researchers, and interested parties for future research, displays, education, and appreciation (Figure 10).



Figure 10 – Curation is one of the most important but underappreciated steps in the archaeological process. (Photo courtesy of the author.)

Permanent curation and care of data should be part of every plan or research design for an archaeological project. This requires, first, that arrangements are made and money is secured for curation before a project even starts. To do this, the archaeologist generally contacts a curator or collections manager from an accredited facility or museum to see if the facility is able and has the room to curate the data that will be generated during the project. When the amount of data that will be collected during some projects is not known, an archaeologist must make a best estimate. Sometimes cultural resource laws stipulate the particular museum or facility where the data must be curated. This is another reason why archaeologists must know the laws and regulations of the region where they work. After the archaeologist finds a curation facility that is able and willing to store the artifacts, the next step is to generate a written document that states the parameters of the agreement. Specifics of agreements vary, but they typically include the names of the parties entering the agreement, the types of data/collections to be curated, the dates when the data/collections will be transferred, the amount that curation will cost, and standards for the data (e.g., a statement that the artifacts will be washed and labeled, that artifact bags will be labeled, and that digital data will arrive in a certain format). In many cases, these details have already been established by the institution and templates of such agreements are available.



Figure 11. Fire-cracked rocks, or stones that have broken after heating, are a type of “redundant” artifact and are often counted, weighed, and discarded before a collection is curated. (Photo courtesy of the author.)

Often curation facilities and museums do not accept artifacts—such as fire-cracked rock, rubble, and unmodified rocks—that provide “redundant” information, or archaeological data that are repetitive and thus do not add to the interpretation of an archaeological site or area (Figure 11).

The reason for this is the curation crisis, a term that refers to the ever-growing shortage of storage space available for properly curating and caring for archaeological collections. This is why archaeologists must collaborate with curators to determine the facility’s policy and learn what they must do to select artifacts in preparation for curation.

Dissemination

One of the final steps of the archaeological process is dissemination, or informing other researchers and the public of the results of an archaeological project through reports, articles, presentations, and outreach. In many ways, dissemination of archaeological information and knowledge is the culmination of an archaeological project. This is one of the most crucial steps in the archaeological process because of the concept that nobody “owns” the past. Archaeologists are ethically obligated to share knowledge and project results with as wide an audience as possible.

One of the most common ways archaeologists do this is through publication. There are a wide variety of publication venues. Reports are perhaps the most common publication venue for CRM archaeologists. In many cases, reports are required by the laws that drive CRM archaeology. They contain the results of the project, the importance of the sites and artifacts found to the fields of archaeology and history, and recommendations or suggestions regarding how to proceed with a given infrastructure project. Research archaeologists, on the other hand, typically publish the results of their work in peer-reviewed journals and books. While these kinds of publications usually present some form of data, they often also address larger research, theoretical, and methodological questions. Both CRM and research archaeologists present their findings at professional archaeological meetings and conferences and sometimes even in introductory-level textbooks like this one.

While publication is crucial and is often considered the pinnacle of dissemination, sharing archaeological findings should not end there because these formats reach only certain audiences. Reports, for example, are generally only read by CRM archaeologists and their employers and often become gray literature, which means they are not widely known and are difficult to acquire. Research articles are typically read by academics and researchers associated with research institutions or universities, and it can be difficult and costly for the general public to obtain access to such sources. Fortunately, this problem is slowly getting better as archaeologists are beginning to publish their work in freely accessible open-source journals and formats, which are available to the wider public.

In order to reach broader audiences, archaeologists often present their findings at public outreach events (see the chapter on [Public Outreach](#)). This can include giving public lectures or talks at local libraries and historical societies, giving presentations to primary school-aged children, making booths and posters for local gatherings and events, organizing public artifact identification events, or leading tours of archaeological sites (Figure 12). Some archaeologists share their research by designing displays in museums and local historical societies. More tech-savvy archaeologists create blogs, videos, and social media posts on archaeological projects. These forms of communication tend to be shared far more widely than other formats. Finally, some archaeologists are interviewed by local radio stations, newspapers, and TV networks about a project. This is a rare opportunity to share information with a wider audience that would otherwise not be exposed to archaeology. Of course, there is always a risk that reporters will not accurately convey, edit, or summarize the information an archaeologist provides, so in these situations archaeologists must take extra care to be clear and concise in their statements, and if possible, proofread the interview or statements to ensure that they are accurate.



Figure 12. Professional archaeologists participating in an artifact identification event, which is one way to disseminate archaeological information and knowledge. (Photo courtesy of the author.)

While sharing archaeological knowledge with the public is vital, it is important to understand that archaeologists also have a responsibility to not share sensitive information about archaeological sites that would make it possible for members of the public to loot, damage, or conduct their own investigations at those sites. For instance, when presenting to public audiences, archaeologists should not disclose site locations. They should also be sure to strip out any location information attached to or embedded within digital photos when posting them on social media platforms. In the past, I have had to specifically ask reporters not to share the exact location of archaeological sites, both for the sake of the landowner's privacy and to ensure the safety and preservation of the site. While most people who hear such reports would not deliberately loot or perform illegal activities at a site, it is better to play it safe.

Conclusion

The primary goals of this chapter were to provide an overview of the archaeological process; help readers understand how archaeologists plan, conduct, and complete archaeological projects by following this process; and correct inaccurate and often romanticized views of archaeology by showing that archaeology is a process that is not just about performing fieldwork in exotic

places. Knowledge of this process helps archaeologists plan ahead and react to the often fluid and unpredictable nature of archaeological projects. Such knowledge is also necessary for anyone who is interested in becoming a professional archaeologist. While not all projects require every step of this process and the order in which these steps are taken vary, some steps, such as curation and dissemination, are always part of any archaeological project. Perhaps the most important point is that each of these steps should be conducted in collaboration with communities, groups, and individuals who have historic ties to the sites and landscapes in question.

Discussion Questions

1. When should engagement and collaboration with descendant communities occur during the archaeological process? Why?
2. What is the most important step in the archaeological process? Why?
3. Which steps in the archaeological process are best known among the general public? How can a focus on these few steps lead to romanticized views of the field of archaeology among members of the public?
4. How might an understanding of the archaeological process help change incorrect, problematic, or pseudoarchaeological perspectives? Why?

About the Author

 A man wearing a checkered shirt

Jacob Skousen is an assistant research scientist with the Illinois State Archaeological Survey. He has been a professional archaeologist for nearly 15 years, and while most of this experience has been in the North American Midwest, he has archaeological experience in the North American Great Basin and Southwest, in Central America, and in the Middle East. His research focuses on the Mississippian period, the precontact city of Cahokia, pilgrimage, and identity formation. In the rare moments when he is not doing archaeology, Jacob enjoys being outside, taking walks, exercising, gardening, and playing the piano.

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2.2: Archaeological Surveys and Remote Sensing

Ian S. Ray, Ph.D., Centers for Disease Control and Prevention*

*This chapter was prepared by Ian S. Ray, Ph.D., in his personal capacity. The opinions expressed in this chapter are the author's own and do not reflect the view of the Centers for Disease Control and Prevention, the Department of Health and Human Services, or the United States government.

Learning Objectives

- Define and describe archaeological surveys, GIS, and Remote Sensing
- Identify the interdisciplinary sciences needed to collect usable geospatial data from pedestrian surveys and public datasets
- Analyze the use of GIS and related technologies and suggest situations where specific applications would be needed
- Explore the use of GIS within specific archaeological projects

In 2011, my husband, James Katsutoshi Malta, had just graduated from the University of Colorado at Colorado Springs with a degree in archaeology. His first professional job was with a CRM (Cultural Resource Management) firm with the title “staff scientist.” This meant he was in charge of collecting artifacts from sites and analyzing them for the company. The best part of the job? In his words, it was getting to say, “We’ve got to get this back to the lab!” But, how did James find the artifacts and what did he do with the information once his analysis was done? (Some may also wonder, how did he survive the eye rolls from the rest of the survey team when he yelled “We’ve got to get this back to the lab!” for the fifth time in 10 minutes?) The answer, at least to the first question, is by conducting surveys and using the geospatial data to provide the clients with a robust analysis of which areas were safe to begin construction in and which areas needed more investigation first, in order to comply with federal, state, and local laws.

Archaeological surveys are used to identify potential sites, locate artifacts, and provide the raw data for more complex interpretations. For example, finding similar artifacts across a large geographic area can help us to figure out what ancient trade networks might have been used, how ancient economies functioned, or how people were using lands. Traditional surveys, more commonly known as pedestrian surveys, require physical presence at a location and specific procedures to look for artifacts on the surface of the ground. These surveys are vital to the entire process of site identification and excavation. However, surveys alone are not sufficient to get an idea of what might be present. Archaeologists have long relied on mapping of these individual artifacts to determine the extent of the site. Modern technology has allowed for the integration of survey data into larger archaeological workflows, giving us much greater speed, precision, and accuracy even when full excavations are not possible or the extent of an archaeological site is not known.

The blending of traditional mapping with modern technology has resulted in the emergence of Geographic Information Systems (GIS) and Geographic Information Science (GIScience). The GIS focuses more on the software and hardware used, while GIScience focuses more on the applications of those technologies to scientific disciplines. For simplicity, this chapter will use GIS as a generic term to refer to both the systems and science.

GIS is not a single method, concept, or program. Instead it is a way of organizing, displaying, and analyzing data that has some type of geospatial component. This interdisciplinary science has been applied to fields from cultural anthropology to urban planning, wildlife management to mining, and economics to anthropology, among others. In today's world, GIS is often intimately tied with Remote Sensing (RS), which is a set of methods that allows for the collection of data without anyone being physically present at a location and without needing to directly observe the objects being studied.

This chapter will examine the uses of GIS and Remote Sensing in the field of archaeology and demonstrate how they complement more traditional methods of surveying and mapping. Not only can these techniques be used to understand past peoples, but they can help us preserve the cultural heritage we have inherited from past generations. We can use these techniques to analyze the movement of ancient peoples, avoid destroying sites during development, and even predict the precise location of previously undiscovered sites.

Surveys, Software, and Statistics

Pedestrian surveys are a cornerstone of archaeology. These surveys rely on large teams of archaeologists and volunteers to walk a site in a specific pattern. Generally, individuals start by lining up at one end of an area of interest, approximately two meters (just over six feet) apart (Figure 1). However, the exact distance between individuals depends on the research design, the amount of

ground cover (plants, snow, etc.), and the logistics of the project. CRM projects will generally need to be conducted on a tight budget with limited time, so their pedestrian surveys may use a spacing of 10 meters to 20 meters, depending on the requirements of the state. On the other hand, a well-funded excavation at a known (and protected) archaeological site will stick to the two-meter rule, since the cost-benefit trade-off is less of a concern; the researchers “know” they will find important artifacts. The team then slowly walks across the field together, carefully scanning the ground for any potential artifacts. Anytime something is found, the team will pause while the item is examined, GPS coordinates are taken, and the item is “tagged and bagged.” This involves completing a standardized form that includes information like the date, GPS coordinates, individual who identified the object, and any contextual information that may be relevant (see [these forms](#) from the University of Arkansas).

 Ten people stand in a line, carrying flags to mark the locations of any artifacts found at the surface of the site.

Figure 1 – Volunteers prepare for a pedestrian survey in the San Gabriel Mountains, near Los Angeles. (By [Angeles National Forest Archaeological Survey, Pacific Southwest Region 5](#) via Wikimedia and licensed under [CC BY 2.0](#))

Pedestrian surveys are often accompanied by systematic excavations of shovel test pits (STP). These are generally laid out in a grid pattern over the area where pedestrian surveys have been completed. As the name implies, shovels (or other excavation tools) are used to dig test holes, regardless of whether artifacts have been found on the surface. Test pits are generally around 30 cm to 50 cm (around 12 inches to 20 inches) in diameter and up to around 1 m (just over three feet) in depth, though the specifics of the site and likely age of the artifacts can require changes to these general guidelines (Figure 2). Some artifacts are too small to be immediately identified, so screens are used to sift through the excavated material to ensure small artifacts are not missed (for more details on this, see the excavation chapter). This allows the researchers to systematically assess where (and if) further excavation is needed. Within the CRM context, STPs may be used in areas where the pedestrian surveys would be obscured by ground cover (like plants or snow), or where local jurisdictions require STPs by law. STPs are sometimes skipped entirely in areas of low likelihood of finding archaeological materials, since digging takes time and can increase the length of the project. Similarly, some areas don’t allow for STPs to be conducted, such as in areas with exposed bedrock or over (geologically) recent lava flows in Hawaii.



Figure 2 – Baltimore Heritage prepares a shovel test pit while examining the archaeology of the American Civil War. By [Baltimore Heritage](#) via Wikimedia and licensed under [CC BY 2.0](#).

Mapping is an essential skill for any archaeologist, both interpreting maps made by others and creating them ourselves. The first step to reading a map prepared by a professional mapmaker (cartographer) is to determine the directions displayed. This is called orientation and typically is accomplished by finding the arrow pointing north (or a compass rose). The next step to reading a map is to determine the scale, or amount that the world has been shrunk to fit within the image. For example, on a 1 cm:100 m scale, each one centimeter on the printed map represents 100 meters of the real world.

In Figure 3, the compass rose indicates that “up” is west and “right” is north. This may seem strange at first if you are accustomed to “up” being north. For context, the sign in Figure 3 is physically attached to a metal grate, so that anyone reading the sign right side up would be facing the west. Historic maps tended to use east as “up.” The term orientation comes from “The Orient,” which is east from a European perspective. Figure 3 does not contain a separate scale, but it still indicates how far major cities are from the observer in kilometers (km).



Figure 3 – An example of a compass rose from the Arch of Bitterfeld in Bitterfeld-Wolfen, Germany. Note that “up” is actually west for this image. By [A. Savin](#) via Wikimedia and licensed under the [Free Art License](#).

Rough hand maps are typically made during any survey and help the archaeologists to envision what is occurring at the site. These are often digitized, either by snapping a photo of the hand-drawn map or using applications like Google Images or Microsoft Paint to re-create the hand-drawn map (for a great example of this, see Figure 2 in [Cultural Resource Management and Archaeology: Conserving Heritage](#)). Few archaeologists are also artists, so our hand maps tend to be very rough and not to scale. They are vital for field notes and keeping track of what is occurring during any survey, but thankfully technology can help make our rough sketches more accurate and presentable to others (see the ArcGIS and QGIS section below).

Once the data from surveys and STPs are collected, and any artifacts appropriately curated, archaeologists then go about converting the pen-and-paper records into digital records. Most of the time, this requires inputting all the information into a spreadsheet, like a Microsoft Excel or LibreOffice sheet (Figure 4), but some archaeologists prefer adding things to Google Sheets. Eventually, these files are compiled into entire databases, such as with Microsoft Access or OpenOffice Base (but those details are best left to data scientists, not archaeologists). Regardless of the specific program used, the data must be entered in specific columns and generally needs to be in numeric format (so that the spreadsheet can be easily used with other programs—discussed in the following paragraphs). Many archaeologists are now skipping the conversion from pen-and-paper records by recording data directly into a digital format while still in the field. This has become easier with applications like Microsoft Forms or Google Forms, as well as with more specialized mobile applications. Keep in mind that those kinds of applications are a more convenient way of accomplishing the same task of organizing data into columns and rows.

Figure 4 – A sample spreadsheet in LibreOffice Calc. Most spreadsheet programs look very similar to this example. By [Jasonh](#) via Wikimedia and licensed under [CC BY-SA 4.0](#).

Statistical Software

Statistical analyses are needed for most archaeological work. This can take a variety of forms, from identifying differences in surface features to finding small changes in the frequency of artifacts (see the Ancient Technologies and Ancient Environment chapters for more on this). Sometimes this involves just counting objects, but sometimes it involves more advanced statistical calculations, from t-tests to ANOVAs (analysis of variance) and beyond. If you're not comfortable doing math by hand, don't worry! That's why archaeologists put data into spreadsheets—so the computer will do the math for us.

Two of the most common statistical programs used by researchers are SPSS and PSPP. SPSS stands for the “Statistical Package for the Social Sciences” and is offered by IBM. SPSS subscriptions are quite affordable while attending college (around \$80 per year, as of 2024), but quickly skyrocket for professionals (around \$100 per month, as of 2024). To avoid this, and to ensure equity for people of all income levels, many professionals switch to open-source alternatives. PSPP isn't a fancy abbreviation, but instead a play on SPSS. PSPP offers most of the common features of SPSS, including a graphical interface and options for coding more advanced statistics, but without any financial investment! In fact, you [can download PSPP](#) right now, for free. The open software movement is vital to creating a more equitable research environment, as are any efforts that make research activities more widely available for both the producers and consumers of knowledge.

Another common approach is to use R and RStudio. R is a programming language developed for statistical analyses and is used by RStudio to run many statistical tests. RStudio provides a GUI (Graphical User Interface), but still requires knowledge of how to write code in R. For more on how R and RStudio works, see the [official RStudio website](#).

Geospatial Software

Once the archaeologist has entered the data into spreadsheets and run any statistics that are needed, the next step is to put the data into GIS software. The two most common GIS programs used are ArcGIS and QGIS. Just like with SPSS and PSPP, one requires a paid subscription while the other is free and open-source. ArcGIS is the industry standard (and priced accordingly), while QGIS is the open-source alternative. Both systems work best with data in .csv format, but any spreadsheet format can be used. Data must be imported into the program and tools run to convert the raw data from the spreadsheet into data that the GIS software can display. This most often involves using GPS data, which may come from pedestrian surveys or STPs. The GIS tools create a layer, or an overlay of data onto a background, for us to visually inspect. See the Working With Spreadsheets and QGIS box for an example of how this is done in QGIS.

Once we have the data in our GIS program and created the layer of our data, we can start mapping out the archaeological site. Archaeologists often create multiple maps to display the information in different ways for different audiences and to highlight different findings. For example, it might be important to show the path of the pedestrian survey on one map and the number of artifacts found in each STP on another map. The process of creating maps showing specific information is called cartography. The principles of cartography are beyond the scope of this chapter, but an example of the kinds of maps created are presented in the Working With Spreadsheets and QGIS box.

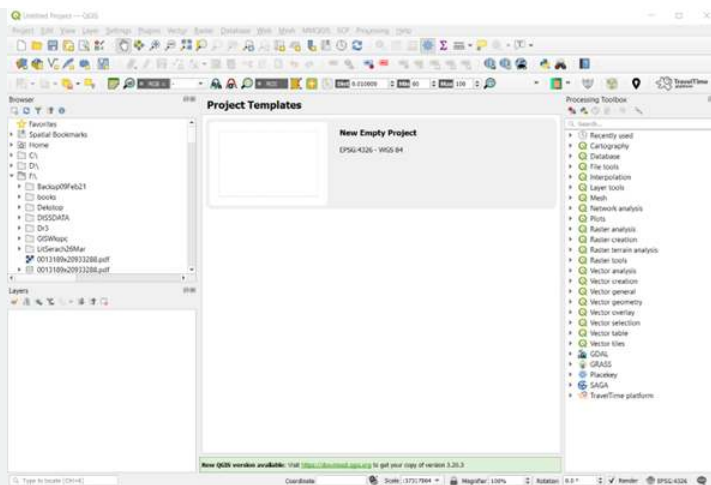
GIS programs are not only used for creating pretty maps—they are much more powerful than that. They can be used by archaeologists at every step of the archaeological process, from planning to the collection and analysis of data and even in the peer review process. For example, each program has a wide array of tools that can be used to do things like plan new pedestrian surveys, create buffers around features like houses or roads, or analyze the topography of an area to predict where artifacts might be located. Unlike in past decades, this last use of GIS programs is now intimately tied with aircraft and remote sensing.

Working With Spreadsheets and QGIS

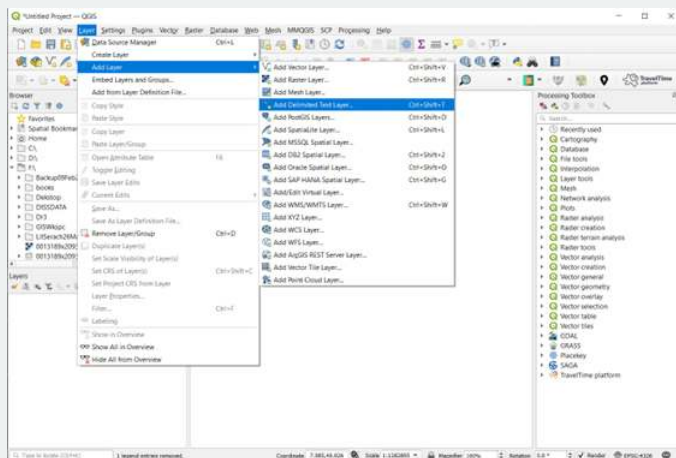
This section demonstrates how to use open-source data and QGIS to create a map of archaeological finds. In this example, data were obtained from [Open Context](#) regarding the location, amount, and type of archaeological finds. This is tied in with the CowQueLatte activity, linked [here](#).

[illegible]

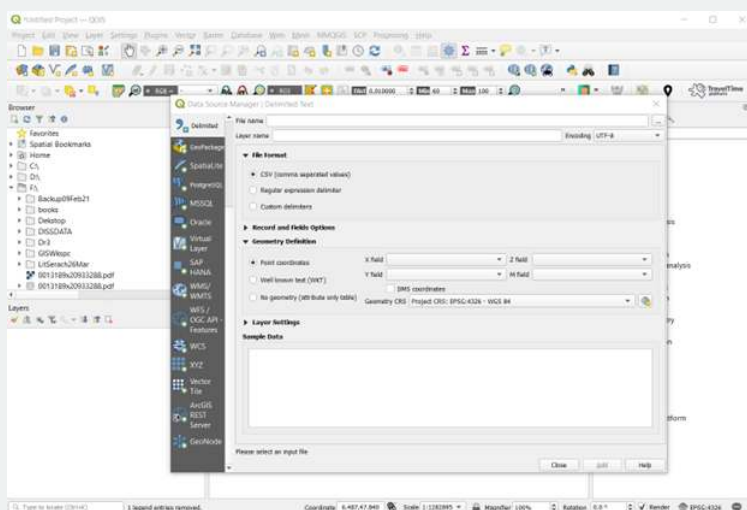
This first pair of images shows the CowQueLatte spreadsheet open in Microsoft Excel and LibreOffice Calc. In both programs, the data is identical—it's only the display that differs between the programs. Whenever using data, it's best to open the file in a spreadsheet viewer (MS Excel, LO Calc, or Google Sheets) to check that the data are correct and accurate.



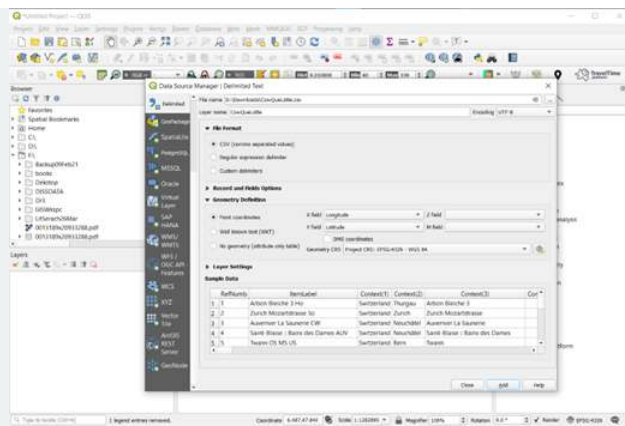
The next step, after ensuring the .csv file contains the correct data, is to open QGIS. This image represents the QGIS home page when first opening the program. For this example, the chapter author selected “New Empty Project.”



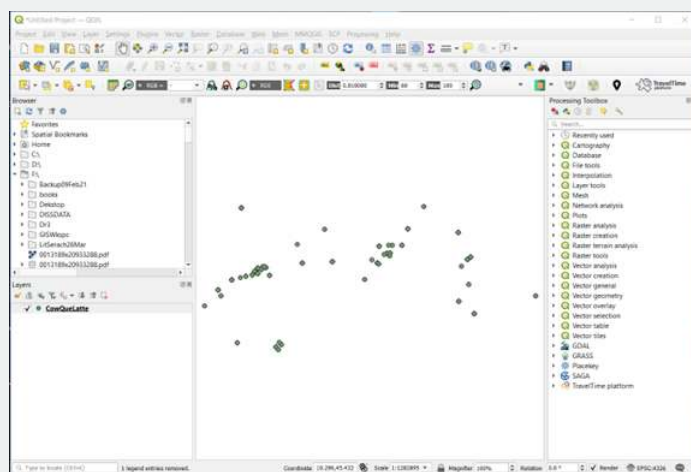
Now that a QGIS project has been started, we need to add the data (from the CowQueLatte.csv spreadsheet) to our QGIS project. This is done by selecting Layer -> Add Layer -> Add Delimited Text Layer.



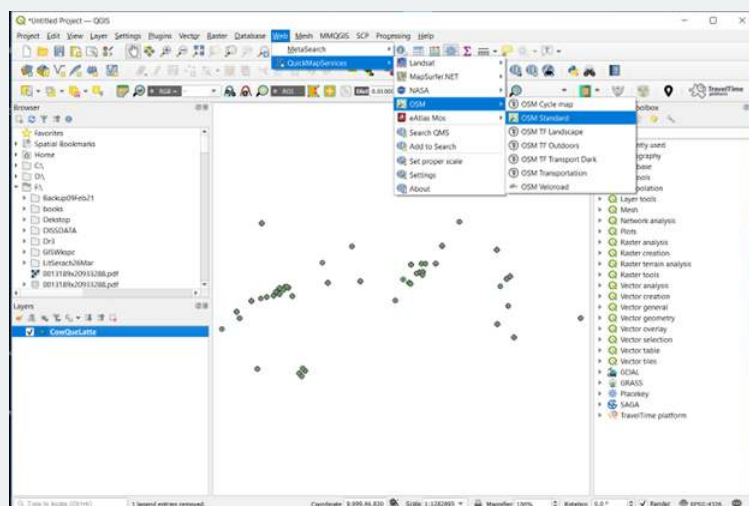
Clicking on “Add Delimited Text Layer” brings up the “Data Source Manager” pop-up box set to the “Delimited Text” option on the left-hand side. This allows us to select “CSV” as the file format before we select the CowQueLatte.csv file by clicking on the three dots after the long “File Name” box.



Selecting the “CowQueLatte.csv” file brings up additional options in the Data Source Manager box. We are mostly concerned with telling QGIS how and where the location of each archaeological find is stored in the spreadsheet. Fortunately, the “CowQueLatte.csv” file already has the Latitude and Longitude saved as specific columns. We can therefore just select “Longitude” in the X field and “Latitude” in the Y field. Remember—longitude lines are numbered from east to west and west to east, while latitude lines are numbered from south to north and north to south.

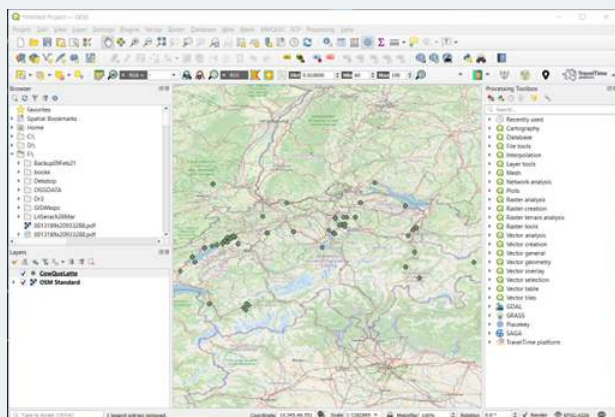


After clicking “Add,” QGIS now has the information to put a point at each latitude and longitude location where an artifact was found. QGIS converted our spreadsheet to a layer of points, with the layer title CowQueLatte in the bottom-left corner.

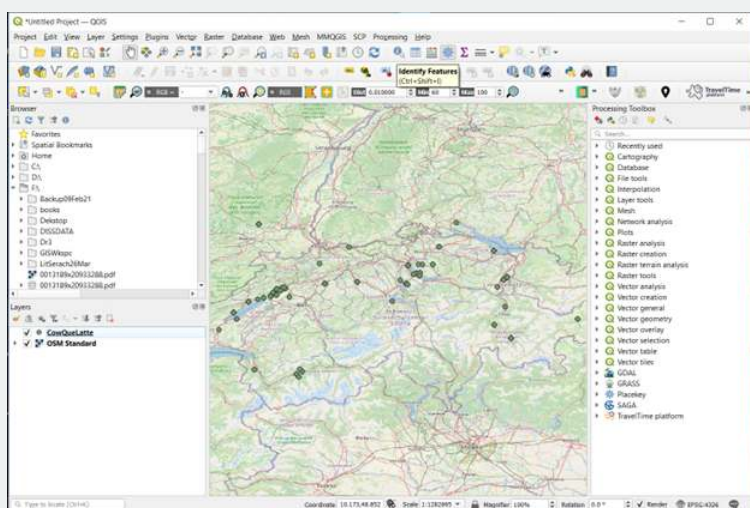


Having the location of each archaeological site is important, but so is having some kind of reference layer so that we can tell the artifacts don’t exist in a white void. To add a base layer, we can select Web -> QuickMapServices -> OSM -> OSM

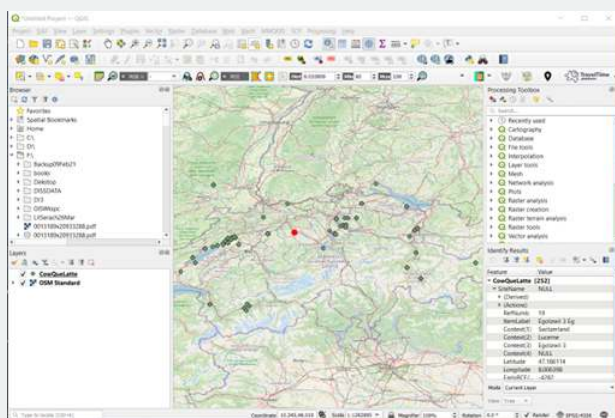
Standard.



Adding the OSM Standard layer gives us a good reference for where each of these archaeological finds were located. The lower-right corner shows Milano (in English, we call this city Milan, Italy) while the center of the map shows Schweiz/Suisse/Svizzera/Svizra (the names for Switzerland in the official languages of German/French/Italian/Romansh, respectively).

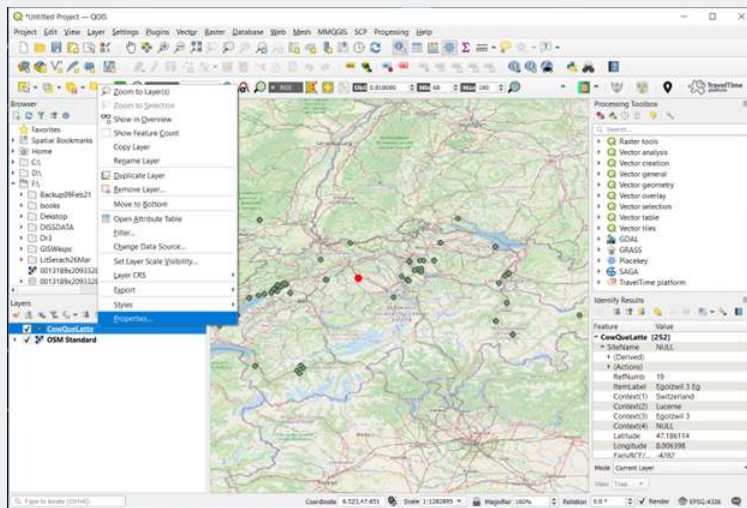


Now that we have all of the archaeological finds displayed and a reference layer, you might be wondering what happened to all the other information stored in the spreadsheet. We can see the data stored for each location by selecting the “Identify Features” button in the middle of the top ribbon under “Processing,” or by entering “Ctrl + Shift + I” on the keyboard.

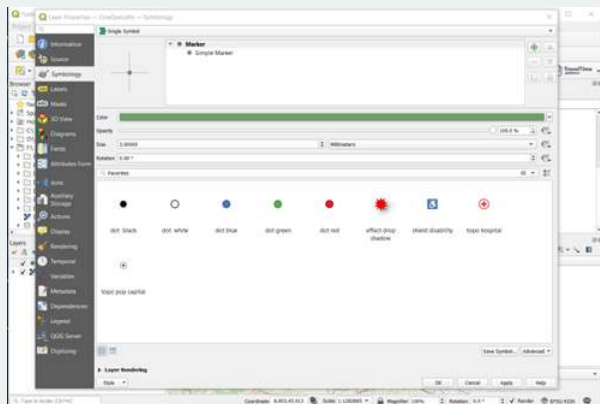


Clicking on any of the points will select the data for that one individual archaeological find. In this case, we have selected the site near the center of the screen. When we click on it, the color changes from green to red to let us know that we have selected

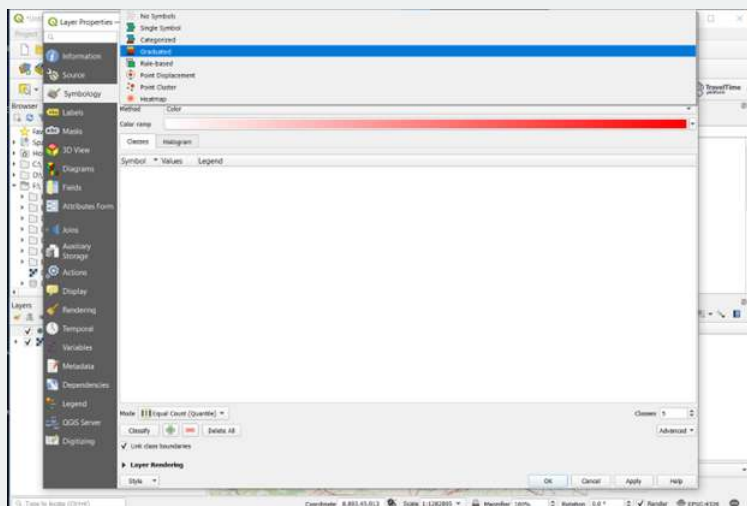
that particular site. The bottom-right corner of the screen also changes to show us all the data stored in the spreadsheet for that row.



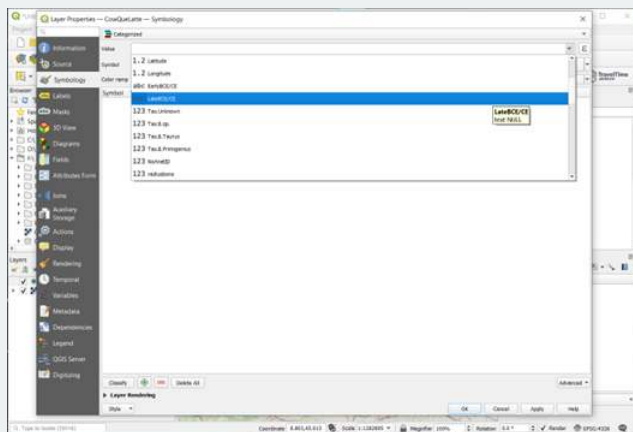
Now, let's change how we see each of the sites visualized on the map. To do this, we right-click on the CowQueLatte layer we created in the bottom-left corner of the screen. Then, we click on "Properties."



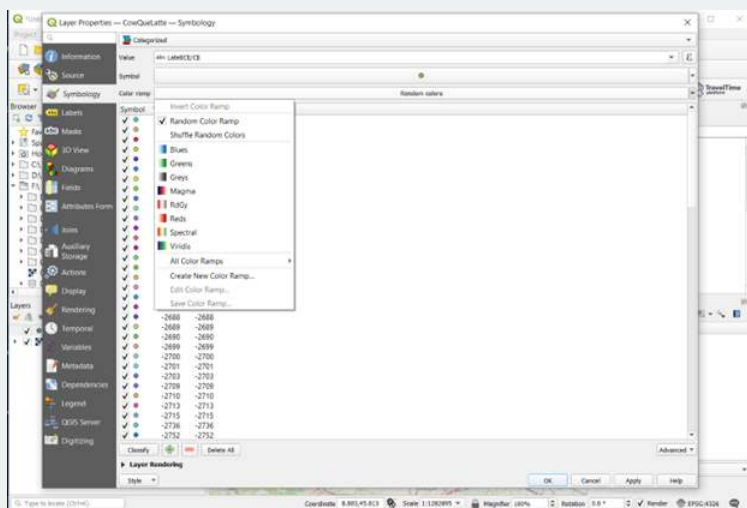
The "Layer Properties" pop-up window allows us to make many different changes to the selected layer. Right now, we're only concerned with changing how we see the locations represented on the map. This is called the layer's "Symbology." The layers have a single symbol by default, with a random color assigned by QGIS when we create the layer. In this example, the color is green, but it could be any color.



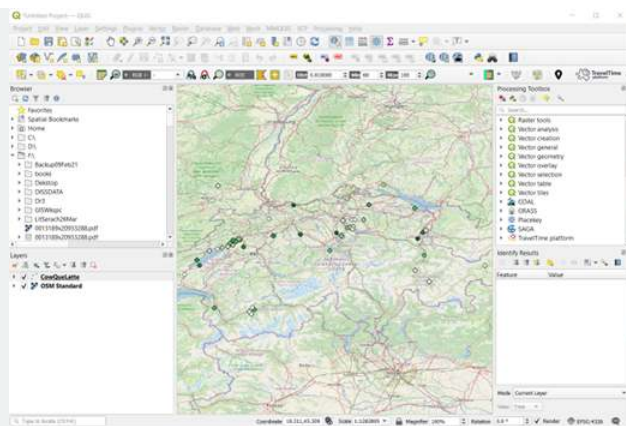
We often need to display more information than just the location of each archaeological site. For example, we might need to show when each site was occupied by people, how many artifacts were found, or what type of artifacts were found. In this example, we'll change the color so that we can quickly see the latest age for each of the finds. This can be done by either changing the "Single Symbol" box to Graduated or Categorized. Graduated will bring up a continuous gradient but won't let us quickly group sites of similar ages together.



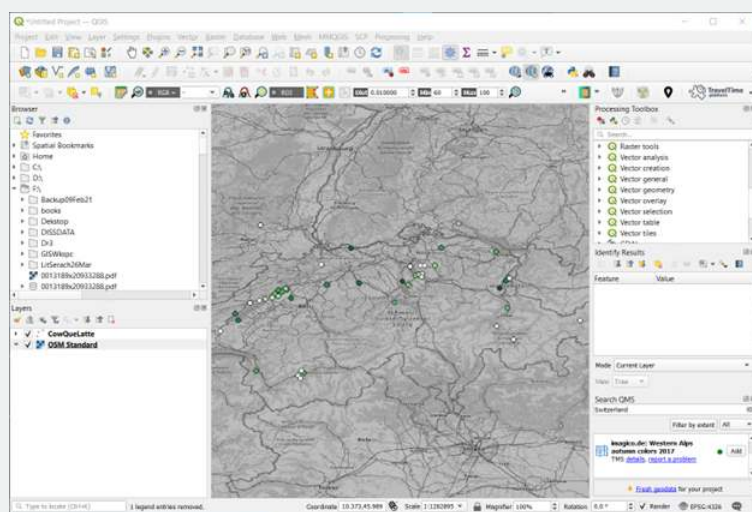
Instead, we select "Categorized" and then need to tell QGIS what "Value" we want the different symbols to be based on. In this example, we're trying to show the most recent occupation of each site, so we'll select the "LateBCE/CE" field.



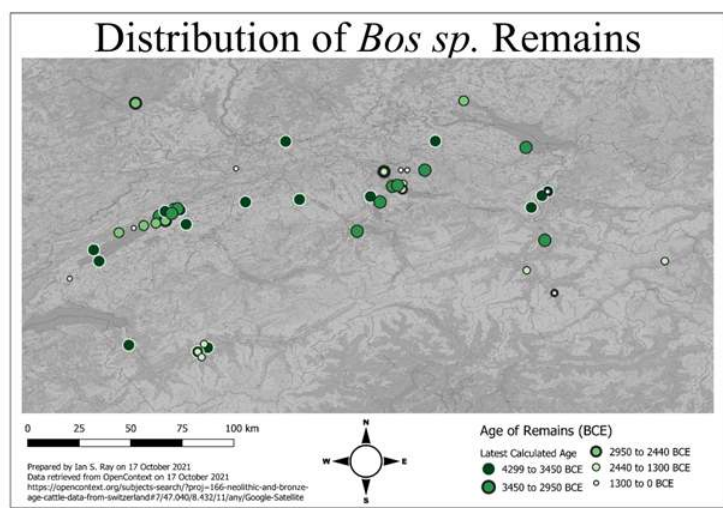
Now we have told QGIS that we are going to choose specific values of "LateBCE/CE" to show as different colors. QGIS has created a whole list of the possible values for "LateBCE/CE" and assigned each one a random color. Since we started off with all the sites shown in a green color, we're going to change the "Color ramp" by clicking on the box that currently says "Random Colors" and selecting "Greens." We also need to shrink down the number of categories QGIS is putting the "LateBCE/CE" values into by clicking on "Classify" in the lower left-hand corner. For our example, we decided to classify five categories of "Late BCE/CE."



Once the color ramp is set to green and five classes have been set up, we click “Apply” and can see this map. You can see that each point is now one of five colors, giving us this view.



Before we finish our map, we need to change the OSM Standard layer. The green values are fine by themselves but can easily be lost in the green background. For this, we just right-click on the “OSM Standard” and change the view to black-and-white.



There are several additional steps we can take in QGIS to create a full map (via the Project—New Print Layout options). The details of how to do this can be found elsewhere, but we are able to create this map showing the latest calculated age of each archaeological find.

Maps like this are crucial to making sense out of large-scale archaeological data. Here, we created a map showing where people were likely to encounter bovines (cows and their relatives). This helps us to interpret the results of any statistical analyses and communicate those findings to the public.

Aerospace, Aircraft, and Archaeology

None of the GIS programs could work without advances in aerospace engineering. Specifically, the Global Positioning System (GPS) satellites allow anyone to map the world around them down to the meter mark, with some systems allowing for millimeter accuracy (<0.04 inches). Those in use by the general public, such as the GPS in the device you may be using to read this textbook, are somewhat less accurate at approximately 5 m (just over 16 feet). The accuracy may be increased substantially if there are multiple systems running at once or decreased if there are environmental hazards, such as buildings, mountains, or trees.

GPS satellites are run largely by the national governments of the world, though private companies are beginning to enter the market as well. These systems are therefore more accurate in countries with ties to the programs, such as in the United States. Unfortunately, there are often fewer satellites for use in remote areas or in the Global South, resulting in less accuracy in these areas.

Other satellite programs are in use to continually map the world around us. One particularly useful program is the Landsat program, run by the United States' National Aeronautics and Space Administration (NASA) and the United States Geological Survey (USGS). The ninth iteration of this program was fast-tracked for launch in September of 2021 and ensures the continued creation of publicly available data. In fact, you could use this [link](#) to create an account and download the data for the area you're sitting in right now.

If you were to download this image, however, you would immediately find that you couldn't see yourself or necessarily make out the features of your immediate environment. Instead, you would find that each pixel represents an area of 900 m^2 ($\sim 1,075 \text{ ft}^2$), or around 100 ft^2 , larger than the average apartment in the U.S. This resolution is not particularly useful for identifying individual homes or people, but is excellent for getting an idea of the ground cover or geographic features of a large area.

Atmospheric distortions, like clouds, wind, or air currents, make greater resolution very difficult. Light must pass through the atmosphere twice, once to reach the ground and reflect off the surface and then a second time to reach the satellite in orbit. Even tiny changes in air pressure, temperature, or wind speed can bend the light enough to make a high resolution image impossible to obtain. Unfortunately, satellites cannot stop and wait for conditions to improve; they must continue their orbital fall around Earth.

Improvements in other areas of technology, however, have allowed us to bring the satellites much closer to home. Aerial images were in use long before the first artificial satellite, the USSR's Sputnik, was launched into orbit. Images from airplanes and helicopters allow for much greater resolution and ease of access, since it is much cheaper and easier to fly a plane than a rocket. Archaeologists have long used aerial photography to map sites, conduct surveys, and even to make the famous discovery of the Nazca lines in Peru (Kosok, 1959; Ruggles & Saunders, 2012). The USGS's EROS archive contains aerial images covering the entire continental United States with each pixel equating to approximately 1 m (3.28 ft) (USGS, n.d.). Specific flights and projects have frequently reduced the pixel size to approximately 15 cm (5.90 in.) (USGS, n.d.). Unfortunately, the utility of this type of aerial imaging is limited due to the relatively high cost of chartering airplanes and the potential distances of many sites from civilian airports.

Regulations, Radar, and Remote Sensing

The past 20 years have seen the rise of Unmanned Aerial Vehicles (UAVs), also known as drones or Unmanned Aerial Systems (UAS). The smaller size of UAVs means that they consume significantly less fuel than a full-sized airplane, with many models running only on battery power (see Figure 5). This reduction in fuel needs means much cheaper, more frequent imaging that can be tailored to specific concerns. Even better for those in the United States, the Federal Aviation Administration (FAA) has created a special type of pilot license for professional UAV pilots. By using this type of license, anyone over the age of 16 can fly a UAV and gather their own imagery. This is often called a "Part 107" pilot license, referring to a specific federal code that allows these pilots to fly UAVs, but not manned aircraft like planes or helicopters.

It is important to note that "manned" and "unmanned" do not refer to the gender or sex of the pilot carried aboard the aircraft. These are older terms that were developed using the term "man" as a gender-neutral term for a human. More inclusive language has yet to be put into widespread use within the aviation industry, but pilots can be just as diverse as any other profession.

Figure 5 – These common UAV designs are frequently used by UAV professionals. Increasingly, the quadcopter design is favored due to the wide availability of commercial models. By [Haraldskinnemoen](#) via Wikimedia and licensed under [CC BY-SA 4.0](#).

The ability to specifically target flights on field sites allows archaeologists to gain all the benefits of aerial imaging without the high costs of launching satellites or chartering planes. We also can fly multiple times, often on multiple days, meaning weather is much less of a concern. These detailed data collections can be used in combination with GIS and Remote Sensing software (discussed later in this chapter) to create detailed maps and 3D models and even reveal features otherwise hidden by vegetation. One example of this is the [Vanderbilt Initiative for Interdisciplinary Geospatial Research](#), which is using data gathered from various UAVs to create [virtual reality](#) models of Andean archaeological sites (Wolf 2021). This project uses not only data collected by the researchers themselves, but also from an entire community of researchers via the Geospatial Platform for Andean Culture, History, and Archaeology (Wernke et al. 2024).

As mentioned in the introduction to this chapter, Remote Sensing refers to many different techniques that allow us to detect objects that cannot be detected from our senses alone. Some of these techniques require us to be physically present near a location, some require a device to be controlled remotely, such as a UAV, and some techniques require a satellite in orbit around Earth. These techniques often involve the use of electromagnetic waves (see Figure 6) or sound waves, but can also use electrical fields, magnetic fields, or even seismic waves.

The first technique developed was sonar (SOund Navigation And Ranging). Sonar was first used to help ships navigate and avoid collisions. The simplest form of sonar sends out a burst of sound waves (called a “ping”) and someone listens for the echo of this “ping.” The time between “ping” and echo is used to calculate the distance to the object. And motion is detected by doppler shift, which causes a higher-pitched “ping” to be heard if the object is moving toward the listener, while a lower-pitched “ping” is heard if the object is moving away from the listener. This can help archaeologists find the location of sunken ships, buildings, or other human-made objects from the comfort (and relative safety) of the surface. Many Remotely Operated Vehicles (ROVs) have been equipped with a combination of sonar and radar to more effectively map the ocean floor, leading to many major discoveries.

One of the most commonly used remote sensing techniques used is radar (**RA**dio **D**etection **A**nd **R**anging). Radar uses radio waves to detect the size, position, and motion of objects by bouncing different wavelengths off anything within the detector’s range. The process is very similar to sonar, with a “ping” of radio waves sent out and an echo detected by sensitive equipment. You probably are already familiar with two of the most common uses of radar—speed detection and weather monitoring. Speed is measured by bouncing the radio waves off a moving object, with the doppler shift caused by the object giving a precise speed of the object

relative to the observer. These are often used by traffic police worldwide to fine drivers for exceeding speed limits. We can also use the reflection of different wavelengths of radio to infer the size, location, and composition of clouds—hence the radar maps common on weather sites.

Cool stuff, but what does that have to do with archaeology? Well, beyond knowing if a site is accessible (due to rain or snow), radar can also be used to image what is underneath dirt or even solid rock. Certain radio waves can move through soil but are reflected by larger objects, allowing archaeologists to penetrate the ground without ever needing to dig. This is called ground-penetrating radar (GPR) and is used to create an image of what is beneath the ground's surface. As we talk about in the “Excavation” chapter, archaeology is one of the only sciences that largely destroys our research sites. However, by using radar and remote sensing, we can save time and energy by knowing exactly where to dig and what we are likely to find.

Another type of remote sensing uses visible light itself. LiDAR (light detection and ranging) works like radar and sonar. Light (typically a laser) is sent toward an object and reflected back to a sensor. Just like with sonar, the time between the laser pulse and reflected detection can be interpreted by a computer to determine the distance to the object. By combining many thousands of individual detections, a three-dimensional map of the environment can be created. The major benefits of LiDAR are increased speed and precision. Light has a much shorter wavelength than sound (sonar ~ 1.5 cm to ~ 1.5 m; LiDAR ~ 900 nm to $\sim 1,050$ nm; see Figure 6). LiDAR has been used extensively to make discoveries of sites in otherwise inaccessible places (see Wernke and VanValkenburgh 2023).

 A diagram of the electromagnetic spectrum, showing the type, wavelength (with examples), frequency, the black body emission temperature.

Figure 6 – This diagram shows the general type, wavelength, and frequency of the electromagnetic spectrum. By [Inductiveload](#) via Wikimedia and licensed under [CC BY-SA 3.0](#).

Archaeologists frequently use the same principles of remote sensing (RS) to detect different landscape features. One fortunate aspect of the involvement of NASA is that many space-based data sources are publicly available. The USGS has compiled much of this data on [Earth Explorer](#). For each pass of the satellite over an area, multiple images are taken at one time. However, if you were to download the files, you would find only black-and-white images. That's because each image represents a single segment of the electromagnetic spectrum, called bands. These bands are specifically tailored to look only at one small frequency range, which is termed the reflectance for that wavelength. The reflectance each band refers to varies depending on the data source (see Figure 7). For example, Landsat 9 is the latest geospatial remote sensing satellite launched by NASA and has 11 bands, of which two focus on thermal imaging (NASA, n.d.).

 A comparison of Landsat 8's different bands by wavelength in nanometers.

Figure 7: This image shows the different Landsat 7 and 8 bands and their approximate wavelength in nanometers. By [USGS](#), image under public domain.

It probably comes as no surprise that, if we're detecting visible light, we probably could also take a photo, especially since, as mentioned before, aircraft (planes, helicopters, or UAVs) are used to collect images. This is true and, at the most basic level, archaeologists can use typical color photographs just like the ones you might get from any digital camera. However, the physics behind light help archaeologists gather much more data than the image you might pull up on your phone.

Aircraft intended to collect research-quality data have sensors that are similar to the satellite sensors used for remote sensing. The most common of these sensors include Red, Blue, and Green light (just like any digital camera) and NIR, or Near Infrared. GIS professionals (archaeologists, geographers, and other scientists) can use many different computer programs to combine the bands into color images, ranging from true-color to any combination of false-color images that help to highlight specific objects (see Figure 8). True-color images represent what the human eye would see. False-color images show what the human eye cannot see. False-color images might use wavelengths outside of the visible light spectrum or may change colors around, for example so blue light is shown with shades of red. It is difficult to make out what features might be important in the left side of Figure 8, but the differences between human development, vacant land, and bodies of water are immediately recognizable in the right-side false-color image.

Figure 8: These Maya ruins, covered by jungle, were easily identifiable using false-color remote sensing (Michenot et al. 2024).

Together, these wavelengths are used to create the NDVI, or Normalized Difference Vegetation Index, which is used to measure plant health or the composition of the plant community in a native ecosystem. The NDVI can be visualized using false-color imagery, where each wavelength from Landsat (or any other camera sensitive to these wavelengths) is applied to one of the Red, Blue, and Green color bands (see Figure 8). These images have been used by archaeologists to uncover a variety of features, including ancient Mesoamerican cities currently covered by jungle (see [Michenot et al. 2024](#)).

While remote sensing can give great detail about a site quickly and (relatively) cheaply, there are times where being on-site is necessary. Since archaeology is one of the only sciences that destroys our study sites as part of the process, we prefer to leave materials in place whenever possible. How can we get data without excavation (and thus, destruction)?

One nondestructive technique is to use Acoustic Reflectance. As mentioned earlier in this chapter, sonar and echolocation both utilize sound to detect objects. Some bats, for example, send out very intense, high-frequency sound waves and listen for the reflection of those sound waves from different objects in the environment. Their brains then process that sound into a three-dimensional impression of the environment. Acoustic Reflectance is a more general application of the same idea and is used with many autonomous devices, like self-navigating vacuum cleaners, to build a model of the environment and determine the best way to avoid obstacles. Archaeologists can use the same concept with artifacts within the ground, just sending the sound waves through the dirt rather than the air. Sensors (microphones) must be placed at regular intervals to gain a three-dimensional view, based on how long the sound takes to reflect to each sensor. On the largest scales, this approach has been used in combination with seismometers (earthquake detectors) to create detailed maps of the deep interior of the Earth (see [Kim et al. 2020](#)).

Another noninvasive way to gather data is known as Electrical Resistivity Imaging (ERI), mostly through soil resistivity. Contrary to what Pokémon taught us, the ground is not completely immune to electricity. All materials transmit electricity, just with differing amounts of resistance (measured in Ohms, Ω). Resistance can be thought of as how difficult it is for electricity to pass through the material, with lower resistance ($> \Omega$) indicating easier passage of electricity and greater resistance ($< \Omega$) indicating greater difficulty. This difficulty, in extreme situations, can result in heat (which is how induction light bulbs, electric stoves, and space heaters work). When applying ERI, just like with acoustic imaging, electrodes are placed in the ground at regular intervals. The closer the electrodes are to each other, the more detail can be seen, but the shallower and smaller the survey area is.

Magnetometry uses magnetic signals to perform a similar function. Magnetometers (the devices measure magnetic fields) can sense the fields generated by certain types of artifacts (such as iron nails or steel swords). Magnetic fields are measured in a unit called Gauss (G), with more strongly magnetic objects creating a higher G field. When the objects' fields interact with the magnetometers' fields, a three-dimensional image can be generated. However, some objects are non-magnetic and thus can't be detected as easily. For objects made of wood or non-magnetic materials, magnetometry can still give an indication of where artifacts may be located and thus help to guide the use of different imaging methods or excavations. In these cases, archaeologists

look for indirect evidence of wood, such as the magnetic fields given off by nails or other fasteners. If an object is very large and nonmagnetic, a weakening of magnetic fields from other artifacts can be used to infer its location.

Archaeologists must prepare to study a site by carefully researching and predicting what materials may be found on a given excavation. If the site is covered by vegetation, ground-penetrating techniques like Acoustic Reflectance or ERI may be ineffective. Similarly, if the site is from a period where iron was not widely used, magnetometry will be ineffective because the entire site will have few magnetic fields to detect.

Conclusion

Digitizing archaeological sites and data is becoming increasingly necessary for archaeologists. In the past, data may come from pedestrian surveys, shovel test pits, or full-scale excavations (see “Excavation” chapter), which simultaneously provide data and destroy the site we are studying. Modern techniques like remote sensing, acoustic reflectance, and magnetometry help archaeologists gather data and target excavations for specific purposes. UAVs help us further target remote sensing and LiDAR to build extremely detailed 3D models of sites prior to and during excavation.

Once collected, data are then entered into digital format (most commonly .csv files) and analyzed using statistical programs. This helps archaeologists quantify sites and perform in-depth research within single sites and across multiple sites and geographic scales (from counties to continents). From there, data are put into a GIS program to create maps, identify features, and use advanced statistics to identify features that aren’t otherwise visible. These approaches are increasingly important in our digital world, as models are frequently made available to other researchers and to the general public—a vital component to both public outreach (see [Public Outreach and Archaeology](#)) and to preserving cultural heritage for future generations (see [Archaeological Ethics and World Heritage](#)).

Discussion Questions

1. What is the importance of traditional survey methods in contemporary archaeological research and how do traditional methods complement or differ from technological approaches?
2. This chapter discusses the increasing use of technology in archaeological surveys, such as GIS, remote sensing, and UAVs. How has this technological integration changed the field of archaeology, and what are the potential drawbacks or ethical considerations that come with it?
3. Remote sensing techniques like radar, LiDAR, and aerial imaging have become essential tools in archaeology, but rarely does any study have the resources to use all possible remote sensing techniques. What considerations would an archaeologist need to take into account when deciding which method(s) to use?
4. The chapter emphasizes the importance of making archaeological data and models available to other researchers and the public. What are the benefits of open access in archaeological data? How do you see open access data relating to ethics, preservation, and public outreach?

About the Author



Ian S. Ray received his PhD in Research Methods and Applied Statistics from the University of Denver and his MA in Anthropology from Ball State University. His work has covered a range of anthropological topics, from reproductive healthcare access to cultural resource management and primate ecology. Most recently, he worked as a Health Education Specialist at the Centers for Disease Control and Prevention, supporting the Public Health Emergency Preparedness program.

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Supplementary Resources

Video: [The Oldest Shipwreck in the World](#)

Video: [The Case Of The Underwater Stonehenge | Time Team | Timeline](#)

Video: [Is There An Iron Age Fortress Under This Welsh Housing Estate? | Time Team](#)

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2.3: Digging In- Excavating Archaeological Sites

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Learning Objectives

- Describe the process of archaeological excavation
- Explain how different site-formation processes affect excavation and interpretation
- Evaluate appropriate excavation strategies for different circumstances
- Explain the ethics of archaeological excavation and collection

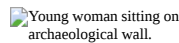


Figure 1 – The author, early in her career, excavating at a Maya site in Guatemala.

I love excavation. I love being outside and getting into the dirt. I love the potential that I might be the first person in 100, 500, or 1,000 years to touch a specific object or uncover a feature that tells the story of past human activities. Even on days (or months!) where nothing much is “discovered,” I like the meditative process of slowly scraping through the soil, watching for minute changes in color and texture that may indicate human activity. I enjoy the discipline of plotting a measured, methodical grid across a site and cutting clear, straight unit walls that show the layers of human activity and other natural processes. I like how archaeological excavation unites physical activity with mental analysis in a way that few academic disciplines do. I routinely tell my students that excavation is the most fun part of archaeology (Figure 1).

But, with all of that in mind, it is important to begin this chapter on archaeological excavation with three warnings:

1. Excavation is only a very small part of what practicing archaeologists actually do—and some archaeologists never go near a trowel. Background research, surveying, mapping, lab work, and analysis are all equally important components of the archaeological process.
2. When you excavate an archaeological site, you are destroying it. You can’t excavate the same ground twice—and this means that it is essential to carefully record everything that you do.
3. There are important ethical concerns about who has (or should have) authority over sites, artifacts, and landscapes of the past. This includes the power to make decisions about whether archaeological sites should be excavated—and if so, when, and by whom.

We’ll reflect back on these warnings as we move through the chapter. For now, let’s begin with a quick review of what an archaeological site is and how archaeologists go about exploring it.

Sites and Site-Formation Processes

While archaeological surveys take place over regions and landscapes (see “Archaeological Surveys and Remote Sensing”), excavation takes place at the level of the archaeological site. But just what is a site? Although the term is widely used, its definition is deceptively complicated. Many in the general public assume an archaeological site must include some sort of ancient monumental architecture, but this is not the case. At its most basic, an archaeological site is a place where there is physical evidence of past human activity. A site may be formed because someone lost or threw away one or more objects as they went about their daily activities. Sites may also be created on purpose, through the burial of offerings, caches, or human remains. Finally, a site could be the result of the abandonment of a settlement, structure, or campsite.

Notably, an archaeological site does not always correspond to an area that would have been understood as meaningful to the people who used it. This is because archaeological sites depend on the deposition of material objects or physical changes to the landscape—and not all activities have a physical trace. For example, when I was growing up, I spent a lot of time in the woods behind my childhood home, building forts or playing hide-and-seek with my sister. Other than the odd lost toy, there is no material evidence of that portion of my childhood. However, some old metal tools that were abandoned (but never used) in those same woods are still present. The material evidence leaves a very unbalanced perspective on how this area was used during the 1980s. Think about your own daily lives; which activities leave a material trace, and which do not?

Robert Dunnell (1992) critiqued the concept of “site” in archaeology as being essentially unhelpful to our understanding of the past, noting that sites are defined by the archaeologists who observe them rather than by the people who lived within them. He argued that the term “site” is defective in part because it could lead the archaeologist to overlook how an individual feature fit into a larger archaeological landscape. Moreover, it’s important to note that an archaeological site may include more than one occupation period, and each occupation may have different boundaries. If I camp by the river and several years later someone builds a factory there, the remains of our two occupations may partially overlap, despite being part of two very different histories. Nevertheless, when an archaeologist records the area, it could be noted as only one site.

Despite these very valid critiques, the term “site” is still standard in archaeological usage, and necessary in cultural resource management in order to be able to legally protect our archaeological heritage (see “[Cultural Resource Management and Archaeology](#)”). As we excavate, however, we should keep these considerations in mind as we ponder how the site was formed. An understanding of site-formation processes should affect how we excavate and how we interpret what we find.

Site-formation processes refer to the way that objects or features become part of the archaeological record through natural processes or as a result of human activity. After a settlement, structure, or campsite is abandoned, the materials left behind may be affected by plant activity, animal activity, human activity, or architectural collapse. For example, the city of Pripyat in Ukraine was abandoned after the Chernobyl nuclear power plant disaster in 1986, and drone footage from 2013 to 2016 shows how the town has changed over the years.

One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://pb.libretexts.org/tracesarchaeology/?p=147#oembed-1>

As we excavate, we need to be able to tell if the placement or preservation of different items is due to their original deposition or the result of post-occupation site-formation processes. After watching the video of Pripyat, look around the place in which you are currently sitting. If that space were abandoned today, what materials would still be there in 30 years? 300? 3,000? 30,000? What materials would have decomposed? What might be in that space that is not there now? What materials would have been moved around and why? How might decomposition or movement of various items affect future archaeologists’ interpretation of the use of that space?



Figure 2 – This abandoned structure shows the effects of floralturbation (plants growing through the stairway) as well as faunalturbation. (The red arrow points to an animal burrow.) The rocks from the wall falling downhill also illustrate graviturbation. (Photo by the author.)

There are a number of different natural site-formation processes that could affect archaeological interpretation. For example, artifacts, ecofacts, and features may be moved as a result of plant growth, especially as roots push through the soil or vines break through architecture. Rodents or other animals may burrow through a site, moving artifacts around, and these burrows may be mistaken for postholes or other archaeological features. This floralturbation and faunalturbation can be identified in many abandoned structures (Figure 2). Other natural site-formation processes include cryoturbation (the mixing of soils and associated

artifacts due to the freezing and thawing of groundwater), argilliturbation (which occurs in clay soils as they get wet and dry), and graviturbation (which occurs in hilly environments as soils, rocks, and associated artifacts roll downhill).

Cultural processes affect the ultimate presentation of archaeological sites as well. Artifacts from a site may be collected and parts of a site may be reused in a manner different from what was intended. Cultural disturbance, like building or farming on top of a previously occupied site, also affects the way the site may appear to archaeologists. By the time a site is recorded, it is often composed primarily of refuse or material that people considered to be no longer useful. For example, at a site I worked at in Bolivia, a local man shared that as a child one of his jobs had been to collect *batanes* (grinding stones) that could still be used, and that these would be sold at the market. As a result, archaeologists likely have a significant undercount of *batanes* that were actually used at the site. Likewise, across the United States, as family farms failed throughout the 20th century, many buildings initially built to house animals were reused for storage or trash, much of which may not be related to the original occupation. In contrast, some of these structures were revitalized and transformed into “rustic” wedding venues. Either form of reuse could confuse future archaeologists interested in the structure, which is why all site-formation processes should be considered as we design our excavation strategies.

Excavation Strategy

An excavation begins by deciding where to dig. Archaeologists do not dig haphazardly! Whether we are working in CRM (cultural resource management) or as part of an academic project, we first carefully identify which sites to excavate and where to excavate on a given site. An excavation needs to be planned according to several factors: the goal of the research, available funding, time in the field, and legal/ethical concerns.

Goals, Constraints, and Guidelines



Figure 3 – Two examples of circular structures excavated at the site of Pukara de Khonkho, Bolivia. (Photos by the author.)

The first thing to consider is the goal of the research. Why are you excavating in the first place? In CRM in the United States, archaeological sites are most often identified in Phase I. Excavation may take place in Phase II or Phase III. A Phase II excavation is generally small in scale, designed to test the integrity and importance of the archaeological site to see if it is eligible for inclusion on the National Register of Historic Places. A Phase III excavation is full data recovery, designed to learn as much as possible about the site. (See “[Cultural Resource Management and Archaeology](#).”) In contrast, an academic project should be guided by a specific, focused research question. What do you hope to learn? An archaeologist who is interested in investigating subsistence strategies would take a very different approach to excavation than one who is researching burial practices, for example. At my own excavations at the site of Pukara de Khonkho in Bolivia, I was most interested in the everyday lives of people at the settlement. As a result, I focused my excavations around the circular domestic structures that were visible on the surface of the site (Figure 3).

Funding is often a limiting factor when it comes to planning an excavation strategy, and this can be true in both CRM and academic contexts. CRM companies will generally bid for projects, trying to balance the need to put forth a competitive bid with the need to earn money to pay the archaeologists and field technicians and also have sufficient funding to effectively follow an appropriate research design. There can sometimes be pressure to complete a project as quickly and cheaply as possible. At the same time, organizations that contract an archaeology firm may have trouble with their own budgetary resources. I once worked on a CRM project that stalled because the development company that had contracted the firm I was working for did not have the funds to continue.

In the academic world, projects are mostly funded through grants. Grants can come from the archaeologist’s own institution, from private granting organizations (e.g., Wenner Gren Foundation, Sigma Xi), from the federal government (e.g., National Science Foundation, Fulbright-Hays), from state or local governments or from nongovernmental organizations. Another avenue for funding

for an archaeologist working at a college or university is to develop a field school around her research agenda so that student tuition/fees can help fund the work. Because of the constant need for funding, archaeologists often spend considerable time working on grant applications or finding other ways to support their field seasons.

Another limiting factor for any archaeological excavation is time. CRM archaeologists need to complete the work within the scheduled time period and will often have developers urging them to be as fast as possible. Academic archaeologists usually work in the classroom through the fall, winter, and spring, so often end up only being able to do fieldwork in the summer months—or if it is possible to get time off of teaching through a sabbatical or other arrangement. When combined with the need to travel to a site—sometimes in a different country—and navigate paperwork and other bureaucracy before beginning any excavation, this often means that project directors must try to fit in a lot of work into a short time period. This may lead to long days of excavation with minimal time off during the field season. It also means that much of the rest of the year is spent in preparation for what may only be a couple months (or less) of excavation, survey, and other field research.

Last, but certainly not least, it is important to consider the legal and ethical perspective. As discussed in [Cultural Resource Management and Archaeology](#), excavation in the United States is regulated under the National Historic Preservation Act (NHPA) and associated laws, which require coordination with State Historic Preservation Offices, Tribal Historic Preservation Offices, and other interested parties, including current landowners. You cannot just dig without the appropriate permits! Similar laws exist around the world, and if you are an archaeologist working in another country, it is your responsibility to adhere to any legal requirements surrounding excavation and the treatment/curation of any excavated objects. For example, when I took part in a research project in Bolivia, we needed to follow the protocols of the national government (through the Unidad Nacional de Arqueología) as well as make arrangements with the local community and individual landowners where the excavations would take place. This often required prolonged discussions and negotiations before we could even think about picking up a trowel. As discussed in [“Archaeological Ethics and World Heritage,”](#) such discussions are incredibly important, especially as it concerns descendant communities, and no excavation should ever be conducted without a genuine consultation.

Sampling Strategies

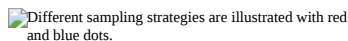
 Different sampling strategies are illustrated with red and blue dots.

Figure 4 – Each of the above boxes shows 15 samples marked in red out of a group of blue dots. In a “random” sample, the 15 red dots were chosen by a random number generator. In a “stratified random” sample, one red dot was randomly selected from each of the 15 lines. In a “systematic” sample, the 15 dots follow a pattern across the square. Finally, in a “judgmental” sample, the 15 dots are grouped in a corner because the researcher wants to focus there. (Image created by the author.)

Once an archaeologist has considered her goals, funding, time, and legal/ethical considerations, it’s time to pick a sampling strategy. In almost any context, archaeologists will not be able to excavate an entire site—nor would they want to. Remember, excavation is destruction, so it is always good practice to preserve at least part of the site *in situ* for future researchers. Archaeologists often begin by mapping a grid over the archaeological site. A basic grid helps us keep track of where different archaeological features are found, where excavation units are placed, and how everything relates spatially. Depending on the specific needs of the project, a sampling strategy for excavation may be random, stratified random, systematic, or judgmental (Figure 4).

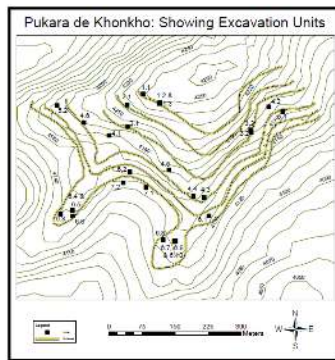


Figure 5 – Map showing the location of excavated structures at the site of Pukara de Khonkho, Bolivia. (Note that unit squares are not to scale.)

So what is the difference between these four sampling strategies? A random sample is exactly that. An archaeologist would look at the site grid, number it, and use a random number generator (or similar approach) to select where to place the units. This may be useful if the archaeologist doesn't know much about the site and is trying to get some basic information. A stratified random sample is when the archaeologist wants to ensure that she has proportional coverage of different parts of the site. For example, if a site had a clear ritual section and a domestic section, the archaeologist would select a proportional number of units in each area, but the placement of specific units within the area would be random. A systematic sample would mean excavating a unit in a consistent pattern across the site. This would ensure full, even coverage of the area, but following the pattern strictly also means that the archaeologist could not prioritize areas of the site with a higher probability of producing useful information. Finally a judgmental sample simply means that the archaeologist would choose where she wants to dig. This is a good way to prioritize specific parts of the site—especially if time is limited—but has the disadvantage of playing into the researcher's bias and potentially ignoring the parts of the site that the researcher does not think are important. In the real world, most excavation strategies use a balance of each approach. For example, in my work on the site of Pukara de Khonkho, I made the judgmental decision to place the excavation units around previously mapped structures because I was interested in everyday life at the site. I chose a stratified random sample of those structures, making sure to select a proportional number of structures from different parts of the site. (Figure 5)

 Deep archaeological excavation

Figure 6 – Deep excavation units are useful in showing stratigraphic layers and uncovering the deep history of a site's occupation. (“Connley Caves” by BLM Oregon & Washington is marked as CC-BY-2.0.)

Depending on the site and the research question, the strategy may be more oriented toward vertical versus horizontal excavations. In a vertical excavation, the archaeologists dig deep excavation units, sometimes in a “telephone booth” style. This is useful in highlighting the site's stratigraphy; archaeologists can clearly see the layers of the soil (and the different contexts of site occupation) in the unit walls. Such excavations may also be necessary if the archaeologists are interested in very early time periods that are under deep soil deposits or if they want to better understand the chronology of site occupation. However, because it takes a long time to dig a deep hole, they would excavate fewer excavation units overall, and would only ever uncover small snapshots of the occupation layers they are interested in (Figure 6).



Figure 7 – Horizontal excavation shows an entire excavation layer. This example from Khonkho Wankane, Bolivia, shows the author by the remains of a large structure built along a long compound wall.

In contrast, a horizontal excavation is designed to bring an entire section or site down to a single occupation layer. This helps archaeologists to see how the different parts of the site were situated in relationship to each other at the time of occupation. This is a great strategy if researchers are following a wall or a building, and want to see it in its entirety. However, if the site was occupied at different times, it prioritizes one occupation over others. Archaeologists would have to dig through (and thus destroy) later occupations to uncover the one they are interested in, and may never get down to earlier occupations (Figure 7).

Excavation Methods

Obviously, there are pros and cons to any excavation strategy, but at a certain point, it's time to get in the dirt and open the first unit! Through the last few pages, I've referred to the archaeological unit, but have not yet defined the term. This is simply the name that is given to the area that is dug for excavation. Archaeological units are usually square, but can be of different sizes depending on the landscape and research question. The default, however, tends to be 2×2 meters. We dig in these box shapes in order to maintain some control over the space of excavation and to help with mapping. The units are generally tied into the overall site grid and oriented to the cardinal directions (north/east/south/west). Archaeologists are very careful to dig nice, straight walls that clearly show a profile of the site's stratigraphy. (Believe me; archaeologists can get very intense about their unit's walls. If you ever walk too close to the edge of a unit and collapse a wall, you will see real anger!)

Tools of Excavation

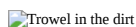


Figure 8 – The trowel is an important tool—and often the symbol of archaeology. (“Trowel” by [Przemyslaw Sakrajda](#) is marked as CC-BY-SA 3.0.)

The trowel (Figure 8) is probably the most important tool in the archaeologist's tool kit (quite literally) and is often symbolic of the discipline as a whole. The standard is a pointed masonry trowel, although a complete tool kit will also often include a “margin trowel” with a rectangular blade to help shape the corners of the excavation unit. Marshalltown trowels inspire fairly intense brand loyalty (at least among U.S. archaeologists), as referenced in Kent Flannery's (1982) classic tongue-in-cheek ode to the field “The Golden Marshalltown.” Field archaeologists tend to have a strong attachment to their personal trowels, and will use the same one for many years. Archaeologists usually keep their trowels sharpened (using a metal file) so that they can more easily cut through small roots during excavation. It is truly a multi-faceted tool, and I've even known some archaeologists to practice competitive trowel-throwing events—on breaks, of course. (See [The ArchaeoOlympic Games](#) for more suggested events—not to be tried at home!)



Figure 9 – The Pythagorean theorem ($a^2 + b^2 = c^2$) helps archaeologists to set up their excavation units. Here, “a” and “b” are the sides of the unit, each measuring 2 meters. If they are set up at a correct right angle, the hypotenuse will measure 2.83 meters. (Photo by the author.)

However, the trowel is far from the only tool used in excavation. Archaeologists need a compass to orient the unit. Measuring tapes are necessary to make sure the unit is plotted to the correct size. When plotting a 2-×-2-meter unit, for example, it is possible to ensure that the corners are in the right place by measuring out a 2.83-meter hypotenuse. And you thought you'd never need to use the Pythagorean theorem (Figure 9)! Nails are used to mark the corners of the unit, and they are wrapped with string, to show the boundaries of the unit wall. An extra length of string is tied to the nail that is chosen as the unit datum (often the highest corner). When a line level is hung from this string to ensure a consistent height, the archaeologist can then measure to the unit floor to keep track of the depth of excavation or to note the location of a specific artifact or feature (Figure 10).



Figure 10 – Student archaeologists measure soil depths using string and a line level. (Photo by the author.)

When it comes to digging, a project may start with a backhoe, a shovel, or a pickaxe to help cut through the thick topsoil and to quickly remove layers of soil that lie over the archaeological context. The choice of tool depends entirely on the type of project and the type of soil. In an environment where archaeologists expect the archaeological materials to appear at a deeper level (for example, when a site is known to lie under plowed farm fields), a backhoe may be used to more quickly remove the upper levels, although a monitor should usually still stand outside and watch to ensure that nothing unexpected is found. A pickaxe may be used if the soil is very compact. On most of the projects I've worked on, however, I've begun with a flat-edged shovel, sharpened so that it can easily cut through and remove the sod.

Once the archaeologists are through the thick topsoil and into the levels where they expect to find archaeological materials, they usually switch to hand tools. Trowels are used to scrape dirt into dustpans, which are then dumped into dig buckets. Clippers cut roots/branches that intrude into the excavation unit. Brushes are important to clean artifacts in situ. At times, smaller or more specialized tools can be used in specific contexts. For example, bamboo tools are often used for excavating around bone in order to avoid scratching it. You can see some of these tools in use at the Cooper's Ferry Site in the short video "The Excavation Process: The Tools."

One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://pb.libretexts.org/tracesarchaeology/?p=147#oembed-2>

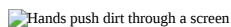
 Hands push dirt through a screen

Figure 11 – Student archaeologists screen dirt at a practice site, using a table screen. (Photo by the author.)

All dirt from the excavation is put through a screen in order to make sure no artifacts are overlooked. Screens can be different sizes and styles depending on the needs of the excavation. A small hand screen can be carried and used by an individual excavator. A larger rocking sifting screen has two legs that sit on the ground, with the archaeologist holding up the other end; to use this screen, a second archaeologist must be responsible for shoveling and loading the dirt into the screen. While these screens are relatively portable, in longer-term excavations, archaeologists might set up larger table screens or hang a screen from a tripod (Figure 11). In the United States, the standard screen size is $\frac{1}{4}$ inch. This is usually wide enough that the dirt will fall through, but small enough to leave most artifacts/ecofacts behind. Sometimes the screen is of different sizes, depending on the needs of the excavation. For example, since fish bones are often small enough to fall through a standard $\frac{1}{4}$ inch screen, a sample of soil may be put through a $\frac{1}{8}$ -inch screen to see if anything is consistently being missed.

How to Dig

Excavation continues in controlled levels. Archaeologists do not dig into the dirt, creating uneven holes. Instead, the trowels are used in a slow, scraping motion, taking down the whole unit evenly, a little bit at a time. Excavation pauses at points for notetaking, sketching maps, and to separate the artifacts/ecofacts found at different depths. When a specific feature is noted (like a pit, a hearth, or a posthole) the feature is excavated separately, in order to keep the items found in that context together and apart from the surrounding soil matrix. This may be useful later in analysis, when archaeologists are trying to date different components of site occupation. When possible, archaeologists will try to leave an artifact in place until its location can be directly mapped in. Archaeologists will not only measure where it is located on an XY axis within the unit itself, but will also measure its depth (as

shown in Figure 10) to get a better idea of how it relates to other artifacts and to the site's geology. At times, artifacts and features will be recorded using GPS coordinates, but these are not always accurate at the scale archaeologists need in all parts of the world.

 Soil profile showing stratigraphic levels

Figure 12 – Soil profile showing stratigraphic layers. (“Soil profile showing 1912 ash layer and ash C” by Katmai National Park and Preserve is marked as CC BY 2.0.)

Sometimes excavation follows arbitrary (usually 10 cm) levels; other times, archaeologists will attempt to follow the natural levels of the soil. Both techniques provide a vertical control to let the excavators know where any artifacts are coming from. Artificial levels are useful when archaeologists do not know the geology of the area well or when there are not clear distinctions visible in the soil between different occupations or time periods. This helps to avoid the mixing of artifacts/ecofacts from different depths, and can be useful in later setting the chronology. When it is possible to clearly distinguish natural layers, however, following these levels can help to distinguish between different deposition events, leading to even better chronological control. As archaeologists dig, they always endeavor to keep the side walls of the unit straight and clean. This helps archaeologists to better identify the site's stratigraphy, which will later be important in determining chronology (see “Dating Methods in Archaeology”). Can you see the shift from the thick gray ash toward the top of the profile to the darker brown subsoil in the image at left? (Figure 12)

Finally, after the excavation is complete and all notes have been taken, the excavators carefully backfill the units. This helps protect the unexcavated portions of the site. Besides, no one wants a field full of holes! Now that you've had the general introduction, explore some examples of various field sites at the AIA's “Interactive Digs” webpage—interactivedigs.com. How do different projects approach excavation? (See “Additional Exercises” at the end of this chapter for a class activity linked to this webpage.)

Recording and Collection

 Excavation and note-taking at an archaeological site.

Figure 13 – The author (seated) is taking notes before she and the crew move to the next stage of excavation.

Through it all, no matter where you are working, the most important thing to remember is to take careful notes, as you can see me doing at the site of Pukara de Khonkho (Bolivia) in the image at right (Figure 13). You never get a second chance to excavate an archaeological unit. Once you have removed the soil and the artifacts, it is impossible to put them back exactly the way you found them. In this sense, archaeological excavation differs from other sciences because it is never fully replicable. Through the process of excavation, an archaeologist is destroying the site. If careful notes are not taken at every stage, information is being destroyed—and there is no way to get it back.

How/What to Record

It is one thing to remember that note-taking is important. It is another to figure out exactly what you should record for any given excavation. Different archaeologists have vastly different note-taking styles. Some have a tendency to record literally everything—from the weather, to the way the dew sparkled on the flowers, to their mood that day, to what they had for lunch.... If an archaeologist writes too much, especially if it is disorganized, it can be difficult for a later researcher to find the important data amongst her prose. In contrast, you can imagine it is even more frustrating to try to decipher field notes that are too sparse, where the information the researcher needs was never recorded in the first place.

For this reason, most archaeological excavations have standardized forms—or context sheets—that have spaces for the information that the excavators are expected to collect from each level or feature context. The specific items on each form vary from project to project depending on the research design and local idiosyncrasies. However, most include spaces to record the name of the site, the

date of excavation, the number of the unit, the level and/or feature number, the depth and size of the context, the color and texture of the soil, the number and type of artifacts, ecofacts, and/or features that were discovered, preliminary interpretations, and any other notes and/or sketches. You can see examples of some context sheets (along with a lesson about how to use them to collect and analyze data) in the “[Gabbings About Gabii](#)” Data Story exercise, linked at the end of this chapter.

 Sketch reconstruction of "Great Baths" at Dion.

Figure 14 – An illustration showing a reconstruction of the Great Baths at Dion (Greece). (“[Reconstruction drawing of the Great Baths](#)” photographed by [Carole Raddato](#) is marked as [CC BY-SA-2.0](#).)

Part of taking good notes also includes collecting good images. Photographs are taken of the archaeological excavation at regular intervals, and some projects supplement with more technological imagery including multispectral imaging or aerial photos from UAVs (unmanned aerial vehicles). However, not all imaging requires technology; many archaeological projects also include an archaeological illustrator. Illustrators are skilled at recording the sorts of details that do not show up well in photos and can also be commissioned to draw site or artifact reconstructions (Figure 14). Even for archaeologists without an artistic talent, however, it is important to be able to draw basic sketches. These include plot maps of the floors of the different levels of the unit as well as of the profile walls. These drawings should plot the location of relevant features as well as artifacts and ecofacts that were found in situ. Remember, when it comes to analysis, it is absolutely essential to know where an artifact comes from in order to be able to interpret what it means. In fact, I would argue that the most important thing about any excavated artifact is its provenience, the way it relates to other artifacts, features, or local geology.

How/What to Collect

When the notes are complete, it’s time to consider what else you will be taking away from the archaeological site. In most cases, excavators will collect lithics (stone artifacts), ceramics, metals, bone tools, other animal bone, human bone and any other objects identified in the field that were made and/or used by humans. These items will be collected in paper or cloth bags, which are carefully labeled by context so that it will be clear what items were found where when they get into the lab. In addition, burnt wood or other carbon samples are often collected in order to be tested for radiocarbon dating (see “[Dating Methods in Archaeology](#)”). Carbon samples should be carefully wrapped in aluminum foil; avoid touching with your hands to reduce the possibility of contamination. In addition, soil samples are often collected from relevant contexts for flotation or other specialized analyses.

Criteria for what should be collected and what should be left behind differ based on the project design and the local archaeological standards. In some cases, it can be hard to tell what is meaningful and what is not when you are in the field. I have been on many projects when objects that looked like lithic débitage in the field turned out to be simple, unmodified rocks once they were cleaned up and analyzed in the lab! In this case, it is generally better to err on the side of caution. An unmodified rock can be thrown out in the lab, but you’ll never get another chance to collect an artifact if you leave it in the field. Archaeologists must also consider where the artifacts will be stored once they are cleaned and analyzed. Good curation is important so that collections can be restudied in the future, but there is a shortage of high-quality facilities available.

In some cases, though, objects cannot—or should not—be collected. Some are too big to be moved from their locations, or they may be part of features (like a part of a structure) that will lose their integrity if removed from the site; preservation may be better in situ than if an item was removed to a lab or repository. In other cases, items should not be removed in accordance with the will of the local or descendant community. There may be spiritual or political reasons that particular items must stay in the location where they were originally found. This is often the case with mortuary or religious contexts. In making these decisions, and indeed through the entire excavation, it is essential to be following clear standards of archaeological ethics.

Ethical Considerations

As discussed in the chapter “[Archaeological Ethics and World Heritage](#),” there are various standards of archaeological ethics that govern professional archaeological activities around the world. In the United States, the best known is the [Code of Ethics of the Society for American Archaeology](#), which highlights nine principles: stewardship; accountability; commercialization; public education and outreach; intellectual property; public reporting and publication; records and preservation; training and resources; and safe educational and workplace environments. In this chapter, I draw on this and other ethical codes in considering archaeologists’ responsibilities as we excavate—responsibilities to those with whom we work, to the archaeological record, to descendant communities, and to students and others interested in learning about the past.

Perhaps the first priority is to make sure that the field site is a safe environment for all who work there. This means making sure the excavation is physically safe: don’t dig units that are dangerously deep, and be aware of the potential for dangerous falls or accidents with sharpened trowels or other tools. Every field site should have a first aid kit, and directors should be aware of the nearest health facility—keeping in mind that field research may be far from well-populated areas. Conducting physical labor in a variety of different environments increases the risk for heatstroke, frostbite, allergies, and other environmental hazards. In certain contexts archaeologists should also be prepared for animal attacks, including snake and insect bites. Bacteria and parasites can also be threats, as can hazardous waste, buried chemicals, or even unexploded ordinances that can be encountered during excavation (Poirier & Feder 2001).

In addition, excavation sites should be free from sexual harassment or discrimination. Unfortunately, this has not always been the case. In fact, a recent survey of field-based sciences (including archaeology) found that a majority of female scientists have experienced sexual harassment and discrimination in the field, and sexual assault is also common (Clancy et al. 2014; Meyers et al. 2018). Racial discrimination is also a problem, especially as archaeology—particularly field archaeology—remains a predominately white discipline. See “[Why the Whiteness of Archaeology Is a Problem](#)” for some specific examples and directions for growth. Until our field sites can be safe for all practitioners, it is difficult to make progress toward stewardship, collaboration, education, or any of our other goals.

Stewardship is the goal to preserve and protect the archaeological record—keeping it out of the hands of looters and other commercial interests. This means excavating judiciously. Since excavation is destruction, archaeologists should only dig when we would learn more from the process than we would gain from preserving the site in situ—or when such preservation is impossible due to outside forces like development or climate events. When possible, at least part of the site should be left unexcavated for future archaeologists who may have the advantage of new technologies for analysis and different research questions to investigate. If a site may be threatened by looters, it is essential to not share its exact coordinates publicly unless it is well protected and/or there is a meaningful reason for doing so (e.g., a public outreach campaign). Archaeologists must also care for the objects that are excavated, making sure that they are appropriately curated and stored. In order to discourage commercialization, archaeologists should avoid providing estimates of price for items found on their sites. And it goes without saying that archaeologists should never engage in commercial activity around artifacts that they have personally collected through excavation.

 White paper with offerings of fat, sugar, and cotton.

Figure 15 – An offering being prepared for an archaeological excavation in Bolivia. (Photo by the author.)

Accountability (to descendant communities and other stakeholders) is key, especially when it comes to human remains or religious sites. Archaeologists do not have an inherent right to excavate anywhere they please; we must coordinate and collaborate with descendent community members and current landowners in addition to following any state or national-level legislation. While it is a science of the past, all science is conducted for the benefit of living peoples, and the needs of those most closely affiliated with the cultural resources should be prioritized. This means respecting that some sites should never be excavated, and that certain protocols may be necessary in other contexts. For example, in the Aymara community in Bolivia where I have conducted research, it is necessary to prepare a *waxt’a* (an offering) for the Pachamama (the Aymara “Earth Mother”) before any sort of excavation begins. This offering is performed by a *yatiri* (an Aymara ritual specialist) in accordance with local tradition (Figure 15). This is similar to what is done when the earth is broken for agriculture or construction. The land (and features on the landscape) are living

beings in this context—part of the community within which the archaeologists work. (See also the “Descendant Communities” chapter for a discussion on successful collaborative archaeological projects.)

As archaeologists excavate, it’s important to remember our responsibility to share what we have learned, first with descendent communities and other stakeholders, but also with the broader public. We have already discussed the importance of good field notes. However, there is little value in even the most comprehensive field notes if they are simply stored in a researcher’s file cabinet or on her hard drive. For this reason, it is considered an ethical responsibility for archaeologists to publish what they’ve learned. Academic archaeologists generally are most rewarded for publishing in peer-reviewed research journals, but it is also important to share information with the general public—through popular magazines, blogs, TV documentaries, webpages, public outreach events, and/or OER (online educational resources) like this textbook. This also helps to combat pseudoarchaeology, by educating the public and debunking ideas that discriminate against native populations. (See the chapter on “Public Outreach and Archaeology” for more information and ideas for outreach as well as the chapter titled *Understanding Ancient Mysteries* for more on the dangers of pseudoarchaeology.)

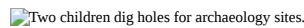
Two children dig holes for archaeology sites.

Figure 16 – The author’s children help to prepare a fake archaeological “site” for college students to practice excavation. (Photos by the author.)

Finally, archaeologists’ obligation to educate also extends to training new archaeologists in the process of excavation. Since a site can never be excavated twice, good training in excavation is incredibly important. Students should have a safe place to learn without worrying that they might destroy irreplaceable cultural materials. In my introductory archaeology classes, for example, I often bury a fake “site” on campus (sometimes with the assistance of my children) so that students can practice setting up a unit, excavating, and mapping artifacts in situ (Figure 16). See Additional Exercises (below) for more suggestions on how to set up practice excavations. Despite the benefits of these sorts of exercises, however, the experience of actually taking part in an archaeological excavation is invaluable, so if you are considering going on in anthropology or archaeology (or even if you just think it sounds like fun!), I would highly recommend attending an archaeological field school. “Field schools” are generally taught over the summer, and provide an opportunity to learn archaeology through hands-on practice while also earning college credits.

Conclusion

I began this chapter with three warnings about excavation: there is much more to archaeology than digging; excavation is destruction; and it is essential to consider ethics. After reading this chapter, I hope you can see the importance of each of these caveats. Archaeology is not just about excavation—and in many contexts excavation may even be harmful. That said, when done carefully and ethically—in collaboration and consultation with descendant communities and while taking copious notes—it is an invaluable tool in archaeology’s efforts to learn about the past. And it can also be a lot of fun! I hope you enjoy your time in the field.

Discussion Questions

1. What are the three warnings the author highlights about excavation? Why do you think these are important?
2. What are some different site-formation processes, and how might they affect excavation and interpretation?
3. What is the process of excavation, and what considerations must an archaeologist evaluate before embarking on an excavation project?
4. What are some of the ethical concerns of excavation and collection, and how should an archaeologist evaluate them?

Additional Exercises

1. Interactive Digs Exercise: Explore one site highlighted on the “Interactive Digs” webpage—interactivedigs.com. Choose whatever site is most interesting to you. Take your time to explore some of the notes, videos, field reports, etc. Be able to briefly summarize what you learned about the site, and compare and contrast what you learned with students who explored different sites. You should consider:
 - a short description of excavation techniques (e.g., What parts of the site were excavated? How were those decisions made? What tools were used for excavation?);
 - a description of any steps being taken to preserve this site and its cultural heritage (e.g., the storage/conservation of artifacts, recording/reconstruction of architecture, publication of discoveries/interpretations, etc.);
 - a reflection on the role tourism may or may not play at this site (e.g., Is this already a tourist destination? Does it have the potential to draw tourists? What benefits may tourism have to the site? What dangers might tourism pose?).
2. Digital Data Stories: Explore the Alexandria Archive Institute’s Digital Data Story “[Gabbings about Gabii: Going From Notes to Data to Narrative](#).” This will give you the experience of working with notes from an excavation to see how archaeologists are able to collect data from excavation and use this data to tell stories about the past.
3. Practice Excavation: There are a variety of ways to prepare a “site” for students to practice excavation. Be creative, depending on your location and resources:
 - You may bury “artifacts” in a spot on campus that students can later excavate. You may want to collect different colors/textures of soil to include in the fake site, and you can also begin to build your own artifact collection with materials from thrift stores (e.g., ceramics that you can break) or by roughly knapping your own stone tools. If it is possible to have a dedicated area so that the soil has time to settle before excavation begins, that is best. One sustainable approach is to have students bury the next term’s “site” after they excavate theirs. Students can write a “story” that the site they create is supposed to represent, and you can see how close the interpretation of the next term’s class is.
 - Another sustainable possibility is to pair with another class that regularly does hands-on activities that leave a material trace on the landscape. For example, another class at our college holds a pit roast each spring. Archaeology students are able to excavate the remains of a previous pit roast to see the feature left behind by that activity.

About the Author



Jennifer Zovar is an Associate Professor of Anthropology at Whatcom Community College in Bellingham, Washington. Her academic research has focused in the Bolivian Andes, where she investigated an archaeological site that was occupied just before the Inca came into the region (and after the collapse of the earlier Tiwanaku polity). In addition to her experience in Bolivia, she has also worked on archaeological projects in Guatemala and across the United States. She enjoys getting in the dirt whenever possible—which has led to some very poor attempts at gardening during seasons when she has not been able to excavate. When she is not researching or teaching anthropology, she loves camping and exploring with her kids and a loyal dog named Hank.

Further Exploration

The ArchaeOlympic Games—<https://archaeology.co.uk/articles/news/the-archaeolympic-games.htm>

Ethics in Professional Archaeology, Society for American Archaeology—<https://www.saa.org/career-practice/ethics-in-professional-archaeology>

The Excavation Process: The Tools, a video from Oregon State University’s excavation of the Cooper’s Ferry Site—<https://www.youtube.com/watch?v=x9pGbpIPU-Y>

Interactive Digs, Archaeological Institute of America—<https://www.interactivedigs.com/>

Why the Whiteness of Archaeology Is a Problem, by William White and Catherine Draycott—<https://www.sapiens.org/archaeology/archaeology-diversity/>

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2.4: Dating Methods in Archaeology

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Learning Objectives

- Describe the range of dating methods commonly used in archaeological research
- Articulate the advantages and disadvantages of specific dating methods
- Explain how theories from the geosciences and biological sciences have been applied to the analysis of archaeological materials
- Identify the terminology used by professional archaeologists and geoscientists to describe the age of a sample

In modern times, archaeology uses methods from both the natural sciences and social sciences to conduct scientific investigations with a strong focus on determining the age of objects. This chapter will cover the basics on the two kinds of dating in archaeology – relative dating and absolute dating. Relative dating focuses on relationships between artifacts or features, and so gives a sequence of events. Absolute dating focuses on calculating a scientifically-estimated age of an artifact or feature. We'll cover the actual methods within each kind of dating in this chapter, but remember that these methods provide lines of evidence that work together to give us a holistic understanding of each site.

However, this approach has not always been the way professionals looked at material culture. For centuries, archaeologists were seen as keepers, and looters, of mysterious objects that represented exotic lands and peoples. Artifacts were treated as art objects, and it was rare for a historian to ask living peoples about how their ancestors saw the world. This led to Eurocentric interpretations of human history that still carry on to this day, especially in the form of documentaries and nonfiction like the infamous *Chariots of the Gods?* book, by Erich von Däniken, which inspired two years later, in 1970, the wildly popular feature-length film. An in-depth discussion of how interpretations of the past have recently moved toward more culturally diverse perspectives and methods can be found in the “Social Impact” chapter of this text. This chapter focuses on the most common methods used to conduct scientifically informed research of past societies and peoples. Glamorized and not-so-scientific interpretations of the archaeological record by untrained people is discussed in the “Pseudoarchaeology” chapter of this text.

Over the last 70 years, continual advancements in analytical technologies and computing power have made it possible for scientists to accurately estimate the age of artifacts — objects that exist as a result of human activity, as well as sediment, rock, and mineral fragments. Modern technology allows us to identify the chemical composition of many organic and inorganic materials. Some examples include the geologic materials our ancestors used to create pigments and clay (Clelland et al. 2015), biological material like calculus from teeth to interpret ancient diets (Cristiani, et al. 2018), and intact genetic material from preserved bone and hair. Being able to gather quantitative data (numerical data) from organic and inorganic archaeological materials has revolutionized our ability to understand the past.

This is a far cry from the methods and interpretations made by British Victorian antiquarians who collected artifacts from sites all over the world. Sadly, many of the most famous artifacts were removed from sites without any description of where they came from, unless that made them more expensive. The majority of the looted objects were bought and sold by aristocrats as part of the art scene or put on display in private collections. With the world's appreciation of archaeological materials focused on beauty and artistic skill, the question of age wasn't explored in any significant way until the late 1800s.

V. Gordon Childe, an Australian archaeologist, is credited with bringing the idea of determining dates for archaeological materials to British archaeology in the late 1920s. This new approach, called culture-historical archaeology, emphasized the classification of objects and the creation of typologies, allowing researchers to identify distinct ancient cultures (Trigger 2007). This more meticulous approach also enabled researchers to assign ancient societies to different time periods, forming the basis of relative dating, or the ability to differentiate older artifacts from younger ones. No longer were artifacts just called “ancient”; now it was possible to accurately assign artifacts to different periods that were corroborated by written records. Oral traditions also became recognized as a valuable perspective on ancient history. While groups of artifacts could now be given a general time frame for when they were made and used, precise dates would not be possible until the Radiocarbon Revolution in the 1940s. In the United States, the method of radiometric dating came directly out of research on radioactive minerals, like uranium-235, which was being studied for its capacity to generate massive amounts of energy. After the deployment of atomic weapons in the 1940s, scientists gained a new understanding of the nature of objects at the atomic level.

As a scientific endeavor, modern archaeological analysis utilizes current technology and analysis techniques, keeping research fresh, active, and dynamic. It integrates the knowledge, expertise, and perspectives of researchers globally by agreeing to use the same notation, allowing information to be shared and disseminated more easily and accurately. The chart below summarizes the most commonly used notation for reporting dates.

Notation	Meaning	Dates for Çatalhöyük (Turkey)	Context
years ago	calendar years ago	9,500 to 8,400 years ago	Informal, public settings
BC / AD	Before Christ / <i>anno Domini</i>	7500 BC to 6400 BC	Mass media and historical records from Christian authors
BCE / CE	Before Common Era / Common Era	7500 BCE to 6400 BCE	Scientific and academic writing. Faith-neutral version of BC / AD
BP	years Before Present (present is 1950 CE)	9,450 to 8,350 BP	Scientific and academic writing, simplifies BCE / CE dates
cal BP	calibrated years Before Present	9,219 to 8,889 cal BP (+/- 200)	Radiometric dates corrected using calibration curve, adjusted to 1950 CE scale
RCYBP	Radiocarbon Years Before Present	9,219 to 8,889 RCYBP (+/- 200)	Alternative notation for cal BP
cal BCE	calibrated years Before Common Era	7,269 to 6,939 cal BCE (+/- 200)	Radiometric dates corrected using calibration curve, adjusted to 0 CE scale

Chart 1 – Comparison of the most common abbreviations seen in archaeological dating (Hakanson 2022).

Clarifying sequences of events is the most valuable benefit of dating archaeological materials. For example, through relative dating gleaned from thousands of Egyptian, Roman, and Greek records, we know that the Egyptian pharaoh Tutankhamun ruled during the 18th dynasty of the New Kingdom period. And, through radiometric dating of plant remains found in his tomb, we know that his reign was from 1353 BCE to 1331 BCE, earlier than Egyptologists had previously thought based on written records alone (Balter 2010).

Having a precise date range allows us to have a global context for archaeological finds. This helps us to recognize that many societies have flourished throughout history and across the globe, not just in places with written records and intensive agriculture. It also helps in the identification of fakes and forgeries, which for centuries have misled well-meaning people into poorly informed interpretations of human social behavior. Scientifically informed dating methods give archaeology credibility as a science, which builds trust between researchers and communities who seek help in understanding our shared past.

Relative Dating

Fundamentals

With the right information, it's possible to reconstruct a sequence of events even if you do not know the exact time that those events occurred. Relative Dating, in which the sequence in which events can be approximated, but the exact dates is a fundamental concept used in archaeology, and it is an idea that can be traced to the field of geology. Geologic processes are an essential component of any archaeological investigation because they help us reconstruct the order of events that happened at a site. By comparing observations about erosion, volcanic eruption, flooding, and seismic activity to the patterns we see in rock and soil, we can piece together the geologic history of a specific area. Just as rivers can change their course in a few decades, we know that ancient rivers like the Rio Grande can carve through rock if given enough time, creating natural features like the Grand Canyon. There are many awe-inspiring natural features all over the world, and they are all examples of the depth of Geologic Time or Deep Time, which is also discussed in the “[Social Impact](#)” chapter of this text.

 Beds of sedimentary rock at Parque Geológico do Varvito, Itu, São Paulo, Brazil

Figure 1 – Beds of sedimentary rock at Parque Geológico do Varvito, Itu, São Paulo, Brazil by Webysther Nunes (own work, [CC BY-SA 4.0](#).)

The geologic time scale can be difficult to understand because geologic processes take place over thousands to millions of years. We rely on the observations of our predecessors to understand how slowly our planet changes. The law of superposition is the idea that if you choose one specific patch of soil, and you dig down through the different layers, the layers at the bottom of your hole were deposited first. Then, as you move up out of the hole, each layer you see as you get closer to the surface is younger than the one below. This phenomenon was described by the Danish scientist Nicolaus Steno in 1669. He also observed that, especially on a large scale, sediments are usually deposited in horizontal, flat-lying layers (Montgomery & Dathe 1994) (Figure 1).

Over time, these layers accumulate or are stripped away by cycles of hot and cold weather, ultraviolet (UV) radiation from the sun, and other natural events. The age of rocks is relevant to archaeologists because “dirt” comes from the breakdown of rocks, minerals, and organic material. “Dirt” can also turn into rocks over long periods of time.



Figure 2 – Hutton's Unconformity at Jedburgh, Scotland, illustrated by John Clerk in 1787 with a photograph of the formation by Keith Montgomery in 2003. ([Link to original image](#)).

In the 1780s, James Hutton conducted geochemical analysis of two geologic features in his home country of Scotland: Hutton's Unconformity and Siccar Point. Hutton's Unconformity has sedimentary beds running vertically in one layer, then horizontally in the layer above (Figure 2). Although researchers were not able to explain vertical formation of rock beds until decades later, it would have taken millions of years for all of the different types of rocks and soils to form (Montgomery, 2003).

If we consider the fact that anatomically modern humans were living at Pinnacle Point, South Africa, at least 170,000 years ago (Marean et al. 2007), it's not surprising that remnants of hominin behavior are left behind in the soil as well, creating an important link between the history of our species and the changes that Earth has experienced since its formation over four billion years ago. The field of Paleoanthropology encourages us to then move our focus to the Cradle of Humankind region, also in South Africa, where we realize that the history of our species goes back millions of years. As people use resources and set up their homes in places, they leave behind evidence of what they are doing. Certain parts of the globe have had people living in the same place for

tens, or even hundreds, of thousands of years, which allows layer after layer of artifacts to accumulate over time. In other places where people did not spend significant time, or there were fewer people around, there were fewer opportunities for things to be left behind for archaeologists to find.

Determining Cultural Periods



Figure 3 – Historic-era glass bottles in the U.S. can often be assigned to an accurate time period using the symbols embossed in the glass. In the example above, stylistic variations in glass bottles is illustrated. Note that the width of the curves represents the relative frequency or abundance of each bottle type during a given time interval. At the earliest time period, only Type A and Type C bottles were used, with Type A (90%) being more common than Type C (10%). At the latest time period, only Type D and Type E bottles were used, with Type D being more common. This type of seriation chart can be used to put archaeological sites with bottles into a chronological sequence. For example, a site with 10% Type A, 40% Type B, and 50% Type C bottles would be older than a site with 5% Type B, 20% Type C, and 75% Type D. ([Link to original image](#))

Relative dating also refers to assigning an object to a cultural period based on its color, size, shape, and other physical characteristics. To do this accurately, archaeologists must cross-reference the objects they find with descriptions of artifacts compiled by previous archaeologists, historians, and looters. Museums have millions of artifacts in their collections that are used as reference when a new object is found. By organizing artifacts into categories based on where they were found, what they are made of, their shape, their thickness, their length, and other attributes, archaeologists and historians have been able to “chunk out” different periods of time based on what people were making and doing. This is called seriation, arrangement in a series or orderly sequence. Stylistic seriation focuses on different designs or styles of objects, and frequency seriation compares the proportional abundance of a design style through time (Figure 3).

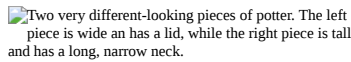


Figure 4. Two pieces of pottery from the same time period, but different locations. Early Classical Mayan (300 CE – 600 CE, left), and Imperial Sui Dynasty (500-600 CE, right). ([Link to original left](#), and [original right](#).)

There are many different cultural periods defined around the world, created by the local archaeologists who conduct the research. Chinese archaeologists define the Paleolithic, Neolithic, Ancient, Imperial, and Modern periods, while Ecuadorian archaeologists focus on the Formative, Pre-Inca, and Colonial periods (Figure 4). It can be confusing keeping these different divisions straight, and they change over time. Focusing on the age of specific settlements, artifacts, or events can make the picture clearer, revealing the diversity of human societies through time.

A diagnostic artifact is a specific type of artifact that marks a specific period of time in the archaeological record. Once a chronology of artifact types and styles is built for a region, it is extremely useful for archaeologists. Clovis points, a prehistoric projectile-point style and manufacturing process, are diagnostic of the Paleoindian Period. This point style was used across the modern-day United States and Mexico (Figure 5).



Figure 5 – Clovis point ([Link to original image](#))

No matter where a Clovis point is found, it can be used to date associated artifacts and contexts to the Clovis Period, approximately 13,000–11,000 BP (Halligan et al. 2016). The style, size, and materials used by the Clovis culture are consistent enough for researchers to say that the technique is the same, and that Clovis culture, including the knowledge of how to make their distinctive point, quickly spread as an idea throughout the region, much faster than the artifacts themselves could have moved. This tells us that the communities of the Paleoindian Period were well connected and able to communicate quickly and accurately over long distances. The discovery of stone tools that are older than the Clovis has clearly demonstrated that humans were in the Americas at least 14,000 years ago, causing many archaeologists to revisit the story of when humans first arrived (Halligan et al. 2016).

In North America, the main cultural periods are the Prehistoric, Colonial, and Historic. Colonists impacted different regions at different times, and so many Colonial-era archaeological investigations use dates that correlate with major events, such as the Jamestown settlement in Virginia or the Rogue River Wars in Oregon. A similar approach is taken with Historic-era investigations, with periods such as World War II or the Korean War helping to define what documents or informants are consulted for information. As you might suspect, the more recent the event or cultural period being studied, the more likely it is that data is available to study. Archaeologists don't just date artifacts that have been excavated during their fieldwork; they are just as likely to date an artifact that has been housed in a museum for decades and has detailed notes about where the object came from, who created it, and what it was used for.

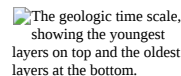


Figure 6 – Geologic time scale used by scientists, in millions of years (Ma). (United States Geological Survey, [Link to original image](#))

Earlier it was mentioned that anatomically modern humans have been around for at least 170,000 years. However, most archaeological investigations focus on the last 20,000 years of cultural development (at least in the Americas). If we use the geologic time scale to describe the current position of *Homo sapiens* in the sands of time, we live in the Cenozoic Era, during the Quaternary Period, in the Holocene Epoch. While not officially accepted by the scientific community, archaeologists have pointed out that humans have accelerated climate change and other environmental catastrophes, leading to the discussion of calling the period starting in 1950 the Anthropocene (Figure 6).

Methods

Written Markers

Written records can be used to date significant events, people, and locations and also add qualitative data to our understanding of past religions, worldviews, and behaviors. Writing systems use different sets of symbols to represent sounds or ideas. Many different forms of writing have existed over time.



Figure 7 – Images of writing systems that have existed over time, left to right:

Jiahu symbols: 6000 BCE, Peiligang culture, China. (Unnamed author, U.S. public domain via Wikimedia Commons. [Link to original image](#));

Intaglio Indus script seal: 2200 BCE, Harappan culture, India and Pakistan. (Harappa Archaeological Research Project, educational use. [Link to original image](#));

fragment of a wall with hieroglyphs from the tomb of Seti I: 1294 BCE, Egyptian culture, Egypt. (Unnamed Egyptian scribe, copyrighted free use via Wikimedia Commons. [Link to original image](#));

Private letter in cuneiform script: 1632 BCE, Babylonian culture, Syria.
(Unnamed Babylonian, U.S. public domain via Wikimedia Commons. [Link to original image](#)).

Ancient scripts have to be deciphered before archaeologists can use the information contained within the text to make interpretations about past cultures. It took archaeologists several decades to decipher Maya glyphs, using objects like the Dresden Codex (a bark-paper book from the 1200s) to meticulously document and cross-reference each glyph. Once Mesoamerican archaeologists could “read” the thousands of stone tablets and codices, our understanding of Maya society was revolutionized (Figure 8).

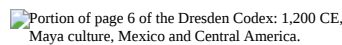


Figure 8 – Portion of page 6 of the Dresden Codex: 1200 CE, Maya culture, Mexico, and Central America. (Unnamed scribes, by Linear77 CC BY-SA 3.0 via Wikimedia Commons. [Link to original image](#))

Sometimes people documented the exact date a significant event happened, such as in diaries, wills, official records, books, photographs, and newspapers. In North America, historic archaeologists use written records extensively in their research. In some cases, historic archaeologists use excavation and artifact analysis to test the accuracy of written records. This is where archaeological techniques cross over into forensic science. Some documents from the colonial period are used by prehistoric archaeologists to reconstruct precolonial societies, but written records that date to before that time are rare. Instead, most cultural knowledge was passed on through generations using oral traditions.

3D Scanning and Photogrammetry

While traditional drawings and photos capture a great deal of information about an artifact, they cannot capture the full three-dimensional reality of archaeological and architectural features. Photogrammetry uses photographs to create maps that show topography, vegetation, and culturally significant features. 3D scanning uses the same principle but takes thousands of measurements of an object using a laser. These measurements are then compiled by a computer program which “draws” the object as a 3D model. Photogrammetry usually captures more surface detail than 3D scanning, so images can be used to gather data about an artifact, and possibly assign it to a specific cultural period. High resolution 3D scans of artifacts and architectural features can be used to make 3D print reproductions or lab models. Being able to transport highly accurate models of specific artifacts to archaeologists around the world has enabled a higher degree of accuracy in assigning artifacts to approximate cultural periods. Archaeologists can also perform 3D scanning to help date museum specimens, since we need to continually reevaluate relative dates.

Fluorine Dating

Chemical dating was developed in the 19th century and represents one of the early attempts to use soil composition and chemistry to date artifacts. A specific type of chemical dating is fluorine dating, and it is commonly used to compare the age of the soil around artifacts located in close proximity. Soils contain different amounts of chemicals, and those chemicals, such as fluorine, can be absorbed by human and animal bones buried in the soil. The longer the remains are in the soil, the more fluorine they will

absorb (Cook and Ezra-Cohn 1959). This technique is particularly useful for determining whether different artifacts come from the same burial context. If they were buried in the same soil for the same length of time, their fluorine signatures should match. The infamous Piltdown Man forgery was identified as a fake by using fluorine dating. The specimen was presented as Darwin's "Missing Link," when in fact the cranium came from at least two medieval era humans, and the jaw came from a modern Bornean orangutan. All three parts had different amounts of fluorine present, indicating that they were not all buried at the same time, and couldn't all be from the same individual (De Groote et al. 2016).

Palynology



Figure 9 – Pine pollen grain under magnification. Pine pollen under the microscope. CC-BY-SA 3.0. [Link to original image](#)

Palynology is the study of pollen grains and other airborne spores. This technique relies on our knowledge of past environmental periods and ecology to make estimates about when humans were doing things. Plants produce and release their pollen at predictable times of year. Also, different species of plants produce pollen grains of different sizes, shapes, and textures. Pollen can be extracted from soil samples from an archaeological site, and then examined under a microscope. Archaeologists trained in this technique can distinguish different genera of grasses, trees, shrubs, and other plants based on pollen grains (Figure 9).

By figuring out which types of plants left their pollen in the stratigraphic levels of a site, those levels can be linked to different paleoenvironments, and thus time periods. For example, there was a dramatic change in the types of plants living during the Pleistocene compared to the Holocene. There was also a shift in how common grasses were compared to trees. Link the amount and types of pollen found on the surface of a stone tool to a specific time period, and you can estimate when humans were at that spot. It can also help determine what season of the year a site was used, presence or absence of agricultural practices or products, and plant-related activity areas within an archaeological context (Crow Canyon Archaeological Center n.d.). For more on how this can be used, see the [Ancient Foodways](#) chapter.

Absolute Dating

Dendrochronology



Figure 10 – Cross section of an oak log by Rbreidbrown. (Own work, CC BY-SA 4.0, [Link to original image](#))

Dendrochronology was one of the first instrumental methods used to date archaeological materials. The technique works by counting individual growth rings on a cross section of lumber or whole trees that were used by humans for building structures or producing wooden artifacts (Crow Canyon Archaeological Center n.d.). Trees grow by adding layers of new material to their outside surface. There are visible rings on a cross section of a cut tree—each ring is the outer layer of the tree that was covered up by the growth it experienced the following year. The color and size of the rings also reflect changing environmental conditions or even injuries and times of stress for the tree (Figure 9).

The twist is that counting the rings on a cut tree only tells you how old that tree was when it was cut down. What if that tree was cut down and used to build an adobe 100 years ago? The real question that needs to be answered is how long ago that tree was

growing. Dendrochronology databases have been created using thousands of tree samples in Europe and the Americas. By laying these timelines side by side, and adjusting their alignment until all of the sizes and colors of the growth rings match, archaeologists have identified long, unbroken spans of time, a sort of tree ring clock. English archaeologists applied this technique to the Sweet Track, an ancient timber causeway in the Somerset region in the early 1990s. By comparing the growth rings from the individual wood pieces in the causeway to samples in several databases, they were able to date the feature to precisely 3807 BCE (New Scientist 1990). No other instrumental technique is this precise.

Radiometric Dating

The age of the earth had been a hotly debated topic in the western world beginning in about the 1600s. Religious leaders, philosophers, and physicists made both educated estimates and tedious calculations in their attempt to define it. The debate intensified in the 1700s with new theories from the geosciences (mentioned earlier). However, the stage was not set for the technique that would lay most of these questions to rest until 1896, when radioactivity was discovered.

In January of 1896, while investigating the curiosity of some uranium salts that continue to emit light after a light source is removed, Henri Becquerel discovered that something coming from these salts was able to pass through metal photographic plates. He had discovered X-rays, sparking a period of intense research into radioactivity. We now know that uranium is among several dozen natural elements that are radioactive — emit energy and particles as individual atoms break down to form other elements. Thorium, polonium, and radium were identified as radioactive by Marie Skłodowska-Curie and her husband Pierre Curie. They were awarded half of the Nobel Prize for Physics in 1903 for their discoveries, along with Becquerel (Nobel Prize Outreach 2021; Nobel Lectures 1967).

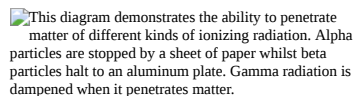


Figure 11 – This diagram demonstrates the ability to penetrate matter of different kinds of ionizing radiation. Alpha particles (α) are stopped by a sheet of paper while beta particles (β) halt to an aluminum plate. Gamma radiation (γ) is dampened when it penetrates matter. CC BY 2.5 via Wikimedia Commons. [Link to original image](#)

A radioactive isotope is one with an unstable nuclear configuration. Stable atoms have a balance between their positive charges (from the protons within the nucleus) and their negative charges (from the electrons outside of the nucleus). Neutrons don't have a charge, but they contribute to the atomic weight of an atom. Over time, radioactive isotopes undergo radioactive decay—the nucleus loses energy and emits particles in an attempt to become stable. The three types of radioactive decay are alpha (α), beta (β), and gamma (γ) decay. Alpha decay occurs when a nucleus ejects 2 neutrons and 2 protons stuck together, called an alpha particle. This is the largest type of particle produced, but also the one with the least energy. Alpha particles can be stopped by a sheet of paper (Figure 11). Beta decay occurs when a nucleus emits an electron, also called a beta particle. This is a smaller particle with more energy, and so can penetrate further into materials. Beta particles can be stopped by a sheet of aluminum foil. Gamma decay occurs when a nucleus emits only electromagnetic radiation in the form of gamma rays. Gamma rays are a form of ionizing radiation that are small enough to fit between atoms and break them apart. They are so small and energetic that layers of lead are needed to fully block them. Gamma rays can cause the most damage to biological organisms and also leave telltale marks on rock exposed to the sun (Montgomery & Dathe 1994).



Figure 12 – Co-60 half-life/decay curve. For cobalt-60, which has a half-life of 5.27 years, 50% remains after 5.27 years (one half-life), 25% remains after 10.54 years (two half-lives), 12.5% remains after 15.81 years (three half-lives), and so on. [Link to original image](#)

The way we describe how quickly each type of isotope breaks down is the unit half-life, defined as the length of time required for half of a given number of atoms of that isotope to decay. As an example, the half-life of the radioactive isotope Cobalt, then after 5.27 years, half of it will decay away naturally, leaving 500 atoms. After another 5.27 years, half of the remaining 500 atoms will

decay, and 250 will be left, and so on. Every radioactive isotope has a standard decay curve calculated using statistics and principles of nuclear physics (Montgomery & Dathe 1994). (Figure 12).

Radiocarbon Dating

The development of radiocarbon dating has had a profound impact on archaeology. In addition to permitting more accurate dating within archaeological sites than previous methods, it allows comparison of dates of events across great distances. Histories of archaeology often refer to its impact as the “radiocarbon revolution.” Radiocarbon dating has allowed key transitions in prehistory to be dated, such as the end of the last ice age and the beginning of the Neolithic and Bronze Age in different regions (Marra 2019).

 A neutron in an atom of Carbon-14 decays into a proton and an electron, creating an atom of Nitrogen-14.

Figure 13 – Carbon-14 decays into Nitrogen-14 when one neutron (n^0) breaks apart into a proton (p^+) and an electron (e^-). Isray89, CC BY 4.0. [Link to original image](#)

The most commonly called upon carbon isotope for radiometric dating in archaeology is Carbon-14, abbreviated ^{14}C . It has an unstable nucleus containing 8 neutrons and 6 protons. The most common form of stable carbon is ^{12}C , with 6 neutrons and 6 protons. When an atom of ^{14}C decays, a neutron is converted to a proton plus an electron. The proton remains in the nucleus, while the electron (beta particle) is ejected. The result of the decay process is an atom of ^{14}N , which is not radioactive since it has a balance of 7 protons, 7 neutrons, and 7 electrons (Figure 13).



Figure 14 – Decay curve for Carbon-14. [Link to original image](#)

One of the frequent uses of this technique is to date organic remains from archaeological sites. Plants absorb atmospheric carbon during photosynthesis, so the level of ^{14}C in plants and animals when they die approximately equals the level of ^{14}C in the atmosphere at that time. However, the moment they die, the ^{14}C in their body begins undergoing radioactive decay, allowing the date of death or fixation to be estimated (Figure 14). By comparing the amounts of ^{14}C and ^{12}C contained in a sample with tree ring or cave-deposit Carbon-14 levels of a known age, archaeologists calculate an approximate age for the sample (Marra 2019). The initial ^{14}C level for the calculation can either be estimated, or directly compared with known tree-ring data from up to around 10,000 years ago. Mineral deposits in caves, called speleothems, can be dated back to about 45,000 years BP. These deposits are formed gradually as water carries minerals into a cave and evaporates, leaving behind a variety of structures like stalactites and stalagmites (Figure 15).

 Different types of cave formations formed when water evaporates, leaving behind minerals that build to form rock structures.

Figure 15 – Types of cave speleothems. Photo by Dave Bunnell showing the most common speleothems, with updated high-contrast labels by Ian S. Ray. [Link to original image](#)

Atoms of ^{14}C and ^{12}C are found in all organic materials and some inorganic materials. The half-life of ^{14}C is 5,730 years, meaning that this technique can give reliable results for objects as old as 40,000–65,000 years. After that point, there are so few atoms of ^{14}C left that you need extremely sensitive equipment to detect it, and the age estimate will be less precise. Uncalibrated age estimates are reported using these conventions: “ ^{14}C year $\pm$ date range BP.” For example, the uncalibrated “raw” date “ 3510 ± 60 BP” indicates that the sample’s uncalibrated age is 3,510 years before present, with an error of 60 years. When reading a technical article that includes radiocarbon dates, you may see uncalibrated or calibrated dates, or both.

Mass Spectrometry

Mass spectrometry measures the charge-to-mass ratio of atoms and compounds. This gives a very accurate measure of what elements are included in a sample, as well as a count of which isotopes are present. Measurement of ^{14}C and ^{12}C was originally done by beta-counting devices, which counted the amount of beta particles emitted by decaying ^{14}C atoms. accelerator mass spectrometry (AMS) has become the method of choice because it counts all the ^{14}C atoms in the sample, not just the beta particles. Because it accounts for every atom ^{14}C , it can be used with much smaller samples (as small as individual plant seeds) and gives results more quickly (Christie et al. 2018).



Figure 16 – Schematic of an accelerator mass spectrometer. By Mike Christie – Own work, CC BY-SA 3.0, [Link to original image](#)

AMS counts the atoms of ^{14}C and ^{12}C in a given sample, determining the $^{14}\text{C}/^{12}\text{C}$ ratio directly. The sample, often in the form of graphite, is made to emit C^- ions (carbon atoms with an extra electron, giving them a slight negative charge), which are injected into an accelerator. The ions are accelerated and passed through a stripper, which removes several electrons so that the ions emerge with a positive charge. The ions, which may have from 1 to 4 positive charges (C^+ to C^{4+}), depending on the accelerator design, are then passed through a magnet that curves their path; the heavier ions are curved less than the lighter ones, so the different isotopes emerge as separate streams of ions (Figure 16). A particle detector then records the number of ions detected in the ^{14}C stream (Christie et al. 2018).

Radiocarbon dating is generally limited to dating samples no more than 50,000 years old. Samples older than this will have extremely small amounts of ^{14}C present. Older dates have been obtained by using special sample preparation techniques, large samples, and very long measurement times to compensate for the challenge of measuring trace amounts of ^{14}C . These techniques can allow measurement of dates up to 60,000 years before the present and in some cases up to 75,000 years before the present (Walker & Walker 2005).

Most mass spectrometry in archaeology is focused on Carbon because of its comparatively short half-life. However, mass spectrometry it can be applied to other substances as well. Isotope Ratio Mass Spectrometry (IRMS) is a form of mass spectrometry used by archaeologists to analyze isotopic ratios of nitrogen, ^{13}C , strontium (Sr), and carbonate (CO_3). These analyses do not produce absolute dates, but can assist in assigning ranges of relative dates or to make interpretations about ecological conditions at the time of formation (marine shell from prehistoric sites is a popular candidate for IRMS analysis). For more on how this can be used, see the [Ancient Foodways](#) chapter.

Potassium-Argon (K-Ar) and Argon-Argon (Ar-Ar) Dating

Radiocarbon dating does not work on fossilized materials because there is no viable organic material left in the sample, but several other types of radiometric dating can be used to determine the age of rocks formed around a fossil. Through the process of radioactive decay, potassium-40 (^{40}K) decays to argon-40 (^{40}Ar) gas, which gets trapped in the crystalline structures of volcanic

minerals. When a potassium-bearing mineral is crystallizing, ^{40}K atoms are not normally trapped within the growing crystal. However, once the crystal is formed, ^{40}K trapped within the crystal lattice begins to decay into ^{40}Ar . This means that all of the ^{40}Ar measured in a sample came from the decay of ^{40}K trapped within the crystal. By plugging the amounts of ^{40}K and ^{40}Ar found in the crystal into a special algebraic equation, researchers can estimate the age of the rock or mineral (McDougall & Harrison 1999).

Argon-Argon (Ar-Ar) dating uses the same principles, the difference being that the ratios of ^{40}Ar and ^{39}Ar are compared instead of determining absolute quantities. This is accomplished by neutron irradiation from a nuclear reactor to convert a stable form of potassium (^{39}K) into the radioactive argon-39 (^{39}Ar) gas. The advantage of this method is that a smaller sample is needed. Another advantage is the analysis is performed after one exposure to the nuclear reactor. In comparison, K-Ar dating requires an extra step for the potassium isotopes to be counted, and then the sample is run again to get a count on the argon (McDougall & Harrison 1999). Multiple “runs” through a nuclear reactor degrades the sample and can introduce error.



Figure 18 – Laetoli footprints. (Original figures by Fidelis T Masao, Elgidius B Ichumbaki, Marco Cherin, Angelo Barili, Giovanni Boschian, Dawid A Iurino, Sofia Menconero, Jacopo Moggi-Cecchi, Giorgio Manzi; cropping/editing by Dennis Pietras – parts of 2 figures from licensed under CC BY 4.0, CC BY-SA 4.0) [Link to original image](#)

One of the most well-known applications of K-Ar dating in paleoanthropology is the dating of the Laetoli Footprints in modern-day Tanzania. Laetoli is a site in the nation of Tanzania, dated to the Plio-Pleistocene and famous for its hominin footprints preserved in volcanic ash (Figure 18). Based on the results of K-Ar dating on mineralized ash, a group of three *Australopithecus afarensis* made the trek through raining ash, followed by a cooling rain, about 3.7 million years ago. Footprints from other animals were also preserved and are dated to the same period. By combining relative and radiometric dating techniques, paleoanthropologists were able to confidently assign this ancient date, drastically improving our understanding of our primate predecessors.

Luminescence Dating

Thermoluminescence can be used to date materials containing crystalline minerals to a specific heating event. This is useful for ceramics, as it determines the approximate date of firing, as well as for lava, or even sediments that were exposed to substantial sunlight. Natural background radiation creates defects in the molecular crystal structure, which traps electrons. Electrons can be released from the crystalline traps by stimulating them with external energy, producing luminescence or spontaneous light. Thermoluminescence (TL) involves heating samples, while optically stimulated luminescence (OSL) involves exposing samples to high-intensity light (Beck 1994).



Figure 17 – Luminescence, by Mauswiesel. (Own work, CC BY-SA 3.0) [Link to original image](#)

The longer the crystals are affected by this radiation, the more electrons are trapped. Archaeologists and geologists calculate the age of a sediment sample based on the time since the sample was last exposed to sunlight or intense heat. Sunlight bleaches away the luminescence signal and resets the time “clock.” The main minerals used in luminescence dating are quartz and potassium feldspar, a common igneous mineral (USGS Luminescence Dating Laboratory, n.d.). The intensity of the luminescence varies depending on the amount of radiation absorbed when the mineral grains were buried, and specific properties of the mineral being stimulated (Figure 17).

Most luminescence dating methods rely on the assumption that the mineral grains were sufficiently bleached at the time of the event being dated. For example, for quartz crystals, a daylight exposure in the range of 1 to 100 seconds before burial is sufficient to “reset” the OSL dating clock (Rhodes 2011). Also, ceramics must have been fired to at least 400°C , or 752°F (Seeley 1975). The amount of light produced is a specific and measurable phenomenon. If the specimen’s sensitivity to ionizing radiation is known, the released thermoluminescence can be translated into a specific amount of time since the formation of the crystal structure. Because

this accumulation of trapped electrons begins with the formation of the crystal structure, thermoluminescence can date crystalline materials to their date of formation; for ceramics, this is the moment they are fired (Beck 1994). Single Quartz OSL ages can be determined for samples from 100 to 350,000 years BP (Murray & Olley 2002).

Electron Spin Resonance

Like thermoluminescence dating, electron spin resonance dating is based on the measurement of accumulated background radiation from the burial environment. It is used on artifacts and rocks with crystalline structures, including tooth enamel, shell, and rock. The radiation causes electrons to become dislodged from their normal orbit. They become trapped in the crystalline matrix and affect the electromagnetic energy of the object. This energy can be measured and used to estimate the length of time in the burial environment. This technique works well for remains as old as two million years (Carvajal et al. 2011). It has the added benefit of being nondestructive, which is an important consideration when dealing with irreplaceable material (King & Zajicek 2019).

Ethical Considerations

It's safe to say that over time, the dating methods used by archaeologists have become more complicated, requiring more advanced techniques and instruments to gather data. Archaeologists rarely work in isolation. A project will involve archaeologists specializing in special dating techniques or the help of technicians who will generate the data that the archaeologist will then use to analyze the site. Extremely technical sample preparation processes and instrumental analysis that was only used by geologists, biologists, and other natural scientists is now being integrated into archaeological analysis. This has also opened the door to researchers from other nations who are now able to collaborate in real time using the Internet.

While this has elevated the public perception of archaeologists and what they are able to learn from past societies, it has also created ethical issues, especially when it comes to analyzing human remains and objects removed from burials. Laboratory analyses are sterile and abstract methods for understanding the past, in comparison to traditional stories, customs, and beliefs. In many nations, the archaeologist is also responsible for complying with laws governing human remains. An archaeologist who discovers a burial may be excited to conduct as many analyses as possible on the items in the burial and what remains of the person, but this might not sit well for descendants of the person buried. More details regarding appropriate treatment of human remains and burial objects can be found in the “Bioarchaeology” chapter of this text.

Discussion Questions

1. Archaeologists have many ways to determine the possible age of a site, artifact, or ecofact. Consider the many types of dating methods that can give scientists a specific age. Which ones might best apply to the following, and why?
 - a wooden lintel, or panel over a door
 - a stela with a date in Mayan numerals carved into it
 - human remains that are obviously not from a recent burial
 - a ceramic pot with residue from plants inside of it
 - a set of fossilized footprints found in association with remains of an animal that became extinct two million years ago
2. Relative dating methods are used to place an object in a particular cultural sequence based on style, shape, and appearance. They can pose special challenges for archaeologists that other methods providing specific dates do not. What might be a challenge of a relative dating method that some of the other dating methods presented in this chapter that give more specific, absolute dates? Explain why it might be a challenge. Why might an archaeologist choose to go with this relative dating method anyway?

About the Author

When Kaitlin turned 17, she participated in her first archaeological field school at Mission San Antonio de Padua in central California. Since then, she has been a part of fieldwork focusing on precolonial lifeways in Ecuador, Utah, California, and Oregon. In 2015, she completed a Master of Arts degree in Applied Anthropology from Oregon State University (go, Beavs!) with a minor in Geosciences. Kaitlin has taught Anthropology and Sociology courses as adjunct faculty at Klamath Community College and Oregon Tech in Klamath Falls. Now she is running a cultural resources consulting firm serving central and southern Oregon. When she isn't working on a project, she enjoys spending time with friends and family, making arts and crafts, and working in the garden.

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2.5: Ancient Technologies- Analyzing the Artifacts of the Past

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Learning Objectives

- Describe the development of a variety of ancient technologies
- Identify appropriate methods of archaeological analysis for stone, ceramic, bone, metal, textile, and other artifacts
- Evaluate the kinds of questions archaeologists can address through artifact analysis
- Describe how experimental archaeology and ethnoarchaeology can help archaeologists to better understand the technologies of the past

The most popular image of an archaeologist may be of Indiana Jones racing from a collapsing temple, clutching a golden idol in his hands. By now you probably recognize that this image is not accurate. That is an example of a looter, not an archaeologist. He is stealing one valuable object as an entire archaeological site collapses around him, and he has clearly not consulted the local Indigenous community. Nevertheless, the idea that archaeology is about finding cool artifacts for display in museums or other contexts persists in the public imagination and in popular media (see the [Pseudoarchaeology](#) chapter). One of the most common questions archaeologists are asked is, “What’s the most interesting thing you’ve ever found?” This is a difficult question to answer because the artifact itself is not what is interesting to the archaeologist. What is interesting to the archaeologist is what an artifact can teach us about how people lived in the past.

In this chapter, you will learn about a variety of ancient technologies and see how archaeologists study them to learn about past societies. We are focusing in this chapter on the analysis of artifacts, portable objects that were made and used by human beings. The analysis of ecofacts and features is discussed in other chapters of the text (see “[Ancient Foodways](#)” and “[Bioarchaeology](#).”) Here, we review the methods different archaeological specialists use to study a variety of tool types. We conclude with a reflection on the roles of experimental archaeology and ethnoarchaeology in artifact analysis.

 A chimpanzee is sitting in the grass with a twig in its mouth.

Figure 1 – The earliest tools were probably like those used by chimpanzees—simple twigs or other natural items used to access food. Source: [Young chimpanzee sitting in the grass](#) by [Tambako the Jaguar](#) is used under a [CC BY-ND 2.0](#) license.

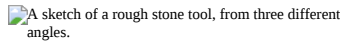
First, however, let’s reflect on what we mean when we talk about tools in the archaeological record. A tool is something that is made for a specific purpose. That purpose was often practical—to skin an animal, carry water, or warm a body—but some tools were made for decorative or religious purposes. Toolmaking is sometimes called a defining characteristic of human beings, although we now know that chimpanzees and other primates (and even some birds) will sometimes make and use simple tools (Figure 1). For example, Jane Goodall famously observed chimpanzees preparing sticks to harvest termites from a termite mound, and they have even been seen making spears to hunt bush babies. However, it is true that tool manufacture and use is an essential part of being human. Some scholars have even suggested that the evolution of human language may have taken place in part because our ancestors needed to be able to talk about their tools and teach each other how to make them (e.g., Morgan et al., 2015).

It is likely that early hominin toolmakers would have made simple tools similar to those of the chimpanzees, but they would have decomposed and would not have been preserved in the archaeological record. Instead, the oldest tools we see are stone tools, what archaeologists refer to as lithics. Other common tool types include pottery and other ceramics and tools and other objects made of

bone or shell. Depending on the cultural context, archaeologists may recover metal artifacts, and they may find textiles and other perishables if the conditions for preservation are good.

The first step in any analysis begins by dividing the collected artifacts into a rough typology based on material—separating stone, ceramics, textiles, and so forth. (See [Additional Exercises](#) at the end of this chapter for an opportunity to practice creating your own typology.) Because different techniques are used to analyze different types of materials, archaeologists tend to specialize. In this chapter, Jacob Skousen is our specialist on lithic analysis, Jennifer Zovar is our specialist on ceramic analysis, and Katrina Worley is our specialist on textile analysis.

Lithic Analysis



A sketch of a rough stone tool, from three different angles.

Figure 2 – Oldowan chopping tool. Source: “Chopping tool” by Jose-Manuel Benito Alvarez is used under a [CC BY-SA 2.5](#) license.

Lithic tools and their by-products are among the most commonly recovered artifacts from archaeological sites, in large part because these artifacts are imperishable. As a result, lithic artifacts are also the oldest known artifacts in the world (Figure 2). The earliest lithic artifacts are Oldowan tools (Sahle & Gossa, 2019).

Special Topics: The Earliest Stone Tools

Humans and their immediate ancestors have been using stone tools for millions of years. The oldest widely accepted tradition of making stone tools, which dates to about 2.6 million to 1.5 million years ago, is called Oldowan, named after the Olduvai Gorge in modern-day Tanzania, where these tools were first identified (Sahle & Gossa, 2019). Oldowan tools consist of minimally flaked stone cobbles (often called choppers), flakes, and cobbles with no modification (see Figure 2). Use-wear studies show that the choppers and the flakes that came from them were used for cutting and scraping a variety of animal and plant material (Lemorini et al., 2014). Archaeologists are not certain which hominin species made and used these tools, since many hominins existed during this time period. A few possibilities include *Australopithecus africanus*, *Australopithecus garhi*, *Homo habilis*, and *Homo erectus/ergaster*.



A brown chipped stone tool against a black background.

Figure 3 – An Acheulean handaxe. Source: [Paleolithic Handaxe 1](#) by Wessex Archaeology is used under a [CC BY-NC-SA 2.0](#) license.

A new stone toolmaking tradition, called Acheulean (named for the town of Saint-Acheul in France), developed around 1.76 million years ago (Lepre et al., 2011). The most distinctive Acheulean tools are large stone bifaces (tools flaked on both sides), better known as handaxes (Figure 3). Other Acheulean tools include scrapers, choppers, and cleavers. Acheulean handaxes are shaped like a teardrop, are more symmetrical than Oldowan tools, and are sharp on all edges. All of these features indicate that making these tools took a greater degree of planning than making Oldowan tools did. Some of the earliest Acheulean tools are found in the same locations as Oldowan-style tools, but it is unclear whether the Acheulean tradition developed from the Oldowan tradition or originated elsewhere. Acheulean tools continued to be used after the Oldowan tradition fell out of use, or until about 250,000 years ago. Use-wear studies indicate that Acheulean handaxes were used for a variety of purposes,

including butchering (Zupancich et al., 2018). *Homo erectus/ergaster* were likely the primary makers of Acheulean tools, although it is possible that later hominin species also made and used these tools.

 Three rows of small chipped stone tools of various colors and shapes are arranged above a ruler.

Figure 4 – Mousterian flake tools. Source: [Paleolithic Tools](#) by Dunechaser is used under a [CC BY-NC-SA 2.0](#) license.

Around 250,000 years ago, as the Acheulean tradition waned, the Mousterian stone tool tradition (named after the Le Moustier Cave site in France) developed. Neanderthals made and used Mousterian tools, which are found throughout Europe and western Asia (Biagi & Starnini, 2014). Mousterian tools are far more refined than tools from earlier traditions. These tools were made from flakes produced using what archaeologists call the Levallois technique — a particular way of preparing cores that produced flakes of a predetermined size and shape (Figure 4). Mousterian tools are variable in shape and function, leading archaeologists to consider the Mousterian tradition as a flexible tool kit (Turq et al., 2013). The Mousterian tradition disappeared around 40,000 years ago, about the same time Neanderthals became extinct, after which rapidly spreading groups of *Homo sapiens* all around the world developed unique types, styles, and traditions of stone tools that were distinctive to particular regions and time periods (Shea, 2015).

 A line drawing of two hands chipping a flake off of a core.

Figure 5 – Core, hammerstone, and flake. Source: Image adapted by B. Jacob Skousen.

Archaeologists generally divide stone tools into two types: flaked stone tools and groundstone tools. Flaked stone tools are made from chert or obsidian, or other fine-grained lithic materials that have a predictable fracture pattern. When a chunk of this material (called a core) is struck in a particular way with a stone or a piece of antler or wood (called a hammer), a flake is produced (Figure 5). Flakes could be used as tools due to their sharp edges or were further modified into other tools. Sometimes the core was also shaped into a particular tool. Two of the most recognizable flaked stone tools are spear or arrow points that were hafted onto the ends of sticks or canes.

 A stone mano is placed on a metate.

Figure 6 – Mano and metate from a precontact Native American site in Arizona. Source: Illinois State Archaeological Survey. Used by permission.

Groundstone tools, on the other hand, are made from sedimentary, igneous, or metamorphic rock and are shaped by pecking or grinding. Some groundstone tools were used to grind or pound seeds, nuts, and other plant material or minerals for pigments or

paints; others were shaped into axes, plummets, or ornaments. Common groundstone tools in the Americas are the *mano* and the *metate*, which were used together to grind seeds or maize (Figure 6).

How to Analyze Stone Tools

Archaeologists who analyze lithic artifacts begin by sorting them into flaked and groundstone objects. They then further divide the two subgroups of artifacts into different artifact types. The two most basic types of flaked stone artifacts are *débitage* (pronounced *deb-eh-taj*) and tools, categories that are then further broken down into more specific subcategories. Subcategories of *débitage* include flakes, cores, and shatter; subcategories of these tools include arrow or spear points, knives, and scrapers. Specific types of groundstone artifacts are generally more varied. Some more common types are *manos*, *metates*, abraders, hammerstones, anvils, and fire-cracked rock. When the artifacts in an assemblage are divided into the desired groups, they are further classified by material type and then are counted and weighted. Other more detailed analyses are often performed, some of which are described below.

Débitage Analysis

 Two sides of a flake are shown, and labelled with 'striking platform,' 'bulb of percussion,' 'sharp edge,' 'dorsal side,' and 'ventral side.'

Figure 7 – The morphology of a flake. Photograph by B. Jacob Skousen.

A common type of flaked tool analysis is examining *débitage*, or the waste produced when making a flaked stone tool. *Débitage* can help archaeologists determine the kinds of tools that were made at a particular archaeological site. Common types of *débitage* include flakes, shatter, and cores. A flake is thin piece of lithic material with certain morphological characteristics such as a bulb of percussion, a striking platform, and sharp edges (Figure 7). Shatter refers to the blocky fragments of stone material created from the hammer crushing the parent material during the flaking process. Cores are the original nodules of parent material from which tools were created.

Stylistic Analysis

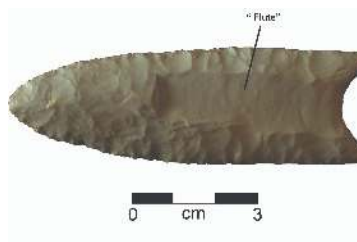


Figure 8 – A Clovis point. Note the characteristic flute. Photo by Thomas J. Loebel. Used by permission.

Identifying styles or types of stone tools requires grouping stone tools with similar attributes. Styles are typically associated with a time period, a geographical region, and/or a function. Stylistic analysis is regularly conducted on spearheads and arrowheads. Most archaeologists, for example, know that a Clovis point (Figure 8), a particular fluted point found throughout North America, dates from roughly 12,000 BCE to 11,000 BCE (Smallwood and Jennings 2015).

Microwear Analysis

Microwear (or use-wear) analysis is a way to understand exactly how flaked stone tools were used. This process involves replicating the flaked stone tool, using it in specific ways (e.g., cutting, scraping, piercing, or drilling) on specific materials (e.g., wood, bone, plants, or animal hide or meat), examining microscopic wear patterns on the used edge of the tool, and comparing the use wear on the replicated tool to the evidence of wear on tools recovered from archaeological contexts (Keeley 1980).

Sourcing Lithic Material



Figure 9 – Mortar and pestle from a precontact Native American site in Arizona. Source: Illinois State Archaeological Survey. Used by permission.

Lithic analysts almost always try to identify the geographic location, or source, from which lithic material was obtained to make stone tools. Sometimes this can be done by macroscopic comparisons of the material type to raw sources obtained from certain locations. In other cases, a microscopic analysis of the crystals or a chemical analysis of the composition of a material is necessary to determine its source.

What Can We Learn from Stone Tools?



Figure 10 – A Maya eccentric flint from the site of El Palmar, Campeche, Mexico. Photo by Jorge Pérez de Lara.

Archaeologists learn numerous things from lithic artifacts. They can learn how past people procured and processed food. Some lithic tools, for instance, were used for hunting (arrow or spear points) or fishing (net weights), while others were used for cutting meat (knives), pounding and grinding seeds or grain (*mano* and *metate*, mortar and pestle [Figure 9]), or breaking open nuts (nutting stone and anvil). Lithic tools can also tell archaeologists about ancient technologies. For example, hammerstones and

anvils were used to make other flaked tools and sandstone abraders were used to shape bone and shell implements. The material stone tools were made from can shed light on where certain lithic materials were procured and the movements of the people who obtained and distributed them. Certain types and styles of stone tools can provide information about the chronology of a site. For example, Clovis points date to the Paleoindian period (Smallwood and Jennings, 2015). Some stone tools can even provide information on group identity, status differences, and religious practices. Classic period Maya eccentric flints (Figure 10) were probably made by specialists, and some were used as symbolic weapons to protect sacred places and buildings from supernatural threats (Fasquelle et al., 2016).

Bone and Shell Artifacts

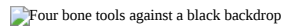
 Four bone tools against a black backdrop

Figure 11 – Examples of simple bone and antler tools found at the site of Pukara de Khonkho, Bolivia. Photos by Jennifer Zovar.

After lithics, bone tools are the oldest found in the archaeological record, dating back at least 1.5 million to 2 million years ago. (See [Bone Tools](#) for an example of a tool from Africa that is 1.5 million years old.) The [Ancient Foodways](#) chapter discusses how archaeologists examine the animal remains that have survived from ancient meals, but here we focus only on the bone and shell items that have been shaped into tools. Bone and shell can be chipped, cut, ground, or polished into a number of different forms. Common bone tools include hoes and other agricultural implements; scrapers or other tools for processing food; fishhooks; weaving tools, awls, needles, or other sewing equipment; musical instruments (e.g., flutes); and jewelry, beads, or other adornments (Figure 11).

Analyzing Bone and Shell Artifacts

There are two parts to analyzing artifacts made of shell and bone. First, an archaeologist considers the same sorts of attributes that are recorded for any artifact—the size and shape of the tool, the techniques used to manufacture the tool, the style or type of the tool, and any microwear. These data can help us better understand the technology of tool production and the context of its use. For example, more than 60 bone tools that were found in the Contrebandiers Cave in Morocco show evidence of being used for clothing manufacture approximately 120,000 years ago. Archaeologists made this determination because the style and use wear are consistent with tools used for working with leather and fur in other contexts (Hallett et al., 2021). Likewise, studies of the marks on bone tools dating to about 35,000 years ago from the Kimberley region in Australia show that they were used for a variety of purposes, including crafting items from plant fiber and resin and for hunting and fishing (Langley et al., 2021).

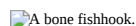
 A bone fishhook.

Figure 12 – Example of a bone fishhook. Can you tell what species this is from? Not without additional information. Source: [Neolithic Bone Fishhook](#) by Gary Lee Todd, PhD, is in the public domain.

In addition to analyzing tool technology, archaeologists also examine the bone itself. They try to identify the skeletal element (specific bone) from which the tool is made as well as the species of the animal it came from. If there is minimal modification (as with the scapula of a large mammal used as a hoe), it may be relatively easy to ascertain the species. However, if the bone has been extensively shaped and polished (as with a point, needle, or fishhook), it may be nearly impossible to identify the species from visual examination alone (Figure 12). Newer techniques can analyze biomarkers in the bone to identify the species of origin (Bradfield et al., 2018). When some species are overrepresented or underrepresented in the tool assemblage, that may provide information about crafting choices or ritual associations between particular tools and particular animals. Likewise, if a bone or shell artifact is made from a species that is not local, this can inform archaeologists' understanding of travel and/or trade routes. For

example, the presence of marine shell beads, gorgets, shell cups, and other prestige artifacts in higher-status households and ritual contexts at the site of Cahokia (in what is the state of Illinois today) show that high-status people there were connected to the Gulf Coast through complex trade routes (Trubitt, 2005).

Ceramic Analysis

Unlike stone and bone tools, ceramics are not found in the archaeological record until after the evolution of modern *Homo sapiens*. However, once they appear in the record, they are often among the most common artifacts. Archaeologically, ceramic refers to any material that humans made out of clay and fired (Sinopoli, 1991). Ceramics are uniquely useful to archaeological investigations because pots and other fired-clay objects are found around the world and preserve remarkably well. Although they break, they do not decompose, and broken potsherds are not often collected by looters (Rice, 1987). Moreover, because they are ordinary, daily-use artifacts, ceramics are found in a variety of contexts and thus can inform archaeologists about many activities related to how they were used and made.

Special Topics: A (Very) Short History of Ceramics

 A small statuette of a female figure.

Figure 13 – A side view of the ceramic Venus of Dolní Věstonice figurine. Source: [Venus von-dolnivestonice-1945](#) by Don Hitchcock is marked with a [CC BY-SA 3.0](#) license.

Surprisingly, the earliest ceramics were not practical tools but ritual objects or works of art. Venus figurines, which have been found across Europe from approximately 35,000–20,000 years ago, were made out of a variety of materials, including soft stone, bone, and fired clay. The oldest known ceramic artifact is the Venus of Dolní Věstonice, a small statue (less than 4.5 inches in height) that was discovered in 1924 in what is Czechia (previously known as the Czech Republic) today. This statuette dates to approximately 31,000–27,000 years ago (Figure 13). In addition to the Venus, there were clay figurines of animals, including mammoths and lions, at the site.

As demonstrated by the Venus and other figures, people clearly knew that clay could be fired to create a hardened material much earlier than when we begin seeing pottery in the archaeological record. In fact, the oldest known pottery was not found until significantly later. Xianrendong Cave, in Jiangxi Province in China, was occupied by a population of hunters and gatherers who used the resource throughout the Ice Age. The oldest sherds, which date to approximately 20,000 years ago, showed signs of burning, suggesting that they were likely used for cooking (Wu et al., 2012). Other early pottery was found in East Asia, especially in what is today China and Japan, long before the advent of agriculture.

Nevertheless, pottery did not become common anywhere in the world until about 10,000 years ago, when people began experimenting with the domestication of plants and animals. This is likely because pottery was not very practical for hunting-and-gathering communities, which tended to be nomadic. Baskets and bags made of animal skins (which are more likely to decompose and disappear from the archaeological record) were far lighter and more efficient for transporting goods than ceramics.

 A ceramic bowl painted with simple designs.

Figure 14 – Later-period Hassuna pottery was covered with a cream slip and painted with red linear designs. This bowl dates to approximately 5500 BCE. Source: [Hassuna redware bowl](#) by the United States Agency for International Development is in the public domain.

However, in many different parts of the world, people started interfering with natural plants and animals about 10,000 years ago. Domestication, sometimes referred to as the Neolithic Revolution, was linked with increased sedentism and with the need to store crops for later consumption. In this context, pottery was a good way to store surplus food and protect it from rodents or other pests who might eat it. Pottery also provided a way to help process new food products, as seen through the discovery of early ceramic cheese sieves (McClure et al., 2018).

It was at this stage that a variety of different types of pottery began to appear as different cultures developed their own styles and decorative techniques. In Mesopotamia, some of the earliest pottery was made in the Hassuna style (Figure 14), which dates to approximately 7,000–9,000 years ago, shortly after some of the earliest domestication.

Pottery Manufacture and Technology

For a potter in ancient times, the first step to making pottery was finding and preparing the clay. Although clay occurs naturally, in order to make a high-quality pot, it is necessary to remove unwanted particles and add in more desirable additives, known as temper. A skilled potter knows that different kinds and quantities of temper prepare the clay for different uses (Rye, 1981). For example, a pot for cooking may be created with a rougher temper, which allows it to heat and cool more effectively without cracking.

 A seated figure throws a pot on a wheel.

Figure 15 – A potter throws a vase on a wheel. It is unclear when or where the first pottery wheel was invented. There have been claims from Mesopotamia, Egypt, China, and the Indus Valley, all dating to approximately 5,000–6,000 years ago. While the use of the wheel spread rapidly through Eurasia and Africa, it was not used in the Americas until after colonization. Source: [Craft: Throwing Clay and Making Vases](#) by [Elbereth Elflein](#) is licensed under [CC BY 2.0](#).

Clay can be molded in a variety of different ways: by pinching a ball into the desired shape, using the coil method, using a mold, building with slabs, and so forth. Different techniques for forming the vessel may be practical, but they can also reflect cultural or stylistic preferences. Likewise, changes may result from the introduction of new technology such as the pottery wheel (Figure 15). Once the basic form of a vessel is made, secondary or decorative forming techniques may be added before it is fired. Techniques may include beating, scraping, smoothing, burnishing, and polishing. Decorative motifs may be cut, carved, or molded onto the vessel. The surface may be covered with slip, glaze, or painted decoration.



Figure 16 – a) Pots that are fired at a low temperature are more porous and are known as earthenware. [Chinese Jar, Neolithic Period, painted earthenware, HAA](#) by [Hiart](#) is in the public domain. b) Pots fired at a medium temperature are stoneware. [Jar, Han dynasty, stoneware with glaze, Honolulu Museum of Art 1865.1](#) by [Hiart](#) is in the public domain. c) Pots fired at a temperature hot enough that most of the clay has vitrified (turned to glass) and appears translucent are porcelain. [Hardpaste porcelain](#) by [VAWebteam](#) is licensed under [CC BY-SA 3.0](#).

Firing techniques also vary by cultural group and chronological period. If you have taken a ceramics class, you probably fired your pieces in an enclosed kiln, which provides a controlled, even heating environment. However, it is possible to create pottery without a kiln. In an open-fire method, the pots are mixed with the fuels on the surface of the ground or in a small pit and then burned. Because it is more difficult to control the atmosphere, careful placement prior to firing is necessary to ensure an even heating environment. Even under ideal conditions, some pots will crack, break, collapse, or fire unevenly, depending on the combination of the heating atmosphere, the rate of heating, and the maximum temperature (Figure 16).

How to Analyze Ceramics

An understanding of the basics of pottery manufacture helps archaeologists analyze the resulting ceramics. The ceramics that have survived in the archaeological record are often broken or have been deposited in a refuse pit. Archaeologists work back from the discarded artifact to better understand the context of its use and creation. Different approaches to archaeological analysis include an analysis of form and function, a stylistic analysis, or a characterization study. The kinds of analyses an archaeologist employs depend on the particular research question she is asking. Many investigations require multiple analyses.

Analysis of Form and Function

The shape and form of an artifact can give us some clues about its function or how it was used. In some cases this may seem obvious—a pitcher is clearly used for pouring liquid, while a large pot with burn marks must have been used for cooking. In other cases, however, the function of a vessel is not as clear. What hypotheses do you have about the uses of the pots pictured in Figure 17?



Figure 17 – Selected pots from the site of Pukara de Khonkho, Bolivia. What do you think each pot might have been used for?
Photos by Jennifer Zovar.

The first step in this sort of analysis is to create a typology, grouping like objects together with like. This is the sort of thing you probably do without thinking about it when you organize dishes in a kitchen: you put the plates on one shelf, the cups on another, and so forth. However, the sorting process becomes trickier when you are organizing items for which you lack cultural context. The people who used the pottery may have had a different classification system than the archaeologists who are studying it. For example, in a recent study, researchers found that there were significant differences in how archaeologists and Indigenous potters sorted a collection of ceramic sherds; the potters often noted specific characteristics that the archaeologists did not recognize (Borck et al., 2020). In addition, it's important to remember that the same pot may have been used for different purposes over the course of its use life, making simple categorization even more difficult.

Even so, it is usually possible to roughly divide any collection into vessels used for storage, for cooking or food processing or for serving or for transfer. From there, additional sorting will depend on the collection. Archaeologists consider a number of attributes, including the shape of the rim, the base, or the handles; the dimensions of the rim or base; the thickness of the vessel walls; the compactness of the clay; the color; the firing environment; the presence of specific paste inclusions; the type of finish; the presence of glaze or wash; and any signs of use wear.

Analysis of Style

In addition, archaeologists may consider stylistic attributes that do not contribute to the function of the vessel. Style is often seen as a proxy for cultural identity. Shared styles may indicate a close social relationship among cultures, while abrupt stylistic changes may indicate some sort of change in social or political organization. Archaeologists may record specific elements or motifs that appear on different pots and consider how they change over time and between sites.

At the same time, an old archaeological adage warns against confusing pots for people. It means that we need to be careful about methodological approaches that focus only on the artifact without considering what the people who created it were trying to communicate. For example, while Iron Age ceramic styles in southern Africa were traditionally interpreted primarily as markers of ethnicity, ethnohistoric and ethnoarchaeological studies show that pottery is more complex when considered through the various lenses of production, distribution, and engagement with different social networks (Pikirayi & Lindahl, 2013). Archaeologists need to recognize that pots and other ceramic vessels are mobile objects and that their styles are a form of communication over both time (as novice potters learn from their elders and from experimentation) and space (as people move, vessels are traded, and pots are used in different contexts over their use life).

Characterization Study

While analyses of form, function, and style consider the design of a pot, characterization studies focus on the clay itself. This can be important for identifying the source of the clay as well as the technical choices potters made in preparing the material. Characterization studies draw on techniques from the physical sciences and focus on the internal microstructure of the clay. This may include mineralogical studies such as petrography as well as chemical characterization.

Special Topics: Archaeological Chemistry and Artifact Analysis

Archaeology increasingly draws on techniques from the physical sciences to aid in data collection and analysis. Archaeological chemistry is often used to help identify the material composition of an artifact or to help determine where it came from. Processes such as instrumental neutron activation analysis (INAA), inductively coupled plasma—mass spectrometry (ICP–MS), or X-ray fluorescence (XRF) may be used to identify chemical composition groups that can be matched to a specific geological provenience. While the instrument for each of these processes uses a different technology, they all break down the chemical elements present in different materials.

Items from a particular class of material (ceramics, different kinds of metal, and various stones and minerals, etc.) will be somewhat similar in terms of their major elements but may differ greatly in terms of their trace elements. For example, any ceramic material is primarily composed of silica (SiO_2) but will have different amounts of other elements. Pots that are made from the same clay source, however, will be more similar to each other. By using a statistical technique called discriminant analysis, it is possible to identify groups in a selected sample by comparing the presentation of selected elements (Figure 18). For example, using INAA, one group of researchers was able to distinguish authentic high-quality Zisha stoneware (produced during the Ming dynasty from clays near Yixing, China) from imitations that were created later in various European countries, a distinction that is difficult to make from visual observation alone (Zhu et al., 2019).

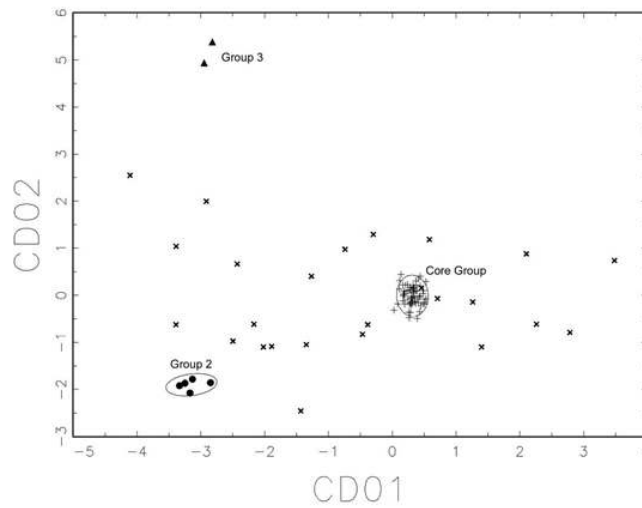


Figure 18 – Results of a discriminate function analysis showing all three chemical characterization groups from Zovar's ceramic characterization study of the site of Pukara de Khonkho, Bolivia (Zovar, 2012). Note that most of the samples belonged to the core group.

While INAA has a longer history of use in the investigation of ceramic materials, ICP-MS has become increasingly popular, in part because it is cheaper and somewhat less destructive (Kennett et al., 2002, p. 444). One of our authors, Jennifer Zovar, chose to use ICP-MS to investigate pottery from Bolivia's southern Titicaca basin with the support of the Field Museum's [Elemental Analysis Facility](#). She wanted to see whether pottery from the site of Pukara de Khonkho was produced locally or remotely, information that would help clarify the role of trade and other interactions related to ceramic production during the period right before the Inca came into the region. The results showed that most of the tested pottery from Pukara de Khonkho and surrounding sites fell into the same chemical characterization group, suggesting that they were all produced with local clays, and that that pattern did not change after the Inca incursion (Zovar, 2012).



Figure 19 – Stonework at the site of Tiwanaku, Bolivia. Photo by Jennifer Zovar.

Characterization studies can also be useful in ascertaining the provenience of stone artifacts. For example, XRF tests were used to determine the provenience of some of the obsidian flakes found at Pukara de Khonkho (Zovar, 2012). Ryan Williams and John Janusek have also worked together to determine the source of Tiwanaku's famous monoliths and other stonework (Figure 19). They found that the sandstone and andesite came from various quarries in the surrounding mountains, which local people see as sacred (Janusek & Williams, 2016).

What Can We Learn from Ceramics?

Archaeologists first became interested in pottery to help establish chronologies of archaeological sites. Since pottery styles change slowly over time, the presence of particular styles can help provide dates for site occupation. In fact, ceramic styles are often used as shorthand for specific archaeological periods. (For example, the Jōmon period of ancient Japan, which spans the entire Holocene to approximately 300 BCE, is named for a specific type of pottery.) In addition, ceramics can be directly dated through thermoluminescence dating. (See [Dating Methods in Archaeology](#).) The use of ceramics to establish dates and to investigate change over time is still important, but analyses of ceramic material provide far more than a simple catalog of pottery types and

technical specifications. Even the most unassuming potsherds contain a wealth of information about subsistence, technology, economy, and identity—as long as archaeologists ask the right questions.

People new to archaeology are often surprised at how much information archaeologists can glean from some simple potsherds. There is much more than identifying the cultural group, time period, and basic function of a vessel. Below are just a few (of many) examples of what we can learn from pots.

We can investigate practices of food consumption and preparation by analyzing the residue left on the inside of a pot. This touches not only on what was being prepared but also on who was doing the preparation of the food. Early generations of archaeologists often overlooked this sort of study because food preparation was assumed to be the work of women, domestic servants, or others with little power in society (Graff, 2020). Also, lipids, proteins, and/or microbes that seep into the ceramics can give information about the specific ingredients that were used and how they were prepared. For example, an analysis of lipids found on pottery at the site of Durrington Wells (near Stonehenge) helped demonstrate that meat (pork and beef) and dairy products tended to be prepared and consumed in different parts of the site, using different vessels (Craig et al., 2015). Additional examples of residue studies can be explored in [How Pottery Offers Glimpses Into Ancient Foodways](#).

We can also look at the process of manufacture to address the division of labor and patterns of trade. Pottery made by individuals for their own household use will leave a different archaeological signature than pottery made by specialists for the purpose of trade. Specialized ceramic workshops at sites in the Indus Valley, for example, suggest that elites controlled the ceramic trade there, while the widespread distribution of Roman amphorae across Europe demonstrates the strength of the Roman trade network (Sinopoli, 1991, pp. 107–114).

Similarly, the presence or absence of high-quality pottery from a site (or from a certain part of a site) may reflect social organization and social hierarchy. In the Classic Maya period, for example, artistic polychrome vases (likely commissioned by royal patrons) were painted with images of the sacred ballgame, Maya rulers, deities, and other intricate images. They are exclusively associated with royal palaces and other elite contexts (Reents-Budet, 1994). See [Ancient Maya Painted Ceramics](#) for more discussion and some beautiful pictures.

Archaeometallurgy

The study of metal in archaeological contexts is known as archaeometallurgy. While metal artifacts are relatively rare at older sites, they became increasingly important over time. Metal technologies have traditionally been used to categorize past societies, although some of these typologies can be problematic, as the special topics box below illustrates.

Special Topics: Decolonizing the Three-Age System

Many nonarchaeologists are familiar with the Three-Age System, which divides human history into three major periods based on the sequential development of technology: the Stone Age, the Bronze Age, and the Iron Age. This model is most often attributed to C. J. Thomsen, a 19th-century antiquarian (a person who studies antiquities) who proposed the chronology based on his work in Scandinavia, and it is broadly applicable across much of Europe and even into parts of the Middle East. The Three-Age System is not regularly used in the Americas, Africa, or much of Asia because the chronological sequence of metal use is not the same in these regions. In addition, the system is often linked with problematic assumptions of evolutionary progress that do not match the evidence. See [It's Time to Replace "Prehistory" with "Deep History"](#) for a discussion on why traditional understandings are overly simplistic.

For example, although Southeast Asia is often overlooked in discussions of technological development, very early bronze work has been recorded in village sites such as Ban Chiang, Thailand, including spear points, adzes, and ornaments dating to about 4,000 years ago. (See [Bronze from Ban Chiang, Thailand](#).) The use of iron and bronze appears to be locally variable across Southeast Asia, and there is little connection between the use of specific metal technologies and patterns of social or political organization. In these contexts, the uncritical application of the Three-Age System can confuse understandings of chronology and archaeological histories (Kanjajuntorn, 2020).



Figure 20 – A golden Inca llama. Source: [Golden Llama](#) by [Kaptain Kobold](#) is licensed under [CC BY-NC-SA 2.0](#).

Likewise, the chronology is problematic in the Americas, where iron was never smelted prior to colonization. However, a variety of highly technologically complex metallurgy traditions developed in the Americas in that period (Lechtman, 2014). In South America, the Moche smelted gold, silver, and copper into decorative pieces associated with elite members of society. (See “[Moche Metallurgy](#).”) Metalwork became even more complex with the Inca, who crafted bronze tools as well as intricate golden treasures (Figure 20).

In contrast, in much of Africa, iron making was the first metal technology to be widely developed. People of the Nok culture in what is Nigeria today built large furnaces for smelting iron around 2,500 years ago (e.g., Rackham et al., 2017), and iron artifacts were important for trade at the site of Jenné-jeno, in what is Mali today. Metalwork was also an important component of trade in the later southern African kingdoms of Mapungubwe and Great Zimbabwe (e.g., Kim & Kusimba, 2008).

The oldest metal artifacts that archaeologists have recovered were made from native metals that were formed into decorative bangles, necklaces, bracelets, and other ornamental objects, either through cold hammering or by melting the metal and shaping it with a mold. At the site of Varna, in what is Bulgaria today, gold artifacts have been identified that were used to designate a social hierarchy approximately 6,500 years ago. (See [Mystery of the Varna Gold](#).)



Figure 21 – Bronze and Iron Age metals from England. Source: [Bronze Age and Iron Age Objects](#) by the Portable Antiquities Scheme is licensed under [CC BY-SA 4.0](#).

Metal alloys were later independently developed in many different locations across the world to serve a variety of different purposes. Bronze, for example, is a copper alloy, which is harder and stronger than copper alone. The first alloys mixed copper with arsenic, but true bronze requires tin. The earliest known tin bronze was found in what is Serbia today and dates to about 6,500 years ago; other early tin bronze is found across the Near East that dates to about 5,000 years ago (Radivojević et al., 2013). Bronze artifacts include axes and spears as well as artistic and/or ritual objects. In Europe and the Near East there was a shift to iron beginning around 3,000 years ago—and earlier in some regions—as new technology enabled furnaces to get hot enough to effectively reduce iron ore into iron metal.

Analyzing Metal Artifacts

Just as with any other material, an archaeologist studying metal artifacts would record their basic attributes—size, shape, weight, use wear, and so forth. However, archaeometallurgists are also specifically interested in determining the specific type of metal that was used. This may begin with a visual examination, looking at aspects such as weight, density, hardness, color, corrosion, and magnetism. For example, iron is magnetic but silver is not, and aluminum is lighter than many other metals. However, more precise investigation may require chemical analysis such as X-ray spectroscopy or mass spectrometry. Elemental analysis of the chemical composition of the metal can help to determine the precise composition of alloys as well as the source of the metals.

This can be important in developing understandings of the technological process that different metalworkers followed at different times and in different places and can also be used to investigate systems of trade and exchange of ideas. For example, in her

research into the complex metallurgical technologies of the South American Andes, Heather Lechtman has used elemental analysis to identify the geographical sources used in Andean bronzewear and to investigate changes over time and space (Lechtman, 2014).

Textile Analysis

While lithics are the earliest items of human manufacture that have survived in the archaeological record, most archaeologists recognize that the earliest tools used by our ancestors would have been made of organic materials such as leaves, twigs, shells, or bone. Organic materials are perishable by nature, and they typically don't survive except under unusual circumstances. One of the groups of perishable artifacts least likely to survive in the archaeological record is textiles.

Textiles can be made from a wide variety of materials, but these fall into two main groups: cellulose fibers from plants and protein fibers from animals. Fibers can be found in the stem, bark, or seeds of a plant. Those found in the stem are called bast fibers. These are found in the stems of flax, hemp, dogbane, milkweed, and nettle. Cotton is the most common seed fiber in both the modern and ancient worlds, but string can be made from the fibers surrounding other seeds. Fibers that come from animals include wool and hair from sheep, goats, llamas, camels, and a wide variety of other mammals, as well as silk fibers from the cocoon of the silk moth. Leather and hides also come from animals, but they are usually a by-product of hunting or slaughtering livestock for meat. Wool and hair fibers don't require that the animal be killed. Originally the wool would have been collected from naturally shedding animals. Shearing the animals is a process that comes with domestication.

The manufacture of a textile typically begins with a strand of a flexible or semi-flexible material. This might be a relatively unmodified strip of bark or a stalk of grass or it might be a strand of fibers that have been processed. Items made from unmodified grass or bark fibers are not very foldable because in their natural states they are relatively stiff. To make the resulting fabric more flexible, the fibers are split, beaten, crushed, steamed, or otherwise processed. This separates the individual fibers from the woody matrix and makes them softer and more flexible. However, such processing means that the fiber will decay more quickly. Animal fibers such as wool from sheep need only be shorn from the animal or collected if the animal sheds its wool naturally. Twisting the softer, more processed fibers creates a flexible cord or string, and a fabric structure created from these processed fibers is more flexible. Some structures have rigid elements in one direction but flexible elements in the other direction. This allows the item to have a degree of rigidity but still be folded or rolled for storage or transportation.

Making String

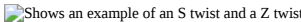
 Shows an example of an S twist and a Z twist.

Figure 22 – “S” and “Z” twists. These twist directions apply to string and cordage as well as elements in basketry and other structures. Author unknown.

Both cordage and spun thread are made by twisting the fibers. The difference is in how the short fibers are joined to make longer lengths. Cordage has spliced joins (bundles of fibers that are overlapped in groups), while yarn has a continuous overlap of fibers. However, those details are difficult to see, especially when looking at fragmentary artifacts. The fibers can be twisted together in two directions, referred to as “S” and “Z” (Figure 22). These initial strands can then be used as is or they can be twisted around each other to form plied yarns. The number of plies can vary significantly, but most archaeological textiles are made either with single strands or with two or three plies of fiber that are twisted for strength. Careful examination of a textile (or a cast of the textile in mud or clay) can help determine the structure of the yarn or cord used to make it.

Special Topics: Textile Structures



Figure 23 – On the left is a tape woven in plain cloth with warp elements running lengthwise and weft elements crossing at right angles from edge to edge. On the right is plaited twill fabric in which each element travels in a zigzag pattern across the fabric. Both plain cloth and twills can be produced by either weaving or plaiting. The edge showing the turning of the elements is key to determining which method was used. Taken by Katrina Worley.

Once the cordage/yarns/threads are made, they can be manipulated into a variety of simple and complex structures. Woven fabrics have two systems of threads; one set runs the length of the fabric (the warp), the other from side to side at right angles (the weft, or “woof” in the older terminology). Twined fabrics have two or more wefts that are twisted around each other as they cross the width of the warp or sets of warps that are twisted as the wefts are passed through. Plaited fabrics have a single system of threads: each thread moves on a diagonal from one side to the other, then turns at the edge and crosses back in a zigzag path along the length of the plait/braid. If an edge of the fabric where the element turns has survived, the difference between a woven fabric and a plaited one can easily be seen (Figure 23).



Figure 24 – Clockwise from upper left: Nalbinding, knitting, and crochet samples against a background of felted wool. Nalbinding is done with a single-eyed needle of bone or wood, knitting is done with two or more straight needles, and crocheting is done with a single hook. All three techniques are used to produce flexible items such as socks and mittens. Felt is made with loose wool that is distributed in an even layer and then subjected to heat, moisture, and agitation in the presence of an alkaline substance such as soap. Felt can be made in sheets and cut to shape or it can be formed around molds and patterns to create three-dimensional items such as boots or shoes. Taken by Katrina Worley.

Other textile structures are produced using a single technique that forms knots or stitches. Knotted and looped nets are used for a variety of items, from carrying bags and hammocks to hunting and fishing nets. Nalbinding was used to create a fabric that was warm, flexible, and comfortable for hats, socks, mittens, and similar items. Knitting and crocheting are much more recent techniques and are used for similar purposes as nalbinding. Sprang is a form of plaiting or braiding that is created on a loom using only warp threads; it is used to create elastic fabrics for hairnets and similar items. Felt is made from compressing wool fibers with heat and in alkaline conditions to form a sheet of interlocking fibers (Figure 24).

Textiles in the Archaeological Record



Figure 25 – Impressions in clay. Center: two- and three-ply cordage. Clockwise from top: knotted netting, looped netting, woven basket, a basket woven with wider material, a coiled basket base, and a twined basket base. In the archaeological record, pots may be formed inside a basket, leaving impressions in the clay, or a basket or bag may be left on wet ground that leaves an impression behind. These impressions can be analyzed to determine the type of textile that made them. Taken by Katrina Worley.

A tiny fragment of a three-ply cord associated with a Neanderthal Levallois flake has recently been found in a context dated 41,000–52,000 years ago (Hardy et al., 2020). This is one of the earliest pieces of direct evidence for textiles. Indirect evidence can be seen in wear patterns on bone or shell ornaments (indicating that they were suspended and used as a bead). Because of their fragile nature, textiles rarely survive to be found in the archaeological record. Most that are found are highly fragmentary.



Figure 26 – A group of spindles of varying sizes and shapes. Each has a fired clay whorl and a wooden shaft. The shafts rarely survive, but the whorls are among the most common pieces of evidence for textile manufacture in the archaeological record. Smaller, lighter spindles are typically used for finer threads and heavier spindles for coarser threads. Some of the smallest clay whorls used to spin very fine threads can be mistaken for ornamental beads. Taken by Katrina Worley.

The ideal conditions for textile preservation are cool, dark, and dry (such as a tomb or a dry cave), but textiles can occasionally preserve in a variety of relatively extreme situations. These include anaerobic wet conditions, freezing temperatures, or sites with specific chemical profiles. Textiles from flax and other bast fibers have been found in the sediments at the bottom of lakes and in marshy sites, while protein fibers (wool, hair, silk, and leather) have been found in the highly acidic conditions of peat bogs. Textiles can also survive when partially burned (carbonized), when encased in salts from the corrosion of metal, or when the soils that surround an item are particularly high in salts. Fabrics made of two different fibers (such as flax and wool) can have “voids” where one of the fibers preserves and the other decays. Depending on circumstances, this can either help or hinder the interpretation.



Figure 27 – Tools can be evidence of textile work even when the textiles themselves aren't present. Many textile craftspeople used a random variety of “pointy sticks” to separate and arrange threads, and these can develop telltale wear marks and patina indicating their use in textile work. Tools made of bone, wood or shell were less likely than metal to damage or abrade threads while working so were generally preferred. Modern versions of these tools may be made of plastic or other materials, but their shape and function are often remarkably unchanged over time. Taken by Katrina Worley.

Trace evidence can be studied even when the fabrics themselves have disappeared. Impressions of fabric structures can be found pressed into mud floors or clay pots that later hardened, preserving a record of the structure (Figure 25). These impressions can be studied for clues to the structures of the fabrics. Other evidence of textiles can be found in the tool kits of the makers. Spindle whorls have been found in many sites around the world. These are bead-like weights for the spindles that are used to spin yarn. They come in a wide variety of sizes, shapes, and materials and can be reflective of that kind of thread or yarn that was being produced (Figure 26). Some whorls are made of repurposed broken pottery, while others are clearly made as spindle whorls. Weights made of fired clay or stone indicate the use of a warp-weighted loom. As with spindle whorls, the loom weights vary in size, shape, and weight and can provide hints about the fabric woven on the loom. Because loom weights can be similar to weights used for other purposes such as fishing, they are usually identified from context. Bone awls for poking holes in hides or other materials, bone or wood needles for sewing or nalbinding, and a variety of beaters to manipulate threads on a loom can all be used to demonstrate the presence of textiles even when the textiles themselves don't survive (Figure 27).

What Can We Learn from Textiles?

Textile analysis is a relatively rare specialization within archaeology in part because of the lack of preservation in most archaeological contexts. That said, given that perishable items would have made up the majority of artifacts for most cultural groups, there is much to be learned from the traces that remain – technology, trade, fashion, ritual, etc.

Finally, there can be an important link between the artisans of today and their ancestors. Suquamish elder and master basketmaker Ed Carriere has worked closely with archaeologist Dale Croes to study traditional basketmaking in the Salish Sea region (Carriere & Croes, 2017)

Experimental Archaeology and Ethnoarchaeology

Whether studying lithics, bone tools, ceramics, textiles, foodways, or metals, archaeologists use a variety of techniques to help test their hypotheses. One approach is to look at the ethnographic record for accounts of technologies in action. This is known as ethnoarchaeology. By comparing the evidence left behind by living peoples engaged in these techniques to peoples alive today and across cultural groups, it is possible to better interpret the archaeological record. Another method is to attempt to replicate the technologies seen in the archaeological record and compare the results with evidence from archaeology. This is experimental archaeology.

Ethnoarchaeology

Ethnoarchaeology studies how living peoples interact with their environments and uses that knowledge to help interpret the past. Keep in mind, though, that living cultures are not some kind of “primitive” relic of the past. While different peoples have developed different technologies, we are all equally human. All human cultures change and adapt to their current situations, and no human culture is any more developed than any other, a fact that must be remembered when creating a research design.

That said, ethnoarchaeology has the potential to contribute to archaeological understanding as long as archaeologists are careful and reflexive. Sometimes, ethnoarchaeology leads to unexpected discoveries, and sometimes it simply serves as a reminder that not everything will show up in the archaeological record. For example, in her work with the Pumé people of Venezuela, Pei-Lin Yu

found that sting-ray spines had ritual uses that would be hard to predict by archaeologists who simply found the item at a site. (See [Ethnoarchaeology](#) video.)

Experimental Archaeology



Figure 28 – Historical reenactment and experimental archaeology: Katrina Worley working as a history interpreter at Sutter’s Fort in Sacramento, California. Spending long periods of time in historic clothing while engaged in traditional activities allows for a deeper understanding of the interconnectedness of material culture with everyday life. The interpretive programs at historic sites such as Sutter’s Fort have long focused on the white Euro-American presence, but more recently such programs have shifted toward a more complete story that includes the perspectives of marginalized groups that were previously ignored. Photo courtesy of Katrina Worley.

Experimental archaeology is a way of understanding the past through the replication of artifacts and the techniques used to construct them. Experimental archaeologists analyze and interpret technologies from the archaeological past and attempt to recreate and use them to answer specific questions. They look at the process of manufacture and the waste products that result from that manufacture. They also look at how the artifact is used and analyze wear and breakage patterns. Public outreach in archaeology, which can include television programs, historical reenactments, and living-history interpretations, often include an element of experimental archaeology (Figure 28). In these contexts, the term “experimental archaeology” is rarely used. Instead, the practice is often described as “hands-on history” or “bringing the past to life” (although both of these terms are misleading).

Experimental Approaches

There are two main aspects of experimental archaeology. The first has to do with the replication of artifacts or (in some cases) entire structures or sites. This involves developing an understanding of the techniques used to acquire the materials and to manufacture an artifact or to construct a site. The second is to use the artifact or site to better understand its function. This allows better interpretation of archaeological finds through analyses of breakage and wear patterns. For instance, an experimental archaeologist may start by creating a replica of a flint blade found at an archaeological site. This provides a basic understanding of the specific artifact and its construction. To better understand stone blades as an artifact type, the next step would be to make a number of replicas and use them to cut a variety of materials. This allows the experimenter to develop an understanding of how the shape of the tool affects its effectiveness. By then examining the wear on the cutting edges of the artifact and the replicas, it may be possible to determine the function of the original artifact.

Kevin Smith and colleagues followed a similar research strategy in their investigation of tools used to make abalone-shell fishhooks on San Nicolas Island in California. After recreating various tools from local stones, Smith used them to create replica fishhooks. By comparing the marks left on the experimental stone tools and shell fishhooks, the researchers were able reconstruct

the sequence of operations in creating the technology. (See [How an Archaeological Experiment Revealed California's Ancient Past](#).)

Artifact Replication

Ideally, artifact replication would use appropriate techniques and materials for the entire project. However, few modern people have the skills needed or the access to necessary tools and materials to replicate artifacts. There are also time constraints to be considered. Sourcing, gathering, and preparing the materials and making the tools needed to make the artifact all add to the time required to replicate an item. In the past, some parts of the process may have been performed by other specialists. For instance, a clay spindle whorl might not have been made by the spinner who used the spindle to make thread. Instead, the whorl might have been made by someone who was familiar with working and firing clay and then sold to or traded the whorl with those who used it. Most replications inevitably end up being a compromise between accuracy and expediency. Replicas often are made using substitute materials and/or modern tools for at least a part of the process. As long as the substitutes are chosen with care and are clearly documented, the results are still valid.

Interpreting the Past

Experimental archaeology and ethnoarchaeology, in sum, are simply ways to help archaeologists test, think through, and imagine how tools, features, and other remains were made and used.

Conclusion

In this chapter, we have shown the different ways archaeologists use objects to better understand the people of the past. Whether archaeologists are focused on artifacts made from stone, bone, ceramic, metal, or textile, they begin with detailed observations. Some analyses require no specialized equipment, while others draw on techniques from chemistry or other physical sciences. As with any study, the specific data that is collected depends on the research questions that are being asked. Hypotheses may be tested through experimental archaeology or ethnoarchaeology. While many of the objects archaeologists analyze may not be the kinds of priceless treasures desired by Indiana Jones, through proper investigation, they all have the potential to teach us a little more about what it means to be human.

Discussion Questions

1. When did the earliest stone, bone, ceramic, metal, and fabric technologies develop, and how do archaeologists know that information?
2. What are some of the similarities and differences in analyzing different types of artifacts?
3. What kinds of questions can archaeologists address through investigations of stone, bone, ceramic, metal, or fabric artifacts? What was your favorite example referenced in the text, and why?
4. What are the benefits and drawbacks of using experimental archaeology and/or ethnoarchaeology to learn about the past?

About the Authors

 Jacob Skousen is an assistant professor of anthropology at Western Illinois University. He has been a professional archaeologist for nearly 15 years, and while most of this experience has been in the North American Midwest, he has archaeological experience in the Great Basin and Southwest in North America, in Central America, and in the Middle East. His research focuses on the Mississippian period, the precontact city of Cahokia, pilgrimage, and identity formation. In the rare moments when he is not doing archaeology, Jacob enjoys being outside, taking walks, exercising, gardening, and playing the piano.



Jennifer Johnson Zovar is a Professor of Anthropology at Whatcom Community College in Bellingham, Washington. Her academic research has focused in the Bolivian Andes, where she investigated an archaeological site that was occupied just before the Inca came into the region (and after the collapse of the earlier Tiwanaku polity). She is continually inspired by how archaeological analysis of the smallest details can lead us to a more complete understanding of the lives of human beings in the past. In addition to her experience in Bolivia, she has worked on archaeological projects in Guatemala and across the United States. When she is not researching or teaching anthropology, she loves camping and exploring with her kids and a series of loyal dogs – Chica, Hank, and Sierra.

 Woman wearing a hat and sunglasses in front of a stone wall.

Katrina Worley is a Professor of Anthropology at American River College in Sacramento, California. She learned how to spin as a child when her mother inherited her grandmother's spinning wheel. When she was learning to spin on her great-grandmother's wheel, Katrina asked her mother what people did before they had spinning wheels and was told to "go look it up." So she did. That led to experimenting with spindles of various kinds, with homemade looms, and ultimately to degrees in anthropology and archaeology. Her thesis work was on the structures of California Indian textiles other than baskets and included samples of the techniques identified in the archaeological and ethnographic collections she studied. Because textiles are part of a broader pattern of interrelated technologies, she has also dug clay, made spindle whorls and loom weights and fired them in a bonfire, and knapped flint and obsidian blades to work with textile fibers. When not working in archaeological techniques, Katrina spins on an electric spinning wheel, weaves on a floor loom, and enjoys baking.

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Further Exploration

This list includes publicly available resources referenced in or relevant to this chapter, which may be of interest to readers who want to learn more. The URLs are typed out below as a courtesy for those who are reading a print version of the text. Please keep in mind that links may break over time and may not be immediately updated. Instructors should use discretion when assigning materials from this list. While the chapter itself has been checked for web accessibility, the editors do not vouch for the accessibility of all supplementary linked resources.

Ancient Maya Painted Ceramics – James Doyle – The Met, April 2017, https://www.metmuseum.org/toah/hd/mayac/hd_mayac.htm

Bone Tools – Smithsonian Museum of Natural History – <https://humanorigins.si.edu/evidence/behavior/getting-food/bone-tools>

Bronze from Ban Chiang, Thailand: A View from the Laboratory – Elizabeth Hamilton – Expedition Magazine 43, no. 2 (2001), <https://www.penn.museum/sites/expedition/bronze-from-ban-chiang-thailand/>

Elemental Analysis Facility – Field Museum – <https://www.fieldmuseum.org/departments/elemental-analysis-facility>

Ethnoarchaeology – video – Boise State Explore – <https://www.youtube.com/watch?v=wj3rX8Nqv3c>

How an Archaeological Experiment Revealed California’s Ancient Past – Anna Goldfield – Sapiens, August 14, 2018, <https://www.sapiens.org/archaeology/experimental-archaeology-california-ancient-past/>

How Pottery Offers Glimpses into Ancient Foodways – Carolyn Wilke – Sapiens, September 8, 2021, <https://www.sapiens.org/archaeology/pottery-ancient-food/>

It’s Time to Replace “Prehistory” with “Deep History” – Stephen Acabado, Marlon Martin, Piphall Heng, Earl John C. Hernandez, and Mylene Q. Lising – Sapiens – December 3, 2024 – <https://www.sapiens.org/archaeology/prehistory-deep-history-southeast-asia/>

Moche Metallurgy – Museo Chileno de Arte Precolumbino – <https://precolombino.cl/wp/en/exposiciones/exposicion-permanente-america-precolombina-en-el-arte/andes-centrales/vitrina-metallurgia-moche/>

Mystery of the Varna Gold – Andrew Curry – Smithsonian Magazine, April 18, 2016, <https://www.smithsonianmag.com/travel/varna-bulgaria-gold-graves-social-hierarchy-prehistoric-archaeology-smithsonian-journeys-travel-quarterly-180958733/>

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Tool Use – Video – Jane Goodall Institute – <https://www.youtube.com/watch?v=5MlytL6JSik>

INSTRUCTOR RESOURCE – Additional Exercises

1. Typology Exercise: You can conduct an easy typology exercise with any collection of items that have some things in common. Jennifer Zovar has done this with a random sample of children’s toys, a bag of mismatched buttons, and a large collection of National Geographic magazines. Use whatever you have on hand. Give student groups a random collection of whatever item you’ve brought in and ask the students to divide the items into groups based on whatever traits they think are most important. After the exercise, compare and contrast the different typologies that different student groups have created. What traits were chosen and why? How might different typologies lead to different interpretations of the material?
2. Ceramic Analysis Exercise: Even if you are working in a college without access to a collection of ceramic artifacts, you can create your own relatively cheaply by buying a few old dishes from a thrift store and breaking them with a hammer. Then, encourage your students to analyze them, using some of the following questions:
 - Count the ceramic pieces in your bags. Separate rims, bases, and body sherds and provide a count of each.
 - How many different vessels do you think are represented in this bag? What do you think each looked like? Can you refit any of the sherds in your collection?
 - Choose one or more individual sherds and record the following information:

- Kind of sherd (body, rim, base, neck, etc.)
 - Thickness (use calipers)
 - Color (Munsell number and color name)
 - Is the paste coarse, medium, or fine?
 - Is there glaze or any sort of surface treatment? If so, describe it.
 - Is there any decoration? If so, describe it.
 - Do you notice any use wear (e.g., burning, sooting, scraping)? If so, describe it.
 - Do you see anything else interesting about the sherd?
 - Can you make a guess as to the form or function of the vessel that this sherd belonged to? What information are you basing this assessment on?
- Using a ceramic diameter sheet, measure at least one base and one rim from your collection. (You can try more if you have time.) Provide a description of the sherd you chose to measure and the rim/base measurement in centimeters.
 - Sketch a profile drawing of the rim and base sherds you measured in your collection. (What does it look like in a side view?) In addition, sketch at least one drawing of a decorated sherd. Be as accurate and detailed as possible. (It often helps to start off by tracing and then adding detail.)
 - Working with your group, reflect on the process. How could the information you recorded be useful in archaeological research? How could it inform our understanding of human activity in the past? What additional information would you like to know about each artifact in order to find out more? What additional tests might you perform?

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2.6: Ancient Foodways- Zooarchaeology and Paleoethnobotany

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Learning Objectives

- Define and describe zooarchaeology and paleoethnobotany
- Outline the primary methods and techniques used in faunal and floral analysis
- Discuss how zooarchaeological and paleoethnobotanical data provide information about past human behavior and the interrelationship between people and their environment

When studying the past, often the most basic questions about daily life prove to be the most challenging. What did people eat? Did they grow their own food or did they procure animals and plants from the environment around them? What sort of faunal and floral resources were available from the surrounding landscape? Did the plants and animals available vary seasonally and did they change over time? In addition to food, what other resources (e.g., hides, antler, wood, bone, medicine) did local plants and animals provide? What else can the animal and plant remains found at archaeological sites tell us about the people who lived there? And how do archaeologists analyze and interpret the data recorded in plant and animal remains in order to answer these questions?

Zooarchaeology and Paleoethnobotany

Animal and plant remains found at archaeological sites provide important insights about past human behavior and how humans interacted with their environment. The evidence obtained can tell us about past dietary practices, what environments were like in the past, how and when plants and animals were first domesticated, foraging strategies, and how plant and animal resources were used for medicines, tools, and ritual items. Analysis of past animal and plant remains are two specialized fields in archaeological research.

Zooarchaeology is the study of animal (zoology) remains from prehistoric and historic archaeological sites. The overall goal of zooarchaeological research is to develop a better understanding of how past peoples interacted with their environment, specifically with animals (fauna). Zooarchaeology is an interdisciplinary field of study that combines zoology and archaeology, with an emphasis on the latter. Fields such as ecology, biology, osteology, taphonomy, animal husbandry, and various others also contribute to zooarchaeological studies. Zooarchaeological or faunal remains are a reflection of past human behavior and living strategies. Analyzing animal remains from archaeological deposits can provide a wealth of information about how past peoples lived (e.g., Russell, 2012)—not just their behavior but also their impact on the environment they lived in.

Paleoethnobotany is the study of how people (ethno) used plants (botany) in the past (paleo), or how people interacted with and impacted their environment through the use, manipulation, and consumption of plants. Paleoethnobotany can be used to understand many things: what plants people ate, how people acquired plant foods, how people prepared plants for consumption, the origins of agriculture, what the environment was like at the site, and so on. Fields such as botany, ecology, agronomy, and soil science also greatly inform paleoethnobotanical studies.

Special Topics: Taxonomic Classification

All biological organisms are scientifically ranked and placed in defined categories in order to group together those sharing similar traits or common ancestry. These taxonomic ranks are hierarchical in structure, meaning that those higher up in the rank are similar in general ways, while those lower in rank are more closely related. The scientific names used in taxonomic classification are agreed upon by the scientific community (the International Commission on Zoological Nomenclature) so that there is mutual understanding between researchers and guidelines for creating and refining taxonomic ranks. The two most common terms used, genus and species, are written in italics and represent closely related species.

This table displays the taxonomic classification for the coyote and common sunflower:

Rank	Animal example	Plant example
Kingdom	Animalia	Plantae

Phylum (division in plant)	Chordata	Tracheophyta
Class	Mammalia	Magnoliopsida
Order	Carnivora	Asterales
Family	Canidae	Asteraceae
Genus	<i>Canis</i>	<i>Helianthus</i>
Species	<i>latrans</i>	<i>annuus</i>
Common name	coyote	common sunflower

An animal closely related to the coyote, such as a red fox, would be in the same ranks for the categories of kingdom through family but would differ by genus and species (red fox is *Vulpes vulpes*). In scientific research and reporting, authors regularly use the scientific names of animals and plants because common names can vary considerably, causing confusion. The Latin names used in taxonomic classification are accepted and understood worldwide.

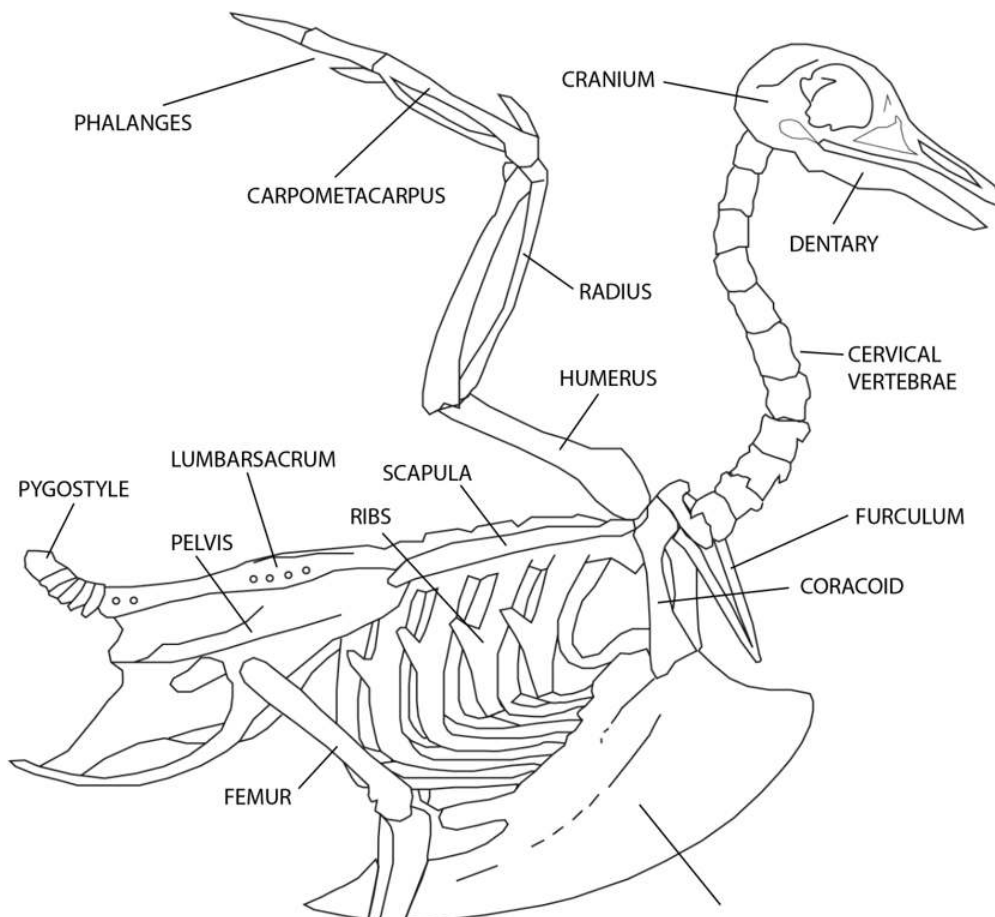
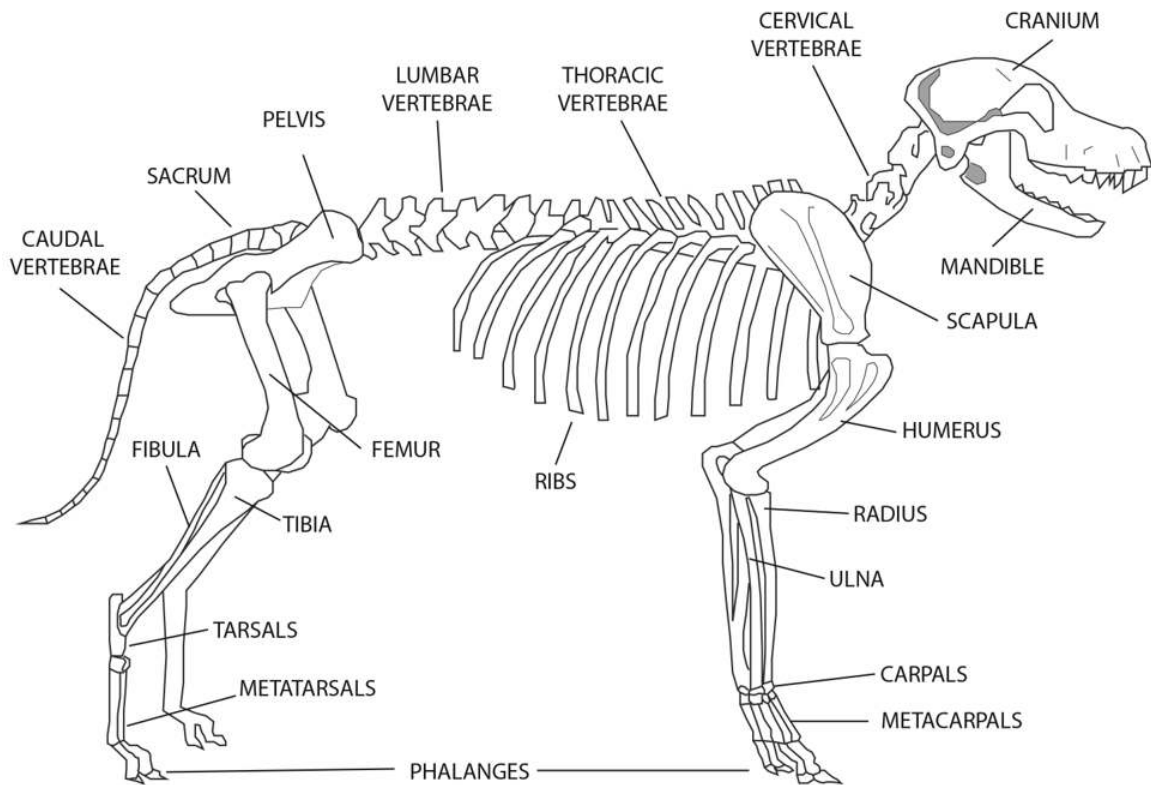
At its core, archaeology consists of the analysis and interpretation of material culture left behind by past peoples. Faunal and floral remains utilized by prehistoric and historic peoples represent specialized material culture obtained from the living biotic environment (often termed ecofacts) and as such are often subsumed under the category of environmental archaeology. Obtaining data during floral and faunal analysis is only the initial step in the process of addressing research questions in archaeological studies. In order to gather significant information from faunal and floral remains, it is necessary to examine in some detail the methods and techniques employed.

Zooarchaeology Faunal Analysis

Zooarchaeological faunal analysis focuses on the study of preserved faunal or animal remains recovered from archaeological sites. Typically, the preserved remains consist of the hard parts of an animal such as bones, teeth, antler, shell, and scales. But also keep in mind that the category “faunal” includes more than the bones of mammals and other vertebrates; it also includes other parts of these animals such as scales, eggshells, rattles, and so on. Invertebrate animal parts may also survive in the archaeological record, such as remains of mollusks, echinoderms, and even arthropods. (That said, our main focus in this chapter will be bones from vertebrates.) Depending on various taphonomic factors, a representative sample of animal remains may preserve over time, forming a zooarchaeological or faunal assemblage for a particular site. Soft items (e.g., hair, skin, muscle, and marrow) only rarely preserve in the archaeological record, in settings such as unusually anoxic wet (e.g., peat bog) or arid (e.g., dry cave) conditions. During analysis, archaeologists examine each faunal remain or specimen individually and record a series of characteristic traits and conditions. This initial step focuses on identifying elements and taxonomy: essentially, identifying the part of the animal as well as the type of animal represented by each specimen. (See Special Topics: Taxonomic Classification, above.) Archaeologists use the information they obtain in this process to develop a zooarchaeological profile of the assemblage, which they can then use to address research questions regarding the human behavior that created the assemblage.

Animal Remains and Basic Osteology

In order to recognize the variety of faunal remains present in an archaeological assemblage, it is necessary to have a basic familiarity with a diverse array of animal skeletons. The animal kingdom can be divided into vertebrates and invertebrates. Vertebrates have backbones or spinal columns and at least some internal skeletal elements. They include mammals, birds, reptiles, amphibians, and fish. Invertebrates, in contrast, lack a spinal or vertebral column. Common invertebrates include mollusks (bivalves, gastropods, squids, octopi), arthropods (insects, arachnids, crustaceans), annelids (earthworms, leeches), and cnidarians (jellyfish, corals, sea anemones). Other than some mollusk and arthropod remains, remains of invertebrates rarely occur in the zooarchaeological record, so the primary focus in this chapter is on the analysis of vertebrate skeletal remains.



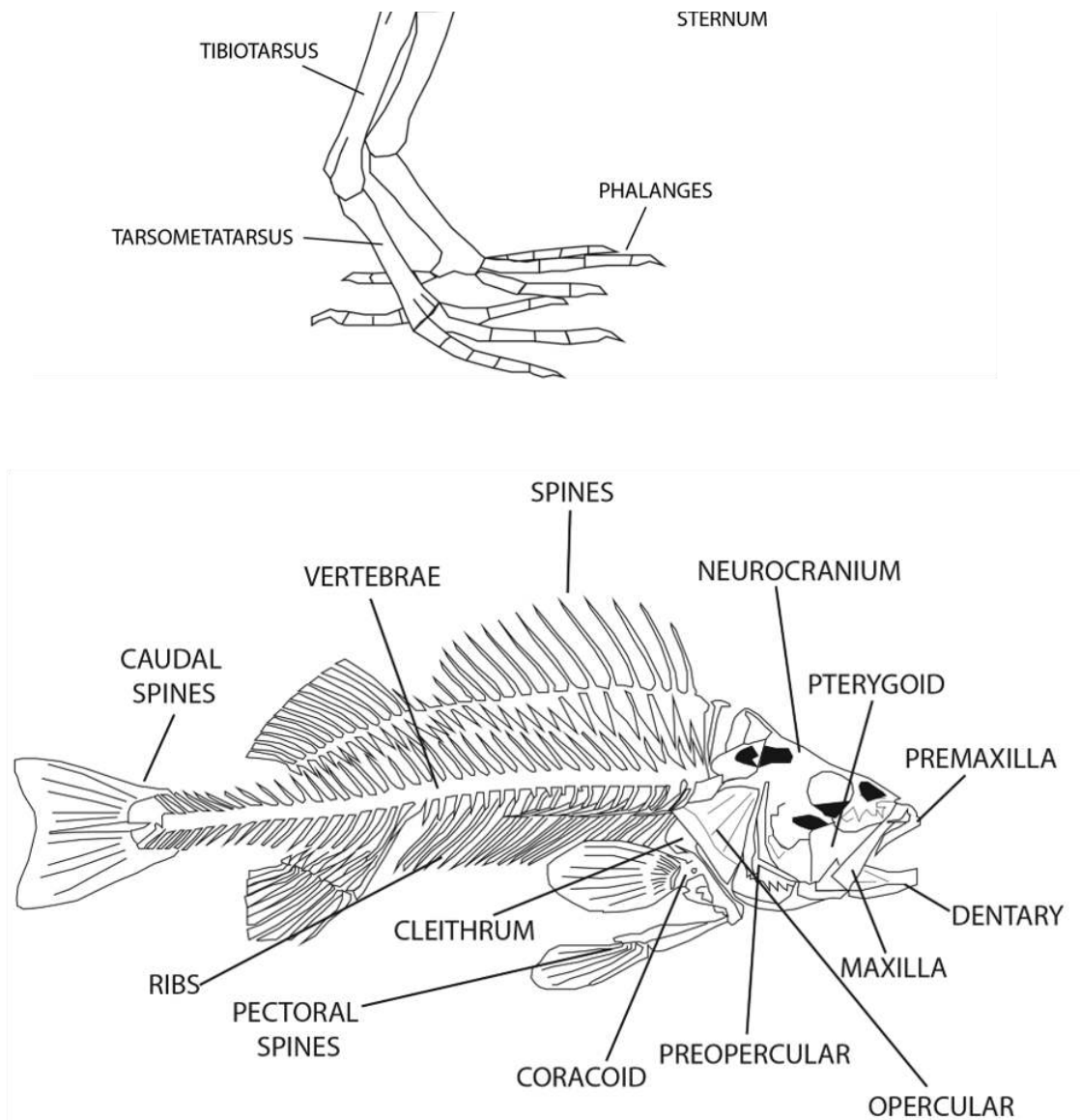


Figure 1. Three representative animal skeletons with the major elements labeled. A is a mammal (a dog), B is a bird (a generic chicken or duck), and C is a fish (a generic bass-like fish).

The typical vertebrate skeleton consists of axial and appendicular elements. The axial skeleton consists of the skull (cranium, mandibles, teeth, and hyoid bone) and the rib cage (ribs, sternum, and vertebrae). The appendicular skeleton includes the bones of the forelimbs and hindlimbs, the shoulder or pectoral girdle, and the hip or pelvic girdle. The number and character of the different axial and appendicular bones vary between taxa, so zooarchaeologists need to be familiar with the general osteological structures of and variations between mammals, birds, reptiles, amphibians, and fish (Figure 1). Each element differs in some respect between animals, and the differences are more pronounced between animals that are not closely related. For example, forelimb bones are similar between dogs and foxes but very different between dogs and beavers. Some animals, such as turtles and fish, have very distinctive skeletal elements that are easily recognized, but differences are still found between the same bones of different species (e.g., catfish bones are easily distinguished from those of freshwater bass). These differences can be used to make classifications between specimens at the class, genus, and species levels.

Mollusk or shellfish remains are some of the few invertebrate remains typically encountered in a zooarchaeological assemblage. Both bivalves and gastropods (univalves) have hard shells with distinct characteristics (e.g., shape, thickness, color, size and orientation of teeth, and presence of exterior bumps or ridges) that can be used for identification. Even when working with fragmentary pieces of shell, examination of multiple characteristics can often be used to distinguish between different species. Whether an archaeologist is working with vertebrate or invertebrate remains, however, the poor condition of the specimens often

prevents identification to a specific element or distinct taxon. Faunal remains should never be assigned a level of identification that is not wholly supported by the available evidence.

Comparative Specimens and Reference Guides

The analysis of zooarchaeological remains begins with recognizing and identifying specimens. Each piece of bone or shell is examined individually and compared to known specimens, either in a comparative collection or in reference manuals. A faunal comparative collection consists of elements from individual animals, all properly cleaned and labeled, that can be used to help an archaeologist identify typically fragmented or incomplete zooarchaeological remains. Reference manuals consist of books, journal articles, and similar publications that provide detailed illustrations (drawings or photographs) of skeletal elements that can be used to identify a specimen. In general, comparative collections are preferable to reference manuals. It is often difficult to obtain the precision necessary to accurately recognize small, distinct traits visible on skeletal elements through drawings or photographs. In addition, many skeletal remains can be quite small, making them difficult to illustrate. Finally, no reference manuals exist that contain detailed illustrations of every bone from every animal found in a given region.

Identifying and Analyzing Specimens

As part of the analysis, archaeologists record the following data for each piece of bone: element, side of the body (when applicable), portion or section of the element present, the age of the animal, and taxonomic classification, to the most precise level possible. For age, an approximation generally equivalent to juvenile or adult is used, based on epiphyseal closure of the long bones, tooth eruption, occlusal wear on the chewing surfaces of the teeth, or similar traits (O'Connor, 2000, pp. 80–97). (See Special Topics: Aging and Sexing Skeletal Elements.) Mollusk shells are treated in a similar manner; the element, portion, and taxon is recorded for each specimen.

Special Topics: Aging and Sexing Skeletal Elements

Animal skeletons grow and change throughout the life of the animal. With careful observation, it is possible to recognize and note these changes and use this information to determine the approximate age of the animal at the time of death. The most common of these is tooth eruption. In mammals, for example, deciduous or milk teeth erupt from the gumline first, then are pushed out and replaced by the permanent or adult teeth. Because this process occurs at a regular rate, it is possible to roughly determine an individual's age based on the eruption and growth of the teeth present. Once adult teeth are fully erupted, they remain with the animal through the rest of their life, but they wear down through use over time. As teeth grind together and chew up food items, the bumps and ridges on the occlusal (chewing) surface of the teeth wear down. With some variation, this occlusal wear can be used to determine age. Diet can affect the results (e.g., eating coarse foodstuffs like grasses can wear teeth down faster), but in general, greater occlusal wear is found in older individuals.

Some skeletal elements are made up of smaller pieces of bones, and the fusion of these pieces can also reflect age. As juveniles, mammal skulls consist of a series of smaller bones that fuse together when the animal is an adult. The sutures, where the smaller bones fuse together, can provide evidence of age. Appendicular limb or long bones also change during development. In juveniles, long bones consist of a bony diaphysis and two epiphyses (one on each end) that are separated by cartilage. As the bones grow, the cartilage disappears and the ends of the diaphysis fuse with the two epiphyses, forming a complete, intact bone. Depending on how much fusion has occurred, this can be used to age the element. Each long bone element fuses at a different rate, so each bone can be used to determine specific ages until the animal reaches adulthood. With experience, an analyst can also recognize muscle-attachment wear, arthritis, and other physical signs typically associated with aged individuals.

Skeletal elements are constant within a given species, but for some animals there are differences between males and females. This is an example of sexual dimorphism, where two sexes of the same species display different characteristics. In certain animals, for example, males have a baculum or penis bone, an element not found in females of that species. In some cervid (deer and elk) taxa, males grow antlers while females do not. Thus, if you find a deer cranium with antlers attached, you can recognize it as a male. In other animals such as caribou, however, both males and females grow antlers, although those of the males tend to be larger and more robust. In other animals, the size and shape of horns and antlers can be used to differentiate males from females.

Other skeletal elements may also differ between the sexes, but these differences are not always mutually exclusive. Elements in males are typically larger and more robust than the same elements in females. For example, canine teeth in male carnivores are usually larger than those in female carnivores, but a large female could have elements larger than those of a small male. This

problem is compounded when examining fragmentary specimens, which are most common in an archaeological faunal assemblage. Identifying these traits or finding a baculum, for instance, would allow the analyst to recognize male or female elements in a zooarchaeological assemblage. In general, relatively few zooarchaeological remains can be securely identified to sex.

Each faunal specimen is also examined for evidence of noncultural and cultural modification. Noncultural modification—that is, alterations caused by nonhuman agents—includes such things as weathering, rodent and carnivore gnawing, and similar taphonomic effects (see the chapter on Ancient Environments; Lyman, 1994). These modifications can impact bone preservation and identifiability, so understanding the nature of these impacts aids in accurately documenting and interpreting faunal assemblages. Cultural modifications include those resulting from direct and indirect human activity. Possible cultural modifications include whether or not a specimen shows evidence of burning, the presence and types of butchery marks, and modification relating to the manufacture of bone or shell tools, ornaments, and similar items. Butchery marks include cut marks, fractures, splinters, and other damage caused by carcass processing (e.g., Binford, 1981, pp. 87–181). In the past, people used bones, antler, shell, and other animal parts as raw materials for a wide array of implements and items used in daily and ceremonial activities. Modified faunal remains can be recognized by cut, scrape, and/or polish marks that resulted from impacts that changed the original shape of the element.

Paleopathologies are a unique situation, as they can result from internal (e.g., disease) or external (e.g., trauma) factors. External factors can be caused by human behavior (Baker and Brothwell, 1980; Bartosiewicz, 2013). Animal husbandry, or the domestication and breeding of certain taxa, can also result in changes to animal bone that can be recognized in the zooarchaeological record (O'Connor, 2000, pp. 147–159). For example, evidence at ancient sites in South America show that domesticated camelids, such as alpacas and llamas, showed changes in dental morphology (tooth shape) after domestication (Wheeler, 1995).

Special Topics: Identifying Microfauna

Most skeletal remains are visible to the naked eye and can be observed and studied simply by looking at them. Some smaller remains, such as fish scales or rodent bones, can be examined more easily using a magnifying lens or loupe. Certain faunal remains, such as insect parts, are difficult if not impossible to distinguish without visual enhancement. Magnification can also make it easier to identify butchery marks, evidence of tool manufacture, and pathologies.

If identification of microfaunal remains is so challenging, then is it necessary to do it? In truth, many small fragments or crumbs of bone are often unidentifiable to element or taxon and provide little if any substantial information. Other remains, however, can provide a wealth of knowledge for the observant analyst. Small rodent teeth, for example, can be difficult to identify unless they are examined under magnification, but they are exceptional indicators of the environment and the climate in which the animal lived. Rodents represent approximately 40% of all mammalian species on Earth and occur naturally on every continent except Antarctica. They have relatively short life spans, occur in a wide range of biomes, and are sensitive to changes in climate and vegetation. This information can be particularly useful if a scientist wishes to know more about paleoenvironmental conditions and changes over time. Because of this, putting extra effort into the study and analysis of rodent teeth can yield great rewards.

Recovery Methods, Sampling, and Context

A faunal assemblage is not a perfect representation of all of the animal remains present at an archaeological site. Rather, it is a biased sample. Not all faunal material preserves over time. Acidic soil conditions, for example, can result in the destruction of more fragile animal remains. In addition, recovery techniques (e.g., hand collection, screening, or flotation) can impact the composition of an assemblage. Flotation through fine-grained mesh will undoubtedly recover more microfaunal remains than screening through one-quarter-inch mesh, for example. Finally, it is rare that an entire archaeological site is completely excavated. Because of this, only the faunal material present in the areas investigated will ever make it to the zooarchaeologist for analysis.

Context is likewise an important consideration. It is typically assumed that the majority of faunal material recovered from an archaeological site represents the remains of animals used by the site inhabitants. Some bone and shell recovered may be intrusive, meaning that it was deposited before or after human habitation of the site. In addition, some animal remains are commensal; that is, they represent animals that live in or near human habitations but are not directly associated with human activity. For example, in any given backyard there may be mice, voles, snakes, frogs, snails, and other animals that are not noticed by the people living in the house associated with that yard.

Special Topics: Indirect Evidence of Human-Animal Interaction

In addition to bone, shell, teeth, and other faunal remains, indirect evidence can be used to recognize the presence of different animals at prehistoric and historic archaeological sites. Rock art paintings and carvings, for example, often portray various animals that were important to the human inhabitants. Gnaw marks found on recovered bones can indicate the presence of dogs or rodents even if their physical remains do not occur in a zooarchaeological assemblage. Animal tracks, although rare, are on occasion found at archaeological sites and can likewise demonstrate the presence of certain animals. The paw prints of dogs and cats, for example, have been found impressed on roofing tiles at sites from the Roman Empire. One clay roof tile in a Roman-era site near a highway in Lincolnshire, UK, shows evidence of a cat paw print. The tile suggests that the owners of the house were wealthy, since only wealthier people could afford to use that kind of material (Daley, 2017). Material culture relating to animal domestication, such as bridle and tack hardware from horses, can be used to recognize the presence of horses at a site even if no horse bones are recovered. Finding a pet collar or a discarded bird cage in a historic privy could likewise indicate that the residents of the adjacent home once kept a variety of pets.

Insect nests, such as those from mud daubers, are occasionally found among the remnants of burned prehistoric structures in the southeastern United States and demonstrate the presence of insect pests in human settlements. Paleofeces (e.g., dehydrated fecal remains, typically found in arid or anaerobic conditions) are one uncommon type of indirect evidence found at archaeological sites. Both human and dog paleofeces were found at several sites in the American Bottom flood plain region of Illinois. Analysis of the faunal remains contained in the dog paleofeces provided direct evidence for dog diet and showed that the dogs ate various fish, amphibians, and small mammals. These examples represent only a small sample of the instances in which indirect evidence provide insight into human-animal interaction in the archaeological record.

Paleoethnobotany and Floral Analysis

Paleoethnobotany is usually split into two methods of analysis based on the size and type of plant remains being studied: macrobotanical analysis and microbotanical analysis. Macrobotanical analysis deals with plant remains such as carbonized seeds and plant parts that you can see with your eyes or with the aid of a low-powered microscope. Microbotanical analysis deals with plant remains that you can see only with the aid of a high-powered microscope, such as pollen, starch, and phytoliths. Starch, a semicrystalline carbohydrate produced by plants, is helpful for plant identification because of morphological (shape and size) variation between different families and genera of plants (Messner, 2011). Phytoliths are made of silica (glass, or sand) and help give plants structure by forming in between cell walls when plants take up silica from groundwater. As with starch, phytoliths can be identified to plant family or genera based on their unique shape and size. Starches are found in carbohydrate-rich plants such as beans, tubers, maize, and cereal grains, while phytoliths are found in greater quantities in the grass family (Piperno, 2006). In fact, many grasses feel rough to the touch because of phytoliths. Pollen is a fine powder that plants make when they reproduce. Plant and tree pollen is dispersed by the wind and settles into soil or on top of bodies of water, such as lakes, where it falls to the bottom and accumulates in the sediment over time. Archaeologists can take core samples of the sediment to investigate changes in pollen type and abundance throughout time. Pollen morphology is also unique to families and genera.

This section will broadly cover a few of the sampling, processing, and analytical methods paleoethnobotanists use to learn about plant use in the past. While macrobotanical and microbotanical data can be used together to answer similar social and environmental questions, the ways that each type of botanical data is recovered and processed can be very different.

Taking into consideration the environment and conditions at a site can help archaeologists determine the suitability of certain sampling strategies. As with zooarchaeological remains, sampling strategies are often determined or guided by the unique taphonomy at an archaeological site. For example, botanical remains in archaeological contexts can be affected by the pH of the soil and whether the botanical sample has been carbonized, waterlogged, or desiccated (completely dried out). Botanical remains that have been carbonized or desiccated tend to preserve in archaeological soils much better than samples that have not. On the opposite side of the spectrum, samples that have been waterlogged—that is, that have continually been in water protected from the effects of oxygen—also tend to preserve very well. However, once such samples are removed from water, they can deteriorate quickly. Botanical remains in more acidic soils risk being dissolved at a faster rate, especially if they are not carbonized or desiccated. All of these factors guide what method archaeologists choose to recover botanical remains.

Sampling Methods

Paleoethnobotanical analysis begins with sampling from a field site. Depending on whether an analyst will be doing macrobotanical or microbotanical recovery, these samples can range from soil to residues on artifacts to dental calculus.

Macrobotanical data are derived almost entirely from plant remains found in soil (except for the cases where botanical remains are desiccated or preserved in waterlogged contexts), while microbotanical data can be derived from remains isolated from both microbotanical and macrobotanical sampling methods.

Soil Sampling

Macrobotanical analysis begins with sampling soil both across an archaeological site and within individual features or units. Important factors to consider when collecting soil samples include 1) what questions researchers want to ask from the data; 2) the context of the site and its features; and 3) the archaeologist's time, resources, or personnel constraints. But how much soil or residue do you need for a sample and how does sample size differ based on the analyses someone wants to make?

Sampling across a site generally takes the form of one or a combination of four methods: blanket sampling, probabilistic sampling, random sampling, and systematic sampling (Guedes and Spengler 2014). Generally, blanket sampling (also called full coverage or total sampling) is the preferred sampling method because it includes soil samples taken from all units and individual features. This reduces the possible bias introduced by other sampling methods (Pearsall, 2000). For a further discussion of how factors like time, personnel, person power, and site size might dictate one of the other sampling strategies, see Guedes and Spengler (2014).

In addition, archaeologists must also consider how best to sample within a feature or a stratigraphic level. The three most common strategies include bulk sampling (collecting soil from a single layer within a single context); pinch sampling (collecting a small amount of soil from various spots and combining these samples into one larger sample, usually done at sites that consist of large cultural layers or levels of construction fill); and column sampling (taking soil in a line down a single column at each unique stratigraphic level). Unlike site-wide sampling methods, in which only one strategy is used, it is common to use all three feature-sampling methods listed above for features and contexts.

For macrobotanical (e.g. wood, charcoal, seeds) analysis, the standard practice is to take 10 L of soil for each context sampled (D'Alpoim et al. 2014). This amount of soil is large enough to be representative of the context as a whole. If a researcher wants to answer questions that also require microbotanical analysis, a subsample of soil from the 10 L should be taken at the same time so that both the macrobotanical and microbotanical data from the site can be fully integrated. Microbotanical analysis only requires a small amount of soil—roughly 100 mL to 300 mL (or half a cup).

Other Sampling Methods

Other common sources for collecting microbotanical data include dental calculus and residues on artifacts and dental calculus. Dental calculus is mineralized plaque that accumulates in layers on teeth, collected from both animal and human remains using a sanitized dental pick or sonicating toothbrush in a lab setting. Microbotanical analysis of dental calculus can give paleoethnobotanists direct information about what a person was eating, unlike the previous methods mentioned, which are only secondary sources of information about diet or how people were using plants in their day-to-day life. Residues include the remains of carbonized food from the inside of ceramic sherds, absorbed material from a ceramic sherd, or material from the cutting edges of lithics. Residues from ceramic sherds can tell archaeologists what people were cooking or storing in ceramic vessels, while residues from lithics can tell archaeologists what people were cutting with these tools. These residues are typically collected in the lab using a sanitized sonicating toothbrush. Pollen data are recovered by taking a soil core from lake sediment and sampling each stratigraphic level. Pollen is used to reconstruct ancient environments.

Processing Soil for Macrobotanical Remains

The process for recovering macrobotanical remains from soil is called flotation. While there are several different methods of flotation, the goal of the process is to separate the dense material in the sediment (the soil matrix itself, rocks, bone, stone tool flakes, etc.) from the light material (wood charcoal, carbonized and modern plant seeds, plant parts, etc.). These light and heavy fractions are separated by adding the soil sample to water and agitating to dissolve the soil into solution, then letting the heavy fraction sink and letting the light fraction float. The light fraction is skimmed off of the top and collected in a small piece of chiffon gauze that allows only water to pass through (Figure 2). The remaining heavy fraction is collected in a 2-millimeter mesh screen. Both the light and heavy fractions are dried away from the sun to avoid heat-induced popping or stress on botanical material; this may take two to three days. After drying, the heavy fraction is sorted to ensure that no plant material remains. Any remaining botanical material is added to the dried light fraction and labeled and sealed in plastic bags for future analysis.

Special Topics: Different Types of Flotation and How Archaeologists Use Them

Flotation is an important step in macrobotanical analysis that paleoethnobotanists use to separate macrobotanical remains such as seeds and wood charcoal from other soil components. While the principle behind flotation is simple—botanical remains will

float because they are lighter than water and bone, stone, pottery, and lithics will sink because they are heavier—there are several ways to go about floating soil samples depending on the size of the samples, access to water, the budget for the project, and other factors.

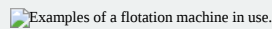
 Examples of a flotation machine in use.

Figure 2. Flotation process using a SMAP-style machine. A) View of the machine. B) Putting soil on the window mesh in the tank. C) Water comes up from the bottom of the tank and soil is manually agitated by hand to help it break up and go into solution. D) Light-fraction botanical material that was skimmed off the top. Photos courtesy of the authors.

Bucket flotation, the simplest method of flotation, can be done just about anywhere. As the name suggests, with bucket flotation an archaeologist puts a small portion of the soil sample in a bucket, adds water, and gently stirs with their hands to break up the dirt and encourage it to go into solution. Next, they slowly decant the water and botanical remains floating on top into another bucket lined with chiffon to catch all of the botanical material. More water is added to the bucket to dissolve more soil and force more botanical remains to float and the process is repeated until no more botanical remains float to the surface. The heavy fraction left in the bucket is then saved in window-screen mesh to look at later for other archaeological material. The pros of bucket flotation are that it requires minimal equipment that is readily available in the field and uses much less water than other methods of flotation. However, it can be a very tedious process if soil samples are large in volume or there are hundreds of samples to process, and it can be difficult to break up soils with a heavy clay content.

SMAP flotation is the next most popular method. It is named after the project that created it, the Shell Mound Archaeological Project. This style of flotation requires the construction of a simple machine (Figure 2) that forces water to rise from below into a large tank or bin and pushes the light botanical material to the top of the tank, where it can be skimmed off the top in the same manner as in bucket flotation. SMAP machines allow archaeologists to process large volumes of soil and can be inexpensive to make. However, they require some expertise to build and cannot recycle water in areas where it is scarce. Lastly, a Flote-Tech machine runs in the same way as a SMAP machine. It can also process large volumes of soil, but the difference is that it allows water to be recycled. However, it is the most expensive method to build.

Each method of flotation has its benefits and drawbacks, and the machine that works best for a project will ultimately be decided by the specific context of the site, the soil, the budget, and available materials.

Analysis of Macrobotanical Remains

In the laboratory, analysis of macrobotanical remains requires only a few simple tools. A geological sieve is necessary to separate the light fraction into different sizes of classes, both to simplify the analysis and to ensure that small seeds are not lost within large pieces of grass or fine silt sediment. The most common sieve sizes are 2 mm, 1 mm, 0.5 mm, and finally the pan, which catches the remaining material, but the size that is used varies by region and by researcher. For example, some projects use 2 mm, 1.4 mm, 0.7 mm, and pan, while some regions without many small seeds skip the 1.4 mm fraction entirely.

A scale is used to weigh the entire light fraction as well as each size class from the geological sieves. This allows the researcher to calculate statistics such as densities and ratios. This information is valuable for answering archaeological questions (see the section titled Paleoethnobotanical Data below for more information on common statistical approaches to macrobotanical data). Finally, a low-powered stereo microscope (also called a dissecting microscope) allows analysts to better see small seeds and unique morphologies that need to be identified for later analysis.

Wood is one of the most ubiquitous botanical remains a paleoethnobotanist will come across in both the field and the laboratory due to its abundant use as a source of fuel and shelter. Wood is primarily encountered as wood charcoal that has been preserved by fire through incomplete burning, either accidentally or intentionally. In rarer cases, at sites with extreme weather conditions a paleoethnobotanist may encounter wood samples that are waterlogged or desiccated. Because wood charcoal is often highly

fragmented and it would be impossible to know whether the wood in your sample is from one branch or ten, it is only ever weighed rather than counted. In addition, data for wood charcoal is only recorded at the 2 mm fraction and above since these data are representative of the entire sample. The small amounts of charcoal remaining in the other, smaller fractions are negligible.

Seeds are the primary material paleoethnobotanists use to answer anthropological questions regarding past peoples' foodways, environment, economy, and more. All seeds 1 mm and larger, both whole and broken, are counted and weighed. Generally, seeds below 1 mm in size are counted only if they are whole, although counting practices may vary by project. Seeds smaller than 1 mm are not weighed because they are too light to register on the scale; for these seeds, archaeologists record only count data.

When identifying seeds, it is important to identify distinct morphological features such as size, general shape, surface texture, appearance of the fractured seed compared to the appearance of the whole seed, and more. Much of this knowledge will come from analyzing samples with a skilled graduate student or professor and by comparing the appearance of the sample to online, printed, and physical reference collections. Popular online reference manuals include the Digital Plant Atlas, the website for the Ohio State University Department of Horticulture and Crop Science, and the Searchable Seed Image and Illustration Gallery. Popular books that have useful images and descriptions of key family characteristics include the Seed Identification Manual (Martin and Barkley, 2004) and Botanical Macro-remains (Schoch et al., 1988).

Analysis of Microbotanical Remains

After samples are collected, they are chemically processed. The process that is used is based on the type of analysis the researcher is doing. For example, starch remains are more delicate than phytoliths or pollen. The differences in the robustness or fragility of samples is why the same method cannot be used to extract all types of microremains. Chemical processing often involves the separation of materials, often by using specific chemicals to dissolve parts of the sample while leaving others intact. Chemical flotation can also be used. Just like standard soil flotation, chemical flotation uses differences in material densities to separate the microbotanical remains from their matrix. This process involves chemicals other than water so that specific densities can be achieved to separate the microremains. Methods for processing these samples can vary greatly, and each lab that analyzes microbotanical samples has a standardized method for each sample type.

 Starch Granules

Figure 3. Photomicrograph of maize starch granules in nonpolarized light (left) and polarized light (right). Scale bar is 100 microns (0.1 mm). Photo courtesy of the authors.

After samples are chemically processed, drops of the isolated microbotanical sample are transferred to a slide using a pipette and mixed with a mounting medium. These slides are then analyzed under a high-powered microscope with filters using polarizing or colored light. Polarizing filters make it possible to identify starches because they have a distinctive cross shape under polarized light (Figure 3). Colored filters can increase the contrast between the background of the field of view and the microbotanical remain being viewed.



Figure 4. Photomicrograph of a maize phytolith. A maize (Zea mays spp. mays) rondel phytolith is circled in red. Source: Albert et al. (2018).

Usually, the analyst needs to be able to recognize unique combinations of shape, features, and size to identify a sample to the level of species or genus. For phytoliths (Figure 4), these shapes include rondel, cross, bilobate, polylobate, bulliform, and hair cells. Sometimes different shapes and sizes of phytoliths come from different parts of the plant (Madella et al., 2005; Piperno, 2006). The shapes of starches can include lenticular, bell, elliptical, or oval, and their surface features can include fissures, margins, lamellae, or hila (Messner, 2011). As is the case with macrobotanical and zooarchaeological analysis, a comparative collection,

reference manuals, or online reference websites can help an archaeologist identify these diagnostic features, and the constraints of these different tools for macrobotanical analysis are the same for microbotanical analysis. For commonly utilized reference manuals and online databases for microbotanical analysis, please see the For Further Information section below.

Zooarchaeological Data

Quantitative Data, NISP, and MNI

After specimens have been identified, the faunal remains need to be quantified (or counted) in such a way that useful, meaningful data are collected. Quantitative data are used to measure the relative abundance of each taxa so that zooarchaeologists can determine what animals humans were using, how important each animal was in comparison to other animals used, and what the presence of animal remains might reveal about past environmental conditions. The information recorded can be of varying usefulness when analyzing a faunal assemblage. Certain basic data are typically recorded for all faunal specimens because other types of data can be calculated based on that information. The basic data that is always recorded is referred to as primary data and the data that is calculated based on primary data is called secondary data (see Grayson, 1984; Lyman, 2008; Reitz and Wing, 1999, pp. 142–238).

The most common primary data that is recorded is the Number of Identified Specimens per taxon or NISP. The NISP documents the number of specimens identified to each element for a given taxon. For example, if an assemblage contains three rabbit molars, two rabbit vertebrae, nine raccoon rib fragments, and seven raccoon humerus pieces, the NISP for rabbit would be five and the NISP for raccoon would be 16. The taxon does not have to be specific, however; if six fragments of long-bone shafts are classified as unidentifiable large mammal, then the NISP for large-sized mammal would be six. It should also be noted that NISP counts recognize partial elements as well as side of the body the element came from, the age of the animal, the size of the element, and other factors. Suppose that the same assemblage contains the following deer bones: one left femur, proximal end only; one left femur, distal end only; two right femora, both complete; and one femur, mid-shaft portion only. The deer NISP is five because each specimen is counted separately, even though some of the femur fragments may be from the same element. The NISP is the basic unit of data that most other quantitative measures in faunal analysis are derived from.



*Figure 5. A sampling of tarsometatarsus elements from a domestic chicken (*Gallus gallus*). The top row has seven right tarsometatarsi (all adult) and the lower level has five left tarsometatarsi (three to the left are adult, the two on the right are juvenile). The specimen on the far left is a right tarsometatarsus from a comparative specimen. Based on these elements, the NISP=12. Based on sided elements only, you get a conservative MNI=7 based on the presence of seven right tarsometatarsi. However, the actual MNI for these elements is nine because there are seven adult right tarsometatarsi and two juvenile left tarsometatarsi..*

One drawback of the NISP is that on the surface, it can overestimate the presence and therefore the relative importance of a particular taxon. Using the above example, there are more raccoon bones (NISP=16) than rabbit (NISP=5) or deer (NISP=5) bones in the assemblage, which would seem to suggest that raccoons were used to a greater extent than rabbits or deer. The NISP does not reflect the number of individuals represented in the assemblage, only the number of specimens or pieces of bone. To compare individuals, the analyst must calculate the Minimum Number of Individuals per taxon, or MNI. MNI calculations are based on repeating elements from the same taxon (Figure 5). If an assemblage contained four right ulnae and two left ulnae identifiable as muskrat, the MNI for muskrat would be four. Minimally, at least four individual muskrats must be represented, as each animal has only one right ulna. There could be as many as six muskrats represented if the two lefts were from totally separate animals, but this cannot be determined with certainty. Having multiple skeletal elements from animals of different ages (e.g., both adults and juveniles) can also affect MNI counts, as adult and juvenile ulnae, for example, would represent separate animals. In general, paired elements are the most useful in determining MNI; bones that are similar and/or occur in relatively large numbers, such as ribs, are less suitable and less likely to provide significant results.

The MNI is usually calculated only for specimens that can be identified to the genus and/or species level, but some exceptions are sometimes made (see Reitz and Wing, 1999, pp. 198–199). This means that MNI estimates are not made for general classification categories (e.g., “indeterminate fish” or “indeterminate mammal”). As a result, potentially significant information on faunal representation may be lost if only the MNI is used. If, for example, an assemblage contains 500 fish bones but none are identifiable to the genus level, then none will be included if the analyst focuses only on MNI results. MNI can also be impacted by the state of preservation to a greater extent than NISP. When bones are poorly preserved, it is less likely that they can be classified to the genus/species level. In most faunal analyses, both NISP counts and MNI determinations are included, so that complementary lines of information are available.

Secondary Data

In addition to NISP and MNI, an array of other data can be gathered from a faunal assemblage. Most of these, however, are drawn from or derive from NISP or MNI calculations or do not provide information that reflects past human behavior. Specimen weight (used to calculate biomass) may be recorded, for example, but the results have more to do with the initial size and robustness of the bone and do not necessarily reflect relative dietary importance. For example, one deer bone might weigh as much as several hundred small fish bones. That does not mean, however, that deer were necessarily a more important food item, although the raw weight values would seem to support such an argument. In contrast, the NISP and MNI counts would suggest that fish were of greater dietary value than deer. Lyman (2008, pp. 84–113) and Reitz and Wing (1999, 222–231) provide excellent summaries of the pros and cons of various types of primary and secondary zooarchaeological data (see also Grayson, 1984).

Paleoethnobotanical Data

After paleoethnobotanical data are quantified (counted and/or weighed), additional statistical methods can be used to examine patterns within the data (Marston, 2014). The simplest way to report botanical data is through absolute counts, which are the raw counts for each individual taxon identified. Other descriptive statistics frequently used are:

1. Density calculations: Seed or charcoal counts/weights are compared against the volume of the original soil sample taken in the field to provide comparability among all samples taken at a site.
2. Proportions/percentages: These calculations are used to standardize the count of one taxon compared to another category of taxon. For example, a comparison of the ratio between maize kernels and maize cupules (the cup-like structure on the cob that holds the maize kernel) at a site can tell you where ancient people were processing dried maize (as a high cupule ratio would indicate) and where they were using the kernels for cooking (as a high kernel ratio would indicate).
3. Ubiquity: Data that records presence or absence are used to calculate the percentage of samples in which a given taxon appears. For example, if you have 10 samples and maize is found in 6 of them, the ubiquity value of maize is 0.60 and tells us maize is present in 60% of samples.

Other types of statistics in paleoethnobotanical reports often include Z-scores (data that is transformed into standard deviations around a population mean), diversity indices (calculated based on the relative values of taxa to indicate homogeneity or heterogeneity of a sample), and more complicated multivariate calculations such as cluster analysis, principal components analysis, and correspondence analysis (see Smith, 2014 for a discussion and examples of multivariate statistics in paleoethnobotany). These statistics can be presented in a number of ways to highlight the patterns or trends analyses reveal.

Ancient Foodways: What Can Zooarchaeology and Paleoethnobotany Reveal?

Faunal and floral remains from archaeological sites can provide a wealth of information about past human behavior and interaction with an environment. Some of the more common areas of study are addressed here, but ongoing research is discovering ever more applications for zooarchaeological and paleoethnobotanical data.

Dietary Patterns

Zooarchaeological and paleoethnobotanical material provide direct evidence for the diet of prehistoric and historic people. Although faunal and floral remains that are recovered do not reflect all of the food refuse people discarded in the past, they provide a sample of what people were eating. This information provides important insight into how animals and plants were processed for consumption and how human dietary strategies changed over time. Not all faunal and floral remains recovered, however, represent food refuse; this issue is addressed in detail below.

Recovered floral remains demonstrate what sorts of wild plants people gathered, what domesticated crops they grew, and how important various taxa were to the site inhabitants. Similarly, the faunal remains recognized reveal what wild animals inhabitants

procured, what domesticated animals they used, and the importance of different animals to the inhabitants. The proportional amounts of animal and plant remains illustrates their relative significance in the diet. By examining assemblages from different sites and different time periods, it is possible to see how dietary strategies varied between regions and changed over time.

In addition, recognizing patterns in what people were eating and how they were processing those types of foods can inform archaeologists about cuisine and the foodways (cultures that surrounded food) at archaeological sites. Combining dietary analysis with ceramic and lithic use-wear analyses, for example, enables archaeologists to use multiple lines of evidence to acquire a more complete understanding of food consumption as well as the social ramifications of dining, feasting, and gender roles (e.g., Kooiman, 2018; Twiss, 2012).

Foraging Strategies

The types of animals and plants recovered at an archaeological site can provide insight into the hunting and foraging practices a site's inhabitants used. Certain faunal and floral species are available or abundant only at certain times of the year and human foragers likely optimized their efforts by focusing on those taxa only when they were likely to yield high returns. For example, nut trees such as oaks produce ripe acorns only in the fall, so foraging groups likely scheduled their seasonal travels so that they were close to oak forests during the autumn months. Likewise, these same mobile foragers might have planned to camp near large lakes or rivers in the spring, when spawning fish were in the shallows and could be caught more easily. By recognizing the time of year when different taxa are available, archaeologists can often determine the seasonality (season of occupation) for a site.

The relative abundance of different animal and plant remains also provides information about foraging behavior. Some hunter-gatherer groups (e.g., big-game hunters) focused their efforts on a select range of large animals, although most groups employed a broad-based subsistence strategy in which they procured a wide array of animals and plants to fulfill their dietary needs. Other groups may have adjusted their foraging strategies on a seasonal basis in order to take advantage of available abundant resources. Agricultural communities, for example, put considerable effort into farming during the spring planting and fall harvest seasons, but during the other seasons they supplemented their diets through hunting, fishing, and foraging.

Paleoenvironmental Reconstruction

Different types of plants prefer different environmental conditions, so the presence, absence, disappearance, or appearance of plant species through time at a single site may indicate changes in an environment such as drought, desertification, increased precipitation, or changing temperatures. These changes in local habitat can also be indicative of human actions that impact the environment such as overgrazing, tree harvesting, agriculture, and environmental management (e.g., Asouti and Austin, 2005). One method of recognizing these changes is through analysis of pollen cores, which can reveal distinct changes in environmental conditions over long periods of time. (See Special Topics: Pollen Coring and Environmental Interactions, below.)

Similar information can be derived from analysis of the different types of fauna represented at a site. Depending on the sensitivity of the taxa, it is possible to reconstruct what a habitat was like during the period a site was occupied. Many animal species flourish only within restricted habitats, and these taxa can be particularly useful when examining environmental changes over time.

Special Topics: Pollen Coring and Environmental Interactions

How can archaeologists, environmental scientists, and geographers learn more about the environment surrounding a lake and the actions of the people occupying the areas around that lake? The analysis of pollen, known as palynology, can help us understand environmental changes on a local level. Palynologists collect sediment core samples from the floors of bodies of water and analyze the pollen, the male gamete of plants, within those samples. Unlike other microbotanical remains, pollen can usually be identified to the species level and therefore can give palynologists a detailed picture of the surrounding plant environment. Pollen also collects in layers of sediments at the bottom of bodies of water chronologically. The pollen at the bottom of a core sample will be the oldest and the pollen at the top of a core sample will be the youngest (MacDonald and Edwards, 1991). Cores collected from these bodies of water can vary in length depending on what periods of time the analysts are interested in and how fast these layers accumulate locally.

After these cores are collected, palynologists sample these cores for radiocarbon dating, also called Accelerated Mass Spectrometry dating, and process the remaining samples to dissolve the sediment, usually with a chemical like hydrofluoric acid. After processing, palynologists identify and quantify all the pollen from the samples in order to understand the surrounding plant community. From these dated samples, palynologists can model the changes in the plant environment surrounding the body of water throughout time and what factors may have been at play. For example, if there was an increase

in pollen from agricultural crops, such as maize, in tandem with a decrease in different types of tree pollens, that would indicate that there was deforestation for agricultural purposes (Alenius et al., 2012).

Plant and Animal Domestication

Tracking changes in seed size (from smaller to larger) across time is one indication that a plant may be undergoing domestication. The recovery of evidence of nonlocal plants in archaeological contexts, such as maize in eastern North America (e.g., Larson et al., 2014), can be evidence of domestication (and of interregional exchange, as discussed below). Similar changes are often seen among domesticated animals, which typically exhibit physical traits that reflect breeding efforts to increase meat production or reduce aggression. It can take many generations for these changes to manifest themselves skeletally, but they can be recognized in the archaeological record over time.

Butchery Practices

Close examination of animal bones may reveal evidence of butchery, such as cut and chop marks, but the bones themselves also provide insight on how carcasses were butchered and processed. First, the location and types of marks identified are direct evidence of the specific manner in which animal carcasses were reduced in size and portioned for further processing. Butchery marks are commonly found near limb joints and muscle attachment points, evidence of the removal of meat-rich limb portions. Other types of cuts, such as those found in areas with little muscle, may represent marks associated with hide or pelt removal.

The bones themselves—and the absence of some bones—are likewise indicative of choices made during the butchering process. If an animal is killed at a great distance from the habitation site, for instance, hunters may choose to leave low-value lower limb or cranial portions at the kill site. As a result, lower leg and skull bones may be underrepresented in the zooarchaeological record of the habitation but may be much more common at kill locations. A large percentage of high-value bones (those supporting large amounts of meat or choice cuts) in an assemblage may indicate the differential distribution of meat resources, possibly reflecting tribute, feasting, or allocation of foodstuffs based on status. Finally, heavily fragmented appendicular bones can also be indicative of marrow extraction and the manufacture of bone grease.

Trade and Resource Movement

The recovery of faunal or floral remains from species not typically found in an area can provide evidence of trade, population mobility, and similar movement of people and resources. For example, marine whelk shells and shark teeth are occasionally found at prehistoric sites across the eastern United States, far inland from coastal areas. These items were likely transported, either directly or indirectly, by traders and travelers moving between these areas. The recovery of tropical plant species in temperate zones (e.g., maize, as noted above) reflects not only interregional trade but also evidence of domestication. Exotic items were undoubtedly highly valued and likely encouraged further contact and commerce. It is likely that many other goods, most of which were perishable and are thus not recognized in the archaeological record, were exchanged between neighboring groups.

Nondietary Use of Faunal and Floral Material

The nondietary use of faunal and floral resources is often overlooked. Most research is focused on dietary strategies and reconstructions of a paleo-environment. A wide range of nondietary uses is recognized (e.g., Russell, 2012), many more than can be addressed in this chapter. A sample of these uses is presented here.

Plant resources were widely used for nondietary purposes but are often difficult to identify because they typically do not preserve well in the archaeological record. Wood was used extensively for construction projects, tools, bowls, utensils, weapons, canoes, and numerous other items in addition to being burned for fuel. Grass, reeds, plant fiber, and pine needles were used to create cordage, woven basketry, mats, and rugs (e.g., Nichols et al., 2000). Storage containers were manufactured from dried gourds such as the bottle gourd (*Lagenaria siceraria*).

The ritual and medicinal use of plants was similarly significant. Tobacco (*Nicotiana tabacum*), peyote (*Lophophora williamsii*), ayahuasca (*Banisteriopsis caapi*), and other mind-altering substances such as opium poppy (*Papaver somniferum*) are derived from plants. Various forms of alcohol likewise come from plant products and have mind-altering effects. These items were widely employed by shamans, healers, and the ruling elite in a variety of ceremonial and ritual activities (e.g., Morehart et al. 2005; Pauketat et al. 2002).

Many faunal remains similarly represent resources used in nondietary ways. Certain items, such as animal hides, sinew, and feathers (for fletching arrows and spears) were likely used for clothing, shoes, and other items but rarely preserve archaeologically. Bone, antler, shell, and other faunal material were fashioned into a variety of items, including perforating implements (awls,

needles, pins, chisels), flintknapping tools (flakers, billets), weaving and hide-processing tools (shuttles, hide scrapers, beamers), gardening instruments (hoes made from scapulas, digging sticks, rakes made from antlers), gaming pieces (dice, gaming sticks), hunting items (spearpoints, fishhooks, harpoon heads), and decorations or ornaments (hairpins, beads, combs, pendants). Mussel shell was carved into beads, buttons, gorgets (ornamental collars), spoons, and scoops, and large marine whelks were transformed into bowls and containers. Turtle shells were made into bowls and rattles.

Faunal remains, both modified and unmodified, were also important as ritual and ceremonial paraphernalia. Small carnivore jaws were often cut and polished and perhaps functioned as items of sympathetic magic. Bone and shell effigies have also been recovered and may have been used in a similar fashion. Numerous other examples exist, but sometimes it is difficult to determine the exact function of these items. Bone, antler, shell, and other faunal material were modified to make a wide array of tools, ornaments, decorations, and ritual items.

Summary: Case Studies

Zooarchaeological and paleoethnobotanical remains can provide considerable insight about past human behavior at prehistoric and historic archaeological sites. Much of this information relates to dietary strategies and paleoenvironmental reconstruction, but faunal and floral remains also provide significant information about the nondietary uses of these resources. We provide two case studies about how zooarchaeological and paleoethnobotanical data are employed in archaeological research.

Special Topics: Case Study, Early Twentieth-Century Dining in East St. Louis, Illinois

Archaeological investigations in the Goose Hill neighborhood, a turn of the century working-class section of East St. Louis, recovered substantial zooarchaeological remains from several different households that allowed for the investigation of differential dietary patterns in an urban residential neighborhood. The information summarized here is taken from Dappert-Coonrod and Kuehn (2017).

The Goose Lake neighborhood in East St. Louis was established shortly after the Civil War. By the turn of the twentieth century, it was inhabited primarily by working-class individuals and families, many of whom were employed at the nearby National Stockyards and associated meat-packing plants. The Goose Lake neighborhood also contained numerous commercial shops and services that supported these residents. Archaeological investigations were conducted in this location as part of the New Mississippi River Bridge Project. All of the work was overseen by the Illinois State Archaeological Survey of the Prairie Research Institute of the University of Illinois at Urbana-Champaign. In addition to the archaeological field and laboratory work, extensive historical and archival research was conducted on this property so researchers could better understand the social and cultural context of this historic community.

Zooarchaeological material chosen for analysis came from three households: 1) the Mead House, also known as the Maple Hotel or the Davis Boardinghouse, a boardinghouse establishment occupied by a variety of tenants who likely lived in the establishment for a few months or years; 2) the Benner household, a single family long-term residence owned by Elizabeth Benner, a widow, and her daughter Victoria; and 3) a rental property at 819 Rear Bowman Avenue, which was characterized as an informal worker's cottage and was occupied by an ever-changing series of tenants, usually couples or small families. Multiple privy deposits were associated with each household that contained relatively large amounts of faunal material discarded by the site inhabitants. These deposits allowed for a detailed comparison of dietary practices among the occupants of the Mead House, the Benner household, and the tenant (or multi-tenant) household.

Cattle, swine, and chicken remains occur in all three assemblages and predominate among specifically identifiable fauna. Mutton (sheep) remains were found in the Mead House assemblage and eggshell fragments were recovered in the Mead House and Benner assemblages. Fish remains (e.g., carp, brown bullhead) were recognized in all three assemblages and cottontail rabbit bones were found in the Mead House and Benner assemblages. Other taxa that were recognized include double-crested cormorant in the Benner household assemblage, turkey in the Mead House assemblage, and graylag (domestic) goose in the tenant household assemblage. Overall, the composition of the assemblages indicate that the various site inhabitants relied on beef, pork, and chicken (and eggs) as dietary mainstays but also included other domesticates (e.g., sheep, turkey, goose) and some wild fauna (e.g., rabbit, various fish) in the diet. Dog bones from at least two dogs were found in the Mead House assemblage, suggesting that pets were kept by some of the residents. Rodent bones were also recognized, indicating that urban pests like mice and rats were a problem.

The cuts of meat, particularly beef and pork, represented by the elements that were recovered provide a closer look at dining in the different households. The Mead House inhabitants consumed more steaks, roasts, and hams (as well as chicken and egg

dishes) and less soups and stews. At the Benner house, they ate a variety of steaks, roasts, hams, stews, and soups, making use of lesser-quality cuts of meat. The occupants of the tenant house, however, ate more soups and stews than the residents of the Mead House or the Benner household. Most of the assemblage bones from the tenant household were from low-value cuts, particularly beef, that were suitable mainly for soups and stews. By economizing on cheaper cuts of beef, the tenant household residents were able to buy at least some moderately more expensive pork hams. This indicates that dietary choices were affected, at least to some extent, by the economic means of each household. The residents of the Mead House boardinghouse received at least some higher-cost beef and pork cuts as part of their room and board. The widow Mrs. Benner was moderately well off financially, it would seem, but still needed to be frugal in her spending. The tenant household occupants, however, were renters with limited funds, and this is reflected in their dietary choices.

Interestingly, the serving dishes and other tableware recovered during the archaeological investigations at each property support the patterns observed in the faunal remains. The dishes from the Mead House boardinghouse included large serving platters for group meals and dishware associated with the serving of steaks and roasts. The Benner tableware, in contrast, contained more fashionable dishes, perhaps reflecting the income and status associated with single-family home ownership. The dishes found in the tenant household privies were of somewhat lower value, but there were also some fancier porcelain dishes that were comparable to those found at the nearby Benner house. While no single line of evidence is sufficient to answer all questions regarding dietary choices, purchasing power, and socioeconomic status, looking at faunal remains and ceramic dishware together can provide important insight into these research issues.

Special Topics: Synthesis of Macrobotanical and Microbotanical Data at the Site of Los Naranjos, Honduras

Los Naranjos is a major multicomponent archaeological site in Honduras that lies on the northern border of Lake Yojoa. The site has monumental architecture and sculpture that date from 1000 to 500 BCE and evidence of jade and pottery styles that link it to the Gulf Coast Olmec. The inhabitants of the site were thought to have been dependent on maize agriculture as their primary food source by 800 BCE, an assumption that has been challenged by recent paleoethnobotanical work that combines both macrobotanical and microbotanical analyses. This case study, from an article by Morell-Hart et al. (2014), will reveal why it is important to use multiple lines of evidence when considering human relationships with plants in the past.

A lake pollen core taken during previous excavations in the 1980s suggested a meaningful variation in plant pollen over time. Levels from the core that corresponded to earlier time periods revealed a high percentage of tree species and no crops such as maize or beans. Researchers interpreted a rise in plants such as Chenopods (the family that contains the popular grain quinoa), maize, and other grasses over time as evidence of early agriculture. Archaeologists interpreted the evidence to show that agricultural intensification occurred later in time based on an increasing percentage of plants from the sunflower family, ragweed, and other plants that flourish in habitats that have been disturbed by human activity. However, the pollen from this core comes primarily from wind-pollinated plants and therefore does not provide a complete picture of plant use and does not show direct evidence of plant use at the site of Los Naranjos itself.

To fill in the gaps in information left by the existing pollen record, Morell-Hart and colleagues collected and analyzed plant data from six kinds of contexts, including macrobotanical samples from light fractions and microbotanical samples taken from the edges of obsidian artifacts used as tools. The samples came from interior surfaces, matrices between surfaces, architectural fill and pit fill, and a midden, or trash dump.

The analysts recovered maize in several different forms, including phytoliths, starch granules, and a charred kernel. However, they did not find other parts of maize that are typically ubiquitous (cupule and cob fragments). They also found amaranth and chia seeds and starch granules of manioc and sweet potato that they identified from residues on obsidian tools. Tree crops were important for early agriculturalists, and botanical evidence from the site suggests that people were using palm species for a variety of culinary and non-edible uses. Interestingly, species that are commonly thought of as belonging to the Mesoamerican agricultural suite (beans and squash, primarily) were not evident at the site. Plants with medicinal or cultural uses were identified through both macrobotanical and microbotanical analyses, including tobacco, various grass species, and sunflower species.

The analysis of the pollen core that was done in the 1980s led researchers to believe that maize agriculture and its two sisters, beans and squash, were present in the region by 1000 BCE. However, microbotanical analysis of starch granules and phytoliths and macrobotanical recovery of whole seeds paints a different picture. The more recent paleoethnobotanical interpretation reveals that instead of engaging in widespread intensive agriculture, the residents of Los Naranjos were likely exploiting a

wide variety of plants, including seed, root, and tree crops. This new analysis also illustrates the use of plants for nonculinary purposes, notably the use of tobacco, which may have been used ritually as well.

While the pollen data were not incorrect, the interpretation of human activity without considering other lines of evidence led to a conclusion that did not show the whole picture of what was happening at the site. Flotation is important for recovering macrobotanical material but is not as directly associated with human activity as microbotanical residues sampled directly from artifacts. Synthesizing a variety of botanical data enriches our understanding of human practices, including nonculinary uses of plants, and complicates our view of the past.

Discussion Questions

1. What can animal and plant remains from archaeological sites tell us about past peoples and how they lived?
2. Aside from diet, what information about past lifeways and environmental conditions can be determined from animal and plant remains from archaeological sites?
3. One important part of archaeological research is the capability to examine how human behavior changed over time. Provide one example of how changes in daily life might be recognized by comparing different faunal and floral assemblages from two sites from different time periods.
4. Zooarchaeological and paleoethnobotanical remains do not always preserve over time. Describe how the absence of certain animal and plant remains might impact our view of life in the past.
5. Following up on Question 4, are there ways for archaeologists to fill in knowledge gaps in the archaeological record when studying the past? What types of indirect evidence might archaeologists use to obtain more detailed insight into the past? For example, even if no horse bones were recovered, the presence of horseshoes and metal bridle pieces would indicate that horses were present at a site. What other examples of indirect evidence can you think of?
6. Faunal and floral resources were often used in ritual and ceremonial activities as well as for utilitarian or everyday activities. Discuss two examples each of animal and plant resources used in ritual activities. Can you provide a similar example from modern-day life?
7. Archaeologists studying animal and plant remains specialize in the identification and analysis of faunal and floral remains. Discuss how knowledge of ecology, zoology, botany, and other fields can provide important insight for interpreting the remains recovered.

About the Authors

 Steven Kuehn is a zooarchaeologist with the Illinois State Archaeological Survey, a division of the Prairie Research Institute of the University of Illinois at Urbana-Champaign. He has more than 30 years of professional experience as an archaeologist, working primarily in the Upper Midwest and Great Lakes region. Steven has analyzed zooarchaeological remains from Paleoindian through Historic Euroamerican sites in the Midwest, the Great Plains, the Southeastern United States, and Alaska. Some of his recent research focuses on Paleoindian subsistence behavior, Archaic bison hunting in Minnesota, and the archaeology of domestic dogs in the Midwest. In his free time, Steven enjoys reading, hiking, and playing board games with his family. Steven also writes short stories and mystery fiction, including novels in his Jacob Caine Archaeology Mystery series



Rebecca Albert earned her MA in Archaeology at the University of California, Santa Barbara in 2021. She was previously the assistant coordinator for the Central Coast Information Center, one of nine archaeological and built environment data clearinghouses in the California Historic Resources Information System. Her undergraduate and graduate research focused on microbotanical analysis of carbonized residues from the Upper Great Lakes in order to gain a deeper understanding of the history

of plant domestication in North America and how these plants may have informed prehistoric foodways. In her free time, Rebecca enjoys quilting, cooking, and playing with her cat, Juliet.

 Woman with microscope

Emily Johnson is a paleoethnobotanist pursuing her PhD in Anthropology at the University of California, Santa Barbara. She has conducted excavations and/or analyses of archaeological sites in Turkey, Israel, Guatemala, Mexico, and throughout the United States. Her current research is focused on investigating the timing, spread, and development of the nixtamalization process throughout ancient Mesoamerica. When not reading about all things corn, Emily enjoys crafting and playing with her cat, Scout.

Further Exploration

Microbotanical reference manuals:

[PhytCore DB](#) (a free website with registration): online database of photomicrographs of phytoliths, searchable by shape, type of sample, site, etc.

[Starch Grain Database](#): a free online database of starch grains collected from modern samples

[Cooked Starch Database](#): a free image database of starches from plants that have been cooked in various ways. From Henry, Hudson, and Piperno (2009).

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2.7: Bioarchaeology - Interpreting Human Behavior From Skeletal Remains

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Learning Objectives

- Define and describe bioarchaeology
- Outline the major components of skeletal analysis
- Evaluate the interconnection of biology and culture in order to understand the past
- Discuss ethical and legal considerations in excavating and handling human remains



Content Warning and Disclaimer

This chapter covers topics related to analyses of human remains. Therefore, images and discussion of remains are found throughout and may be potentially distressing to readers. Along those lines, none of the images of remains throughout this chapter are of Indigenous peoples but are sources from anatomical teaching collections and historic Euro-American cemetery excavations. Authors of this chapter advocate for descendant communities in matters of repatriation and are committed to protecting and advocating for their ancestral legacies.

In celebration of Juneteenth in 2020, the [Portsmouth African Burying Ground](#) Stewardship Committee in Portsmouth, New Hampshire requested analyses of dental calculus, or hardened dental plaque, to reconstruct diet from the skeletal remains of individuals exposed during construction in 2003. The cemetery was actively used during the 1700s, when enslaved peoples were bought and sold along the city's coastal docks. However, it was paved over as the city of Portsmouth expanded (Sammons and Cunningham, 2004). The construction project exposed the coffins of early Black Seacoast inhabitants, providing a rare look at the lives of individuals in bondage in the American colonies. The cemetery and associated memorial today serve as a symbol of Black history, legacy, and perseverance during the terror of slavery. While bioarchaeologists can examine the dental calculus or the skeletal remains of these peoples, bones and teeth alone do not tell a complete story. Physical remains and burial sites cannot be understood without appreciating their deeper context and personal meaning to stakeholders — in this case, the modern Black descendant community of Portsmouth today.

Thousands of miles away, as part of the [Central Belize Archaeological Survey](#), bioarchaeologists excavated a uniquely shaped skull in the sweltering humidity of the Caves Branch Rock-shelter (CBR) in the jungles of Belize. Named simply Burial 99 by excavators, this individual was a Late Classic burial (CE 600 – CE 900) in a typically Late Preclassic / Protoclassic (300 BCE – CE 300) rock-shelter. The highly fragmented remains of Burial 99 laid next to a ceramic bowl, intermingled with the burials of others. Back in the lab, the individual was estimated to be an older female whose cranium had been intentionally shaped during childhood to appear more elongated. Head-shaping was commonly practiced among the urban Maya elite who buried their dead deep in caves rather than in rock-shelters. However, Burial 99 was the only individual with cranial-shaping in this space, possibly indicating that her geographic and social origins were quite different from that of the farming villagers she was buried with at the mortuary rock-shelter. It would take chemical, microscopic, and other advanced laboratory methods to reconstruct her life (and death) to demonstrate more broadly what her presence in the rock-shelter could mean about ancient Maya social dynamics (Biggs and Michael, 2017; Wrobel, 2018).

These examples demonstrate how bioarchaeologists can provide insight about past lives and experiences from a population and individual-level. Though far apart geographically and temporally, both rely on data from the human skeleton to expand inferences about human behavior in the past. Bioarchaeology is the study of human remains (e.g. bones, teeth, and mummified remains) from archaeological sites. It is a field of study that bridges two subdisciplines within anthropology— biological anthropology and archaeology (Figure 1).

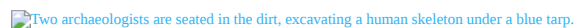


Figure 1 – Burial excavation at the Santa Clara Valley Medical Center Historic Hospital cemetery. Notice how small tools like wooden dowels and small brushes are used for the delicate field work of a bioarchaeologist excavating human remains. Photo courtesy of Lisa Bright.

The field of bioarchaeology is relatively new, the term being coined in 1977 by Dr. Jane Buikstra to refer exclusively to the analysis of human remains. A bioarchaeologist is an expert in the analysis of human osteology (the study of bones) and odontology (the study of teeth), as well as the techniques and methods of mortuary excavation. While people have always been intrigued by the remains of the dead (as evidenced by the thousands of human skeletons in museum collections around the world), there has historically been little emphasis on studying humans from a biocultural context. The biocultural approach, or the study of humans through an understanding of the interconnectedness of biology, culture, and environment, is fundamental to bioarchaeology and indeed, to anthropology as a whole.

Integrating archaeological context into the study of human remains provides depth and cultural meaning to skeletal data. In bioarchaeology, context refers to the space, time, and culture within which the individual lived and died. The careful, contextualized interpretation of archaeological evidence alongside skeletal remains is integral in developing hypotheses and drawing inferences about humans of the past, including population dynamics, the human experience, and diverse adaptability of past societies. The study of human skeletons can reveal information about diet, stress, and lifestyle of individuals. This in turn, contributes to our understanding of social organization, social/cultural identity, gender roles, structural violence, and much more. Studying regional disparities in past populations' health and diets sheds light on how behavior and societies change over time. Such shifts include intensifying agricultural production, political unrest and upheavals, colonization, and the impacts of past climate change. This affords insights into the possible challenges posed by our modern climate change.

This chapter will provide an overview of the main contributions and methods of bioarchaeology and the study of human remains from the past. We will first explore how analyses of skeletons are conducted in the laboratory, then how recording demographic information (like age and sex), diet, disease, stress, and related forms of data contribute to how we interpret larger questions in anthropology like migration, social stratification, human-environment interaction, and many other themes by combining biological data with burial data.

Laboratory Analyses

Much of the research and data collection that a bioarchaeologist does happens inside the laboratory. Depending on the type of analyses being performed and the expertise of the bioarchaeologist, their laboratory may have long tables with padding to lay out a skeleton in anatomical position (bones positioned as they are in the living body), equipment like calipers and other tools to measure bones, scales to weigh samples, beanbags and cork rings to hold skulls in place, specialized lighting, and a collapsible camera studio.



Figure 2 – Bioarchaeologists specialize in studying skeletal remains and burials. They are trained archaeologists who work in the field as well. Here Dr. Samantha Blatt helps train students about burial discovery and excavation methods. © S. H. Blatt, used with permission for this book.

Other bioarchaeology labs may have chemical fume hoods for processing samples for isotopes, a digital light microscope, glass beakers or ceramic crucibles, petrographic saws often found in geology labs for making bone and tooth thin sections, hand-held saws, and shelves of archival boxes with human remains. Many times, these labs also have corners or closets stuffed with archaeological field equipment like shovels, trowels, sieves, wooden dowels or bamboo sticks for excavating around bone, buckets, and personal protective equipment for recovering remains (Figures 1 and 2). Some bioarchaeologists either work in labs or bring their samples to labs with electron microscopes, laser ablation, mass spectrometers, and other precision tools, and clean rooms full

of DNA-extracting equipment. So, there is no one type of laboratory environment in which to find a bioarchaeologist since the techniques and methods used encompass skill sets and technology found in fields outside anthropology.

The Human Skeleton

 At left, a human skeleton is laid out on a table. At right, two gloved hands are holding calipers and measuring the skull.

Figure 3 – Bioarchaeologists lay out skeletons anatomically to take inventory of the bones present before beginning laboratory analyses. Part of documenting a skeleton involves metric, or objective numerical measurements, and nonmetric, or subjective observations, to estimate age, sex, stature, and disease. Bones are also measured, photographed, and sampled depending on the research questions being asked. The image to the right shows measurement of a cranium using a spreading caliper. (Courtesy of S. H. Blatt, used with permission for this book.)

After human remains have been carefully excavated and brought to the laboratory (see Excavation chapter), bioarchaeologists take photographs and inventory the remains (Figure 3; Table 1). The next step is to build a biological profile of the individual, which includes an estimation of age, sex, ancestry, and stature using skeletal and dental traits (Figure 4). Additionally, signs of disease, stress, growth deprivation, or other anomalies are recorded. Due to the antiquity of many sites, remains are often not complete or well-preserved.

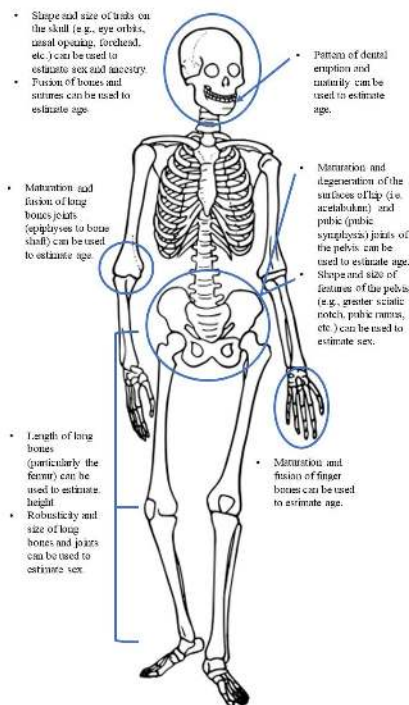


Figure 4 – Major skeletal features (circled) used to reconstruct the biological profile. See the resources in eForensics and eSkeletons for more information. © S. H. Blatt, used with permission for this book.

Bioarchaeologists use a combination of methods to generate ranges for age and stature or estimations (rather than determinations) of sex and ancestry. For instance, probability of sex or ancestry is calculated based on referring to the observations and measurements of thousands of skeletons, but can never be 100% known from skeletal analyses. Similarly, while dental eruption is a highly accurate way to estimate age from a child's skeleton, there is enough individual variation and overlap in eruption ages, that an age range (e.g. saying "5 years $\pm$ 16 months" versus "6 years") is more likely to be accurate and account for unknown individual variability. It should also be understood that these methods are often population-specific. For example, several formulae exist for estimating stature from the length of long bones (such as those bones in the arms and legs), but these are dependent on estimation of sex and ancestry first to use the most accurate formula.

Bioarchaeology uses similar methods as forensic anthropology when reconstructing a biological profile. However, forensic anthropology focuses on modern human remains in medicolegal contexts that usually represent individuals who died less than 50 years ago. This chapter will not cover osteology or the methods of estimating the biological profile from the skeleton in detail as there are already many resources available. Students can refer to the free Open Access texts [Explorations: An Open Invitation to Biological Anthropology](#) (specifically [Chapter 15](#) and [Appendix A](#)) or [Introduction to Human Osteology](#) for details on skeletal

anatomy terms, bone formation, and methods to develop the biological profile. Other resources include [eForensics](#) and [eSkeletons](#), which provide introductory information about methods used to reconstruct a biological profile.

Table 1 – Proper Handling of Human Remains

DO	DON'T
Handle remains with respect and dignity	Objectify or treat remains as things to be studied or simple data sources
Consult with families and descendant groups and, if possible, direct family members regarding cultural requirements for the care of remains. Follow all state and federal laws regarding archaeological work and human remains (36CFR).	Remove remains without sufficient legal and ethical consideration and planning
Use only padded surfaces to prevent damaging the remains	Use irreversible preservatives or materials in reconstruction of remains (e.g. super glue, cement, wires, dowels, acryloids, permanent labeling)
Always use two hands to hold and carry remains	Desecrate remains by poking fingers in the skull openings or treating the remains as ornaments or objects
Package in paper bags and acid-free boxes when first excavated and still damp from soil. When dry, store in watertight containers and out of direct sunlight	Package remains in containers or bags that retain moisture (this can lead to mold or decay)
Limit access to public to preserve physical remains and the dignity of the deceased	Publicly display human remains without permission from the descendant community
Photograph remains and obtain proper permissions if destructive analysis is undertaken	Use invasive or destructive analytical methods without appropriate consultations of justification
Keep a clean laboratory analysis space	Consume food or drink where remains are stored

Major Research Themes

Paleodemography



Figure 5 – This graph demonstrates the comparative mortality hazards at the Santa Clara Valley Medical Historic Cemetery (VMC) and the Alameda-Stone Cemetery. (Image created by Lisa Bright.)

Once a biological profile is generated for a skeleton, bioarchaeologists can begin to assess the data for population-wide patterns. Paleodemography is the study of past population dynamics, including distributions of age and sex through time (Milner et al. 2008). Demographic reconstructions focus on vital statistics, such as life expectancy, probability of death at certain ages, mortality rates, and population size and density. Demographic analyses use hazard models, which are nonlinear mathematical functions that represent age-related changes in the risk of dying (Figure 5). Paleodemographers must deal with strong selection bias: not only are they working with the remains of those who did not survive, but they must remember that the vast majority of human remains decompose before archaeologists can recover them. Therefore, what they have they may not fully represent the demographics of the once-living population.

Mortuary Analysis

The dead do not bury themselves; it is the living who perform mortuary rituals for the dead. By investigating funerary sites, bioarchaeologists and mortuary archaeologists examine the context in which the individual was buried and attempt to reconstruct their social structure and individual identity through the interpretation of grave goods (objects included in the burial such as jewelry, weapons, pottery, etc.), skeletal remains, and funerary structures. This may mean examining burial positions (e.g., flexed, extended, or placed on one side), burial locations (where is this individual in relation to others), burial containers (e.g., were they wrapped in cloth, a wooden box, an embellished casket), grave goods, seasonality of the burial, the interment style (was it a primary burial, a cremation, a secondary burial where the individual has been moved since the initial burial), and the burial area itself. All of these variables can reveal information about the deceased individual, the living persons who buried the dead, and the

complex interplay of ritual, material culture, and social memory. See [Digging Up the Dead](#) for one student's reflection on what she learned working at an archaeological field school at a 400-year-old cemetery in Poland.

For instance, during the analysis of Burial 99 from Belize, mentioned earlier, it became clear to bioarchaeologists that rock-shelters like those she was buried in were part of a large mortuary landscape. In the Maya world, the use of mortuary and ritual space is intentional and symbolic. Rock-shelters in Belize containing burials served as memorial stops along a path pilgrims would travel to memorialize their ancestors and legitimize boundaries of those in power. The placement of Burial 99 in the rock-shelter also represents a return to a ritual location that had been largely unused for burial for several hundred years prior. Therefore, understanding burial placement within archaeological landscapes can inform us about the ways people of the past constructed and used their environment, which reflect the sociopolitical and ritual dimensions of a society.

Taphonomy

Taphonomy is the study of the decomposition, modification, and alteration of a body after death but before the body's been recovered. (See additional discussions of taphonomy in the Landscapes and Ancient Foodways chapters). The body can be affected by many environmental, biological, and cultural factors occurring after death (see examples at [eForensics](#)). A combination of extrinsic and intrinsic factors make each postmortem (after-death) event unique. Extrinsic factors are those external to the body, while intrinsic factors refer to the nature of the body itself (Table 2). Bioarchaeologists rely on taphonomic analyses to establish the time since death, distinguish human agents (e.g. trauma on the bone, ornamental modification of bones and teeth, and ritualized dismemberment with stone tools) from non-human agents (e.g., animals scavenging and river flows pushing bones), understand decomposition rates and patterns of disarticulation, identify variables in preservation, and reconstruct events and circumstances long prior to death (antemortem), at or around the time of death (perimortem), and after death (postmortem) (Stodder, 2008).

Table 2 – Taphonomic Factors

Intrinsic Factors	Extrinsic Factors
Body mass (as well as bone size and shape), age, sex, state at time of death (e.g. disease and trauma)	Water, soil pH, temperature, humidity, season of death, oxygen, animals, insects, microbes, fluvial transport, human treatment/placement of the body (e.g., location of burial, grave typology, clothing, and chemical treatment)

Scientists who study taphonomy also perform actualistic and experimental studies to understand the effects of intrinsic and extrinsic factors in various burial scenarios. Actualistic studies aim to experimentally reproduce various circumstances of burial and decomposition. Systematically observing, recording, and describing the impact of specific extrinsic factors on a body can generate diagnostic criteria to identify and interpret those same factors and circumstances in the past. Aside from actualistic studies, bioarchaeologists also rely on uniformitarian principles. Actualistic studies often take place in “body farms” like those in [Tennessee](#) or [Texas](#), and are [experiments involving human cadavers](#) placed in various scenarios and environments. So, the decomposition of bodies is examined to understand how factors such as climate differences; whether a body was clothed or unclothed; and whether a body was found in the trunk of a car, in a lake, in a cement block, scattered on the ground, or buried impact the recovery and analysis of the body. These principles are based on an understanding that natural phenomena that occur today are the same that occurred throughout the past. So, an understanding of the effects and processes involved in soil erosion by modern scientists observing these phenomena allows bioarchaeologists to apply this knowledge to interpreting bone preservation, body positioning, etc. While environmental dispersion of remains is somewhat predictable, human dispersal is based on cultural beliefs, and thus to an outsider, may appear unpredictable; and this is exactly why a biocultural approach is necessary.

For example, many scholars have explored the markings on bones and patterns of placement of bones caused by animal scavenging, digestion, and human butchering practices in the past. Dr. Samantha Blatt and Dr. Amy Michael have applied knowledge from those studies to understanding coyote scavenging and to identifying digestion of human bone by coyotes and other canids so they can better comprehend why some bodies in forensic cases are not recovered.

While taphonomy is a fundamental part of bioarchaeology, there are still significant unknown intrinsic and extrinsic factors that may confuse even an experienced scientist. For instance, natural mummification often occurs in hot and arid environments, but can also happen in environments devoid of oxygen or in freezing temperatures. The discovery of [Ötzi](#), also called “the Iceman,” found frozen in the Ötztal Alps, on the border of Italy and Austria is a great example of this. His body was found by hikers in 1991 and was so well-preserved that both the hikers and experienced law enforcement officers believed him to be a missing person from modern times. However, radiocarbon dating revealed that he'd died between 3400 BCE and 3100 BCE. Law enforcement and

forensic personnel were also the first on call in 1979, when a girl discovered a mummified torso in a burlap sack in a lava tube in the small town of Dubois, Idaho. The remains were unidentified until 2019 when Dr. Amy Michael, Dr. Samantha Blatt, and members of the [DNA Doe Project](#) used anthropology and forensic genetic genealogy to identify the man who was known as Joseph Henry Loveless. (For more on this project, see [Identification of a decedent in a 103-year-old homicide case using forensic anthropology and genetic genealogy](#) or [He Escaped from Jail...a Century Ago](#).) Loveless's mummified and headless remains had gone unidentified for more than 40 years despite attempts by anthropologists, local law enforcement, and the FBI. Because the taphonomic factors in the cave were largely unknown, it was difficult to determine at first when the man had died. Incredibly, Loveless was found to have died in 1916, nearly 60 years before his mummified remains were recovered in the cave. In this case, the cave environment acted to preserve the remains (including the DNA used in his eventual identification). See Special Topics boxes below on Weathering and Staining, Cremains, and Commingled Remains for additional examples of how taphonomic processes affect bioarchaeology.

Special Topics – Weathering and Staining

Bone weathering, or the chemical or mechanical deterioration of bone, is one of the most commonly observed taphonomic changes (see Fernandez-Jalvo and Andrews, 2016 for more on taphonomic alterations). Weathering can appear as sun bleaching, cracking, flaking, warping, and/or erosion. Weathering is often scored on a scale of zero to five and varies based on sun exposure, wet/dry, and freeze/thaw cycles. If a body decomposes on the soil surface, the exposed bones will show progressive cracking and whitening with time, and eventually display deep splinters, exfoliation and splintering on the bone surface. By contrast, a body that has been buried may decompose more slowly and the bone can become stained by the surrounding soil. Bone that has been interred for an extended time tends to show uniform coloration, while bones buried only briefly show substantial variations in the same colors (Pokines et al. 2022). It is possible for both sun bleaching and soil staining to occur unevenly across the body or on a single bone, thus providing clues to how the body or bone was placed or moved. Sometimes bone can appear very white due to other circumstances. Calcine bones, which are white due to heat exposure, can be mistaken as sun bleached bones. Similarly, culturally-based mortuary practices may impart differential weathering to the bones. Some cultures' funeral rites include preparing the bones of the deceased by stripping the flesh from bone, followed by degreasing the remaining bones. This results in a similar bleaching of the bones, though not due to sun exposure.



Figure 6 – Root etching, which appears as white etched impressions on the bone surface. (Courtesy S. H. Blatt, used with permission for this book.)

Root etching is a common taphonomic modification that is recognized as shallow grooves or discolored tracks on the bone surface (Figure 6). These tracks are etched by the growth and decay of plant roots adjacent to the bone. As these roots grow and decay, various acids are produced which dissolve the mineral parts of the bone in direct contact with the growing root systems. Pine needles can cause a similar taphonomic effect, though in less organized lines. Algae and moss can grow on bone exposed to the surface and can leave green discoloration, the stain resulting from the chlorophyll of the plant and plant allies. Damage caused by insects (e.g., wasps, termites, and beetles) can also mimic root etching.



Figure 7 – Example of cupric staining on the clavicle and scapula from a burial at Santa Clara Valley Medical Center Historic Hospital cemetery. (Photo courtesy of Lisa Bright.)

Cupric staining refers to a staining of bone resulting from copper or copper alloys (e.g. bronze and brass). This type of emerald green or even blue staining, along with staining from other metals like iron (anywhere from a red/orange color to green, blue, or black coloration) and mercury (usually a gray/bluish or black color), is the result of the corrosion of metals, found in jewelry, clothing rivets, coffin hardware, or weapons adjacent to the body (Figure 7). Indeed, the Latin term for copper, *cuprum*, gave us the chemical symbol Cu. Sometimes these corroding alloys help preserve other burial objects such as textiles. A red stain on the bone can also be the result of red ochre being applied to the body during burial. Red ochre, a natural clay earth pigment, has been used in mortuary practices around the world for thousands of years.

Less is known about the taphonomy of teeth, which are assumed to be less susceptible to taphonomic processes than bone since they are more mineralized and less likely to decompose. However, teeth and other dental tissues are still vulnerable to mechanical damage, including breakage, as well as heat damage. There has been some documentation of these dental tissues absorbing chemicals or being affected by the pH of the surrounding soils (Blatt et al. 2019). Dental tissues and dental restoration materials (e.g. fillings made from amalgam, composite, or porcelain) also show variable damage to corrosives, natural or man-made, and can soften or be completely dissolved in acidic soils.

Special Topics – Cremains



Figure 8 – “Valley of the Fugitives” represented by plaster casts of Mt. Vesuvius victims. Marked with CC BY 4.0.

Heating and thermal damage to bones and teeth have dramatic effects and are well studied. Cremation is a common mortuary practice around the world and throughout time. Cremation can utilize different technologies and thus may result in anything from a lightly heated or cooked bone to very fragmented bones, or in the modern Western world, bone that has been ground to ash. Unlike today, where modern cremation equipment results in crushing and grinding bones into small fragments and powder, many cremation practices not involving modern methods result in much larger skeletal elements at the end of the process. The source of heat, temperature, proximity to the heat source, and duration of heat exposure greatly influence the damage to the bone. For instance, a modern crematorium can reach temperatures of 1000 degrees C, while a campsite fire may reach half that temperature. Archaeologically, bones exposed to heat can preserve well, like those of the remains of humans from Pompeii who died during the volcanic eruption of Mt. Vesuvius in AD 79. The decomposed remains at Pompeii left a void of air under the ash layer that covered the bodies, allowing archaeologists to make plaster casts of the bodies encasing bones (Figure 8).

An understanding of tissue and bone depth in different areas of the body is essential for interpreting sequence and events, such as body placement or dismemberment, prior to a cremation. Bones in the body that are shallow to skin and muscle, such as fingers or the cranial vault, will burn before deeper set bones such as those of the joints. Some cultural practices involve dismembering the body, or cutting the body apart much as one would butcher an animal for food. In these cases, the joint surfaces of some bones may be exposed to heat before other areas. The bioarchaeologist must consider the placement of the body and body parts in proximity to the heat source, as well as if the bone was fleshed, green (i.e. defleshed, but not dry), or dry when exposed to heat. Additionally, certain types of cracking, fracturing, warping, and/or shrinkage of bones serve as criteria for interpreting the burning event (Pokines et al. 2022).

Case Study:

 Map of the island of Mangaia showing the six tribal districts.

Figure 9 – The island of Mangaia split into six tribal districts. Marked with CC BY 4.0.

On the smallest of the Cook Islands, Mangaia, human skeletal remains representing hundreds of individuals were found burned and deposited in a rock-shelter midden with other animal remains (Steadman et al. 2000). The question that arose for bioarchaeologists was, why? What happened on Mangaia? Analysis of the bones by Dr. Samantha Blatt, then an undergraduate student, revealed part of the story. From the brown, tan, and black color of most of the bones, most showed evidence of cooking or burning at lower temperatures without direct exposure to a heat source. Bones heated at high temperatures and those unfleshed can change from brown to black and then to white coloration, known as calcined. The bones represented males and females of all ages, treated in the same manner as animals when they are consumed: deposited and commingled in a midden within a rock-shelter. The pattern of burning suggested that the bodies had been butchered and the most utilitarian parts, with the highest yield of muscle tissue, exhibited the greatest exposure to heat. Most bones also appeared to have been fleshed when burned from the patterns of fragmentation and cracking on the bone surface. Other sites on the island showed cut marks that appeared to be made by humans on human bones. Tying in historical context, it is possible that a change in chiefdoms along with environmental strain resulted in the killing of a group on the island and the bodies were burned, perhaps through use of low heat earth ovens, and possibly even consumed.

Like Mangaia, other Polynesian islands have shown archaeological evidence of intense internal competition for food and other resources and intensified production systems that exceeded the capacity of resources on an island. There are also ethnographic records noting the increased intergroup aggression, raiding, and warfare among people of the island in different geographic regions. Mangaia itself was divided into six districts spreading from the coastline and each meeting at the volcano at the center of the island (Figure 9). Archaeological sites in all districts have shown a significant change in vertebrate consumption through time. While initial isotopes from human bone were interpreted to indicate a cannibalistic diet, more recent analyses suggested a diet of fish and terrestrial animals, but not necessarily cannibalism. The increased nitrogen levels found in human bones may also have been related to nutritional stress, but do not rule out nutritive cannibalism (cannibalism practiced for nutritional need) (Barca et al. 2016).

Want to learn more about analysis of burned human bone? Explore the resources [here](#).

Special Topics – Commingled Remains



Figure 10 – Sorting of commingled faunal remains. (Courtesy S. H. Blatt, used with permission for this book.)

Commingling is the mixing of whole or fragmented remains of two or more individuals into a single context (Figure 10). Commingling can result from multiple taphonomic processes, such as animal scavenging or intentional depositing by humans, which can occur in singular events or in longer-term, repeated episodes, depending on the cultures' funeral practices. Commingling can also happen unintentionally in a lab or in curated collections that lacked context upon acquisition or lost context and excavation documents at some point after a museum had acquired the specimens.

Taphonomic processes aside, long-term assemblages are usually the result of the continued use of a burial space by communities. Primary burials are those which remain *in situ* from the time the body was first deposited. Whether intentional or accidental, secondary burials happen when remains are exhumed or moved and then reburied. Sometimes the presence or absence of small bones, like those in the hands, can be used to identify whether an assemblage is the result of a primary or secondary burial. This is because, as bones are removed from one location to another in a secondary burial, smaller bones may be lost or not recovered during the transfer. In primary burials, these small bones are more likely to be present and discovered by archaeologists.

Episodic assemblages can be the result of mass burials, whether because of plagues, warfare, sacrifices, or any event that results in the death of multiple individuals in one time period. This can be in a single incident, such as a flood or battle, or in

recurring incidents, such as in cases of plague or diseases. Therefore, these episodic assemblages tend to have less commingling than longer-term assemblages. Additionally, the representativeness of the bones or demography of the assemblage on the whole can be more limited. For example, an assemblage resulting from warfare may exclusively contain young adult males with evidence of skeletal trauma. An assemblage resulting from a plague, which is more likely to affect the very young and the very old, may not be representative of typical population demographics. Fear of the spread of a disease could also mean the individuals were given minimal rites and burials without grave goods, coffins, or any sign of their rank in society. Often, this fear results in hurried burials in preexisting pits or mass graves that differ from general burials.

The first step to understanding the extent of commingling is to create an inventory of all the bones present in the assemblage. From skeletal inventories, the minimum number of individuals (MNI) and/or minimum number of elements (MNE) can be calculated. First, special care must be taken to identify the side of the body from which each bone comes. The size and skeletal maturation of bones can be used to determine the approximate age(s) of the skeleton(s) at death. Skeletal maturation refers to using multiple lines of evidence, such as the fusion of the epiphyses of long bones, to estimate how old an individual was at death. It is important to remember that, while skeletal maturation occurs at a predictable rate, it does not directly correspond to calendrical age. Thus, two different 15-year-olds may show very different levels of skeletal maturation, despite being the same age. Likewise, any pathological lesions from chronic diseases, like syphilis, or traumatic injuries, like a broken, but healed, arm, should be noted, as these patterns may help in pairing disarticulated skeletal elements.

In the simplest of methods, the number of the most abundant bone type is equal to the MNI (Figure 11). Consider an assemblage that consists of twelve right and eight left femora, eight right and ten left humeri, and ten right and eight left radii. In this case, the MNI would be twelve based on the presence of the right femur of twelve individuals (since people only have one right femur each). Alternatively, the number of paired bones from bilateral elements can be added into this calculation. One issue with this method is that fragmented or damaged bone may limit the ability to pair elements. You can practice MNI in the second activity listed in [Additional Exercises](#) at the end of this chapter.

 Drawing of skeletal elements showing 1 adult left femur, 1 child left femur, 1 nonadult right femur, 2 adult femur, 1 adult cranium, 1 left humerus, 1 right humerus

Figure 11 – Try calculating the MNI based on the bones in the assemblage. Consider that there is a left and right nonadult femur (possibly the same nonadult individual), one left and two right adult femora (possibly indicating as few as two adults), a left and right adult humerus (possibly indicating as few as one adult), and one adult cranium. The adult cranium could belong to the same individual as the adult humeri and the right and left adult femora. Therefore, while it is possible that each bone in this assemblage represents a different individual (a maximum of eight individuals), the MNI in this case is three (at least one adult and at least one nonadult). (Courtesy S. H. Blatt, used with permission for this book.)

If fragmented elements are included, minimum number of elements, or MNE, becomes an increasingly important method, which may involve zonation of identifiable fragments by bone morphology and division of fragments according to location in the body. For fragmented collections, it is generally the MNE that is needed to account for the fragments forming specific types of bones. Like MNI, size, side, cut marks, taphonomy, or particular anatomy can help indicate which fragments may be part of the same whole bone. In some cases, this is a fraction (e.g. three vertebrae needed to account for an assemblage, 24 in an individual, so 3/24 might be the MNE). A common derived metric of MNE is MNE/MNI, which indicates how many of that bone is found relative to how many you would expect to find if the MNI were actually the number of animals or humans contributing to the assemblage. In some studies, image analysis and GIS software are used to count overlapping fragments.

Disease

 Front, back, and side views of a severely fractured femur, which healed at an angle.

Figure 12 – 3D scan of severe fractures in a femur, which subsequently caused infection. This fracture did not rejoin correctly during healing, resulting in the unique angle of the bone which also weakened its integrity. (Courtesy S. H. Blatt courtesy of the Idaho Virtualization Lab, Idaho Museum of Natural History, used with permission for this book.)

Paleopathology is the study of diseases in the past. By analyzing data at the population, rather than individual, level, paleopathologists are able to theorize about the interplay between disease and other social phenomena. Thus, activity patterns, living environments, injuries, and social rank/roles can be added into the interpretation of skeletal markers of disease. Pathologies

of the skeleton can be divided into eight categories (see Table 3). Grauer (2011) provides a detailed overview of pathological conditions in the human skeleton.

Table 3 – Categories of Skeletal Disease

Pathology	Cause	Examples
Traumas	Accidental injury or intentional violence, cosmetic, therapeutic. Result from outside force.	Cranial shaping, foot binding, fractures, blunt and sharp force trauma, high velocity projectile trauma, thermal alteration (Figure 12)
Congenital Diseases	Developmental or genetic.	Cleft lip and palate, abnormal curvature of the spine (kyphosis and scoliosis), club foot
Infectious Diseases	Long term infections from bacteria, viruses, or parasites.	Causes osteoblastic (bone growth) or osteoclastic (bone loss) responses. Leprosy, osteomyelitis, treponemal diseases (syphilis, pinta, yaws and bejel), dental caries (Figure 13)
Circulatory Diseases	Disruption in normal blood circulation can result in osteonecrosis (bone death) or disrupted growth.	Hematopoietic disorders or anemias
Metabolic Diseases	Nutritional stress or malnutrition of macro- or micro-nutrients.	Scurvy (vitamin C deficiency), rickets (vitamin D deficiency in children), osteomalacia (intestinal malabsorption of calcium in adults) (Figure 14)
Endocrinological Diseases	Abnormal skeletal growth related to issues with the pituitary and thyroid glands.	Gigantism, acromegaly, or conversely pituitary dwarfism
Neoplastic Diseases	Proliferation of cells in bone, cartilage, fibrous tissue, or blood vessels.	Malignant, or cancerous, tumors affecting bone are either carcinomas or sarcomas, depending on what type of tissue they originate from. Sarcomas develop in bone and muscle, while carcinomas arise in epithelial tissue associated with many organs. The identification of types of tumor in bone depends on histological examination of the tumor
Dental Diseases	Multiple causes such as diet, oral bacteria, food processing, other stressors.	Caries (cavities), ante-mortem (prior to death) tooth loss, wear (attrition, abrasion, and erosion), periodontal disease, calculus, hypoplasia, and hypocalcification (Figure 15)



Figure 13 – Osteoblastic lesions (periostitis) on a femur from the Santa Clara Valley Medical Center Historic Hospital cemetery. (Photo courtesy of Lisa Bright.)

Complicating interpretations, the modern understanding of health and disease states cannot be directly imposed on the peoples of the past. Not all diseases have skeletal correlates, and not all individuals respond to disease processes in similar manners.

Today, bioarcheologists use the term health to include not only disease, but also stress. Health refers to the overall well-being of an individual, including emotional and mental health, which cannot be determined from skeletal remains alone. Stress refers to the physiological disruptions from homeostasis, or the normal functioning of the body. The immediate rush of adrenaline in the stress response alters the functioning of the body, though long-term exposure to this “adrenaline rush” can have cumulative effects on the body. This long-term stress response is called the allostatic load, or the long-term elevated or fluctuation endocrine responses related to stress. This allostatic load, if sufficiently severe and long-term, can impair cellular functions in the bones and teeth, resulting in pathologies that can be observed by trained bioarchaeologists. For a video introduction to these ideas, see “[Reconciling ‘Stress’ and ‘Health’ in Bioarchaeology](#)”.



Figure 14 – Illustration of skeleton with the bent and curved bones resulting from rickets. Originally published in 1749, this illustration is evidence that scientists have been studying human remains for centuries despite the relatively new fields of bioarchaeology and forensic anthropology. (Source: <https://commons.wikimedia.org/wiki/File:V0007817.jpg>)

Bioarchaeologists can only assess issues of health and stress in a limited capacity for two reasons: 1) not all diseases and pathologies result in skeletal correlates; and 2) not all bones are recovered from any given individual or site. Bioarchaeological assessment, while limited to recovered remains, is underpinned by knowledge about how individuals typically respond to stress, interpretations of skeletal deformities or lesions, and an understanding of the healing process. However, skeletal tissue has a general response to issues of health and stress, making the diagnosis of specific causes or pathogens difficult (Figure 16). To further complicate interpretations, the skeleton has a limited number of responses to diseases, and so multiple disease states may result in the same deformities. Bioarchaeologists document the type and distribution of bone lesions to create a differential diagnosis of which specific disease processes may have been present. For more information, view “[The Archaeology of Disease Documented in Skeletons](#)”.



Figure 15 – This individual is edentulous, meaning all teeth have been lost due to disease before death. (Courtesy S. H. Blatt, used with permission for this book.)

Initially, bioarchaeologists studying disease in the skeleton interpreted the presence of bony lesions as direct evidence that an individual suffered from a disease, while the absence of lesions indicated that they were healthy (see examples of skeletal pathologies and traumas at [Digitized Diseases](#) and [FOROST](#)). In the 1990s, osteologists and paleodemographers began to realize that inferences based on this binary approach to disease were flawed. Bioarchaeologists named this problem the osteological paradox, or the reality that individuals without lesions may have been more ill than those with observable lesions (Wood et al., 1992; Wright and Yoder, 2003). Because it takes time for bone tissue to react to disease, individuals without lesions may have suffered acutely from a disease and died before any skeletal reaction could occur. Conversely, those with skeletal lesions had a normal bodily response to disease, and thus may have been successfully fighting off the disease. Indeed, the cause of death may have been entirely unrelated, such as a traumatic injury or homicide. Confounding this issue is the fact that it is difficult for osteologists to identify hidden heterogeneity, or the predisposed frailty of an individual to disease and stress due to genetics or other aspects of lifestyle.



Figure 16 – Notice the small holes in the endocranial (inside) bone of the skull. These are called arachnoid fovea and are not pathologies or trauma but rather pseudo-pathologies and commonly present. Pseudo-pathologies like these holes do not result from disease; they are a normal part of human variation. Features on bone like these could easily be mistaken for markers of disease without bioarchaeological knowledge. (Courtesy S. H. Blatt, used with permission for this book.)

Though bioarchaeologists have studied infectious epidemics and plagues in the past for decades, the COVID-19 pandemic certainly brought to light the [value of such research in the modern world](#). Specifically, bioarchaeologists have contributed to understanding infectious diseases that originated and spread among ancient peoples. For instance, they can document patterns in the age distributions of cemeteries during previous epidemics. The 1918 flu pandemic, for example, caused the highest mortality among young adults, while COVID-19 has targeted older and more vulnerable groups. Studying the plagues of the past gives clues about the impact of [socioeconomic and infrastructure factors](#), hygiene and social-distancing practices, [medical waste practices](#) of cultural material to inform environmental practices, and the evolutionary development of globalized diseases today. What do you think the [archaeology of COVID-19](#) will reveal?

Figure 17 – Osteophytes and lipping of the margin of the vertebral bodies (left) and porosity of the vertebral body (right) of the lumbar vertebrae in the lower back, indicating osteoarthritis. (Courtesy S. H. Blatt, used with permission for this book.)



Figure 18 – Harris lines in the wrist (radius and ulna) seen on a X-ray (indicated by the red arrow). “Growth Arrest Lines” by James Heilman, M.D. is marked with CC BY-SA 4.0.

Mechanically demanding activities can leave distinctive marks on bone, especially those of a repetitive nature (e.g. rowing and sewing). Table 4 provides examples of some of the most frequently recorded features in the skeleton used to make inferences about activities and stress in life. These markers of activity can give insight into aspects of gender, socioeconomic class, social status, occupation, and more, including interpopulation comparisons and comparisons through time. Bone is dynamic and adaptable tissue, constantly being broken down and reformed in response to mechanical loads placed upon it. Generally, activity makers fall into two categories; degenerative and biomechanical.

 Close-up image of upper front teeth, showing linear enamel hypoplasia

Figure 19 – Linear enamel hypoplasia of the upper front teeth. (Courtesy S. H. Blatt, used with permission for this book.)

Degenerative activity markers result from activity (or a lack thereof), such as osteoarthritis, in which bone and cartilage wears away with age and use, impacting movement (Figure 17). On the other hand, biomechanical markers, or those that modify the shape and structure of bones through function/use and motion generally build, rather than wear away bone. Entheses are a good example of biomechanical markers on bone. An enthesis in this sense is the location on a bone where a muscle attaches and therefore the size and shape of an enthesis can indicate regular body movements and associated occupations. Unlike bone, however, teeth do not have a cycle of repair, so their activity markers are permanent and occur only during fetal development and the first few years of life. Some studies have linked arduous labor to bone conditions, like osteoarthritis, but more recent work (Rando & Waldron 2012) has failed to support this in modern populations. Currently, bioarchaeologists do not link the conditions seen in bones to specific activities, but rather associate them with lifestyle factors such as kneeling a lot while working, which could be associated with kneeling while grinding grain on a ground stone in preparation for eating.



Figure 20 – Porotic hyperostosis (seen as small holes in the bone) of the top and back of the skull (on the parietal bones). (Courtesy S. H. Blatt, used with permission for this book.)

Table 4 – Skeletal Markers of Stress and Activity

Skeletal Marker	Appearance	Cause	Type of Marker
Entheses	Bone remodeling or resorption (size and shape changes) at site where muscle attached to bone	Habitual strain and loading on bone at sites of muscle attachments. Variation due to sex, age, diet, body size, genetics, and health	Activity (Biomechanical)
Dental Wear	Loss of enamel on tooth crown and exposure of dentine tissue underneath.	Attrition — tooth-on-tooth contact (grinding teeth from stress, tooth overcrowding in mouth); Abrasion — contact of teeth with dietary (food texture or preparation) or nondietary objects (smoking pipes, labrets); Erosion — chemicals such as acidic foods or stomach acids	Activity (Degenerative)

Osteoarthritis	Osteophytes — marginal lipping (Figure 17). Eburnation — smooth, shiny joint surface Pitting and porosity of joints	Progressive degeneration of joint surfaces due to loss of cartilage and bone-on-bone contact	Activity (Degenerative)
Harris Lines	Thick white lines visible in radiographs of long bones (Figure 18)	Cessation of bone growth in childhood due to many physiological and psychological stressors	Stress
Fluctuating Asymmetry	Left and right teeth of the same class vary in size from each other	Non-specific stressors (multiple factors) during tooth development	Stress
Linear Enamel Hypoplasia	Linear bands around the circumference of a tooth crown (Figure 19)	Non-specific stressors (multiple factors) during tooth development causing decreased, slowed, or flawed mineralization of enamel tissue	Stress
Porotic Hyperostosis	Small holes or porosity on the vault of the skull (Figure 20)	Non-specific stressors (multiple factors) that usually occur in childhood Can be associated with anemia and hematopoietic disorders	Stress
Cribra Orbitalia	Small holes or porosity on the roofs of the eye orbits (Figure 21)	Non-specific stressors (multiple factors) that usually occur in childhood Can be associated with anemia and hematopoietic disorders	Stress
Periostitis	New bone formation with a porous appearance on any bones, but commonly observed in long bones of the limbs	Non-specific stressors (multiple factors) throughout life Lesion resulting from inflammation of the periosteum (the membranous sheath covering the outer surface of bone)	Stress



Figure 21 – Cribra orbitalia (seen as small holes in the bone) of the eye socket. “Cribra orbitalia” by Dead Men Tell Tales is marked with CC BY-SA 4.0.

Growth and Development

Other features of the skeleton can allow bioarchaeologists to make inferences about the impact of stress and disease on the skeletons of children during growth. Studying the remains of children from the past allows archaeologists to measure the impact of stress (both physical and psychological) on those remains. This information can be combined with other types of archaeological evidence to build a picture of the stressors affecting peoples of the past. Understanding how stress during growth impacts the appearance and later health of adults is important for understanding paleodemographic patterns and, ultimately, the evolutionary adaptations different populations utilize. Lengths and widths of long bones have been used to estimate the physiological age of children. “Physiological age” refers to the maturity of body structures, rather than a specific reference to time (chronological age). Conversely, age estimation from the eruption or development of teeth provides a more accurate chronological age in terms of ranges of days, months, and years. Assessing the age of individuals in this way allows growth rate and delays in growth to be examined in cultural context. Some researchers have used the frequency of stress markers in childhood, such as linear enamel hypoplasia (LEH) in teeth, along with the presence of periosteal reactions, cribra orbitalia, and porotic hyperostosis that appear on the skeleton, to predict mortality in adulthood. Studies have shown that individuals with more LEHs (or earlier forming LEHs) who experienced stress during childhood tend to die earlier than those individuals exhibiting fewer LEHs (Temple, 2014). You can practice analyzing skeletal stress in the third activity listed in [Additional Exercises](#) at the end of this chapter.

Diet and Migration

Reconstructing past diets can provide additional context for evaluating the effects of nutrition on growth, development, stress, and disease. There are many ways to study paleodiets archaeologically; you can analyze the plant and animal remains from sites, the microwear related to food processing on tools, the coprolites (fossilized feces), and the residue from pottery and ground stones. However, these methods do not demonstrate the effect of food processing (grinding, cooking, fermenting, etc.) on growth and development. This is made more complicated by the general lack of plant and animal remains at gravesites.

Chemical analyses using isotopes from bones and teeth has become a standard practice in bioarchaeology (Ambrose and Krigbaum 2003; Jaouen and Pons 2017). Isotopes are atoms that are of the same element but have differing atomic masses. Atomic mass is the number of protons plus the number of neutrons, but the chemical properties of an atom are determined by the number of protons alone. Thus, isotopes are two atoms of the same element (same number of protons), but with differing numbers of neutrons. In archaeology, the most commonly used isotopes are carbon, nitrogen, oxygen, strontium, and sulfur. Bioarchaeologists can examine isotope ratios in hair, teeth, bone, and fingernails. Using stable isotopes, or isotopes that are not highly radioactive, bioarchaeologists can study issues of disease, cultural affiliation, migration, and diet. Because you literally are what you eat, carbon and nitrogen levels in bone protein (mostly collagen) and bone minerals (hydroxyapatite) reflect what plant, animal, and fish sources were consumed by the individual. However, bone is constantly being built and destroyed by the skeletomuscular system, so these analyses only reveal what was eaten in the last decade of life. Unlike bone, dental tissues do not remodel after growth in childhood; therefore isotopes from teeth archive childhood diets, when tooth formation was active. When ratios in teeth are compared to ratios of the same elements in bones, it can show changes in diet over the individual’s lifespan. Studies of migration and provenience use the oxygen and hydrogen isotopes that occur in drinking water. Because oxygen ratios vary by region, the

rates in bone reflect the region the individual lived in or traveled to near the time of their death, while these same ratios in teeth reflect the region of drinking water during their growth in early life.

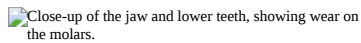


Figure 22 – Dental attrition (wear) of the mandibular molars (appearing as ground, rounded, and flattened cusps of the white tooth crowns with yellow dentin exposure) as well as calculus, appearing as white clumps and brown staining, under the dental enamel. (Courtesy S. H. Blatt, used with permission for this book.)

Another innovative way that bioarchaeologists may study diet is from dental surfaces. Researchers have analyzed the textures and depths of micro-scratches on the chewing surfaces of teeth to identify hard or soft food consumption. The calcified dental plaque (dental calculus) on the enamel is another direct means of examining diet (Figure 22). It was in this way that bioarchaeologists were approached by the Portsmouth African Burying Ground Stewardship Committee in New Hampshire to examine phytoliths in dental calculus from the skeletons recovered. The stakeholders of the project were particularly interested in understanding the rich cultural history of certain foods and meals for modern African Americans. Bioarchaeologists can scrape calculus from teeth and, through a series of washes and different microscopy methods, identify food particles and other items like fibers and bacteria. When eating plants, silica micro-fossils from plant tissue, called phytoliths, can become embedded in the enamel and dental calculus. These phytoliths are morphologically variable, allowing not only the type of plant to be identified, but also the specific tissue of the plant that was consumed. Similarly, pollen, starch, and diatoms (single-celled algae like plankton) can also be identified in dental calculus, opening up a new world of examining both the living and burial environment of the individual.

Special Topics – Isotopes and Migration

In 2013, a human skull was handed over to Dr. Samantha Blatt (a common occurrence for a bioarchaeologist). The skull had been in the possession of the Idaho State Historic Preservation Office for a number of years, but had not yet been analyzed. Unfortunately, there was little information about the context of the discovery, the time period of the remains, and the cultural affinity of the remains. It is not uncommon for bioarchaeologists to receive remains from all over the world that were used as ornamental pieces or for private collections without documentation, therefore the skull was analyzed to help bring this information to light.

The skull appeared archaeological based on dental attrition and was later dated using radiocarbon to CE 1300 to CE 1415. Using biological profile methods, the individual was estimated to be a middle-aged female and likely of Native American descent. At this point, Dr. Blatt notified the state archaeologist and contacted regional Indigenous groups for consultation and repatriation.

Most notably, the skull was covered in a red pigment with hairs attached. Dr. Blatt and her colleagues (Watkins et al. 2017) analyzed the chemical structure of the pigment and the microscopic identity of the hairs, conducted mitochondrial DNA (mtDNA) analysis from a sample of bone and dental calculus, and compared the carbon and oxygen isotope ratios from bone and tooth samples.

The analyses revealed that two different kinds of hairs were distinguishable. One of the hair types was identified as human, while the others were most consistent with the hairs of sheep, deer, or dog. The pigment on the skull was analyzed using scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), and micro X-ray fluorescence (XRF). The EDS results indicated that the pigment was mercury sulfide or cinnabar. Unfortunately, since cinnabar chemistry has not been thoroughly sourced around the globe, trace elements could not be used to place the origins of the cinnabar. Results of the mtDNA analysis indicated that the DNA was poorly preserved. However, amplification of the sample revealed that the individual carried a 9 bp deletion, indicating that the individual was indeed Native American. Still, Dr. Blatt did not know which tribe or region the individual came from. After the results indicated the general origins of the skull, bioarchaeologists and state archaeologists repatriated the remains to Indigenous descendants of the region closest to where the remains were believed to be found (refer to section about NAGPRA below).

The isotopic carbon values indicated that C3 plants and salmon were likely a large part of the individual's diet. The oxygen isotopes of the teeth and bone in the samples differed. The bone had significantly lower carbon and oxygen values, indicating that this individual had migrated from a different location early in early life. The oxygen isotopic values from the teeth suggested that the individual had ingested water from a high latitude or altitude, beyond the archaeological evidence of their having lived on the highest peak in Idaho. These oxygen values from the teeth and bones, though they varied, both suggested that the individual had ingested water from a range of locations north of Idaho, such as in Canada, Alaska (in early life), and even higher in the Rockies (later in life). These data were unexpected, but underscored the need for and value of using multiple analyses in bioarchaeology.

Taphonomy of starches from dental calculus has given clues to food processing and the heating of foods. Researchers even study the DNA from oral bacteria in dental calculus to understand the impact of disease and coevolution with changes in diet and subsistence practices. One of the first studies examining dental calculus in humans from an archaeological site (Blatt et al. 2011) found bacteria, phytoliths, and cotton fibers in calculus from prehistoric Ohio. Interestingly, cotton cannot grow in Ohio! In order for these people to have had cotton in Ohio, they would have had to trade with other people in a different region where cotton could grow or travel there themselves. This discovery from the calculus had implications for early trade routes and crafting practices in prehistoric populations.

Aside from the dietary uses of isotopes, they can also inform bioarchaeologists about geographic origins and migrations of individuals. Dr. Lesley Gregoricka and colleagues (2014) at the University of South Alabama, used strontium isotopes in the dental enamel to test the geographic origins of six individuals believed to be vampires, buried in a Polish cemetery dating to the 17th and 18th centuries. Villagers had placed iron sickles across their necks and stones below their jaws. These items are apotropaic or symbols of a vampire burial — they were an attempt to prevent the “undead” from reawakening and biting another victim. These “vampires” were not those portrayed in film (though they inspired such portrayals) — they were individuals who would have been feared as monstrous and/or suspected of taboo behavior. Dr. Gregoricka and her coworkers (2014) found that all of the individuals marked as “vampires” in the cemetery were local to the region, so while it is not likely they were feared because they were unknown foreigners, they could have been some of the first villagers to die of cholera, which was believed to have supernatural causes at the time.

Listen to Dr. Gregoricka on this [NPR interview](#) discussing her research or read the article [here](#).

In bioarchaeology, the transition from foraging (hunting and gathering) to agricultural (farming) communities has been examined across the globe. Of particular interest is how the diets of farmers resulted in disease and stress reactions, which varied from the impact of foragers' diets. In North America, increased consumption of maize has often been correlated with an increase in dental disease and infectious diseases simultaneously accompanying a more sedentary lifestyle. Consumption of certain foods, like maize versus meats, have also been shown to distinguish the diets of males and females (implying gendered differences), members of social and ethnic classes, and age or life stage at some sites. Conversely, consumption of rice in the agricultural communities of Southeast Asia, did not have the same impact on dental health and increased dental cavities as maize or corn did elsewhere (Halcrow et al., 2013). So, bioarchaeologists seek to understand foodways in order to capture aspects of culture and lived experiences within context, but also comparatively.

NAGPRA and a History of Ethics in Bioarchaeology

In the United States and other countries, archaeologists who recover, curate, or study human remains and funerary artifacts do so while abiding by state and federal laws aimed to protect the civil and spiritual legacies of descendant communities. But these laws have not always existed. In the late 19th century, the cultural and biological remains of Native Americans were often looted and put on display or sold without consideration of how Indigenous peoples were harmed by these actions. During that time, museums like the Smithsonian Institute, the Army Medical Museum, and the American Museum of Natural History were opening and competition grew among them to fill their exhibit halls and storage shelves. Most of these artifacts were obtained by anthropologists or untrained archaeologists.

 A black and white photo of a small boy sitting on the steps of a building.

Figure 23 – The orphaned Inuit child, Minik, who was brought to New York City in 1897 for study. “Minik in New York” by unknown author is in the public domain.

The founders of American anthropology played unfortunate roles in perpetuating the disregard for Indigenous remains under the guise of their own cultural and temporal biases. For instance, Franz Boas, the “father of American anthropology,” not only bought and sold Native American remains, but also helped orchestrate the invasive study of living Indigenous peoples. At the request of Boas, Lieutenant Robert Peary brought six Inuit from Greenland to New York City in September of 1897, to live at the American Museum of Natural History. Thousands of visitors to the museum paid a quarter to view them. Within a few weeks, the Inuit began to get sick. By February 1898, they began to die from tuberculosis. Within eight months only two Inuit had survived, one an orphaned boy named Minik (Figure 23).

Minik remained in New York and was adopted by the museum superintendent. When Minik’s father died, the museum staff and Boas staged a mock funeral in Central Park. There was no body buried; instead Minik’s father was dissected and his remains were stored at the museum. Minik later learned the truth about his father’s remains through newspaper articles and demanded the return of his father’s body. Many years later, in 1992, the body of Minik’s father was returned to Greenland, but was met with hesitation by some of the Inuit who did not venerate, but rather reviled dead bodies. Reburial and return of remains in this case called for an individualized approach to the situation, an approach that was beginning to be realized among all anthropologists in North America at the time.

Civil Rights and the Road to NAGPRA

In the early 1970s, Native American groups sparked a civil rights movement in response to the long history of looting and destruction of the cultural and biological remains of Indigenous peoples. Among many others fighting for protection of Indigenous rights at this time, Maria Pearson protested the unequal treatment of Native American remains compared to those of white Americans being uncovered during road construction in Glenwood, Iowa. The remains of the white Americans were immediately reburied, while those of the Native Americans were sent for study. Her activism following this incident led to the passage of the Iowa Burials Protection Act in 1976. This was the first legislative act passed in the United States specifically protecting Native American remains. Her work started a cascade effect in legislature and anthropological acknowledgment of the civil rights of Native Americans regarding their cultural and biological remains.

In 1986, the Society for American Archaeology devised the Statement Concerning the Treatment of Human Remains, which prompted the need for communication and understanding among archaeologists and Indigenous peoples. In 1986 (updated in 2021), the Advisory Council on Historic Preservation outlined six principles regarding the treatment of human remains and grave goods, and this included the consideration of preserving rather than excavating burials, treatment of remains during study, and reburial or repatriation on a case-by-case basis. In 1989, the World Archaeological Congress adopted clauses concerning the science and treatment of human remains put forth by the Vermillion Accord developed by archaeologists and Indigenous peoples together. Many federal laws seeking to preserve and protect archaeological artifacts had been enacted and revised prior to and during this time period. For example, the 1970 UNESCO (United Nations Educational, Scientific and Cultural Organization) conventions also sought to regulate the import and export of cultural objects in museums and public institutions and the return of objects. Yet, it was not until 1990 that the Native American Graves Protection and Repatriation Act (NAGPRA) was passed.

NAGPRA requires federal agencies and institutions that receive federal funding to return Native American cultural items to their descendants and culturally affiliated tribes (Table 5). “Cultural items” include human remains, funerary objects, sacred objects, and objects that have ongoing cultural significance that can be shown to have lineal descent. This law requires that agencies holding such remains provide inventories and written summaries of their holdings and consult with descendant populations to agree upon the repatriation, or the return and disposition of the artifacts and remains. NAGPRA provides guidance for repatriation, the long-

term care of items, and federal funding. Agencies must work to establish the cultural affiliation of a descendant population with artifacts or remains. Once cultural affiliation is established, those descendant groups are granted the final determination about the disposition of the artifacts and remains. Cultural affiliation is established based on overall examination of historic and prehistoric evidence of group identity including biological, archaeological, linguistic, and oral tradition to a geographic area. Any claim considered “reasonable” is valid as it is recognized that claimants may face an unfair or impossible task into absolutely proving their connection with cultural items. In this respect, historic and archaeological gaps in knowledge about Indigenous peoples’ history and migrations are not considered to be strong enough evidence against a claim for cultural affiliation. Even so, some tribes have struggled to obtain federal recognition as Native Americans, which has precluded their role in the dialogue of NAGPRA and in claiming cultural affiliation.

Table 5 – Main Features of NAGPRA

- Federal funding and guidelines for the treatment and return of Native American human remains and funerary goods.
- Cultural items include: human remains, associated or unassociated funerary objects, sacred objects, and objects of lineal descent.
- Agencies (e.g. museums and universities) must establish cultural affiliation of the remains.
- Cultural affiliation can be established through archaeology, history, linguistics, genetics, and oral tradition.
- Acknowledgement that affiliation is not always possible through evidence, but beyond reasonable doubt is unneeded.
- Tribes must be consulted if remains are recovered or if there is a potential for remains being disturbed.

Learn more about the [Native American Graves Protection and Repatriation Act](#) through the National Park Service.

NAGPRA also requires that Indian tribes or Native Hawaiian organizations be consulted whenever archaeological investigations encounter or may expect to encounter cultural items on federal or tribal lands. In the case that cultural items are excavated or removed, specific procedures according to the 1979 Archaeological Resources Protection Act (ARPA) must be followed. For example, if human remains were unexpectedly recovered on federal or tribal lands or lands transferred by the federal government to states under the Water Resources Department Act, excavations must stop and culturally-affiliated groups must be contacted. Any further excavation plans would then need to follow ARPA and come under tribal review. Violation of ARPA, Section 106 is considered a felony and involves fines and other punishments. Violation of NAGPRA is similarly a criminal offense which can result in 12 months imprisonment and a \$100,000 fine. The first major test of NAGPRA was “The Ancient One” (see Special Topics box below).

Special Topics – The Ancient One

In many ways, NAGPRA dramatically changed the day-to-day practices of archaeologists and bioarchaeologists and is helping to stimulate collaborative interactions among bioarchaeologists, archaeologists, and descendant communities to build more constructive and holistic partnerships. Since this legislation, nearly one million human remains, funerary objects, and sacred objects have been repatriated.

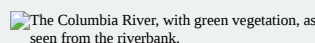


Figure 24 – The Ancient One (also known as the Kennewick Man) was found on the banks of the Columbia River, near Kennewick, Washington. (“Columbia River” by Ken Lund is marked with CC BY-SA 2.0.)

This is not to suggest that compliance with NAGPRA or the tumultuous history of archaeologist–Native American interactions is uncomplicated, unevolving, or settled. One of the most heated battles following the enactment of NAGPRA surrounded the discovery of skeletal remains in 1996 near Kennewick, Washington (Figure 24). At first, these remains found along the Columbia River were thought to be modern and of forensic significance, but an archaeological team led by James Chatters dated the skeleton to 8,900 to 9,000 years old. This skeleton came to be referred to as Kennewick Man or “The Ancient One” by Native Americans.

The individual was estimated to be a middle-aged man, approximately 5’ 7” to 5’ 9”. He had a projectile point embedded in the ilium of his pelvis sometime before death. He also had moderate arthritis in his elbow, knees and vertebrae, and healed

fractures. Carbon, nitrogen, and oxygen isotopes in his bone collagen indicated that he had consumed a diet of marine mammals almost exclusively for decades prior to his death and that he'd drunk glacial water melt from as far away as Alaska. This suggested that he was highly mobile along the Northwestern coast during his life.

Though DNA analysis in 2015 clearly indicated that The Ancient One was more closely related to Native Americans than to any other living population and that in particular his genetic profile was related to those of living members of the Confederated Tribes of the Colville Reservation, these data were revealed long after prior examinations were done by biological anthropologists. These researchers suggested that the individual had cranial traits that appeared inconsistent with traits understood to be associated with Native Americans. Many outside of the scientific community took this statement to infer that Europeans and not Native Americans were among the earliest inhabitants of the Americas. A long legal battle ensued, and the Umatilla tribe claimed the remains but this claim was contested by researchers. Several anthropologists brought legal suits against the United States to conduct testing on the skeleton.

By all accounts the antiquity alone of these remains make them unique and rare in North America. Initially, researchers were allowed to continue their study. In 2004, the United States Court of Appeals for the Ninth Circuit rejected the appeal to this case brought by the United States Army Corps of Engineers and Umatilla, Colville, Yakama, and Nez Perce tribes on the grounds that cultural affiliation was not clear. In 2005, Senator John McCain attempted to introduce an amendment to NAGPRA changing the definition of Native American to include past and present cultural groups. If passed, The Ancient One would have been more easily affiliated with a tribe. But since cultural affiliation was not assigned, the remains were kept at the Burke Museum in Washington, away from the eyes of the public, and under the legal ownership of the Army Corps of Engineers, who denied researchers access to the skeleton for further study.

Though later researchers refined this ancestry estimation to include Native Americans, Ainu, Polynesians, and other East Asian groups, the initial claim halted an expedient repatriation and created much tension between researchers and Indigenous groups. Finally, in 2016, the United States House and Senate passed legislation to repatriate The Ancient One to a coalition of Columbia Basin tribes for reburial according to their traditions. In 2017, one day after being cataloged according to NAGPRA, hundreds of members from Columbian Basin tribes witnessed his reburial. Currently, the extent of physical variation among Native Americans is better recognized, and it is clear that The Ancient One possesses traits consistent with the early North American inhabitants.

See "[The Kennewick Man Finally Freed to Share His Secrets](#)" to learn more.

Current Issues in Bioarchaeology

While bioarchaeologists study the past, they use modern methods. As in any science, research trends change over time. Current trends in bioarchaeology reflect the desire to learn more about the specific individual life experience, as well as the influence of larger environmental and social processes on the individual and population across the course of life. These larger environmental and social processes can inform current problems that affect communities around the globe. Just as uncovering the remains of The Ancient One had repercussions for Native American tribal members and future NAGPRA cases, bioarchaeological research today is driven by current issues.

Osteobiography and the Individual

Osteobiography, a term used to define the exhaustive collection of all information about a given individual, was coined in the 1970s but has regained popularity recently in bioarchaeological research. Through the careful investigation of all evidence related to the individual (e.g., skeletal remains, grave goods, historical records, and mortuary data), a detailed life narrative can be developed. Understanding the individual does, in effect, help researchers to understand and humanize the population data that bioarchaeologists have traditionally analyzed. For instance, an individual with significant healed fractures may signal to the bioarchaeologist that the population cared for this person during their healing process. Osteobiographies result in more sophisticated understandings of personal identity during life (Hosek and Robb 2019) and can result in more empathetic and sensitive portrayals of past people (Boutin and Callahan 2019). Osteobiographies, in this way, serve as a bridge between qualitative and quantitative social science research. Alexis Boutin provides a fictive osteobiography sample in "An Osteobiographical Narrative in Alalakh". You could learn more about the Bioarchaeology of children in the video [Osteobiography: Human Studies from the Bones](#).

One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://pb.libretexts.org/tracesarchaeology/?p=239#oembed-1>

Histology and Molecular Studies

Histology, or the study of microscopic tissues, can be applied to both bone and dentition. Bioarchaeologists may elect to use histological methods to address different research questions. For instance, dental histology can reveal data about incremental growth patterns and health disruptions that cannot be known by examining the dental enamel with the naked eye (Michael 2016; Moes and Blatt 2018). Bone histology may help bioarchaeologists to understand patterns of decomposition and burial environment within and between individuals at a cemetery site (Turner-Walker and Jans 2008). Looking within the bone to see bacterial or fungal changes/invasions can help bioarchaeologists reconstruct the postmortem burial environment.

Molecular studies similarly use a fine-grained approach to understanding the past (Lambert and Grupe 2013). Ancient DNA can be used to understand varied experiences of the human past including migration patterns, food exchange and consumption, changes in diet and composition of ceramics, and even soil analysis and land use.

Bioarchaeologists explore the pressures that resulted in human migration, competition, and resource exhaustion in the past, though these issues are becoming increasingly important to examine in our increasingly global world (Harrod and Martin, 2013; Schug 2011). Through isotope studies, human movement and migration can be mapped in the past. Cross-disciplinary data from geographers, geologists, and historians can help bioarchaeologists interpret skeletal evidence of violence and disease. Archaeological evidence for collapsing or transitioning social networks and mass spread of disease can sometimes be linked to changes in environment, climate, and resources that may have pushed a population to the brink or sped up clashes between populations. To learn more, you can read “[The Long View of Climate Change and Human Health](#)” and/or watch “[Bioarchaeology and Climate Change 103](#).”

One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://pb.libretexts.org/tracesarchaeology/?p=239#oembed-2>

Gender and Performance in the Past

Bioarchaeologists necessarily are concerned with examining gender and potential gender roles in the past. Gender should not be conflated with sex estimation, but rather seen as a lived performance (Walker and Cook 1998). Gender roles and expectations can shift over an individual's lifetime, so “seeing” gender in the archaeological record can be a complex interpretive task. Feminist scholarship in bioarchaeology has greatly improved how we envision gender roles, performance, expectations, and identity in past populations (Agarwal and Wesp 2017; Sofaer 2009).

Current conversations and research into LGBTQ2S+ (lesbian, gay, bisexual, transgender, queer, Two Spirit, and more), nonbinary, and intersex individuals in the past is starting to be explored in the field. While these terms are modern and may not exclusively reflect gender or sexuality diversity of past societies, gender identities outside of just masculine and feminine are not a modern invention. Gender identity is fluid and a personal experience and both gender and sex run along a spectrum (there are chromosomal combinations beyond XX and XY and hormonal effects that can modify trait expression of sexual characteristics). So, there may not be material correlates left behind for archaeologists to interpret gender or sex from a skeleton alone. Deeper investigations into skeletal morphology, DNA, grave goods, and any existing historical records may provide further context.

A recent example, the re-analysis of the Revolutionary War general Casimir Pulaski, illustrates how detailed explorations of skeletal biology, sex, and gender can result in broader understandings of gender performance in the past across cultures (Estabrook and Powell 2016). The circumstances surrounding Pulaski's death and burial in 1779 were unclear, leaving the identity of the person buried at the associated monument uncertain. When the skeletal remains were examined, they appeared to be consistent with Pulaski's height, age at death, and known injuries, however had traits most consistent with a female. So, scholars have debated whether Pulaski was in fact intersex. Pulaski's identity was later confirmed through DNA. Additionally, Pulaski was found to have a condition called congenital adrenal hyperplasia, in which a genetic XX chromosome female is exposed to high testosterone during fetal development and is born with male sex characteristics. For more on Casimir Pulaski, see “[Revolutionary War Hero's Skeleton Suggests He Was Intersex](#).”

The incorporation of gender theory into bioarchaeological analyses has now started to be applied in forensic anthropology and law enforcement with some scholars' work focusing on identification of LGBTQ2S+ individuals from gender-affirming surgeries and contextual evidence, strategies to understand and reduce harm to LGBTQ2S+ victims and including a holistic approach. The theories and methods used and developed within archaeology are, therefore, useful in the modern world, not just in interpretations of the past

Interested in seeing how gender is important to reconstructing the identity of unknown individuals in forensics? Explore the resources available through the [Trans Doe Task Force](#).

Violence and Skeletal Evidence of Trauma

Skeletal evidence of trauma, in association with mortuary and archaeological evidence, may help bioarchaeologists reconstruct singular or pervasive intra- and inter-group conflict in the past. Injury patterns, rates and types of injuries throughout life, and differences between males and females may all be important pieces of information to consider in groups with documented or suspected warfare, raiding, and conflict histories. Broader narratives about the cultural and ritual aspects of violence can be illustrative in understanding human behavior in the past (Martin and Harrod 2015; Walker 2001).

Forensic and archaeological evidence of trauma on the skeleton can reveal a lot about complex social issues and structural violence, a form of violence in which social structure and institutions mandate and perpetuate inequality thereby causing harm, beyond simply documenting evidence of cause of death. Harm from structural violence can include physical harm visible on the skeleton including skeletal trauma evidence resulting from marginalization of a group of people impacting their growth, diet, health, and health care. When patterns emerge in the form of varying frequencies of disease, stress, malnutrition, and trauma by comparing skeletons from different social classes or groups, societal measures inflicting (intentionally or unintentionally) structural violence may be the root cause. Bioarchaeologists can document both the skeletal results of such violence and the societal parameters from cultural-historical evidence.

Tulsa, Oklahoma in 1921 witnessed one of the most violent racially motivated events in United States history. In the past 75 years, this massacre, which took the lives of 300 Black community members, was swept under the rug of history. Mob violence erupted at a courthouse when shots were fired at a wrongfully accused Black teenage boy, which after two days left the otherwise prosperous, peaceful, and primarily Black Greenwood community, called the “Black Wall Street,” destroyed. Beginning in 2020, Dr. Phoebe Stubblefield began excavations of the unmarked graves of the Tulsa Massacre to help identify the victims of that tragedy and rebury them honorably for their families. Dr. Stubblefield, herself, is a descendant of Tulsa Massacre victims and her work has opened a stage for very public discussions amongst bioarchaeologists about the history of racism in the field, the methods that biological anthropologists use to estimate ancestry, and the disproportionate use of persons of color and marginalized bodies in skeletal collections for research. As Dr. Stubblefield said herself, “[I work with the dead, but this can help the living.](#)” In a very real sense, bioarchaeologists and forensic anthropologists can impact modern lives by coming to grips with the violence of the past.

You can learn more about the massacre [here](#) and watch Dr. Kary Stackelbeck speak about her archaeological work at the site [here](#).

Collaboration With Descendant Communities

An important part of honoring the past is connecting material culture to living descendant communities (Colwell 2016; Tully 2007). Community-based archaeological projects actively engage descendants to guide, inform, and/or lead bioarchaeological research about ancestors. While not all community members may want to be part of the excavation process, *all* bioarchaeologists must respect the wishes of descendant communities when developing their research plans. Importantly, if community members have not been consulted, bioarchaeologists should contact these groups and open meaningful dialogue about research questions and practices. Bioarchaeological research, which should always center the wishes of the communities most affected by the archaeological discoveries, has begun working toward research questions most meaningful and relevant to descendant communities.

Chapter Highlights and Conclusions

In this chapter, you were introduced to the work of bioarchaeologists analyzing the human skeleton to interpret broad anthropology themes about demography, gender, disease, diet, stress, migrations, behavior, and lifestyles of past peoples. We opened the laboratory doors to help you peek in to find the reconstruction of a biological profile to identify the age, sex, ancestry, and stature of an individual from their skeleton and how taphonomy and practices like cremation can help archaeologists understand mortuary rituals and environmental stressors. Then we explored the six categories of bone disease, which can help narrow down answers for questions about malnutrition, human-environment interactions, caretaking, violence, and childhood. We also saw how technologies in microscopy and histology, chemical analyses like isotopes, GIS applications, and the integration of multidisciplinary methods beyond anthropology can all be applied to understanding life in the past.

Perhaps most importantly, we saw how bioarchaeology is the study of life from death and is both influenced by and can influence current issues in the modern world. The lives and people of the past bioarchaeologists study are important to their living descendants today and it should be a prime focus of bioarchaeologists to consult with, collaborate with, and honor the legacies of the ancestors of descendant communities by following federal laws like NAGPRA and archaeological ethics. Bioarchaeology is dependent on the field methods of archaeology and the theories and interpretive procedures of anthropology as a whole just as it attempts to extract multiple levels of data from a single component of human existence — the skeleton.

Discussion Questions

1. What kinds of questions can bioarchaeologists answer from studying human skeletal remains?
2. How does bioarchaeology relate to archaeology?
3. What is taphonomy, and why is an understanding of taphonomy often critical in human skeletal remains analyses?
4. What is NAGPRA, and how does it relate to ethics in bioarchaeology?
5. What is paleopathology, and how is it used to interpret past health and behavior?
6. What are some of the current issues and themes in bioarchaeological research?

Additional Exercises

1. The Florida Public Archaeology Network has a resource called G.R.A.V.E. (Gravestone Research and Volunteer-based Education) that may be modified to fit instructors' needs or students' interests. Explore <http://www.fpan.us/lesson-plans/g-r-a-v-e-gravestone-research-and-volunteer-based-education/>. Ask students to consider the following during their explorations of gravestones and cemeteries: 1) What factors might influence grave organization and gravestone type?; 2) How does socioeconomic status of individuals and communities affect cemetery organization? Maintenance?; 3) Can anything about religious beliefs or personal values be inferred from the cemetery and/or the gravestones?
2. Practice MNI with this activity, prepared for the [Explorations Lab and Activities Manual](#): <https://docs.google.com/document/d/1poWStx-dnyvdovVX4V6fy7Hb99xV1Fn2SAEjn6TqrXw/edit>
3. Try your hand at analyzing real data collected from two archaeological sites, comparing the diets and lifestyles of foragers versus agriculturalists in the prehistoric villages of Hardin and Indian Knoll in the American Midwest. [The Tale Bones Tell](#) activity was prepared to accompany the Nova video "The Great Inca Rebellion."

About the Authors

 Dr. Samantha Blatt is currently an assistant professor at Idaho State University. Originally from the East Coast, she received her Ph.D. from the Ohio State University in biological anthropology with an emphasis in bioarchaeology and dental anthropology. Her research interests have focused on the histological microstructures of dental and skeletal tissues, disease, growth, and childhood in ancient North America, forensic and archaeological taphonomy of teeth, and individualizing skeletal traits. She is particularly interested in using innovative methods and strategies to revitalize cold cases and has worked to repatriate numerous NAGPRA-related skeletal remains. Her work with museum collections and preservation offices includes analyses of 40,000-year-old canids, shrunken heads, prehistoric and historic dental calculus, cannibalized remains from the Cook Islands, and an Incan mummy. She has two bulldogs, Falkor and Atreyu, and loves thrifting, '80s films, and exploring old museums, and once went on a vacation to try 200 types of cheeses.

 Amy Michael is a biological anthropologist specializing in the investigation of human tooth and bone microstructure in an effort to answer questions about past and modern bodies. Using the principles of skeletal biology, Michael asks questions about health, pathology and age-at-death to better understand people in the past and present. With training in bioarchaeology, forensic anthropology and historical archaeology, Amy has worked on field projects in the United States, Belize and Albania. Dr. Michael is passionate about bringing a social justice perspective to her work on forensic cold cases. She is a founding board member and Director of Professional Collaboration for the Trans Doe Task Force, a grassroots organization led by forensic genealogists and supported by anthropologists, which works to identify transgender and non-binary decedents in forensic cases. Outside of work, Michael enjoys collecting obscure horror movies, hiking through the mountains, and doting on her senior pug.

 Lisa Bright (Ph.D, RPA) is an archaeologist and also a consultation coordinator at the California Department of Transportation. She teaches anthropology at several community colleges in Northern California. Lisa has previously worked as the campus archaeologist for Michigan State University and as an osteologist for cultural resource management projects. Her primary research interests include taphonomy, paleopathology, and the biological impacts of institutions. Lisa's doctoral research focused on the health and nutrition of a historic indigent cemetery near San Jose, California. Lisa enjoys cooking, reading, and camping with her husband and two dachshunds.

Further Exploration

"The Archaeology of Disease Documented in Skeletons," a lecture by Charlotte Roberts: https://www.youtube.com/watch?v=sTcMCCP_Lkg

“Bioarchaeology and Climate Change 103,” a video lecture: <https://www.youtube.com/watch?v=EkAIfW54KXA>

Central Belize Archaeological Survey: <http://anthropology.msu.edu/cbasproject/>

Digging Up the Dead, by Joanna Pearce: <https://www.sapiens.org/archaeology/mortuary-archaeology/>

Digitised Diseases: <http://www.digitiseddiseases.org/alpha/>

DNA Doe Project: <https://dnadoeproject.org/>

eForensics: https://eforensics.info/learning_module/index/

eSkeletons: <http://eskeletons.org/>

See especially the Taphonomy module (https://eforensics.info/learning_module/taphonomy/)

Explorations: An Open Invitation to Biological Anthropology: <https://explorations.americananthro.org/>

See especially Chapter 15 – Bioarchaeology and Forensic Anthropology (<https://explorations.americananthro.org/wp-content/uploads/2019/11/Chapter-15-Bioarchaeology-and-Forensic-Anthropology-3.0-1.pdf>) and Appendix A – Osteology (<https://explorations.americananthro.org/wp-content/uploads/2019/11/Appendix-A-Osteology-V-2.0.pdf>)

FOROST: <http://forensicosteology.org/buscar.php?language=en>

“He Escaped from Jail After Allegedly Killing His Wife a Century Ago. Now His Headless Torso Has Been Identified Through DNA”: <https://www.washingtonpost.com/history/2020/01/02/he-escaped-jail-after-killing-his-wife-century-ago-now-his-headless-torso-has-been-identified-through-dna/>

Introduction to Human Osteology: <https://scholarworks.gvsu.edu/cgi/viewcontent.cgi?article=1004&context=books>

“Kennewick Man Finally Freed to Share His Secrets,” by Douglas Preston: <https://www.smithsonianmag.com/history/kennewick-man-finally-freed-share-his-secrets-180952462/>

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2.8: Historical Archaeology

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Learning Objectives

- Define historical archaeology and discuss its contributions
- Explain how historical archaeologists work with artifacts, written documents, and oral histories
- Discuss examples of historical archaeology in North America

Introduction: What is Historical Archaeology?

Historical archaeology is a subdiscipline of archaeology that includes the study of artifacts, oral histories, and documentary records, among other lines of evidence, to investigate questions about our more recent past. According to Barbara Little, historical archaeologists' goals include "preserving and interpreting sites, supplementing and challenging the history we know through documents, reconstructing people's ways of life, improving archaeological methods, and understanding modernization and globalization" (Little 2007, p. 22). Archaeologists who specialize in this type of research are called historical archaeologists. (A historic archaeologist, on the other hand, would refer to someone who did archaeology in the past. For example, the late 18th-century excavations directed by Thomas Jefferson at a burial mound in Monacan Indian territory of what is today known as Virginia could be described as historic archaeology.) (Hantman and Dunham, 1993).

Historical archaeology in North America often involves research on places that have a post-contact occupation, referring to the period after Europeans made contact with the Indigenous people of North America. Contact may include physical interactions, the exchange of trade goods, or the introduction of new plants, animals, and diseases. However, historical archaeology doesn't automatically begin whenever Europeans arrived somewhere. Many communities around the world have documented history before European contact, but in this chapter we focus on historical archaeological sites from North America that include places that people lived in before, during, and after contact with Europeans and other non-Native Americans. There are also historic sites with deep Tribal histories and were never home to Euro-American people, and still other sites that have significant, multilayered immigrant histories. Keep in mind that there is no single date that marks a divide between pre-contact and post-contact sites in North America or other colonial contexts. European colonial contact happened across the continent and the world over hundreds of years. Furthermore, many European goods were traded among Tribal and other Indigenous people before any European person ever showed up in person because of existing Indigenous trade networks. Since archaeologists examine material culture (such as trade goods), trade networks and interactions in the historic period are important to us.

In James Deetz's classic book *In Small Things Forgotten*, he described historical archaeology as "the archaeology of the spread of European cultures throughout the world since the fifteenth century, and their impact on and interaction with the cultures of indigenous people" (1977, p. 5). Deetz revised his definition in a later edition, acknowledging that Indigenous people impacted European people as well, and that African people and immigrants other than Europeans have also played important roles in history. Deetz wrote that "both African American and Asian American archaeology are integral components of American historical archaeology, as is the history of the Native American peoples following the initial contact with European peoples" (Deetz 1996, p. 6).

Historical archaeology has become more concerned with the "archaeology of the modern world" (Orser and Fagan 1995) or, more broadly, "the development of the modern world" (Little 2007, p. 14). Archaeologist Robert Paynter wrote that in addition to studying culture, we should examine capitalism, class structure, and the various effects of the modern world on different communities (1988). Understanding the "modern world" means that we must examine the large global networks that were established by colonial settlement and how people and artifacts moved across those networks (see Hall 2000, p. 2), as well as how colonial settlement was driven by the economy of merchant capitalism (Hall 2000, p. 18).

Historical archaeology cannot be limited to a certain time period or defined by the appearance of a single dataset, like written records (Little 2007). This is because the contexts that have helped to form our definitions of what is and is not historical

archaeology have changed with the evolution of the discipline, which is the subject of the next section. For better or worse, archaeology and historical archaeology have developed out of European fields of study that defined periods and groups in relation to European modes of thought. This means that early definitions for historical archaeology were led by those modes of thought but have not remained static. We have revised the definition of the field in North America and our expanded research questions to examine the various processes that have shaped the human experience, including social, cultural, economic, and political.

In This Chapter

In this chapter, we will explore some of the important themes and research questions investigated by historical archaeologists using examples from the United States and Canada. We will also briefly trace the theoretical and methodological developments in the field. Understanding the history of our discipline helps us understand why we do historical archaeology the way we do and what we can improve upon. We also reflect on how archaeological interpretations have political power of their own. We will examine how historical archaeologists use artifacts, documents, oral histories, and ethnohistory to help us interpret the past. We will show how historical archaeology can contribute to our understandings of race, class, gender, and ethnic identities by exploring these issues as they emerge through material culture. Lastly, we conclude with an overview of where historical archaeology is going and how that future builds on what we already know and do.

Written Records

Historical archaeology often includes written records as an additional line of evidence, along with the artifacts and features we study. So does historical archaeology include archaeology of the Mayan civilization, where a writing system was in use over 2,000 years ago, or the ancient Greeks and Romans, who had written works nearly 3,000 years ago? Most archaeologists who work in those regions today would probably say no, choosing to identify themselves as Mesoamerican or classical archaeologists. And in Europe, archaeologists who study the early periods of history consider themselves “post-medieval” archaeologists rather than historical archaeologists. These examples demonstrate how people working in different places understand the study of the development of the modern world through material culture.

Before historical archaeology was its own subfield within archaeology, people investigated the material remains of their recent past. Pilgrims from the Mayflower excavated burial mounds along the coast of present-day Massachusetts that included European goods alongside Indigenous belongings. The ensuing debate on the Mayflower about the meaning of these discoveries became one of the earliest recorded discussions of historical archaeology (Willison 1945, p. 151–152). Early projects such as those of the settlers from the Mayflower (Deetz 1977, p. 29) and British mapping surveys (Cotter 1993, p. 4) set the stage for the work of early 20th-century archaeologists who combined their interests with the developing field of anthropology in North America. Influenced by the anthropological work of Franz Boas, archaeologists began to include investigations of post-colonial contexts in their cultural historical research, attempting to quantify and interpret the effect of Spanish colonialism on an Indigenous village by examining pottery types found at the site of a mission church (Kidder 1958) and sometimes including consultations with contemporary Indigenous peoples as part of such questions (Montgomery et al. 1949). However, as this work was part of the burgeoning discipline of archaeology that followed the research questions and theoretical perspectives defined by a culture history approach, historical archaeology was not considered a separate field.

Following on the heels of the United States’ passage of the [National Historic Preservation Act](#) of 1966, and multiple conferences discussing the formation of a specific subfield for historical archaeology, the [Society for Historical Archaeology](#) was founded in 1968. This international society set the agenda for historical archaeology in North America by identifying specific questions that were part of that research, such as: What kinds of questions can archaeology answer that history or anthropology alone cannot? What can be gained by combining archaeological methods with historical and anthropological ones?

Some people have wondered why anyone would bother to explore historical archaeology when we already have documents about the past. Once Europeans arrived, they began documenting what happened, whom they met, and what the landscape looked like, and sometimes they even recorded Indigenous languages. Indeed, these documents can help us know what those authors thought about their experiences in the world. Even J.C. “Pinky” Harrington, a founding father of our field, described historical archaeological work as an auxiliary science to history, pointing out that many early historical archaeological projects mainly provided supplementary data to interpret places that were important in American history (Harrington 1955). In his landmark article, *Archaeology: Handmaiden to History*, Harrington’s contemporary Ivor Noel Hume (1964: 215) described the typical historical archaeologist working in the first half of the 20th century as “a historian with a pen in one hand and a trowel in the other.” Later in the century, Deetz offered that historical archaeologists have the potential added benefit of anthropological training, which gives us a lens to look more broadly at the human experience by applying culture as a framework to interpret history.

Relying on the presence of written records as a way to define historical archaeology can be a problem because we can't assume that everyone throughout history knew how to write, had access to writing materials, or had their accounts preserved. Many people were not written about, either, meaning that Indigenous people, poor people, enslaved Africans, those with low social status, and many women and children were left out of the historic record. However, people left out of the documentary record also had important roles in shaping history, and their histories are worth examining.

By the late 1970s, some historical archaeologists began to focus on how average people lived, exploring what those people left out of great historical works valued, and how they related to their social worlds. For example, in North America James Deetz's examination of gravestone motifs in Puritan New England with his colleague Edwin Dethlefsen (1967) demonstrated a link between changing culture and religion and a preference for different grave carvings, which could be quantified and plotted on a graph. By studying gravestones, along with other material remains that were "forgotten" by traditional historical narratives, historical archaeologists could better understand what the past was actually like for most people, not just those with the privilege of a written record (Deetz 1977). By investigating the small things of the past, historical archaeologists realized that they could contribute important information about the lives of groups who were not recorded in textual sources.

Some historical archaeologists have examined the histories, sites, and artifacts associated with famous people or places, for example the Jamestown colony or George Washington's home at Mount Vernon in the United States, which have been part of American history books since before archaeologists had data to add. Other historical archaeologists have sought to use historical archaeology to fill in the gaps in the historic record, to contradict the histories as written by victors, and find a balance between the histories of famous men and of common people. These practices lay the groundwork for what would become feminist archaeology, a theoretical approach designed to address gender and other intersections of identity. Part of this shift also included focusing on the study of non-Anglo-descent sites in colonial areas, such as Kathleen Deagan's research at Spanish colonial sites in Florida and the Caribbean (Deagan 1973), where she used historical archaeology to consider the lives of "people who otherwise reside at the margins of society" (1996, p. 154) because of their status or race.

This is something we struggle with, because of the power imbalances in history. The groups of people who were left out of the historic record may have had few material possessions and less political or social authority compared to the powerful people who show up in documents, and so they are sometimes elusive even in the archaeological record. Just as written records about the past are biased by their authors and audiences, materials from the past possess meanings assigned by their owners and users, and by archaeologists who interpret possible meanings today. Because we are researching sites where multiple different cultures have come into contact with one another, artifacts may carry multiple meanings to different people.

Go Back and Get It

While the written record in North America has a bias toward people of European descent, these are far from the only people who are interested in the past. Barbara Little suggests that what historical archaeologists learn from the past "has the potential to inspire us as well as chasten us" (Little 2007, p. 15). She means that we should not avoid difficult or controversial periods of history, for example, the devastating effects of settler colonialism on Indigenous people, or the legacy of slavery in North America. Many historical archaeologists have worked to address race and racism in the past, and examine how the past affects racial inequalities today.



Figure 1 – The Sankofa symbol, meaning “go back and get it,” was discovered on the lid of a coffin in the New York African Burial Ground (photo by Alexandra Martin)

Sankofa (Figure 1) is an Andikra (West African) symbol that translates as “go back and get it,” demonstrating an interest in understanding the past. Sankofa became especially meaningful to historical archaeologists during the 1990s excavations at the New

York [African Burial Ground](#) in the area currently known as Lower Manhattan, which will be discussed in detail later in this chapter. The symbol was discovered on the lid of one of the historic wooden coffins at the site and became emblematic of how archaeological research could help recover information for the descendant community. Sankofa represents the importance of learning from the past and recovering what was lost so that we may move forward. The significance of learning from the past has also been highlighted by organizations like the Colonial Williamsburg Foundation, whose mission for decades was “To help the future learn from the past” by preserving Williamsburg’s history for visitors—a goal to which historical archaeologists have contributed.

Case Studies in North American Historical Archaeology

Following the brief Norse occupation in Atlantic Canada, culture contact in North America paused for the greater part of 400 years. The 16th century marked the first formal European expeditions to explore the shores and waters of North America, and to extend the mercantile system of economic exploitation across the Atlantic by claiming and extracting raw material resources. These colonial expeditions included conquistadors murdering their way through Central America (e.g., Evans 2015), European fishers exploiting the North Atlantic cod populations (see Jackson et al. 2001, p. 629), the Basque extending their whaling tradition into Labrador Bay (Loewen and Delmas 2012), the development of a transatlantic fur trade (Reynolds 1906), the introduction of European diseases to the Native American populations (see Warrick 2003), and Sir Walter Raleigh’s abandonment of the colonists of Roanoke in his quest for fame and fortune in the Court of Queen Elizabeth I (Klingelhofer and LUCKETTI 2013). These events set the stage for later colonial expansions in North America that would have far-reaching consequences for European habitation on the continent and define how we understand this occupation archaeologically.

The 17th century marked the founding and establishment of many colonial enterprises by Europeans in North America. This meant constant influxes of new colonists and an expansion of economic strategies to aid in the establishment of larger and larger colonies. However, this was a European expansion with resistance. The experiences of the Spaniards in the Southeast and Southwest demonstrate the complex relationships Europeans had with Indigenous peoples that sometimes ended in defeat. English colonies like Jamestown appear to have eked out an existence because of indifference or minimal hostility from surrounding Indigenous groups. In other areas, such as Ferryland, Newfoundland, Europeans established their colonies in places the Indigenous people had not inhabited for a number of years prior to their arrival. Additionally, there were expansions to areas that seem to have had little if no habitation before the arrival of Europeans such as on the island of Bermuda (Fortenberry and Brown, 2011). We see expansion of the global market into North America and the establishment of the colonial economic industries that will play such a large role in the establishment of permanent European colonies on the continent.

In the 18th century, a major marker of American history was the American Revolution. However, archaeological research into the different colonies across North America reveals a more detailed account of a turbulent century. The Spanish continued to expand their missionaries into the area we now call California, even as missionaries faced resistance from Indigenous people in North America (see Liebmann 2010; Voss 2014) and conflict with Spanish officials in Europe (Espinosa 1988). In the British colonies, the colonists were growing restless while strengthening their economies, fortified by enslaved Africans (Battle-Baptiste 2011).

During the late 19th and throughout the 20th century the development of mass transportation systems profoundly changed life in North America (see Johnson 2012). Railway lines spread across the continent, followed by the development of cars and the associated roads and interstates that still move people and goods today. Increasing access to cheap and ever easier transportation upped the flow of goods and people. Transportation’s impact can be seen in historical archaeology in two ways. First, the types of material goods found at historical archaeological sites demonstrate how industrialization and ease of transportation caused an increase in the use of mass-produced goods and a decrease in locally made artifacts (Purser 1999). Historical archaeologists working in the 20th century can use catalogs, magazines, and newspaper ads to help identify artifacts because they were manufactured in one location, advertised widely, and shipped to consumers across the continent. Second is in the study of archaeological sites related to the development of transportation systems and the increased movement of people across the continent. These types of sites include boom towns, work camps, roadside attractions, debris from the transit of people, and even the road or railway lines themselves. Archaeologists study these types of sites to help us understand how transportation was changing the physical and social landscape of North America.

Canada

The earliest archaeological evidence for the European whalers in North America comes from Red Bay in Labrador, Canada (Loewen and Delmas 2012). This port was established by Basque mariners who came from Southeast France and Spain. The site has significant archaeological evidence for their presence in Canada as early as the 1530s, including submerged ships, ovens for

processing whale oil, middens of food and other debris, a cemetery and living quarters (Loewen and Delmas 2012). [Red Bay](#) is on the United Nations Educational, Scientific and Cultural Organization list of heritage sites for its importance to the nation of Canada and for its importance to Global Heritage.

Kanata

In the 16th century, the French crown sponsored exploratory voyages to North America. In the early 1530s, navigator Jacques Cartier was chosen to undertake the French effort. Cartier led three expeditions between 1535 and 1542. It was in Cartier's chronicles that the term Canada (Kanata), an Iroquoian language word meaning "village," was first used to refer to the area surrounding the St. Lawrence River (see Leacock 2008). Archaeologists' interest in Cartier's interactions with the First Nations people is an example of how historical and prehistoric archaeology overlap during the contact period (Tremblay 2016). Cartier recorded walled First Nation villages along the St. Lawrence River at Hochelaga (Montréal) and Stadacona (Québec City). Cartier recorded two separate lists of words used by First Nations people. Twentieth-century historical linguists analyzed these documents and determined the people of Stadacona and Hochelaga were speaking an Iroquoian language (Hoffman 1955, 1961; Lounsbury 1978), identifying these peoples as St. Lawrence Iroquoians. Archaeologists have paired an enigmatic hybrid Iroquoian/Algonquin archaeological signature with the identity of St. Lawrence Iroquoians. The true identity and modern descendant community affiliation of the St. Lawrence Iroquoians continues to be debated.

Cartier's third voyage to Kanata in 1541 was somewhat different in scope, including a colonial component. The explorations were left to Cartier, while the establishment and management of what was to become the first permanent French colony was entrusted to Jean-François de La Rocque, Sieur de Roberval (Morison 1971, p. 434). The settlement was constructed on the rocky outcropping of Cap Rouge at the confluence of the St. Lawrence and Cap Rouge rivers (just upstream from the modern city of Québec). In 2005 the archaeological signature of the colonie perdue was rediscovered (Fiset and Samson 2009). The excavations recovered over 6,000 artifacts of 17th-century life, including luxury food items imported for the colonial nobility (Fiset and Samson 2009; Côté 2009). According to Hélène Côté (2009), spatial distribution of these goods indicate a re-creation of European hierarchical society within this tiny colony in North America. Artifacts recovered from the site also include Iroquoian pottery, indicating interactions with the local St. Lawrence Iroquoian population. Finally, artifacts including crucibles used to smelt unrefined gold were recovered, indicating that the colony was heavily invested in searching for precious metals (Côté 2009).

While on the coast of Newfoundland, Jacques Cartier made mention of encountering numerous fishing crews from Basque country, as well as his homeport of Saint Malo in Brittany and elsewhere in France (Biggar 1993, p. 160). This indicates the involvement of European cod fishing off the coast of Newfoundland and the Maritime provinces predating Cartier's voyages into the interior of North America. Peter Pope (2008, p. 38) has described the immense nature of the historic salt cod industry, an industry that is less than a passing thought for most people in the 21st century. However, during the 16th century the northernmost peninsula of the island of Newfoundland, known as the Petit Nord, was an economic driver of Western Europe (Betts et al. 2014). North American salted codfish provided sustenance for Europeans for hundreds of years.

While the cod fishery was an immensely important aspect of economic history, the seasonal and temporary nature of cod fishermen's habitation on the North American coasts has made the archaeological signature of cod fishing difficult to ascertain (Faulkner 1985; Pope 2008, p. 42). Still, numerous archaeological sites have been identified on the rocky Canadian coast that indicate cod were salted and dried on the shore in small camps known as "fishing stages" and processed in structures known as "fishing rooms." Additionally, the presence of European goods at nearby First Nations sites indicates that the Beothuk and Innu Native Nations established informal, possibly contentious, trade and exchange with migratory French fishermen (Martijn 2003; Pope 2015).

French North America

The dawn of the 17th century in New France saw a concerted effort in colonization. Nineteenth- and 20th-century histories of Canada cite the triumvirate of fur, fish, and faith as the primary objectives of Canadian settlement. In his review of French colonial archaeology, Gregory Waselkov (1997, p. 12) cites a different triumvirate of the archaeology of New France: 1) the search for "great men," 2) a fascination with military sites (e.g., forts), and 3) a strong interest in Native American sites that contain definitively French artifacts. Both of these rudimentary sets of classifications can effectively be employed to highlight the archaeological signature of 17th-century French colonial North America.

Explorer and diplomat Samuel de Champlain, "the Father of New France," played an integral role in the establishment of the fur trade with the First Nations peoples of the Canadian interior. Samuel de Champlain and his exploits have been the focus of numerous documentary and archaeological research projects (e.g., Côté 1992; Côté 2000; Fischer 2008; Niellon 2008; Pendery

2012). The most recent large-scale investigation that is associated with Champlain is not related to the establishment of Québec City or his explorations westward.

In the early 2000s, archaeologist Steven Penderly led an international team to investigate the history and archaeology of the French settlement on Isle Saint-Croix, a tiny island in the center of the St. Croix River, the international boundary between the state of Maine and the province of New Brunswick (Penderly 2012). The settlement was built in 1604 under the command of Sieur de Mons and his young lieutenant Samuel de Champlain. The settlement lasted but one winter before being moved to the southern tip of Nova Scotia. The quick abandonment of the site, non-invasive use in the 19th century, and subsequent protection of the St. Croix Island International Historical Site during the 20th and 21st centuries by [Parks Canada](#) and the [United States Parks Service](#) have left the island a veritable treasure trove of information relating to 17th-century French settlement.

As the economic ventures of fur and fish pushed colonization in New France, proselytization efforts largely at the hands of the Jesuits followed quickly behind (Jaenen 1985). The Society of Jesus was founded in 1534 as a proselytizing religious order. Though the Jesuits were by no means the only religious order in New France, they left an indelible mark on the history of North America. The Black Robes, as they were often called by the Indigenous population, explored the interior of the continent, setting up missions to convert the Native population along the way (Axtell 1985; Bilodeau 2001; Blanchard 1982; Eccles 1990, 1998; Leavelle 2003; Moogk 2001; Richter 1985; Salisbury 1992; Steckley 1994). The most notable mission to be examined archaeologically was Sainte Marie Among the Huron (BeGx-1) in Midland, Ontario.

In 1639, the construction of a fortified mission complex began. This base, surrounded by a wooden palisade with stone bastions, housed a chapel, hospital, forge, mill, stables, and two distinct residence areas. One residence served as a hospice in which the missionaries who returned from the outpost missions could rest and recuperate, and the second was a residence for the *donné*, pious laymen whom the Jesuits contracted as laborers and artisans (Eccles 1990, p. 44; Jury and Jury 1965, p. 82–89). The entire complex ultimately became the epicenter of a Huron-Christian community (Jury and Jury 1965, p. 98).

Archaeological investigation at the site of the Sainte Marie Among the Huron Mission has been a process over a century and a half in the making. The first recorded excavations at the site were undertaken by the Jesuit priest Father Felix Martin in 1855 (Tummon and Gray 1995, p. 6). There were also two major excavations that took place in the middle of the 20th century. High-profile excavations led by Wilfred Jury from the University of Western Ontario (Tummon and Gray 1995, p. 3; Jury and Jury 1954) led to the subsequent reconstruction of the mission in 1964–1968 (Tummon and Gray 1995, p. 3). Before Jury's excavation, though, there was an earlier excavation, from 1941 to 1943, with Kenneth E. Kidd as the principal investigator (Kidd 1949; Tummon and Gray 1995, p. 3).

New York

New Amsterdam

The 17th-century North American experience is often summed up by Native American interaction with the three major colonizing powers of Britain, France, and Spain. The role of the Dutch, however, is almost universally overlooked. The archaeology of this relatively small colony reveals another important facet of European settlement. In the 17th century, the Dutch came to the area known today as New York primarily in pursuit of fur trading (Hunter 2010). There, they encountered the Mohican and the Lenni Lenape, who were one of the largest groups among the more than 80,000 Algonquian speakers who occupied the New York area in the centuries prior to European contact (Pritchard 2007, p. 4). The Lenni Lenape resided in and around Manahata (Pritchard 2007, p. 6), which may have been the first documented Native place name in the Northeast, drawn on a map just “a little north of where Manhattan would be” (Goddard 2010, p. 279).

On the second of English navigator Henry Hudson's voyages in search of the Northwest Passage, he was in the service of the Dutch East India Company. The Dutch declared the area from the Connecticut to the Delaware Rivers as Dutch territory and began settling along the Mahicanichtuck River, called the “North River” by the Dutch, and now named after Henry Hudson as the Hudson River (Grumet 2009). Holland granted fur traders a license to trade European goods with the Native people in the area they called New Netherland (Albany) (Reynolds 1906).

In 1621, Dutch merchants and investors established the Dutch West India Company, supported by the Dutch government, and the permanent settlement of New Amsterdam (New York City) was planned (Nash 1992). New Amsterdam's success was built on the fur trade, and by 1628, the Dutch were sending 8,000 pelts a year to Europe (Nash 1992:89). However, with their focus on trade rather than on establishing self-sustaining settlements, and the decline of their fur trade by the mid-century, most of the Dutch merchants left. Finally, in 1664 the English took over the political administration of the former Dutch colony and declared the area as New York territory, ending the Dutch settlement (Allen 2011).

The first Dutch settlement in the region, Fort Nassau, was constructed in 1614. Historical documentation tells us that Fort Nassau had been built in a flood plain and was washed away in a flood the spring of 1617 (Huey 2016, p. 379). Any remains of Fort Nassau have long since been destroyed by both the course of the Hudson River and the cultural changes of the last 400 years of construction that gave birth to the modern capital of New York state (Huey 2005, p. 96). Fortunately, cultural resource management laws have helped to limit destruction, and most archaeological research relating to the colony has been undertaken as cultural resource management projects.

The oldest Dutch archaeological remains in the Hudson Valley relate to Fort Orange (Huey 1974, 1991, 2005). Fort Orange was built in 1624 on the west bank of the Hudson River, within the boundaries of what is now Albany, New York. In his exhaustive documentary and archaeological research on the colony of New Netherland, Paul Huey, a retired New York state archaeologist and New Netherland specialist, places the construction of Fort Orange within the initial phase of the colony's infrastructure development (Huey 1991, p. 327). The survival of archaeological remains at Fort Orange is no doubt due to the fact that when the English captured Dutch Fort Orange, the English moved the fort to a new location, thus escaping intensive development at the time (Huey 1991).

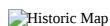


Figure 2 – Map of New Amsterdam in 1660. *Redraft of the Castillo Plan* is in the public domain.

The second phase of frontier development of New Netherland was the illegal village of Beverwijck, near Fort Orange. By 1652 over one hundred illegal houses had been built on the north side of the fort. Infrastructural development in the Hudson Valley beginning as early as the 1790s and continuing to the present day have yielded a varied degree of archaeological data relating to the early Dutch settlement of Albany. Through Huey's numerous works, he has created a virtual inventory of Dutch history and archaeology along the "North River" (Huey 1974, 1988, 1991, 2005, 2016). Fort Orange's contemporary, Fort Amsterdam in Manhattan, was not well preserved. However, Fort Amsterdam did include laying out the nearby streets which eventually became New York City (Figure 2). Indeed, the modern course of Wall Street follows the Dutch wall created around the colony of New Amsterdam, and Broadway is located on the site of the Dutch street.

African Burial Ground

One of the economic pillars of colonialism in North America was the trading of enslaved and captive people from Africa, and historical archaeology has been integral to understanding their lives (Battle-Baptiste 2011). From excavations at major plantations (Leone et al. 2005), at the houses of presidents (Battle-Baptiste 2011), and in communities of freedmen (Hutchins-Keim 2018), archaeology has helped to understand the ways that those of the African Diaspora, and their descendants, lived and adapted to life in North America. Archaeologists specializing in African Diaspora research draw from the material culture record, as well as from theory looking at landscapes of power, homeplace, and Black feminism (Battle-Baptiste, 2011).

Widespread archaeological research led to the creation of the [Digital Archaeological Archive of Comparative Slavery](#), a database allowing for geographical and temporal investigation of enslaved peoples and their descendants in North America. Another ongoing database project is the Michigan State University digital history project, "[Enslaved: Peoples of the Historical Slave Trade](#)." Funded by a \$1.47 million grant from the Mellon Foundation, this website will link data across multiple databases, allowing researchers to search for data "to identify enslaved individuals and their descendants" (Hawthorne et al. 2018).

Plantation archaeology in particular has been a large part of understanding history after the arrival of European colonists (Fairbanks 1984; Leone et al. 2005). While these excavations may also aim to understand the owners of such landscapes (White 2016), these investigations regularly focus on the enslaved populations at plantations. By looking at the remains of their living quarters and material items, archaeology helps us to understand the majority of people living and working in such landscapes (Leone et al. 2005). Sites such as Colonial Williamsburg have enduring projects that explore important living areas for enslaved people (Battle-Baptiste 2011) to understand the economy and the social systems of these communities (Leone et al. 2005). However, not every archaeological excavation investigating the African diaspora has been smooth.

While New York City had one of the larger and more thoroughly documented free Black populations in the 18th century (LaRoche and Blakey 1997), historic assessments before the construction of a new Federal building suggested that few burials would be found within the project area (LaRoche and Blakey 1997). Almost five city blocks that were used as a burial ground for thousands of enslaved Africans in the 17th and 18th centuries had been nearly forgotten and built over. Although the burial ground was visible on historical maps, it was thought that previous work in that area and infilling to expand the island had already destroyed the majority of the burials. Unfortunately after archaeologists uncovered 419 burials from the site, it was clear that this was not the case.

A group of descendant community members and activists shut down the excavations (McGowan and LaRoche 1996, p. 114). Eventual consultation with local African American communities and activists led to a fruitful study looking at how the health of Africans buried there compared to other populations living at the same time (LaRoche and Blakey 1997), what sort of objects were considered important grave goods, and the discovery of the Sankofa symbol on the lid of one historic coffin. This site was a key ethical case study in archaeology demonstrating how important descendant community voices are when excavating at historic sites (Blakey 2008). Today the [African Burial Ground](#) is a National Historic Landmark where visitors can learn more about New York's history and the preservation of this significant place.

Virginia

Roanoke

In the 16th century, many Indigenous people of the North American eastern coastline were living in towns, supported by seasonal resources and farming the fertile riverine land (Horning 2009, p. 131). Although European explorers had been visiting the East Coast since Giovanni da Verrazzano's visit on behalf of France in 1524, and the French had established fortified trading posts by 1540 (Reynolds 1906), the earliest planned colony was not until decades later. The people on the coast of what is known today as North Carolina first met English colonists in 1584, when Sir Walter Raleigh planned to start a settlement. The following military expeditions "inaugurated a history of hostilities between English and Natives in America" (Klingelhofer and Lucchetti 2013, p. 181). Archaeological evidence of exchange patterns among English colonists at Roanoke, as well as at the 16th-century Spanish mission site at Ajacan and the later English settlement at Jamestown, suggest that Europeans repeatedly violated the rules of gift exchange, which increased hostilities (Mallios 2006). By 1590, the entire group of English settlers had disappeared, leaving the word "Croatoan" carved in a fort post (Klingelhofer and Lucchetti 2013). Croatoan was the name of an Indigenous town to the south, but search parties never found evidence of survivors, and Roanoke became known as the "Lost Colony." However, dendrochronological analysis has shown that extreme drought likely affected the settlers' access to food (Gallivan 2011), and North Carolina's state-recognized Tribal groups "know that the colonists were absorbed into native society by their ancestors" (Horning 2009, p. 131).

J.C. "Pinky" Harrington undertook the first professional archaeological work at the Fort Raleigh National Historic Site in the mid-1900s, examining an earthwork feature and dozens of 16th-century European artifacts, including musket balls, German counter disks, and earthenware olive jars (Klingelhofer and Lucchetti 2013). Archaeological work in the 1990s confirmed that the remains of a nearby structure was a workshop where Elizabethan scientists were testing metal ores in 1585 (Klingelhofer and Lucchetti 2013). However, archaeologists did not recover domestic artifacts in these excavations that would indicate the location of the Roanoke settlers' homes. In 2008, the First Colony Foundation archaeologists were joined by the crew of *Time Team America*, a television program featuring a group of diverse archaeologists who bring various skill sets, technological advancements, and specialized equipment to assist with archaeological projects in the United States (Dixon 2009). At Fort Raleigh, *Time Team* and staff archaeologists exposed a large area, revealing undisturbed 16th-century artifacts, including Algonquian pottery, French ceramics, and a necklace made of copper lozenges (Straube 2013 p. 196). These artifacts are the material remains left behind by the colonists when they abandoned England's first attempt at a settlement.

In the 17th century, after the failure at Roanoke, British colonists established and settled in colonies on the eastern coast and the "English Shore" on the east coast of Newfoundland. Here they continued to come into contact with different groups of Indigenous people, resulting in archaeological and documentary evidence of cross-cultural interactions. Often the stories of these 17th-century colonies, like the story of the Pilgrims' first Thanksgiving at Plymouth colony, serve as "part of a larger national origin myth for Americans" (Deetz and Deetz 2000, p. 9), but as stories, may belie the complexity of the interactions and effects of colonization on both the English and Indigenous peoples. Archaeological excavations can provide a unique lens into these pasts.



Figure 3 – The historic site of Jamestown is now a National Park. Photo by Jennifer Zovar.

Jamestown is known as the first permanent English colony in North America (Figure 3). Three English ships sent by King James arrived on the coast of what is today known as Virginia in May of 1607. In 1607, this land was part of the country of Tsenacommacah, which was under the rulership of Wahunsenacawh, a paramount chief whose seat of power has been excavated at Werowocomoco (see Gallivan 2018). Wahunsenacawh, also known as Chief Powhatan and as the father of Pocahontas, led an estimated 13,000 to 22,000 Algonquian-speaking people (Horning 2009). The Powhatan peoples had used the swamplands in which the English landed, indicated by the recovery of 16th-century native belongings, like a nearly complete Townsend cooking pot excavated at Jamestown, but by the early 17th century, they were not residing on the island (Horning 2009, 131). The English stayed and erected James Fort, a triangular palisade, enforced at the three corners with cannons (Noël Hume 1979, 27). Jamestown served as the capital of Virginia until 1699, when the government moved inland to Williamsburg.

The first systemic archaeology at Jamestown was through the National Park Service in the 1930s, directed by J.C. “Pinky” Harrington (Noël Hume 1979, p. 31). They were looking for the original fort, which was found in 1994 under the direction of Bill Kelso and the Jamestown Rediscovery project. Significant archaeological work at Jamestown has focused on the so-called Starving Time, a period between 1609 and 1610 when severe drought, poor water quality, and intercultural hostility resulted in famine and extreme mortality (Blanton 2000). In 2013, Kelso and other Jamestown archaeologists reported the analysis of the skeletal remains of a teenage girl who had been butchered, indicating that the starving colonists had resorted to cannibalism during the Starving Time (Horn et al. 2013). Recently, the Jamestown Rediscovery project has focused on looking for material evidence related to the first enslaved Africans in a British colony as part of the 2019 “American Evolution” commemoration. The first Africans sold into slavery in British America landed in Jamestown via a Dutch ship in 1619 (Noël Hume 1979:43). Angela, an enslaved African listed on the 1625 census, lived with the family of Captain William Pierce on Jamestown Island, and archaeologists hope to “define the physical and cultural landscape in which Angela lived and worked” (Hall and Givens 2018).



Figure 4 – Tourists and actors visit the Governor’s Palace at Colonial Williamsburg (photo by Jennifer Zovar).

In the 18th century British colonies on the East Coast, in the Virginia Colony, moved their capital from Jamestown to Williamsburg, where it took center stage in Virginia’s political events leading up to the American Revolution. [Colonial Williamsburg](#), the largest living history museum in the world (Figure 4), reconstructed the colonial period city, based in large part on archaeological research conducted by Colonial Williamsburg Foundation archaeologists. Marley Brown III, who served as the director of archaeology for 26 years in the late 20th and early 21st century, suggests that Williamsburg is where the modern excavation techniques of historical archaeology got their start (Brown and Chappell 2004). After British archaeologist Ivor Noël Hume arrived in the 1950s and professional excavations became standard, Noël Hume contended that no reconstruction or restoration of a historic feature could be considered complete without extensive archaeological work (Brown and Chappell 1997, p. 72). In 1964, a Department of Archaeology was established, which has provided a foundation for the archaeological techniques of Chesapeake sites and beyond. Furthermore, a close relationship between Colonial Williamsburg and the neighboring College of William and Mary provided opportunities for a generation of historical archaeology scholars, including students who became leaders in the archaeology of the African Diaspora (e.g., see Battle-Baptiste 2015; Franklin 2015).

Florida

Spanish colonizers made several entradas, or expeditions, into the Southeast in the 16th century. Through archaeological excavations and historical records, archaeologists have traced the route of the leader of one of the biggest entradas, Hernando de Soto (Clayton et al. 1995; Vega 1993). In the 16th century the Spanish took control of the region they called La Florida, which at times extended all the way into South Carolina and all the way over to Louisiana. The year 1565, specifically, marks the beginning of what is known as the First Spanish Period (Table 1), which continued until 1763 (Reitz 1993: 376). During this period, various religious orders of the Catholic Church began their attempts to convert the native groups in the Southeast to Christianity (Hann 1990; Thomas 1989; Wade 2008). The missionization process, the establishing of missions and conversion of native populations by the Franciscans, was one of the Spanish colonial strategies, combining government and the Church to colonize the Southeast with as little use of the military as possible (Milanich 2000: 14; 2006: 4). We see the remains of the conversion efforts in the excavations of some of the missions that dot the landscape.

Table 1 – Historical Periods for Florida

Period	Dates	Notes
First Spanish Period	1565–1763	
British Period	1763–1784	
Second Spanish Period	1784–1821	
American Period	1821–present	Florida was a U.S. territory from 1821 until it became a state in 1845. (Florida Department of State – A Brief History)

The 17th century marks the height of Spanish colonial occupation of the Southeast. The Franciscans established missions across the landscape in many of the villages of the Guale, Timucua, and Apalachee. There is some evidence, based on historical records, that the Timucua and the Apalachee influenced each other in accepting the missionization process due to competition between the two groups (McEwan 2000, p.65). One of the best examples of a Spanish mission was San Luis de Talimali, the head village for the Apalachee (McEwan 2000, p. 67). Today, visitors can tour [Mission San Luis](#) and see reconstructions of the old fort, an Apalachee council house, and a church, among other things. Meanwhile, the Spanish also set up a few forts in St. Augustine, [San Marcos de Apalache](#), [Fort Barrancas](#), and Pensacola, the remains of which can still be seen today (Deagan 1983, p. 1991).

Many changes occurred during the 18th century in the Spanish Southeast of North America. In 1704, raids led by British-backed Creek soldiers burned many of the Spanish missions, including the Apalachee capital of San Luis. In response to this, Guale and Timucua villages moved closer to St. Augustine. While some Apalachee were enslaved by the Creek, some chose to join the Creek because they saw the Spanish as unable to protect them anymore, and some followed the Spanish westward to Pensacola (Hann 1988; Saunders 2000; Thomas 1993). One of the missions that was established after this move was Mission San Joseph de Escambe. Field schools from the University of West Florida worked for several summers on this site north of Pensacola ([Pensacola Colonial Frontiers blog](#)). The contracted Spanish and Native territory remained the status quo until 1763, when the Spanish surrendered La Florida to the British following the French and Indian War, effectively ending the First Spanish Period and beginning the British Period (Table 1). However, the British returned the lands to the Spanish following the American Revolution in 1783, beginning the Second Spanish Period. It would remain under the Spanish domain until 1820, when the land was ceded to the United States.

Southwest

In the 16th century, Spanish colonists followed a similar pattern in the American Southwest and Northwest Mexico. Several entradas by men such as Coronado occurred prior to permanent colonization by Juan de Oñate in 1598 (Elliott 2012; Knaut 1995; Wilcox 2009). We know of these early entradas into what is now New Mexico and Arizona mostly through historical accounts of the Spaniards themselves as well as through oral histories of the many Puebloan groups that the Spanish encountered along the way (Nuñez Cabeza de Vaca, Covey, and Pilkington 1983). The combination of church and state was also a Spanish colonization strategy in the Southwest, with priests accompanying the first colonists as well as more priests coming thereafter (Benavides and Morrow 2012; Wilcox 2009). In fact, according to historical documents from Franciscan priests, after the failure to find mineral wealth, it was the missionization efforts that led to the Crown maintaining Nuevo Mexico as a territory in the 17th century (Weber 1999, p. 3; Wilcox 2009, p. 134). Archaeology has helped us understand not only what Spanish colonialism was like on the ground versus the rules and regulations the Spanish government put forth, but it has also allowed us to attain a better understanding of the

effects of Spanish colonialism on the native populations living in these regions. It is important to note that the Spanish did not merely occupy the landscape and force the native groups to bend to their will. They encountered thriving communities that, though at times forced to acquiesce to the Spanish, still found ways to navigate their social and political worlds to create spaces for themselves. This process was not a passive acceptance of Christianity or Spanish rule, but rather an active engagement.

Franciscan Missions and Pueblo Revolt

In the 17th century Puebloan groups in the Southwest were forced to accept Spanish authority due to Spanish squelching of any native attempts to prevent them from taking over upon the arrival of Oñate in 1598 (Knaut 1995; Wilcox 2009). Over the next 20 to 30 years, the Franciscan priests built missions in many of the Pueblos, including Pecos, Gran Quivira, and Hawikuh (Hayes et al. 1981; Montgomery 2002; Smith et al. 1966). However, the Puebloans did not passively accept the Spanish presence. There is evidence of Native resistance in artifacts such as ceramics, on which symbols used by Native groups were thought by the Spanish to mean acceptance of Christianity when in reality they held different meanings for the Puebloans (Mobley-Tanaka 2002; Liebmann and Preucel 2007). In 1680, many pueblos, led by Po'pay and other spiritual leaders, revolted and kicked the Spanish out for 12 years (for more in-depth information on the Pueblo revolt, see: Dongoske and Dongoske 2002; Knaut 1995; Liebmann 2010, 2012; Liebmann and Preucel 2007; Preucel 2002; Roberts 2004; Weber 1999; Wilcox 2009).

Diego de Vargas successfully retook New Mexico in what is known as the Reconquista in 1692, though it would not be until 1696 that Puebloans stopped rebelling against Vargas (Liebmann 2010; Preucel 2002; Roberts 2004; Weber 1999). Following the Pueblo Revolt and then the Reconquista, the Catholic priests and the Spanish government officials were more relaxed in their stance of trying to force the Puebloan groups to live strictly by Spanish and Catholic policies (Knaut 1995; Liebmann and Preucel 2007; Montgomery 2002; Weber 1999). Churches were rebuilt and missions re-established (Hayes 1981). From the Spanish perspective, despite initial appearances of a good relationship, Spanish civil authorities and the Franciscans were soon clashing over who had greater authority (Espinosa 1988; Hackett 1937). Material culture, particularly Puebloan ceramics, do change in the post-Revolt period as some designs are abandoned and others see new use (Liebmann and Preucel 2007; Mobley-Tanaka 2002).

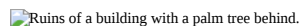
 Ruins of a building with a palm tree behind.

Figure 5 – Mission San Juan Capistrano is one example of a California mission, founded in 1776 (*Mission San Juan Capistrano* by Ken Lund is licensed as [CC BY-SA 2.0](#))

The 18th century marks the development of the mission system in what is now California (Figure 5). The California missions were established relatively late, around the mid-1700s, and continued until the early decades of the 1800s (Green 2001). As with previous colonization efforts, the Spanish began with smaller expeditions into California before permanent settlement began in response to increased activity of other colonial powers on the Pacific Coast (Voss 2014). Although *reducción*, or combining native villages regardless of village affiliation, was practiced to a certain extent in both the Southeast and the Southwest, it was a large part of Spanish policy in California. Native Americans from different groups were forced to live together in the Spanish missions, as seen by excavations at some of these missions (Voss 2014), though there was often resistance from these same groups, which manifested in individuals running away from the missions who were then discussed in Franciscan documents.

The Future of Historical Archaeology

In this chapter, we have explored how the development of the discipline of historical archaeology influenced what questions were asked and what theory we could use to explain our findings. Expanding from those theories and questions, we have given a brief example of what we know happened during this period on the continent archaeologically, exploring how European goods, such as copper sheets, were integrated into the economy of established cultures on the continent. We've examined how European presence changed in different regions, touched on the lives of the enslaved people of Africa who were brought to the continent without their consent, and explored histories of the nation states that now call North America home.

It is clear from archaeological evidence and Tribal oral histories that North America was full of life and culture before Europeans arrived. With evidence such as Viking habitation in Canada between 990 AD and 1030 AD (Davis et al. 1988) and the [Birni](#)

peoples, who lived on both sides of the Bering Sea, the newness of the continent was a construct by and for the Europeans of the 15th century and beyond to allow continued colonization and extraction of resources from the continent for their benefit. However, that is not the whole story of human habitation of the continent. Historical archaeology helps to critique colonial and European-centric historical narratives by looking at the stories of people who are left out of those narratives. Archaeology such as this aids in dispelling myths of an Anglo- or Eurocentric development of the nation states in North America by demonstrating how a plethora of different cultures helped to create the place that is now known as North America. This chapter serves as an introduction to some of the themes, questions, peoples, and sites that historical archaeology has helped us understand as part of the past of North America.

Historical archaeology has helped us to explore much of the human past of North America, including landscape change, economies, migrations, and even the relationships between people within a household. Historical archaeology is a dynamic discipline that is leveraging new technologies as well as returning to old collections and sites, which give us details about the past. Particularly as technology continues to decrease in price and historic sources are becoming digitized and accessible around the world, technology is becoming an extremely important point to leverage for understanding the potential of historic archaeology. Like the rest of archaeology, historical archaeology is changing to include diverse narratives as well as leverage new ways to demonstrate our importance to the public.

Understanding the research themes and goals of historical archaeology in North America allows us to understand what questions are explored in historical archaeology, identify relevant stakeholders and descendants of the material under investigation, and utilize appropriate theory and resources to interpret the past. It gives us a better understanding of the past so that we may use that knowledge to understand modern problems, making the field vibrant and relevant to everyone. Each century since the colonization of North America by Europeans has left a material imprint on the landscape and archaeologists have used this to better understand landscape change, the formation of national identities, and the lives of the people that have created modern society. From the 16th century to yesterday, material culture continues to be an important part of human life in North America, helps to tell us about each other, and may help us better prepare for the future.

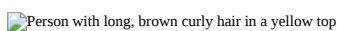
Discussion Questions

1. Define historical archaeology. What role can archaeology play in investigations of time periods that also have written history? Why is archaeology important here?
2. The chapter begins with a discussion of the *Sankofa* symbol. Why is this important and what does it say about the role of historical archaeology?
3. This chapter describes a number of examples of historical archaeological research across North America. Compare and contrast important themes in two different regions.
4. What directions do you see historical archaeology taking in the future? What are some avenues that you would like to explore?

About the Authors



Alexandra Martin is the archaeologist at Strawberry Banke Museum in Portsmouth, NH. She conducts research at the museum's archaeological sites and is responsible for maintaining the museum's collection of over one million archaeological artifacts. Alix is also a faculty fellow in the Anthropology department and coordinator of the Native American and Indigenous Studies minor program at the University of New Hampshire. As a board member of the New Hampshire Archeological Society, she serves as the editor of the society's publication, *The New Hampshire Archeologist*. Alix holds degrees in Anthropology from Mount Holyoke College and The College of William & Mary.

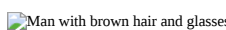
 Paulina F. Przystupa, PhD is a Filipino-Polish-Canadian-American Postdoctoral Researcher in Archaeological Data Literacy at the Alexandria Archive Institute / Open Context. Trained as a historical landscape archaeologist exploring socialization and assimilation at children's institutions, Paulina works in pedagogy-focused digital archaeology contexts to understand the dynamic ways people learn and teach archaeology and the ways that education shapes national and community identities.



Valerie Bondura is an educator and archaeological anthropologist with multiple commitments in higher education. She is passionate about feminist and decolonial approaches to anthropology and to education, and understands teaching and learning to be core practices for community-building and social justice. Valerie holds a Ph.D. in Anthropology (Archaeology) from Columbia University. During her graduate research, she worked with communities, archives, and archaeological data in the Northern Rio Grande to re-write histories of persistence and change across historic and ongoing colonial periods. Valerie has taught within her discipline and in university writing programs since 2014 and also serves as Director of Teaching and Learning at the Jewish Theological Seminary.



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Further Exploration

This list includes publicly available resources referenced in or relevant to this chapter, which may be of interest to readers who want to learn more. The URLs are typed out below as a courtesy for those who are reading a print version of the text. Please keep in mind that links may break over time and may not be immediately updated. Instructors should use discretion when assigning materials from this list. While the chapter itself has been checked for web accessibility, the editors do not vouch for the accessibility of all supplementary linked resources.

African Burial Ground – <https://www.nps.gov/afbg/index.htm>

Birnirk Peoples – Birnirk National Historic Landmark – <https://www.nps.gov/places/birnirk-site.htm>

Colonial Williamsburg – <https://www.colonialwilliamsburg.org/>

Digital Archaeological Archive of Comparative Slavery – <https://www.daacs.org/>

Enslaved: Peoples of the Historical Slave Trade – <https://enslaved.org/>

Fort Barrancas – National Park Service – <https://www.nps.gov/guis/planyourvisit/fort-barrancas-area.htm>

Mission San Luis – <https://missionsanluis.org/virtualTour/>

National Historic Preservation Act – <https://www.nps.gov/subjects/historicpreservation/national-historic-preservation-act.htm>

Parks Canada – Saint Croix Island International Historic Site – <https://parks.canada.ca/lhn-nhs/nb/stcroix>

Pensacola Colonial Frontiers Blog – <https://pensacolacolonialfrontiers.blogspot.com/>

Red Bay – Red Bay Basque Whaling Station – <https://whc.unesco.org/en/list/1412>

San Marcos de Apalache – Florida State Parks – <https://www.floridastateparks.org/parks-and-trails/san-marcos-de-apalache-historic-state-park>

Society for Historical Archaeology – <https://sha.org/>

United States Parks Service – Saint Croix Island – <https://www.nps.gov/sacr/index.htm>

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CHAPTER OVERVIEW

3: A Tour Through Time - Case Studies of World Archaeology

3.1: The Colony of Avalon, Ferryland, Newfoundland, Canada

3.2: Archaeological Data Literacy and Cattle Bones from Neolithic and Bronze Age Switzerland

Thumbnail: A close up of a broken shoe on the ground (Unsplash License; [Tmava University](#) via [Unsplash](#))

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3.1: The Colony of Avalon, Ferryland, Newfoundland, Canada

Robyn Lacy, Ph.D., Black Cat Cemetery Preservation

Introduction

Map showing location of Ferryland.

Figure 1 – Map showing Ferryland. (Clausnitzer and Gaulton; Figure 1.)

Located on what is now known as the Southern Shore, a stretch of coastline on the east coast of the Avalon Peninsula, approximately 80 kilometers south of the city of St. John's, the town of Ferryland sits at the edge of the water, and has for the last 400 years (Figure 1). Ferryland was founded on the traditional territory of the Beothuk people, who occupied much of the island of Newfoundland.

Prior to permanent settlement, Ferryland was known as a hospitable harbour with shelter for boats and people alike. It was a favorite location for seasonal fishers, and the English were known to have been exploiting the cod stocks off the coast of Newfoundland by 1502; Ferryland was well known for its quantity of fish by the early 17th century (Quinn 1977). With the cod fishers came the need to prepare the fish for their journey back to Europe, and fishing stages and flakes were constructed each season to support the industry, only to be abandoned for the winter. Today, the hills surrounding Ferryland are bare and the impact of humanity on the landscape is very clear. While much of Newfoundland remains covered by extensive forests, settlements that were preceded by seasonal fishing operations were often stripped of trees.

Documentary and archaeological evidence demonstrates that Ferryland was occupied by the Beothuk people, as well as seasonally by European fishers beginning in the 16th century. Several Beothuk artifacts and features such as hearths have been located at Ferryland, which was considered to be far outside of what was thought of as their traditional territory (Marshall 1995; Pastore 1989; 1992; Gaulton 2001). While it is unclear exactly what relationship existed between the Beothuk and the European fishers in Ferryland, the identification of grape seeds in Beothuk hearths, a fruit not native to Newfoundland, is evidence that the two groups were trading by at least one point in time (Gaulton 2001). By the time Sir George Calvert, the First Lord Baltimore, and his settlers arrived, however, the Beothuk people were not inhabiting the site, and in fact it appeared that they were only there sporadically for brief periods, perhaps visiting for trading or scavenging resources after the fishers had left for the winter (Gaulton 2001).

Captain Edward Wynne, the first governor of Ferryland, spoke of the need to conserve the trees upon his arrival at the site in 1621 with 11 settlers, under the instruction and patronage of Calvert (Cell 1982). A letter written by Captain Daniel Powell, who brought another ship of settlers to Ferryland in 1622, included observations on how the coastline near Ferryland was “so spoiled by the fishermen, that it is great pity to behold them, and without redress, undoubtedly will be the ruin of this good land—for they wastefully bark, fell, and leave more wood behind them to rot, than they use about their stages, although they employ a world of wood upon them and by these, their abuses, do so encumber the woods everywhere near the shore.” (Cell 1982).

Calvert's goal was to establish a permanent settlement in the harbour, an economic enterprise like those established by other companies in the “new world.” Known as the colony of Avalon, the settlement was constructed on partially deforested land, and as a result, Ferryland became one of the first settlements in North America to be constructed primarily out of stone.

Archaeology has revealed the well-preserved foundations of the Ferryland settlement, one piece in the history of a place which was home to many different groups of people, most of whom never encountered the previous occupants of the space. Today, Ferryland is still home to a little over 400 people, four times the number who lived there in the early 17th century. The historical settlement, located in the inner harbour of the outpost town, plays an important role for the present community, as both an economic boost as a tourist attraction and a point of local pride. Many people in Ferryland have worked for the Colony of Avalon Foundation over the

years, proving time and time again that historical sites are important and valuable cultural heritage assets, and remain valid and contributing aspects of their communities.

Colony of Avalon 1621–1637



Figure 2 – The mansion house

Calvert obtained the land, already known by its reputation as having a nearby fishing ground, from Sir William Vaughan, in order to construct the colony and make a new home for his family (Gaulton 2006). Captain Wynne and his handful of settlers were the first to arrive and begin building the colony, starting with a 44-x-15-foot dwelling that was constructed to house the settlers. Later in 1623, the “mansion house,” the largest and grandest residence built in Ferryland, was constructed—the home of the Calvert family. The mansion house was constructed from locally quarried slate (Figure 2), the outcrops of which were within a few hundred meters of the settlement (Gaulton 1997), while other slates were gathered from additional outcrops nearby, and the material was used to make roof tiles, pot lids, sundials, and gravestones (Gaulton 1997; Lacy, et al. 2018).



Figure 3 – Broken 17th-century slate roof tile.

The Colony of Avalon, the idealistic name of Calvert’s settlement, was located within the naturally created “pool”: a sandbar or arm of gravel and sand that curves out from the Ferryland Downs, shifting with the tides every year and creating a naturally protected harbour. Ferryland was organized in a similar manner to other English port towns of the period, with a large stone quay projecting into the harbour, waterfront storage buildings, a cobblestone street, and other buildings such as dwellings, kitchens, and a forge (Gaulton 2006, p. 33). During the Calvert period in Ferryland, most structures would have been roofed with locally quarried slate (Figure 3), as is evidenced from the vast number of slate tile deposits which have been identified within early-17th-century structures at the settlement (Gaulton 1997; Lacy 2017; Spiwak 2020).

The most dramatic features of the settlement were the ditch, earthworks, and palisade, which surrounded the entire site. The fortifications, crossed on the east by a wooden bridge, were approximately 6 meters wide in many places, and ringed an internal earthwork that supported a large wooden palisade that surrounded not only the settlement, but also an anthropomorphic mound in the southeast corner of the settlement, the bastion, which once contained a cannon(s) and provided an excellent view out of the only viable entrance to the otherwise protected harbour.



Figure 4 – The waterfront wall

Wynne and his early settlers built a forge, a brew and bake house for beer and bread, a seawall as part of the harbour front and wharf area, as well as a stable for horses, a kitchen garden where many crops were raised for the settlement, and many other buildings (Figure 4). Through the archaeological record, evidence of high-status goods has identified the potential for inhabitants with some disposable income at the site—through gold-covered glass beads, ceramics like North Italian marbled slipware (which were expensive but not only used by gentry), a gold gilt processional cross, and a number of other objects.

It was Calvert's goal to have his settlement be a place of religious tolerance, in a time of turmoil in Britain. Calvert announced himself as Catholic in 1625 after leaving his position as the secretary to the king, four years after his colony had begun, and wished to see the settlement as a place where Anglicans and Catholics could worship freely and without persecution. Accounts inform archaeologists that while there was no formal church constructed, as far as the excavations have revealed, the mansion house was used for both Anglican and Catholic services, much to the chagrin of many of the settlers (Stourton 1628). Although he had been told of the favorable weather in Newfoundland, Calvert found his first winter in his colony cold and difficult, and struggled with the living conditions. In the particularly difficult winter of 1629, he wrote “of 100 persons, 50 sick at a time, myself being one, and nyne or ten of them dyed” (Cell 1982). These events, described in a letter to the King of England, prompted Calvert to ask for additional land in Virginia, where the climate was more favorable and where he might try to start another settlement. While the request for land in Virginia was not granted, Calvert was eventually granted land in what is today Maryland to start another settlement as an economic enterprise. George Calvert died in 1632 after he returned to England and did not witness his son Cecil found the settlement of St. Mary's City in Maryland or have the City of Baltimore (from the Irish *Baile an Tí Mhóir*, or “town of the big house” [Egan 2016]) named for him.

The Pool Plantation 1637–1696

After the Calverts left Ferryland, the settlement continued to operate. While it survived on the coast of Newfoundland, it did not prosper for some time. In 1637, Ferryland came under new leadership. Sir David Kirke and the Marquis of Hamilton and the Earls of Pembroke and Holland were all named coproprietors of the Island of Newfoundland by King Charles I (Gaulton 2006). Kirke was appointed to oversee the economic aspects of this venture and arrived at Ferryland with his family and 100 additional settlers, to set up the settlement as the base of his operation, removing William Hill, who had been left to manage the plantation.

Along with adding a tax on foreign fishing vessels and rent for fishing rooms, Kirke fundamentally changed the organization of the settlement itself, developing it into his “Pool Plantation.” A tavern was built over Calvert's horse barn, and later the “Kirke House” was constructed adjacent to the brew and bake house, which absorbed these earlier structures into its kitchen. After the death of Charles I, Kirke, who was a loyalist, was seen in an unfavorable light, and upon returning to England in 1651, Kirke was imprisoned and died behind bars. He left his widow, Lady Sara Kirke, and four sons behind. Lady Sara chose to remain in Ferryland, and took over the operations of the plantation, and is considered to be one of the first female entrepreneurs in the “new world” (Gaulton 2006). Local legend suggests that Lady Sara was buried on the Ferryland Downs, near her Pool Plantation (Gaulton and Tuck 2003).

In the late 1600s, Ferryland was the subject of two attacks, first by the Dutch, and later by the French. The Dutch raid in 1673 was the result of retaliation against the English, who had just pushed the Dutch out of their previous colonial settlements in New York. Four Dutch ships attacked the small fishing enterprise, destroying homes and burning fishing boats, including property belonging to Lady Sara Kirke and her sister, Lady Hopkins (Lovelace 1675). It is apparent that no lives were lost during this attack, and the settlers remained to rebuild afterward.

The French attack on Ferryland, and much of the scattered settlements on the Avalon Peninsula, came as the result of war between Britain and France, declared in 1689. The French had already occupied portions of the south coast of the island, and departed from their settlement of Plaisance (Placentia) in 1696, led by Pierre Le Moyne d'Iberville by land and Jacques-François de Brouillon by sea. On Monday, September 21, 1696, the French fleet arrived at Ferryland and proceeded to ransack and burn the settlement (Clappe et al. 1697). The settlers who escaped without being captured were forced to spend the winter away from their homes; however many eventually returned to the Ferryland harbour again the following spring, and it has been permanently occupied by European settlers ever since. Three of the sons of Sir David and Lady Sara Kirke were captured and taken to Placentia as prisoners, where two of them died, and the third son died later in St. John's as a result of his earlier imprisonment.

Archaeological Excavations in Ferryland



Figure 5 – Seventeenth-century pipe fragments

Test excavations were carried out in Ferryland as early as the 1880s by M.F. Howley, and additional testing was conducted around the Pool and on the mainland in the 1930s by Dr. Stanley Brooks, an entomologist from the Carnegie Institute in Pittsburgh, Pennsylvania (Tuck 1996; Gaulton 2006). While the location of Calvert's Colony was never forgotten, its exact placement in Ferryland had not been completely narrowed down, so these early days of digging in the town explored several possible areas around the harbour. While Brooks believed that the famous mansion house was located on Ferryland mainland, J.R. Harper believed the settlement was closer to the Pool, and his 1959 excavations revealed artifacts from the mid- to late-17th century, including pipe bowls (Figure 5), case bottle glass, and North Devon sgraffito ceramics (Gaulton 2006).

Memorial University of Newfoundland began test excavations at the site in 1968 based on these findings, and in the 1980s, under the direction of Dr. James Tuck, formal excavations began in an effort to locate the 17th-century settlement. Those early excavations revealed that the site was better preserved than anyone had previously expected (Tuck 1996; Gaulton 2006). After a brief hiatus, excavations at Ferryland have been ongoing through present day with support through Memorial University of Newfoundland and Labrador and the Colony of Avalon Foundation. This long-standing community-university partnership continues to conduct excavations, run tours, and house the collections for the site in its storage facility and museum on the site.



Figure 6 – Ongoing excavations near the “prette street”

Throughout the years of excavation, the grounds surrounding the Pool have revealed the stone foundations and lower walls of many buildings, including Calvert's mansion house, the Kirke house, stables, warehouses, docks, a courtyard, a kitchen, a forge, several houses, defensive earthworks, and the “prette street” which Edward Wynne referenced in his letters back to Calvert (Figure 6). The cobblestone street runs the length of the site, and while only some of it is currently exposed to be walked upon by thousands of visitors every summer, the extent of the 17th-century feature is protected beneath sediment and the modern road to the Pool. There are plans in the future to reroute the harbour road in order to expose the full length of the 17th-century cobble street, but it is currently unknown when this will take place. Test pitting carried out by Gaulton (et al. 2017) cleared a viable area for the rerouted road, and simultaneously uncovered evidence of additional 17th-century structures outside of the confines of the fortified settlement.

Excavations have revealed not only the building techniques implemented at the settlement, but how the early European settlers who lived there conducted their lives, and the environment in which they lived. While the first stone house at Ferryland measured 4.5 meters x 13.3 meters, it had to act as living quarters for all settlers upon its construction, until other houses were built (Cell 1982). In contrast, Calvert's mansion house was built for the Calvert family shortly before their arrival and consisted of the central mansion house, a courtyard, and several semi-attached domestic and non-domestic structures (Tuck and Gaulton 2013). The kitchen garden, although Wynne boasted of its productivity, has been re-created and contains plants that early letters suggested the settlers had been growing themselves with some success. A horse stable-turned-ale house indicates that while the wealthy continued to display their status through gold beads and expensive objects, there was still a tavern for the fishers to relax in after a day on the rough Atlantic Ocean (Ingram 2016).

In 2011, Clausnitzer's thesis explored the material culture of the 17th-century brew and bakehouse structure on the east side of the enclosed settlement. Through analysis of the artifacts and structural components, his research determined that the original structure was built in the early 1620s, as is indicated in early letters, and was dismantled to make room for another building less than 20 years later.

Hawkins (2016) examined the uses and importation of the Surrey-Hampshire Border ware ceramics in Newfoundland and English North America. Her research was the first to extensively analyze Border ware ceramics on the East Coast of North America, and can aid with further identification of English Border ware vessels in colonial settlements.

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Figure 7 – The view overlooking the settlement from Downs

Lacy (2017) conducted an excavation in search of the “lost” 17th-century burial ground in Ferryland, which would likely contain the dead from the fateful winter of 1629. She used spatial data from similar British settlements along the east coast of North America to help inform the trench locations in an attempt to identify burial shafts in Ferryland. The burials have yet to be identified; however excavations have revealed where they are *not*, and have identified many additional aspects of the site, such as locating the southern defensive ditch and embankment, a slate processing deposit, and a previously unknown 17th-century occupation area east of the fortified settlement (Figure 7).

Although the excavation has been ongoing for decades, new information is being revealed every year that changes our understanding of the site and the lives of the people who built it.

Ongoing Investigations and a National Historic Site

In 1953, the Colony of Avalon was officially designated as a National Historic Site of Canada, giving it protection for future generations, as a testament to early settlers' ingenuity in 17th-century North America. With the expansion into the current building, the Colony of Avalon Foundation provides a museum, visitor resources, a collections and conservation lab, and collections storage for artifacts recovered from the excavations. Excavations are ongoing under the direction of Dr. Barry Gaulton of Memorial University of Newfoundland and Labrador, aided by eager undergraduates, graduate students, community members, and volunteers who all work hard to continue research into the settlement and how those early settlers lived and worked.

Ferryland is a significant site, not only for the archaeological record of colonial settlement and fortification in 17th-century North America, but as an economic center and point of community pride for the people of Ferryland. After the French attack in 1696, people living in Ferryland left the settlement at the Pool and were sent back to Devon, but many of these individuals returned to Ferryland the following year. Ferryland has been an occupied community ever since, and ties to the historical site and the archaeological excavations are located within the heart of the community, on the shores of the harbour. Many residents work at the site, or have worked there over the years, being part of the museum, the conservation work, guiding tours, keeping the grounds, or being part of the excavation itself. If Calvert's goal was for his settlement to be an economic enterprise, in some way, it has found that calling as an archaeological site providing employment to locals and students from Ferryland and other communities along the Southern Shore.

As a National Historic Site of Canada, the archaeological dig at the Colony of Avalon is open to the public during the excavation season, usually between June and September of every year. They are welcome to visit the museum and take a guided tour or borrow guidebooks to take themselves around the site. During the week, archaeologists working at the site are there to answer questions about their ongoing research, creating a unique opportunity to see the excavations and interact with archaeologists while they work, which is often difficult to do given the remote locations of many excavations.

The Colony of Avalon Foundation offers an experience for interested visitors who want to get a little closer to the action, and support the not-for-profit organization along the way: “Archaeologist for a Day.” This experience gives the visitor the chance to excavate alongside archaeologists on the dig, learn about the archaeology of the site, help recover artifacts, and have lunch at the nearby Lighthouse Picnics.

Recent research at Ferryland covers a variety of topics related to the Beothuk occupation, as well as the 17th-century to the 19th-century European occupation at the site. Along with Dr. Gaulton’s ongoing work dealing with multiple aspects of the settlement including plans to eventually re-excavate and fully expose the 17th-century street built by Edward Wynne and his settlers in the early days of Ferryland, graduate student research is ongoing at the Colony. Duncan Williams’s research examines life in early 19th-century Ferryland, and the changing settlement patterns that occurred as the center of the settlement moved from the Pool to other parts of the protected harbour. With the rise of a new permanent settlement and resident-controlled settlement, Williams explores the Downs House, which was occupied by several prominent individuals in 1800–1850, and is about 300 meters from the Colony of Avalon archaeological site (Williams 2018). J.D. Archer’s project explores the kitchen associated with George Calvert’s mansion house, in the center of the settlement (2021). His research examines a collection excavated in the kitchen with the aim of identifying different uses of the structure between the Calvert and Kirke periods as well as answering questions related to working versus living spaces.

Lewis-Sing’s research involves a macro-analysis of the paleoethnobotanical record from contexts associated with the 16th-century Beothuk occupation at Ferryland. The samples used in the project also contain evidence of the European migratory fishery occupation. Grape seeds, a non-native plant to Newfoundland, have been identified as well as many other varieties of plant which offer the opportunity to investigate potential cross-cultural interactions between Beothuk people and European fishers. Spiwak’s ongoing research looks at the large-scale use of local slate at Ferryland, through a number of nearby quarry locations exploited by skilled tradesmen (2020). Little research has been done on the quarrying and slate tile manufacturing process at the colony thus far, and her research aims to determine how 17th-century quarrying and slate processing in Newfoundland may have been derived from the homelands of the settlers, particularly Wales.

Conclusions

The Colony of Avalon was a settlement built with the dreams of economic gain and religious freedom in the “new world” and has endured on the Southern Shore on the east coast of Newfoundland for centuries, despite deaths, hardship, and destruction. While often overlooked beside its famous counterparts such as Plymouth, or Jamestown, Ferryland was a hub of activity from 1621 onward. Ongoing research conducted at the site is expanding archaeologists’ understanding of what life was like in 17th-, 18th-, and even 19th- and 20th-century Newfoundland, and more information is being uncovered every day.

If you visit the site today, you will find community archaeology and local pride in history coupled with high-quality collections management and archaeological research, all carried out at the same time. Ferryland is truly a unique archaeological site as well as a unique settlement in the 17th-century colonial period in Newfoundland and mainland North America’s history. The style of construction, continuous occupation of the area, relationship with early fishers and Beothuk people, and ongoing heritage of the landscape itself makes it a wonderful place to visit and study.

About the Author



Robyn Lacy received her Ph.D. in Archaeology from Memorial University of Newfoundland and Labrador, where her research focused on the development of burial landscapes in 17th-century colonial burial grounds in northeast North America. Her second book, *Daisy Wheel, Hexfoil, Hexafoil, Rosette: Protective Marks in Gravestone Art*, was published in 2024 with Berghahn Books.

Her work in gravestone conservation takes her across Newfoundland, and she regularly presents her research at international conferences and on her research blog, Spadeandthegrave.com.

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3.2: Archaeological Data Literacy and Cattle Bones from Neolithic and Bronze Age Switzerland

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In this case study, we introduce archaeological data literacy by drawing from a data set titled *Neolithic and Bronze Age Cattle Data from Switzerland* collected by Elizabeth Wright and colleagues ([Wright et al 2021](#)). This data set aggregates previously published data from a variety of sources, and focuses on data about cattle during the Neolithic and Bronze ages. Wright et al (2021) define the Neolithic and the Bronze ages as between the years of about 4500 and 800 cal BC. They divide the data into specific sub-temporal units that exist within each epoch. The data mainly come from archaeological sites in present-day Switzerland but also from other parts of West-Central Europe, such as Germany and Liechtenstein.

As explored in Wright (2021), creating a data set like this is complicated but worthwhile to address trends such as regional adaptations and changes to human behavior. Specifically, this data set supports research focusing on how people exploited domesticated and wild cattle during the Neolithic, by leveraging bone measurements and morphological differences to separate wild and domesticated cattle. Another use for this data set can be to explore how people in that region changed how they used cattle over time. Changes in use demonstrated significant relationships with adjacent regions, which shows that during the Neolithic, groups of people didn't necessarily live in isolation from one another. They had relationships with neighbors hundreds of miles away!

These are the sorts of things that you can learn and do if you have good archaeological data literacy. But what does it mean to have archaeological data literacy? Well, archaeological data literacy is when a person knows how to [read](#), [work with](#), [analyze](#), [argue](#), and [communicate](#) utilizing archaeological data. Whenever we're learning something new in archaeology, either on our own or in a classroom setting, we're engaging with that new information in a variety of ways. It could be that we're reading an article on a new topic, or we're looking at a graph from a publication, or we're replying to a post on social media. Or, we might be tossed a spreadsheet full of numbers and words we're not familiar with. When presented with new information we can react in a bunch of different ways.

Some people feel comfortable looking at the numbers as numbers, playing with them using a spreadsheet program, or using a programming language like R to examine trends. In contrast, others will want to read more articles to contextualize those numbers before doing anything. Those are just a few ways to react to the data but any response requires a certain level of established data literacy. Folks who have that kind of data literacy already understand different kinds of numbers, and feel comfortable exploring questions or finding keywords that they are familiar with. They might not need much guidance to get started with the data. If that's you, great! If it's not you, it's okay! Not everyone is comfortable jumping right into spreadsheet or code-based analysis. Some folks might be afraid that they'll break the data, or make the wrong conclusions because they don't know enough about the topic. That's okay, too! These fears are understandable and common, but they can be surmounted!

Either way, if you're interested in playing with the cattle data on your own, we have a [full exercise as a PDF](#) to guide you through it. Those who enjoy coding can explore the [same resource in R markdown](#) as part of a [larger data literacy project](#). The goal of that exercise is to acclimatize you to making mistakes, messing up, and the idea that there's no way to break the data! Anxieties you have about numbers, spreadsheets, and data, are normal. They're a part of advancing your data literacy. In this text though (the one you're already reading), we're going to use examples from this data set to explore what it's like to learn to 'read' data.

If you've gotten this far you're probably heaving a sigh of relief, knowing that data literacy isn't only about looking at numbers. A lot of the data that we engage with in archaeology has a numerical component, but the numbers aren't always numbers... In Kansa and Kansa (2013), *Open Archaeology: We All Know That a 14 Is a Sheep: Data Publication and Professionalism in Archaeological Communication*, they show how the numbers that we see in a table may mean more than what they appear. The numbers might be keys that link to data in another table (such as linking bones to measurements taken on them), or they might be codes used as shorthand that are translated into text in another document (i.e. "14" = "sheep"). This highlights how there are numbers or data of different kinds and they cannot always be treated as the same! And this is where the data literacy component of "reading" both draws from what you know and extends it a little further.

To dig into this a bit deeper, there are different kinds of numbers that may be categorized or understood by the acronym NOIR. This is short for nominal, ordinal, interval, and ratio. These different kinds of numbers limit how we can explore the data to

examine trends, or apply statistical tests. Let's quickly go through what each of these kinds of numbers are, and how you might use them. Keep in mind, *each of these types of numbers is actually a type of data*.

- Nominal numbers, or nominal data, are data which can be organized into categories. In an archaeological analysis of our cattle bones, this could be by sex if we want to separate bulls from cows, or by location if we want to put all of the bones from Liechtenstein together. It's important to see that nominal data are things that can't be divided numerically, only categorically. For example, a "1" for "male", a "2" for "female", and a "3" for "unknown sex" serve to separate these two categories, not rank them or allow them to be tallied.
- Ordinal numbers, or ordinal data, are data which can be put into a ranking, or a list based on an order. We could order cattle bones by weight from lightest to heaviest, or by their length from shortest to longest, or by their excavation date from most recently to longest ago. When working with ordinal data, we're not concerned with how much difference there is between our data points, just that there is a difference that we can rank.
- Interval numbers, or interval data, are data that can be categorized and ranked in equal intervals, and where the differences between numbers mean something but there's no true zero. For the cattle bones, a bone's deposition date is an example of this, though...it's a little complicated. A bone from Wright et al (2021) dates to 1600 BCE. What that actually means is that someone or thing left it there 1600 years Before the Common Era (BCE) with the common era event being our zero. But if we want to know how long ago 1600 BCE was from today, today being in the year 2023, we'd need to add the two, $1600 + 2023$, to get 3623 years ago. So while the units are the same (equal intervals of one year) the amount (number of years in the range) changes depending on when or where you measure from.
- Ratio numbers, or ratio data, are data that have consistent units occurring at equal intervals, can be ranked, and have a 'true zero' (an absolute lower limit that you can't go below zero). Continuing with our cattle data, a bone's weight, or length has an absolute zero because you can't have a negative weight or length for something that exists! This is where the measurement comes in: while the units might drive the change in number, the actual value measured will not change no matter what units you record in. An existing cow bone will have a fixed length and fixed weight in whatever units you pick. It's very informative to use ratio data when working with bones, because since ratio data is never negative, you can use it to calculate frequencies (how often you find a kind of bone), and standard deviation (what is 'normal' for a given kind of bone).

Understanding the kind of numbers (or data) you're working with is important to figure out how you can analyze them. In the data story we linked to near the beginning of this text, we have folks focus on terms related to time. "When?" is an important question in archaeology and matters regardless of geographical locations and kind of excavation. And to explore that question, based on what we learned above, will probably require us to consider either ordinal or interval data. You can explore both ways of understanding time, as ordinal or interval, in the *Cow-culating Your Data* exercise by using a spreadsheet program or by using the statistical program R.

However, as we've said before, there are more ways to engage with data than by using numbers. Another way to explore and cultivate data literacy skills is through considering your data as narrative, practicing the arguing and the communicating components of data literacy. What stories does your data tell? How can you think and share the past through your data in a way that other folks, especially non-archaeologists, can relate to? Data may be collected in numbers, but it can be expressed in words. An important part of growing your data literacy is the ability to share your results in clear, concise language that engages your reader.

You can do this by considering different kinds of voices you may use to tell the story of a data set. Take a look at [Neolithic and Bronze Age Cattle Data from Switzerland](#) by clicking on the Data Records hyperlink and selecting a data type. Play around with the settings of the various images on the page, moving sliders, filtering and clicking buttons, practicing your "reading" data skill. Then consider how you might tell someone else about the things you observe in the data set. Consider how the way you tell someone might change based on their age or cultural background? How would you change the way you spoke if you were telling a professor versus your elementary school teacher? These are all people who might be interested in knowing about these bones but their interest in the story may vary depending on what pieces you highlight and how you tell them about it.

Data literacy is a process of continual growth and learning. Throughout a career in archaeology, your archaeological data literacy will grow, and your ability to synthesize information will increase. Learning how to approach data is a lifelong process, and one that will, ultimately, make you a better archaeologist!

About the Authors

 Person with long, brown curly hair in a yellow top.

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L. Meghan Dennis, Ph.D., Alexandria Archive Institute

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Further Exploration

This list includes publicly available resources referenced in or relevant to this chapter, which may be of interest to readers who want to learn more. The URLs are typed out below as a courtesy for those who are reading a print version of the text. Please keep in mind that links may break over time and may not be immediately updated. Instructors should use discretion when assigning materials from this list. While the chapter itself has been checked for web accessibility, the editors do not vouch for the accessibility of all supplementary linked resources.

“Full exercise as a PDF” – Cow-culating Your Data with Spreadsheets and R: A Digital Data Story – https://alexandriaarchive.org/wp-content/uploads/2022/05/CattlebonesDSComplete_v1-0.pdf

“Larger literary data project” – Digital Data Stories – <https://alexandriaarchive.org/digital-data-stories/>

Neolithic and Bronze Age Cattle Data from Switzerland – <https://opencontext.org/projects/c89e6a9e-105a-4368-9e90-26940d7bf37a>

“Read, work with, analyze, argue, and communicate” – Defining Data Literacy – <https://alexandriaarchive.org/2021/05/27/defining-data-literacy/>

“Same resource in R markdown” – Cow-culating Your Data with Spreadsheets and R: A Digital Data Story – <https://codeberg.org/OpenContext/DigitalDataStories/src/branch/main/DataStory1-CowculatingYourData>

This page titled [3.2: Archaeological Data Literacy and Cattle Bones from Neolithic and Bronze Age Switzerland](#) is shared under a [CC BY-NC 4.0](#) license and was authored, remixed, and/or curated by [Isabel M. Scarborough](#), [Jennifer M. Johnson Zovar](#), [Ian S. Ray](#), and [John A. Donahue](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.

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Glossary

12C | carbon-12, notation for isotope of carbon, the most commonly used element for determining the age of organic materials in archaeology

14C | carbon-14, notation for isotope of carbon, the most commonly used element for determining the age of organic materials in archaeology

39Ar | notation used for argon-39, used in dating rocks, minerals, and fossils

39K | notation used for potassium-39, used in dating rocks, minerals, and fossils

40Ar | notation used for argon-40, used in dating rocks, minerals, and fossils

40K | notation used for potassium-40, used in dating rocks, minerals, and fossils

Abrader | A tool used for grinding, smoothing, or polishing, which could be used to shape bone and shell implements.

Accelerator mass spectrometry (AMS) | Instrumental method for calculating age that uses a mass spectrometer.

Actualistic studies | Modern experiments used to understand phenomena in the past.

Agency archaeologists | Government employees, generally with advanced academic degrees in anthropology or related fields, who specialize in historic preservation law.

Alloy | A metallic compound, formed through the mixing of two or more metals.

amphorae | Long, slender storage containers commonly used in ancient Greece and Rome.

Animal husbandry | The domestication and breeding of select animal taxa.

Anthropocene | An unofficial unit of geologic time used to describe the most recent period in Earth's history, when human activity, specifically nuclear weapon detonation, started to have a significant impact on the planet's climate and ecosystems.

anthropology | The social science that examines human culture and humanity. In other words, the study of humankind.

Antiquarian | A person who studies or collects antiques or antiquities.

Antiquities Act | The oldest law passed to protect archaeological resources in the United States, designed to protect historic sites on federal lands from vandalism and theft

Appendicular skeleton | In the Vertebrate skeleton, elements associated with the fore and hind limbs, the pectoral or shoulder girdle, and the pelvic or hip girdle.

applied anthropology | The use of anthropology as an applied science, typically outside of an academic context, used to solve real-world issues.

archaeological process | a generalized series of steps or tasks an archaeologist takes to successfully develop, conduct, and complete archaeological projects.

Archaeological registrars | Government employees who oversee the management of data on archaeological sites, collecting data provided by professional and avocational (unpaid) archaeologists.

archaeology | The subfield of anthropology that studies the human past through the analyses of material remains

Archaeometallurgy | The study of metal in archaeological contexts

Artifact | An object that was made and used by humans in the past.

atmosphere | In ceramics, the condition of gasses during firing. Ceramics are 'oxidized' when there is excessive oxygen or 'reduced' when there is not enough to burn the fuel.

Awl | A pointed tool used for punching holes, often as a part of leather work.

Axial skeleton | In the Vertebrate skeleton, elements associated with the skull, spinal column, and rib cage.

BCE / CE | (before common era/common era) - notation for reporting ages that moves away from the BC/AD date notation used by the Christian/Gregorian calendar. This is a more inclusive way of reporting dates that is recognized internationally.

bioarchaeologist | A scientist who studies human biological remains (such as skeletal remains) from archaeological sites.

Bioarchaeology | The study of human remains excavated from archaeological sites.

Biocultural | Scientific exploration of the relationship between biology and culture.

biological anthropology | The subfield of anthropology that focuses on the study of humans as biological organisms.

Biological profile | Age, sex, ancestry, stature, trauma, and pathological assessment of skeletal remains.

Biomass | In zooarchaeology, a type of secondary data that uses allometric scaling to estimate relative dietary significance based on comparison of faunal specimen weight.

blanket sampling | A sampling strategy also known as "full coverage" or "total sampling," which takes samples from all units and individual features.

brothel | A place where people may engage in sexual activity with sex workers.

Bucket flotation | A method of flotation done by hand, in which soil is simply dissolved into a bucket so that any botanical remains will float to the surface.

bulb of percussion | the bulb-shaped area on a stone flake or tool directly below the point of impact for knocking off flakes

burial mound | A mound built over a grave or graves, usually earthen but may be made of stones.

Cache | An intentionally buried collection of items.

cal BP | (calibrated years before present) - correct notation for radiocarbon dates that are adjusted to account for reservoir effect, sample contamination, isotopic fractionation, and other natural effects that introduce error in the calculation of radiocarbon age

Ceramic | In an archaeological context, any material made by humans out of clay and subsequently fired so that the clay chemically changes and hardens.

Chemical flotation | The use of chemicals of differing densities to separate microbotanical remains from their matrix.

Chert | A type of fine-grained sedimentary rock that flakes easily and is often used for stone tools. Also known as flint.

climate proxy | preserved physical characteristics that stands in as indirect evidence for direct measurements of the meteorological past

Clovis | When used in reference to lithics, a Clovis point is a fluted lanceolate spearpoint found throughout North America and dating from between roughly 12,000 and 11,000 BCE.

Collections managers | Archaeologists tasked with properly caring for the collections that come to a collections facility (usually lodged within a museum, often at the county or state level).

Commensal | In zooarchaeology, refers to all organisms living in or around humans and human habitations that are not typically considered dietary items or faunal resources; in general, the humans neither benefit nor are harmed by the presence of these animals.

Commercial archaeologist | An archaeologist working in cultural resource management, either as an independent contractor or as an employee of a larger firm. Secretary of the Interior guidelines requires an advanced degree in anthropology or a related field.

Commingling | The combination of the bones from two or more individuals

Common Era | Shortened to CE, a term used by scientists to denote a secular alternative to AD

community archaeology | The active participation of non-archaeologists in the archaeological research process, ideally including various components that the community is involved in

Comparative collection | An assemblage of correctly identified, labeled, and complete specimens that can be used to assist in the identification of unknown, typically fragmented, specimens.

consolidation | restoration of a building, such as an archaeological ruin

Context | The specific location in which an artifact is found, and by association its relationship to other artifacts and ecofacts recovered from the same specific location.

Context sheets | In excavation, a 'context' is a specific layer or feature that is excavated as a unit. The 'context sheet' records the information gathered from a specific context.

Core | When used in reference to lithics, a core is the base material from which flakes are chipped in order to make stone tools.

Cremation | The burning of a dead body as part of intentional funerary rites.

creolization | Shannon Dawdy provides three definitions of creolization: "the birth of a colonial culture with the birth of a native generation-a transplantation of the old world in a new place," or acculturation into an established Creole community, or "the interbreeding of diverse peoples and figuratively the hybridization of cultures." (Dawdy, 2000, p. 109-110).

critical | An approach to public archaeology which works to unsettle the interpretation of the past as told by socially dominant groups, typically with ulterior motives that socially subjugate other groups, by distorting the telling of the past

cultural anthropology | The subfield of anthropology that focuses on the scientific study of modern peoples and culture. It is the core subfield of anthropology.

Cultural patrimony | Any cultural object or marker of shared heritage that belongs to the community as a whole.

Cultural period | A period of time that is characterized by certain types and styles of artifacts; used to estimate a relative date.

Cultural Resource Management | The process by which historically significant landscapes, structures, buildings, sites, and artifacts are identified, assessed, and cared for to ensure their perpetuation for scientific research and personal edification, reflection, and enjoyment.

Cultural resources | Material manifestations of a people, past or present, that can be investigated and interpreted in the service of a society.

Curation | the practice of cataloging, preserving, storing, and caring for archaeological collections and data.

curation crisis | refers to the ever-growing shortage of storage space available to properly curate and care for archaeological collections.

data collection | a part of the archaeological process when archaeologists gather data, either through remote sensing, survey, excavation, analysis, etc.

Datum | A fixed point used to measure from when mapping.

Debitage | The waste produced when making a chipped-stone tool.

Decay | The process through which the nucleus loses energy and emits particles in an attempt to become stable.

Decay curve | A graph showing the speed of radioactive decay, calculated using statistics and principles of nuclear physics.

Deep Time | A timeline of the natural events that have affected the Earth since the planet was formed, going back billions of years (synonymous with Geologic Time)

Degenerative activity | Any activity (or lack of activity) that leaves marks or wear patterns on the bone.

demijohn | round bottle with a narrow neck capable of holding three to ten gallons of liquid

Dendrochronology | An archaeological dating technique that works by counting individual annual growth rings on a cross section of lumber or whole trees that were used by humans for building structures or producing wooden artifacts

Descendant communities | Living people who are descended from the group(s) who occupied an archaeological site.

Diagnostic artifact | A specific type of artifact that marks a specific period of time in the archaeological record.

diaspora | Referring to the spread of a cultural group away from their traditional homeland.

Diffusionism | An archaeological theory that sought to explain change in the archaeological record by ideas or technologies diffusing, or spreading, from a single point of origin

Discriminate analysis | A statistical tool used to create or test groupings of objects.

dispossession | the taking away of property or land away from a person or a group

dissemination | informing other researchers and the public of the results of archaeological projects through reports, articles, presentations, and outreach.

documentary records | Written records including government documents, census records, treaties, directories, forms, maps, letters, and books.

Domesticates | Refers to plants and animals that have experienced a human-induced transformation in their reproductive and care needs. This transformation can be both physical and genetic.

Domestication | The process through which plants and animals change biologically as a result of human interference, becoming dependent on humans at the same time that humans become dependent on them.

débitage | debris formed from the creation of lithic, or stone, technology

Ecofact | A natural object that was used by humans in the past. For example, the bones left over from a chicken dinner.

Ecofacts | Inclusive term used to represent faunal and floral material obtained from the biotic environment and used by prehistoric and historic peoples.

educational | An approach to public archaeology which aims to facilitate people's learning of the past via archaeological thinking and methods

Element | In zooarchaeology and bioarchaeology, term used to refer to a single or individual bone, tooth, scale, scute, valve, or similar faunal remain.

Empirical | Data that can be counted, measured, and quantified.

Environmental archaeology | Subdiscipline of archaeology that focuses on the relationship between past societies and the environment in which they lived; typically includes zooarchaeology, paleoethnobotany, and geoarchaeology.

Epistemology | A branch of philosophy dedicated to the study of knowledge, colloquially phrased as "how you know what you know."

Error | A term for describing how "off" a scientific measurement is.

Ethnoarchaeology | An approach through which archaeologists observe living peoples with similar material culture in order to test hypotheses about how objects were made or used in the past.

ethnocide | the extermination of an ethnic group's cultural identity

ethnogenesis | "The creation of a new ethnicity forged through the experiences of colonization and culture contact" (Voss, 2008)."

Experimental archaeology | An approach through which archaeologists may attempt to replicate the manufacture or use of artifacts in order to test hypotheses about their role in the past.

Faunal remains | Any and all animal (fauna) remains encountered at archaeological sites.

Faunalturbation | A site formation process describing the movement of artifacts, ecofacts, or features as a result of animal activity.

Feature | An indication of human activity in the past that cannot be removed from the site. This might be the remains of a building or a discolored stain in the soil that represents an old trash pit.

Field school | A class (usually taught over the summer) where students learn about archaeology through doing it.

Fired | In reference to ceramics, this refers to heating the clay so that it chemically changes and hardens.

firing environment | In ceramics, the atmosphere, temperature, and pressure during firing.

Flake | When used in reference to lithics, a flake is the long linear sliver of stone removed from the core, which can be used as a tool itself or further shaped into a scraper, knife, projectile point, or other chipped-stone tool.

Floral remains | Any and all plant (flora) remains encountered at archaeological sites.

Floralturbation | A site formation process describing the movement of artifacts, ecofacts, or features as a result of plant activity.

Flotation | The process of using water to separate soil into its components that are heavier and lighter than water.

Flote-Tech | A flotation machine

fluorine dating | a specific type of chemical dating commonly used to compare the age of the soil around artifacts located in close proximity using different amounts of fluorine absorbed by human and animal bones in the soil

Fluted | When used in reference to lithics, a fluted point is one that has had a long flake removed from both sides at the base, which would have made it easier to haft to a spear or other projectile.

Fossilization | The preservation of an organism against natural decay processes.

fossilized | an organism that is preserved against natural decay processes, usually through petrification

Geographic Information Science | abbreviated as GIScience, a research field that defines geographic concepts in the context of Geographic Information Systems

Geographic Information Systems | abbreviated as GIS, a computer database that analyzes information and displays it geographically, typically in an interactive map format

Geologic Time | A timeline of the natural events that have affected the Earth since the planet was formed, going back billions of years.

glaze | In ceramics, a glassy coating used to waterproof a vessel and for decoration.

gray literature | reports and other documents and forms of dissemination that are not widely known or distributed and difficult to acquire.

Groundstone | Stone tools that are made from sedimentary, igneous, or metamorphic rock and shaped by pecking or grinding

Half-life | The length of time required for half of a given number of atoms of that isotope to decay.

hard archaeological fiction | fiction that is based on archaeological data

Hidden heterogeneity | Cannot directly observe the variation in a population's frailty.

high-level questions | In archaeology, questions that are about greater meaning and generating social theories—not necessarily related to the objects in front of you but to humanity as a whole.

historical archaeology | A subdiscipline of archaeology that includes the study of artifacts, oral histories, and documentary records, among other lines of evidence, to investigate questions about our more recent past.

holistic | Connecting elements of different disciplines or parts of society together

Holocene | The geological epoch following the Ice Age, from approximately 11,700 years ago through the present day.

Hominin | All species, including side-branches and extinct species, on the human evolutionary line.

Horizontal excavation | A style of excavation in which a large area is brought down to a single occupation area, allowing a bird's eye view of the site.

hybridity | Situation where the boundaries of identity are mixed, or where influences from two or more cultural groups are present (see Liebmann, 2008, Silliman, 2013).

In situ | Left in the place where it was found.

Informant | In Anthropology, a person who provides specific information about a research topic.

Instrumental methods | Methods of analysis that use a piece of scientific equipment (other than the human senses) to gather data. Mass spectrometers, microscopes, radiation detectors, cameras, scales, and computers are all scientific instruments.

Interment style | The method used to bury a dead body

Intersectional | Intersectionality is an analytical framework that considers how different forms of social stratification (e.g. ethnicity, gender, class, sexual orientation) are interwoven, and how systems of power impact those marginalized by their social status.

Intrusive | An item found in archaeological context which was deposited before or after the human habitation or activity directly associated with a particular component, and as such does not reflect the activities that created the site.

Invertebrates | Animals lacking an internal vertebral column or backbone; this term refers to all animals not found in the subphylum Vertebrata.

Isotope | One of two or more forms of the same element that differ in the number of neutrons in the nucleus.

Isotope Ratio Mass Spectrometry (IRMS) | A form of mass spectrometry used by archaeologists to analyze isotopic ratios of nitrogen, ¹³C, strontium (Sr), and carbonate (CO₃).

Isotopes | Atoms of the same element that contain different numbers of neutrons.

Judgmental sample | A sampling strategy based entirely on the judgment of the researcher.

Kiln | A kind of oven where the heat is produced in a firebox and flows either up or down into a chamber where the pottery sits.

Law of superposition | The idea that if you choose one specific patch of soil, and you dig down through the different layers, the layers at the bottom of your hole were deposited first.

lenticular | In botany, lens-shaped or covered in lens-shaped markings

Levallois | A technique for making stone tools used by Neanderthals about 400,000 to 250,000 years ago

LGBTQIA2S | Lesbian, gay, bisexual, trans, queer, intersex, asexual, two spirit.

LiDAR | short for light detection and ranging, a technology that sends a burst of light (typically a laser) towards an object to calculate the distance between the object and the ground

linguistic anthropology | The subfield of anthropology that focuses on the interaction between language and culture.

literature review | when an archaeologist conducts background research before starting a project. This can involve studying the local geology, plant and animal life, and environment; previously identified archaeologists sites and projects in the area; past property owners, man-made modifications to the landscape; and other research that has been conducted on the time periods, cultures, and research topics the archaeologist is interested in.

Lithics | Stone tools and the waste material from their creation.

logic of elimination | the idea that settler colonial regimes aim to destroy Indigenous groups and societies

Looting | Illegally removing objects from sites

Low-level questions | In archaeology, questions that can be answered through simple observation, with solutions that are more or less objective.

Luminescence | Spontaneous emission of light by a substance.

Macrobotany | Plant remains you can see with your bare eyes or a low-powered microscope, including seeds and wood charcoal.

macroscopic | can be seen with the naked eye (as opposed to microscopic)

Mano | The handstone used to grind food against a metate (lapstone).

Mass spectrometry | A technique used to analyze the mass of different molecules in a sample

Material culture | In archaeology, a general term used to refer to all tangible items created, used, and left behind by past cultures; this includes not only artifacts but larger items such as structures and cities.

Metate | The lapstone that the mano (handstone) grinds against.

metisage | Mixed heritage (Nassaney, 2008).

Microbotany | Plant remains that you can only see with a high-powered microscope, including starch, phytoliths, and pollen.

Microfauna | Small animal remains that are difficult to discern with the naked eye; artificial magnification is typically needed for accurate identification.

Microfaunal | Small animal remains that are difficult to discern with the naked eye; artificial magnification is typically needed for accurate identification.

Microwear | The small signs of usewear that often occur along the edge of a tool. Since different uses lead to different wear patterns, a microwear analysis can help archaeologists better understand how a tool was used.

Midden | An accumulation of garbage, usually discarded in a hole in the ground

Middle-range questions | In archaeology, questions that lie somewhere in between low-level and high-level, asking what specific material evidence can tell us about human action in the past.

mikveh | An immersive bath used for cleansing rituals in Judaism

minimum number of elements | fewest possible number of bones (elements) from people or animals in a skeletal collection or archaeological assemblage

Minimum number of individuals | Fewest possible number of people, or animals, in a skeletal collection or archaeological assemblage.

Minimum Number of Individuals per taxon or MNI | The minimum number of individuals represented by the faunal remains identified to a recognized taxonomic group in a zooarchaeological assemblage.

Modification | Any impact or activity that results in the physical alteration of a faunal (or floral) remain; cultural modifications are those caused directly or indirectly by human activity, such as butchery or tool manufacture; non-cultural modifications are those resulting from non-human or natural activity, such as carnivore or rodent gnawing, weathering, and similar taphonomic processes.

NAGPRA | Native American Graves Protection and Repatriation Act

Nalbinding | An ancient technique used for garments in many parts of Northern Europe, made of a structure of interlinked loops formed using a wooden or bone needle.

National Historic Preservation Act | The landmark federal law protecting US cultural heritage, which governs how cultural resource management is practiced today.

National Register of Historic Places | The US federal government's official list of sites, buildings, structures, landscapes, or objects that are considered worthy of preservation because of their historic value.

Native American Graves Protection and Repatriation Act | A law passed to protect Indigenous ancestral remains and funerary objects, requiring identification of the lineal descendants of the peoples whom those materials represent, and their return to be reinterred or managed as those peoples deem best.

Native metals | Metals that can be found in nature in a pure, metallic form (e.g. gold, copper, silver)

Number of Identified Specimens per taxon or NISP | The number of identifiable faunal remains associated with a recognized taxonomic group in a zooarchaeological assemblage.

Obsidian | Naturally occurring volcanic glass, which flakes well to a very sharp edge and is often used for stone tools.

Odontology | The study of teeth.

Oldowan | The earliest type of lithic artifacts, roughly-flaked butchering elements that were made by our earliest human ancestors at least 2.6 million years ago.

oral histories | The collection and study of historical information using sound recordings of interviews with people having personal knowledge of past events.

Oral traditions | Orally transmitted stories and other cultural information that are collected through ethnography.

Osteobiography | A narrative of an individual's life history as told by their skeleton.

Osteological paradox | It is concerned with the heterogeneity in disease risk, selective mortality, and demographic nonstationarity on the health of past populations.

Osteology | The study of bones.

Paleoanthropology | A branch of paleontology and anthropology which seeks to understand the early development of anatomically modern humans.

Paleodemography | The study of population structure (age, sex, survivorship, etc.) in past populations.

Paleoethnobotany | The study of how people used plants in the past.

Paleoindian | A term which is used to refer to the period of the Ice Age in North America following standard archaeological chronology. The Clovis point dates to the Paleoindian period.

Paleopathologies | The study of pathologies (trauma, disease, and congenital defects) found in ancient human and animal populations.

Paleopathology | The study of disease as viewed through the skeleton in past populations, or animals.

Palynology | the study of pollen grains and other airborne spores

paste | In ceramics, the material used to make an object, including the raw clay as well as inclusions like feldspar and other minerals.

pedestrian surveys | a method of locating artifacts by walking a given area, typically with a group of people walking 2 to 10 meters apart arranged in a horizontal line

Petrography | A technique in which thin sections of the ceramic are viewed under a microscope in order to identify the minerals within the clay matrix or additional inclusions.

Phase I | The first step in CRM archaeology, consists of a survey to identify whether a property is an archaeological site. It is designed to determine if there are any cultural materials in the impacted area.

Phase II | The second step in CRM archaeology, designed to evaluate whether or not a recorded site is eligible for inclusion on the National Register.

Phase III | The third step in CRM archaeology, consisting of data recovery following an approved research design. This type of data recovery is conducted when an eligible site cannot be preserved.

Phytoliths | Rigid structures made of silica, formed in plant tissues to provide support.

Pleistocene | The geologic term for the epoch popularly known as the ice age.

Plied | Plied yarn is yarn that is made of two or more single strands of yarn twisted together.

Plummet | A weight, often in a teardrop shape, which may have been attached to fishing nets to help them sink.

pluralist | An approach to public archaeology which tries to understand relationships between material culture and different members of the public

Pollen | A fine powder that plants make when they reproduce.

portage | land barrier that water craft must be carried over between two bodies of water

post-contact | A historic period after European-Indigenous contact.

Post-processualism | A response to Processualism, the body of theory in archaeology that emphasizes that how we interpret the archaeological record is subject due to variance of human cultures and the cultural and other implicit biases that archaeologists themselves bring into the field.

Postprocessualism | A theoretical approach building on humanistic methods.

Primary burial | A burial that is in its original location and position.

Primary data | In zooarchaeology and paleoethnobotany, information obtained directly from the faunal or floral remains undergoing analysis; primary data are obtained during the initial stage of the analysis, and the results can be replicated during subsequent analysis.

privy | a trash pit in an outhouse, or outdoor bathroom without plumbing, which often had household trash in addition to human waste.

probabilistic sampling | A sampling strategy also known as 'judgmental sampling,' where samples are taken primarily from units and features that are thought to be of interest.

Processualism | A theoretical approach building on scientific methods.

Profile walls | The sides of the excavation unit.

Provenience | Generally refers to place of origin but in archaeology is typically used to reference the location where an artifact was found (i.e., depositional context).

Provenience | The place of origin or source of an artifact or material.

Pseudoarchaeology | Claims that misrepresent the nature of the archaeological record and archaeological methods in order to support predetermined conclusions.

Public outreach | In archaeology, a collection of methods archaeologists use to engage the public in archaeological research as well as general public awareness.

public relations | An approach to public archaeology which works to form connections between archaeology and individuals and/or social groups in order to broaden public awareness and understanding of archaeology in society

Qualitative data | Information or data that is not easily described with numbers.

Quantitative data | Information with a value that can be measured or counted (quantified), and have a distinct numeric value; contrasts with qualitative data, which refer to information that observed, characterized, described, and recorded but not quantified.

queer archaeology | A branch of post-processualist archaeology pointing out that peoples of the past often did not conform to Western notions of gender and sexuality

radar | abbreviation for Radio Navigation And Ranging, a technology that sends a burst of radio waves, or pings, to an object to calculate the distance between the object and the ground

Radioactive | Atoms of elements that emit energy and particles as they decay into other elements.

radioactive decay | the process through which the nucleus of a radioactive isotope loses energy and emits particles in an attempt to become stable

Radiometric dating | Dating methods based on the radioactive decay of isotopes, such as Carbon-14 or Potassium-40. By knowing the rate of decay for a radioactive element, researchers can determine the age of artifacts, structures, and stratigraphic layers.

Random | A sampling strategy in which samples are selected through chance, or through arbitrary selection.

random sample | A sampling strategy through which a certain number of specimens is randomly selected.

readability | the amount of education, usually measured in years, that someone would need in order to understand what someone is saying in a written text

Reference manual | A published book, journal, or similar document or record that contains detailed information—typically illustrations—that can be used for specimen identification.

Relative dating | Assigning an object to a cultural period based on its color, size, or shape.

Remote Sensing | also abbreviated as RS, a set of methods that allows for the collection of data without anyone being physically present at a location and without needing to directly observe the objects being studied

Repatriate | To return human remains and/or cultural items to their descendant communities.

Repatriation | In bioarchaeology, the process of returning human remains and burial associated artifacts to the descendent population.

research design | A formal statement of the project goals and the methods that will be used to reach the project goal or goals.

Salvage archaeology | An ad hoc process of extracting whatever one can from an archaeological site in imminent danger of destruction from natural catastrophes (e.g., forest fires, shoreline erosion) or construction occurring outside of the archaeological review process.

Sankofa | An Andikra (West African) symbol that translates as “go back and get it.”

Scapula | The bone commonly known as the shoulder blade, found in most animals.

Seasonality | Determination of what season (or seasons) of the year in which a site was occupied, based on the recovery of faunal and floral remains from species present or particularly abundant (e.g., migratory waterfowl) during a particular season, or by the presence of select seasonal indicators (e.g., growth lines in deciduous trees, or antlers in certain cervids).

Secondary burial | A burial that has been moved from its original place of interment.

Secondary data | Information derived from primary data using indices and quantitative techniques; in contrast to primary data, secondary data are typically analytical products rather than based on direct observations or measurements.

Sedentism | The practice of permanently living in one place (usually in villages, towns, or cities) as opposed to following a more nomadic lifestyle.

Sediment | Rock and mineral fragments

Seriation | Relative dating method in which artifacts from multiple sites are placed in chronological order.

settler colonialism | a type of colonialism based on replacing or displacing a usually Indigenous population with a new settler population

Shatter | The blocky fragments of chipped stone material created from the hammer crushing the parent material during the flaking process.

Shearing | The process of cutting the wool off of a sheep or similar animal.

Sherds | Short for potsherds, referring to the broken pieces of pottery found at archaeological sites.

shovel test pits | pits often laid out in a grid pattern over the area where pedestrian surveys have been completed, used in Phase II archaeological exploration to test to see if a site is a good candidate for further excavation

Site | A place where there is physical or material evidence of past human activity.

Site formation processes | Natural and cultural factors through which an archaeological site is created following the deposition of cultural material.

slip | In ceramics, a watery clay that can be used to finish or decorate a vessel.

SMAP | A method of flotation that uses a simple machine.

sonar | abbreviation for Sound Navigation And Ranging, a technology that sends a burst of sound waves, or pings, to an object to calculate the distance between the object and the ground

Spindle whorls | Bead-like weights for the spindles that are used to spin yarn. They come in a wide variety of sizes, shapes, and materials.

Sprang | A form of plaiting or braiding with a fixed warp, used to create elastic fabrics for hairnets and similar items.

Stakeholder | A person with an interest or concern in something.

stalagmite | a rock formation in a cave formed over time by accumulating calcium deposited that dripped from the cave ceiling

Starch | A semicrystalline carbohydrate produced by plants.

Stratified random sample | A sampling strategy through which a certain number of specimens is randomly selected from a variety of predetermined categories.

Stratigraphic analysis | A form of analysis that originated in geology. The goal of stratigraphic analysis is to understand the layering of soil in order to make temporal and cultural interpretations.

Stratigraphy | Layers of soil and associated artifacts, which help to determine a site's chronology.

striking platform | A place on a flake that marks the location where the core was struck to remove the flake – it is often marked by a small, flat surface directly above the bulb of percussion.

subsurface | just below the surface

systematic | methodical

Systematic sample | A sampling strategy through which a regular pattern is followed.

systematic sampling | A sampling strategy through which samples are selected at regular intervals across the site or within the unit.

Taphonomy | The study of the transition from the biosphere to the lithosphere, anything that happens to a body from the time of death to the time of discovery.

Taxonomic classification | The systematic ranking of biological organisms based on hierarchical categories that reflect the sharing of similar traits or common ancestry.

Temper | When used in reference to ceramics, material that is intentionally added to the clay to prepare it for different uses. Temper can include quartz and other minerals; grasses or other organic materials; or ground shell, bone, or pottery fragments.

Thermoluminescence | A dating method which measures accumulated radiation since the last time a material has been heated. When used on ceramics, this will usually provide the approximate date that the piece was initially fired.

THPO (Tribal Historic Preservation Officer) | Someone officially designated by a federally-recognized Indian tribe to direct a program approved by the National Park Service, who assumes some or all of the functions of State Historic Preservation Officers on Tribal lands.

Tool | An object that is made for a specific purpose. Tools are generally characteristic of humans although some animals are also known to make and use tools.

Traditional Cultural Property | A place significant to the cultural practices and belief systems of one or more groups of people.

Traditional Ecological Knowledge | The knowledge Indigenous peoples have learned about their environment through interacting with it for generations.

Typology | A grouping or classification of different objects based on predetermined criteria.

Unit | In archaeology the (usually) square space that is excavated, slowly and in layers.

use-wear analysis | a method in archaeology that determines how an artifact was used by looking at evidence of wear on the artifact

Venus figurines | Small statuettes of women found across Europe from approximately 35,000-20,000 years ago.

Vertebrates | Animals with a spinal column or backbone, and at least some internal skeletal elements; refers to the subphylum Vertebrata, within the phylum Chordata in the animal kingdom (kingdom Animalia).

Vertical excavation | A style of excavation that prioritizes depth, allowing archaeologists to view stratigraphic layers and observe the chronology of the site occupation.

vessel-glass | glass that was part of a vessel

Warp | In weaving, the set of threads that runs the length of the fabric.

Weft | In weaving, the set of threads that runs from side-to-side along the fabric, at right angles with the warp.

Woodland | The period in Eastern North American history spanning from 3200 to 1000 years ago (1200 BCE to CE 1000), or as late as CE 1600 in some places, when Native Americans started to live more sedentary lives and use horticulture and agriculture

X-ray spectroscopy | A technique that measures X-ray photons to characterize different materials.

Zooarchaeology | The study of animal remains recovered from prehistoric and historic archaeological sites, to better understand how past human-animal interaction.

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