

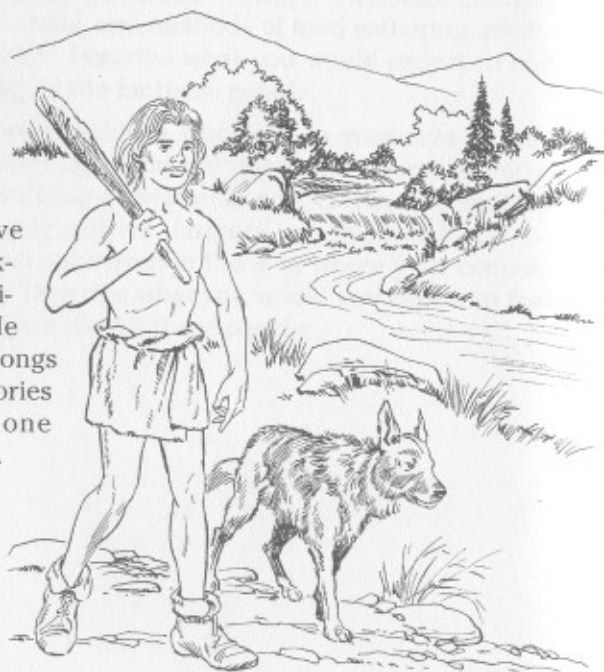
Introduction

Imagine a boy living where you live now, but hundreds or even thousands of years ago. He might have been about your age. Like you, he had friends and enjoyed playing games.

He had a home and a family. He shared the beliefs of people in his community. He spoke a language that sounded just right to him, and his way of understanding the world made sense.

But where you live now was a much different place when the boy of the past lived there. It might have been a dense forest or an open plain. His house might have been made of animal hide stretched over poles, or bricks of mud and straw baked in the sun, or slabs of sweet-smelling cedar split from huge trees and decorated with carvings of eagles, ravens, and salmon.

The boy might have been taught how to hunt with spears or bow and arrows, or how to plant grains and store the harvest for winter. He might have learned to heal sicknesses by using medicines from plants. He may have sung the songs that kept alive the stories of his people from one generation to the next.

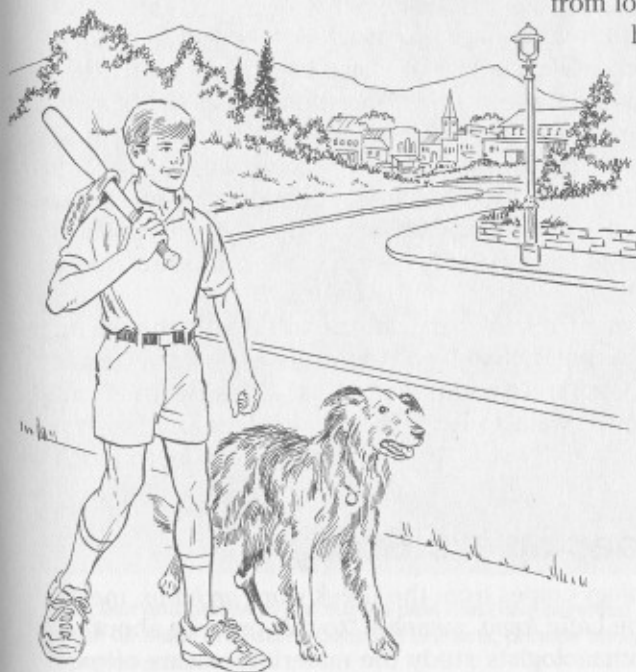


The boy had no wristwatch, but he kept track of time by looking at the sun and observing shadows on the ground. In his religion, he may have worshiped the spirits of the fish or buffalo that fed his people. He might have believed that gods lived on the tops of mountains, inside volcanoes, or in the spirits of certain animals.

Sometimes the sun shone warmly on the boy's face, and sometimes he took shelter from storms. His life was as real then as yours is today—full of bright colors, smells, tastes, and sounds. Like you, he probably thought the world in which he lived would never change much.

But that world has changed, and most of the people who lived long before us have been forgotten. Their homes have crumbled and disappeared. The bowls they ate from and the tools they used have become scattered. Their languages and beliefs are largely lost. Their stories may now be but a whisper in the wind.

Even so, you can learn about that boy from long ago and the life he led. You can discover some of the ways that his life was like yours, and how it was different. To make these discoveries, you need a key to begin unlocking the secrets of the past. That key is archaeology.



Who Are Archaeologists?

Archaeologists are detectives who study how people lived in the past. They figure out what happened, when, how, and why. Using the clues that people left behind, they try to understand how and why human culture has changed through time. (A *culture* is the way of life shared by a group of people and passed down from one generation to the next. The people of a given culture have the same language and similar customs, beliefs, ceremonies, habits, food preferences, and so on.)

Archaeologists do their work, in part, because they want to satisfy their curiosity. Like all of us, archaeologists love to find out about other people, other places, and other times. We all benefit from their studies because archaeologists like to share their discoveries with the public. They provide answers to our questions about the past.

Knowing about those who lived before us is important because the people of the past helped to make us who we are today. The beginnings of our knowledge can be found in the things people knew and did thousands of years ago. Our languages and our ways of doing things—that is, our cultures—have been passed down through the ages.

We are only the most recent generations to inhabit the earth. Human culture has been enriched by all of the generations of people who lived, worked, and enjoyed life before us. As we learn about these ancestors of ours, we also learn about ourselves and how we got to be the way we are. By studying the past, we can learn much about the present.

What Archaeologists Study

The word *archaeology* comes from the Greek word *archaios*, meaning “ancient,” and the Latin *logia*, meaning “to talk or write about”—that is, to study. Archaeologists study the material remains of past

cultures—the things people left behind—to learn how people lived and how cultures have changed through time.

Archaeology is a branch of a larger science called *anthropology*—the study of human beings. While anthropologists are concerned with all aspects of human makeup and behavior, archaeologists focus on the stories of the people of the past—people who are no longer around to speak for themselves.

Much of archaeology is the study of people who did not leave a written history of their experience, or who left records in languages that we no longer understand. Even so, these people have left clues about themselves. Evidence of their existence may take the form of *artifacts* such as stone or metal tools, or pieces of broken pottery. Or we might find signs of human activity, such as rocks arranged in circles, or earth blackened by campfires from long ago, or trenches that show where walls once stood.

(Photo courtesy Texas Archaeological Research Laboratory, University of Texas at Austin)



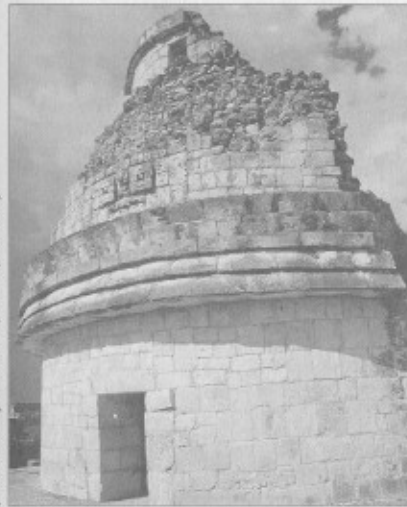
The bits and pieces of the human past that have survived into the modern age, such as these prehistoric Caddoan artifacts, provide information about vanished peoples and cultures.

(Photo courtesy Paul P. Steed, Dallas, Texas)



At the Parthenon, a temple on the Acropolis at Athens, Greece, conservators used scaffolding to aid in the reconstruction of this massive structure.

(Photo courtesy Forest Frost, Lincoln, Nebraska)



The Caracol, or Round Tower, probably an astronomical observatory, at Chichén Itzá, Yucatán, Mexico.

(Photo courtesy Forest Frost, Lincoln, Nebraska)



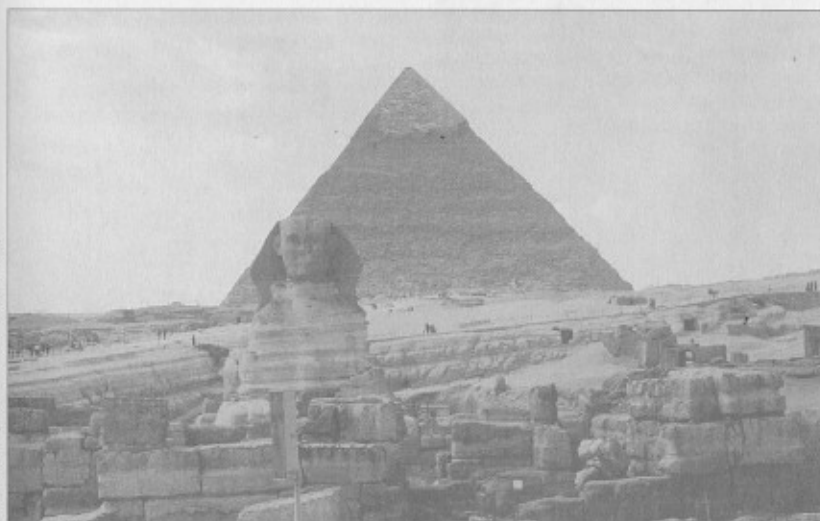
Detail of the three-story Palace at Labná, a Mayan site in Yucatán, Mexico.

(Photo courtesy Paul P. Steed, Dallas, Texas)



The Roman Forum in Rome, Italy.

(Photo courtesy Paul P. Steed, Dallas, Texas)



The Great Sphinx at Giza in Egypt, with a Pyramid in the background.



President Abraham Lincoln's home at Springfield, Illinois.



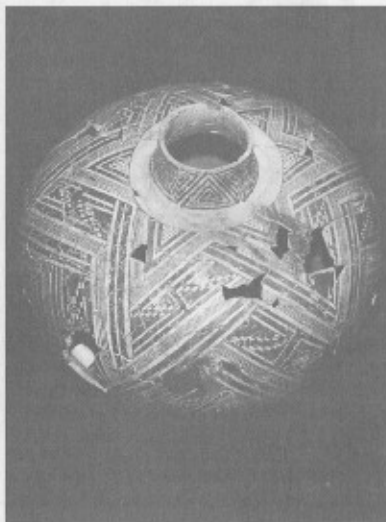
The Great Hall at Grand Portage National Monument in Minnesota. The original structure was built in 1784 and was later reconstructed using information learned through archaeology.

Many archaeologists specialize in studying groups of people who lived thousands of years ago. Some study the civilizations that built the great Pyramids in Egypt and the temples in Greece, South America, and Asia. Some archaeologists are interested in the hunters whose spear points pierced the sides of mammoths in the American Southwest twelve thousand years ago. Others devote their careers to studying the remains, found in Africa, of the earliest humans known to have lived on the earth.

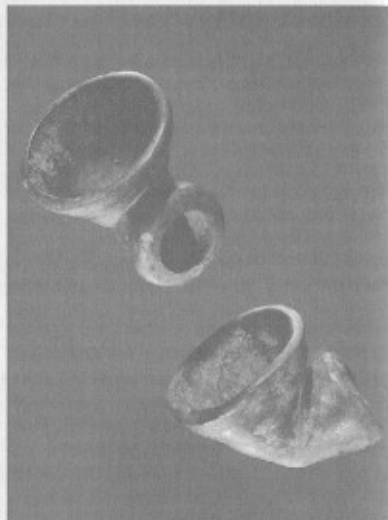
Archaeologists also unravel puzzles about people who lived much closer to our own time. The discovery of artifacts and settlements abandoned relatively recently—in historic times—helps tell us what happened to the people who made or built them. We get clues from items found in sunken ships, forgotten farmsteads, buried villages, and traditional Native American gathering places.

Archaeologists study both historic and prehistoric cultures. What's the difference between history and prehistory? Prehistory deals with the time before people learned to write. It begins when humankind appeared on this planet long ago, and ends with the advent of written history, when people started to make written records of their activities.





Large black-on-white painted Pueblo vessel recovered near Quemado, New Mexico.



Two elbow pipes made of clay, recovered from a prehistoric Caddoan village located in Red River County, Texas.



Black-on-white mug recovered near Farmington, New Mexico.



Artifacts and Relationships

Archaeological artifacts are any items that have been made, used, or changed by people. Examples include stone tools, arrowheads, pottery, coins, cans, bottles, and jewelry.

Artifacts typically are small enough to be portable—easy to carry around. The items were perhaps lost by their original owners. Some might have been broken and thrown away. Many were hidden to keep them safe, or placed alongside the bodies of their owners in burial sites. To archaeologists, artifacts—and the *relationships* between artifacts and where the items are found—are windows into the lives of the people who once lived at that place.

This idea of relationships between objects is important. Think of all the little parts that go together to make a wristwatch. If you take the individual parts out of a watch and study each one separately, will that tell you how the watch functions? No. You must look at all of the parts in place inside the watch to see how they work together.

The same is true of archaeological sites. Like a watch, an archaeological site is a complicated package that must be opened carefully and studied as a whole if we are to make sense of it. A researcher who looks at only a few stone tools and a few kernels of corn might find that, by themselves, the artifacts reveal little. However, if the tools are found in a room with a hearth or fire pit, a grinding stone, and other stone tools and artifacts, the researcher might conclude that the room was a prehistoric living area. A few kernels of corn found in a space that did not have a hearth or any other artifacts would suggest that the room was probably a storeroom.

The study of artifacts and the sites where they are found can reveal much about the everyday activities of the past. We can learn where people lived, how they got their food, and what they wore. Archaeological findings may also explain some of the important events in the lives of people long dead—a war or a ceremony, for instance, or a major fire or flood. Such discoveries can help us to understand what shaped entire civilizations.



Related Sciences

Several related sciences help to shine a light into the past. *Geologists* study the earth itself and how it changes over time. They examine the clues revealed by rocks, soil, and the shape of the land. Geologists are interested in the forces that form the physical features of the land and alter the land's appearance.

Paleontologists examine fossils of dinosaurs and ancient vegetation. (Fossils are the stone-like remains of living things that developed as minerals from the soil slowly replaced the chemicals in the dead animals or plants.) Paleontologists dig for fossils to learn about animal and plant life of long ago. They share their findings by writing reports and creating museum exhibits.

Don't be misled by the movies or television shows you may have seen that show prehistoric humans hurling spears at dinosaurs. That could never have happened. There were no people on the earth when dinosaurs lived. The dinosaurs became extinct long before humans arrived on the scene.

To help you keep these "ologies" straight, here's a simple list:

- Anthropology—the study of humans in the widest sense
- Archaeology—the study of human activities and cultures of the past
- Geology—the study of rocks, soil, and terrain
- Paleontology—the study of fossils of ancient animals and plants

The study of history also is often useful in archaeology. One way to think of history is that it is the past revealed through written records. Journals, newspapers, shopping lists, legal papers, books, and letters are only a few of the sources of information historians draw upon to re-create moments of the past. Archaeologists may use written records to locate sites, to find out how artifacts were made and used, and to expand their understanding of earlier times. Even when they are investigating prehistoric sites, they may research the historic record for clues to the more distant past.

Archaeologists may draw upon the knowledge and methods of other specialties and sciences, too. Among these are architecture, astronomy, art, biology, botany, chemistry, geography, and physics.

(Photo courtesy Fort Worth Museum of Science and History)



◀ Paleontologists study dinosaurs, such as this 110 million-year-old *Tenontosaurus*, and other life forms from the distant past.

Geologists study the earth itself. ▶



(Photo courtesy Deborah Lightfoot Stumore)



◀ Historians study the relatively recent past as it is revealed through written records.

The Steamboat *Bertrand*: Lost and Found

In 1865, a big steamboat called the *Bertrand* was making its way up the Missouri River. It carried a full cargo of supplies destined for miners and settlers a thousand miles up the river in Montana.

Just north of Omaha, Nebraska, at a turn in the river called DeSoto Bend, the *Bertrand* hit a submerged log. Water poured through the hull. Everyone on board safely reached the shore, but the boat sank into the waters of the Missouri.

In the decades that followed, the river gradually changed course, leaving the *Bertrand* covered with thirty feet of mud. People forgot about the steamboat in DeSoto Bend, or they remembered it only in stories passed down from one generation to the next. Hidden in the earth, the *Bertrand* was lost, but well protected.

In 1968, treasure hunters called *salvors* put together clues from old documents and discovered where the *Bertrand* lay. For months, archaeologists from the National Park Service cleared away the mud a little at a time until they had uncovered the remains of the steamboat. Inside the hull, they found clothing, tools, and thousands of other items.

You can see the artifacts recovered from the *Bertrand* at a visitor center in the DeSoto National Wildlife Refuge at Missouri Valley, Iowa. Archaeologists use laboratories in the visitor center to preserve and study the contents of the steamboat, a process that will continue for many years.

The *Bertrand's* artifacts are a window through which we can see how people lived in 1865. Through archaeology, we can understand much about how the people of another time worked, what they wore, what they ate, and what goods they used.

Although the *Bertrand* never reached its destination in Montana, it served as a time capsule. This steamboat brought cargo to people a century later and delivered not just old-fashioned tools and clothing, but also a wealth of knowledge about the past.

Artifacts recovered from the *Bertrand* are displayed at the DeSoto National Wildlife Refuge at Missouri Valley, Iowa.



(Photos courtesy DeSoto National Wildlife Refuge, United States Department of the Interior, Fish and Wildlife Service)





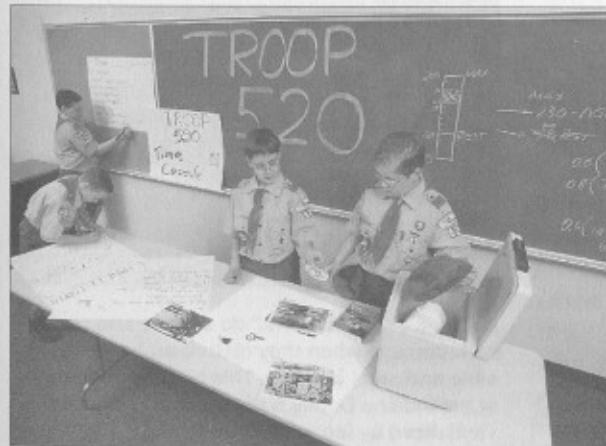
Digging up an archaeological site carries with it a duty to carefully document everything that is disturbed. The excavation process is destructive and the paper record is often all that remains. Without careful records, precious and fragile pieces of the past may be lost forever.

Archaeology and Responsibility

Perhaps you have been at a ceremony where a time capsule from a hundred years ago was opened. There might have been coins inside, and newspapers, photographs, and other items that people a century ago thought were important. You probably thought the contents of the capsule looked odd and antiquated, yet seeing the items helped you learn about the people who had so carefully placed them in the capsule.

After the ceremony, what happened to those objects? If one person took them home and kept them in a box, no one else would be able to view them. Or, if everybody at the ceremony took away one item, it would soon be hard to remember everything that had once been together in the capsule. Some of the items would probably be lost or given away or sold. As its contents were scattered, the meaning of the time capsule would be lost.

But if the artifacts found in the capsule were properly studied, labeled, and displayed in a public place, everyone could enjoy them.



An archaeological site is like a time capsule. Both contain messages from the past.

People interested in the past could use the items to learn what a place or a culture was like long ago. Future generations could have the same pleasure in seeing the items as you did when the time capsule was first opened. The message from the people of the past would be kept alive, passed down from generation to generation.

An archaeological site, such as the wreck of the steamboat *Bertrand* or the remains of a prehistoric village, is like a time capsule. Each may contain items that, when studied together, will reveal much information about who was there and what their lives were like.

Archaeological sites, like time capsules, must be opened in the right way so that the information they contain will not be lost. That is a job for archaeologists, who have studied excavation procedures and preservation techniques.

Being an archaeologist requires training to learn the correct methods to find, excavate, document, and interpret sites and the artifacts they contain. We rely on archaeologists to use the right procedures so that they can gain as much information as possible when they excavate a site or lead others in uncovering artifacts. We rely on them to interpret messages from the past. We also rely on them to share with all of us the information that they discover.

Pothunting and Vandalism

An archaeologist's careful work can be ruined by a looter or vandal who steals artifacts or damages a site. These thieves, called "pothunters," only want to find items from the past and take them. Pothunters don't care about the knowledge that might be gained



(Photo courtesy National Park Service, Midwest Archeological Center, Lincoln, Nebraska)

Looters, or "pothunters," do serious and permanent damage when they disturb archaeological sites and steal artifacts. This historic cemetery at the Indiana Dunes National Lakeshore was vandalized by looters.

from studying how the artifacts are related to other materials at the site. Pothunters may keep artifacts for themselves, or sell them for money. In either case, the artifacts disappear from public view, and the information that they might have provided is lost forever.

Pothunting is stealing. Such looting robs present and future generations of knowledge that can never be replaced. Pothunting is against the law on state, federal, and Indian lands, and in many privately owned areas.

Protecting the Past

There are many ways you can help to preserve archaeological sites and artifacts and the knowledge that comes from them.

- *Do not dig for artifacts* unless you are working under the direction of a trained archaeologist who has an approved excavation permit.
- If you see others digging for artifacts, report what you have witnessed to a local law enforcement agency or the agency that manages the land, or tell the site manager, a park ranger, or other responsible official.
- If you think you have discovered artifacts, leave them alone. If you are in a national or state park or forest, report the find to a ranger. Otherwise, contact your state historic preservation officer. (See the resources section in this pamphlet.) Experts can evaluate the artifacts where they were found, then determine whether further study should be done.
- Volunteer to help historical and archaeological societies monitor sites against vandalism and repair any damage that has been done.
- Learn all you can about the archaeology of your area so that you can better inform others about the importance of protecting sites and artifacts.

Ozette: A Legend Comes True

Among the Makah Indians of northwestern Washington, the story is told of a great disaster that destroyed the tribe's ancestral home. The legend says that, long ago, a mountain of mud fell upon their village at the edge of the Pacific Ocean.



A new chapter was added to that story in 1970, when raging winter storms sent high waves to scour the beach at a place called Ozette. The waves washed away part of a mud bank and exposed many artifacts, among them a canoe paddle, fishhooks of wood and bone, the shaft of a harpoon, bits of inlaid boxes, and a woven hat.

Excavation of the site showed that the Makah legend is true: About five hundred years ago, a mountainside of wet clay plunged down the steep, tree-covered slope above the coastal village. The mudslide buried the sturdy cedarwood houses without destroying them.

The wet clay sealed the houses so tightly that everything inside was preserved except flesh, feathers, and skins. Looms, wood carvings, wooden bowls, cone-shaped rain hats made of spruce roots, baskets, and even cloth—materials that are rarely recovered from any archaeological site—were held safe through the centuries.

The land is part of the Ozette Indian Reservation, home of the Makah tribe. Archaeologists and members of the tribe worked together to investigate the site. People from the reservation helped with the excavation and with running a preservation laboratory at nearby Neah Bay.

Special techniques were needed to uncover and preserve the waterlogged wooden remains at Ozette. The excavators built a complicated pumping system that sprayed jets of water of different strengths—from blasts powerful enough to remove dense mud from house planks, to a gentle trickle used for washing the muck from combs and wooden spindles.

By agreement, all excavated objects have remained on the reservation in a museum built and operated by the Makah tribe. "We look in a special way at what has come from the mud at Ozette," say the Makah, "for this is our heritage."



The Development of Archaeology

Archaeology as it is practiced today is a fairly new science. Several hundred years ago, people who dug into ancient sites often did so only to find treasures that could be collected or sold. While many of the collectors called themselves "antiquarians," by today's standards they were little more than pothunters.

Thieves did enormous damage. In Egypt, for example, thieves broke into most of the Pyramids and tombs and took what they found without leaving any record of what had been there. They were not interested in learning about those who had left the artifacts or covered the walls with symbols.

Over the years, fortunately, many people came to realize that the information that could be gained from a site was often more valuable than the artifacts themselves.

In 1799, a slab of black basalt was found in Egypt near the town of Rosetta. The stone had three inscriptions on it—the same text written in three different scripts. One inscription was in Greek, one was in a type of cursive writing once used in Egypt, and the remaining inscription was in ancient Egyptian *hieroglyphs*.

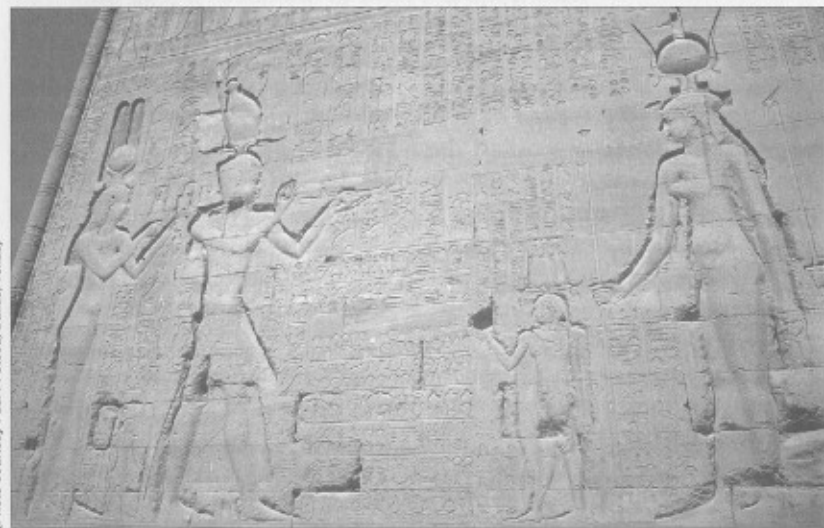
Hieroglyphic writing uses symbols or pictures to represent objects and words.

Hieroglyphs had been found on the walls of Egyptian monuments and tombs, but no one had been able to



The Rosetta Stone was the key to deciphering Egyptian hieroglyphs.

decipher them until the Rosetta Stone was discovered. Investigators used the Greek version of the text, which they could read, to translate the mysterious pictures on the stone and learn what the symbols represented. It was the breakthrough scientists needed to understand the pictorial writing system of ancient Egypt.



Before the Rosetta Stone was discovered, scientists were mystified by Egyptian hieroglyphic writing.

A long-lost culture began to come alive as the people who had made their homes along the Nile River thousands of years ago began speaking through their writing to the people of the modern world. Similar developments happened in other parts of the globe as investigators began unraveling the mysteries of the past and piecing together the stories of ancient peoples everywhere.

American Archaeology

In the United States, Congress has passed laws that recognize the importance of our past and the need to protect archaeological sites. The first major piece of federal legislation for preservation was an

act of Congress in 1889 that authorized the president to protect Pueblo Indian ruins at Casa Grande, Arizona. Among the important laws since that time are the following.

Antiquities Act of 1906. This law protected cultural materials found on public lands and was intended to stop the destruction of prehistoric sites and artifacts in the West. It also set up a way for responsible archaeologists to excavate important sites.

Historic Sites Act of 1935. This act authorized several programs to be carried out under the National Park Service. Under this law, sites that have exceptional value for commemorating or illustrating U.S. history can be protected as national historic landmarks.

National Historic Preservation Act (NHPA) of 1966. At the time of this law's passage, more archaeological sites and historic buildings were being destroyed by rapid economic development than by pothunting or vandalism. This landmark piece of legislation extends the protection of the federal government to historic resources at the state and local levels. The act provides for federal grants to state



Monks Mound is a prehistoric Mississippian site at Cahokia, near East St. Louis, Illinois.

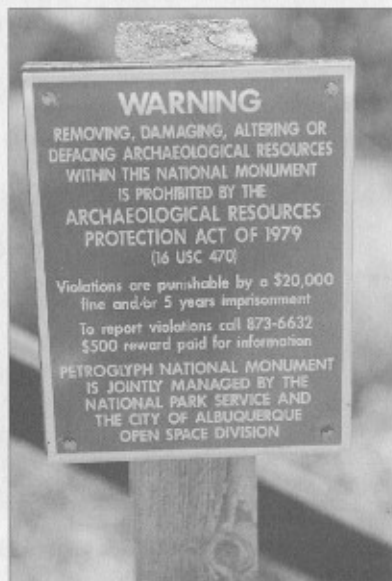
and territorial historic-preservation agencies, and its passage led to the establishment of the National Register of Historic Places. The National Register includes not only national historic landmarks, but also sites, objects, buildings, and districts (collections of structures) that are significant in American history, architecture, archaeology, and culture.

Archaeological Resources Protection Act (ARPA) of 1979. This law gives more protection to archaeological resources on public and Indian lands and encourages the sharing of information gathered from these sites. It also toughens penalties for the unauthorized excavation of or damage to archaeological sites, and controls the sale of artifacts. Since 1979, all construction on federal lands or that uses federal funds requires an archaeological survey to find out if archaeological sites will be damaged by the construction, and how the information from the sites can be recorded before that happens. All states have similar laws that protect archaeological resources on state lands.

Native American Graves Protection and Repatriation Act (NAGPRA) of 1990. Archaeologists exploring the past sometimes come upon the bones and other remains of human beings. Prehistoric remains found in archaeological sites in the United States are the remains of Native American peoples.

Contemporary Native Americans have raised concerns that the burial grounds of their tribes

The Archaeological Resources Protection Act (ARPA), passed in 1979, toughens the penalties imposed on those who damage archaeological sites.



should not be disturbed, any more than the cemeteries of other groups. Most American Indians believe that the remains of their ancestors should not be stored or displayed in museums, but should be reburied according to the traditions and religious beliefs of their tribes.

The NAGPRA protects Native American grave sites on lands managed by the federal government. The law requires thousands of federally funded museums and agencies to inventory their holdings of human remains, grave goods, sacred objects, and other items important to Native American cultures. The museums and agencies must tell the tribes about the sacred and cultural items in their collections, and return the objects to the tribes that claim them.

Appreciating the Past

As you can see, archaeology has become an important science for exploring our past and preserving our heritage. Visitor centers have been built at many archaeological sites where you can view artifacts and learn about the people who made and used them. Museums, schools, and public buildings may also have exhibits that share with everyone the knowledge gained by studying the past.

Programs at many colleges and universities invite young people to learn the methods of archaeology, then to help excavate sites and prepare artifacts for display. Archaeology clubs and professional associations promote the appreciation of the past and help protect cultural resources.

Libraries are a rich source of information about archaeology and ancient cultures. Librarians can help you find books about the



This plaque in Mesa Verde National Park describes an exhibit about Pueblo kivas, or underground ceremonial rooms.

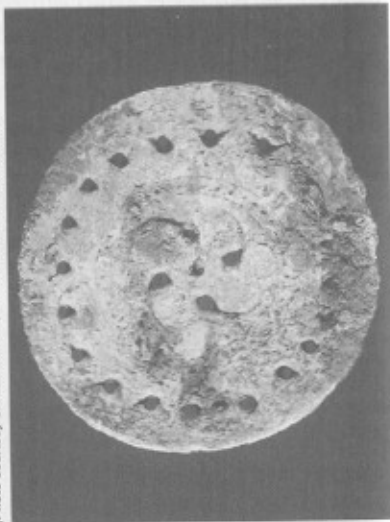


science of archaeology, and about the peoples and periods of the past that interest you.

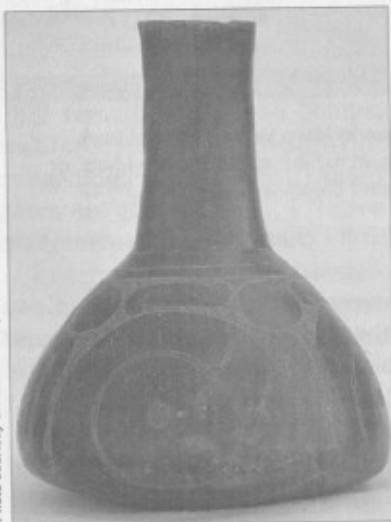
The Internet also offers many opportunities for exploring the world of archaeology via computer. Many archaeological sites and visitor centers have home pages, as do university programs, federal agencies, and archaeological organizations.

For some suggested books and Internet sites, see the resources section of this pamphlet.

Conch shell gorget, recovered from a prehistoric Caddoan village in Texas.



(Photo courtesy S. Alan Skinner, AR Consultants, Dallas, Texas)



(Photo courtesy S. Alan Skinner, AR Consultants, Dallas, Texas)

Polished black ceramic vessel with engraved lines filled with red pigment, recovered from a prehistoric Caddoan village in Texas.

The Iceman: Visitor from the Past

In September 1991, hikers in the Alps along the border of Italy and Austria found a body frozen in a glacier at an altitude of 10,500 feet. The corpse was so well preserved that the hikers thought it was a fellow mountaineer who had died on the slopes recently.

Medical examiners soon realized, however, that the dead man was not a recent accident victim. The mummified body had been locked in the glacier for some 5,300 years, making it the most ancient human body ever found virtually intact. The "Iceman," as he has come to be known, was a visitor from a prehistoric world. With him, he brought his clothes, tools, and weapons.

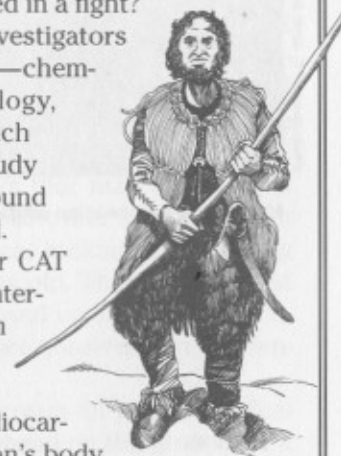
Scientists examining the body and the artifacts found with it discovered that the man was well equipped for Alpine travel. He carried a backpack, a knife with a flint blade, an unfinished bow, a leather quiver with more than a dozen arrows, a copper ax, and several small tools of flint and bone. He stood about 5 feet 3 inches tall. He was perhaps 40 years old, with dark hair and a beard. He wore leather shoes lined with grass for warmth. The man's leather jacket was finely stitched with threads of animal sinew or plant fiber.

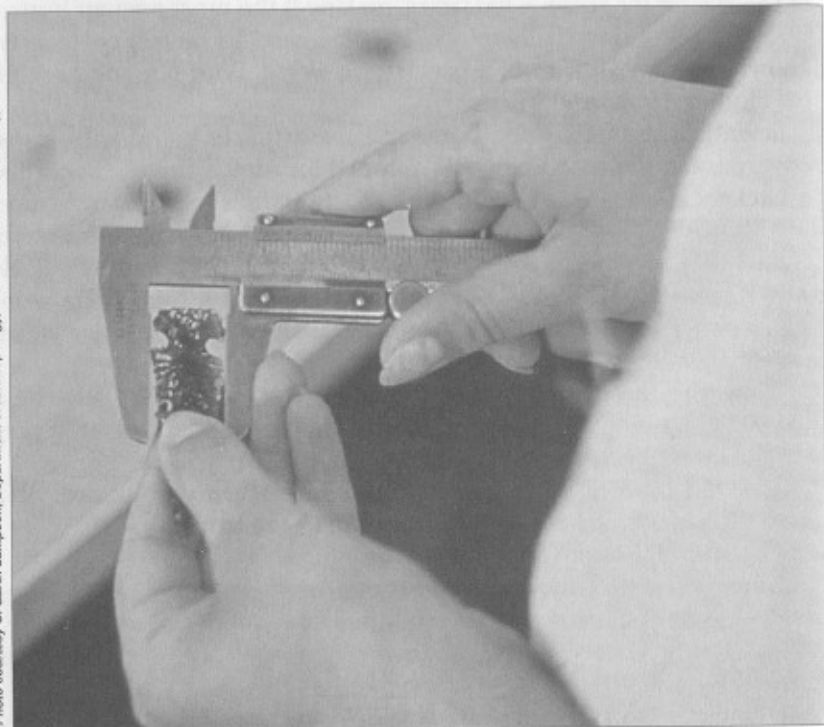
What was the Iceman doing so high in the mountains? Was he a herdsman tending sheep or cattle? Was he hunting deer, or searching for flint or copper? Was he on the run from enemies?

How did he die? Did a sudden mountain storm, a blizzard, or a dense fog catch him by surprise? Did he freeze to death? Did he starve? Was he hurt in a fall, or injured in a fight?

To answer these and other questions, investigators are using the techniques of many sciences—chemistry, biology, medicine, anatomy, radiology, meteorology, archaeology, history, and such combinations as paleoethnobotany (the study of plant use in prehistoric times). Pollen found on the Iceman's clothing has been identified.

Three-dimensional computer images, or CAT scans, have been made of the skeleton and internal organs. Tests for carbon 14 have been done on the grass lining of one shoe and on the body itself. (Carbon 14 tests are a way to date artifacts. See the section on radiocarbon dating later in this pamphlet.) The Iceman's body will be left as intact as possible for future investigators to examine with even more sophisticated techniques.





Measuring an obsidian artifact from the Nightfire Island site in Oregon.

How Archaeology Happens

Archaeologists follow a careful step-by-step process designed to protect resources and obtain the most information possible. The process includes these steps:

- Site location
- Site excavation
- Artifact identification and examination
- Interpretation
- Preservation
- Information sharing

Site Location

Archaeologists find sites in many ways. Sometimes they study old letters, maps, journals, and other documents for clues to the locations of historic settlements or Indian camps. They may use aerial photographs and pictures taken from satellites to home in on the places they are searching for.

Sites are sometimes found during surveys that may be required before new roads, dams, apartment houses, or other structures can be built. Archaeologists walk the entire area, looking for anything made by humans that is more than fifty years old. They may dig test pits or trenches in the pathway of the proposed construction. If artifacts appear, the site may be excavated before construction machinery disturbs the area.

Luck sometimes plays a role in the discovery of archaeological sites. Scouts on a hike might notice an arrowhead on the ground, or a piece of pottery. *They don't move the artifact*, but report the location to archaeologists who can examine the item where it lies and determine whether it signals the presence of a site worth studying.

In 1940 in southwest France, some boys playing in the woods found a hole in the ground. They widened it with their pocketknives and discovered the entrance to a cave. On the white walls of the cave were *pictographs*—pictures of humans and animals painted in black, yellow, and red by people who had been there thousands of years earlier.

In 1974 in China, a farmer digging a well broke through the roof of the tomb of an emperor who had lived more than two thousand years ago. Archaeologists who excavated the tomb found an army of pottery statues—thousands of life-size soldiers and horses made of terra-cotta, standing in rows to guard the dead emperor.

When archaeologists survey an area to find sites, they will usually examine rodent burrows. Burrowing rodents sometimes uncover

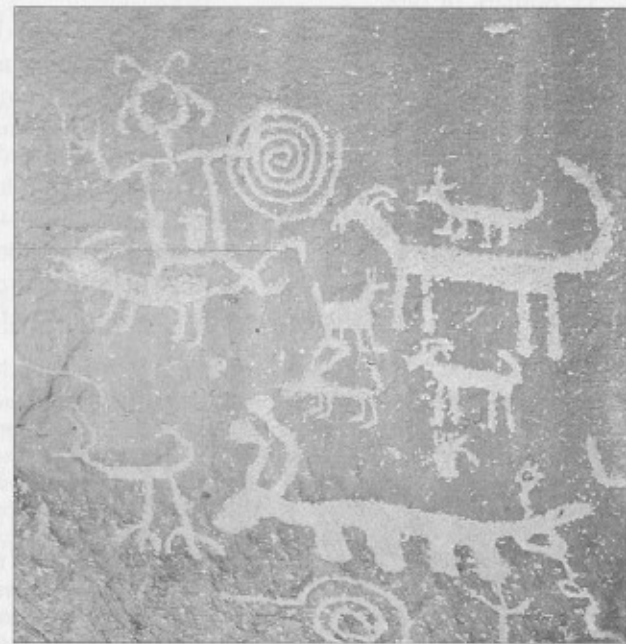


The tomb of China's first emperor held one of archaeology's most awesome finds: a life-size, terra-cotta army of about six thousand warriors with their horses and chariots.

(Photo courtesy Sue Linden-Lindley, curator of collections, Department of Anthropology, Southern Methodist University)



An early artist depicted a familiar animal—a buffalo—in a cave painting at Lascaux, France.



Images scratched into rock surfaces are called *petroglyphs*. Painted images are called *pictographs*. These petroglyphs were chipped into the rock in prehistoric times.

artifacts. Such finds in or near burrows might be a clue that other items lie buried in the earth below. Newly plowed farm fields may also turn up buried artifacts.

When they have discovered a site, archaeologists thoroughly examine the area before disturbing it. They walk all over the site and look for artifacts and surface features to help them understand what might be found there, as well as how old the site or objects are. They may dig test pits to get an idea of what is below the surface of the ground. They may use *magnetometry*, which measures changes in the magnetic field that can show features such as hearths, where the ground was once heated by fire. Archaeologists sometimes use ground-penetrating radar and metal detectors to locate buried artifacts, houses, or pits.

Information from the initial survey must be written down so that the site can be found again. Archaeologists often illustrate a site report with photographs, maps, and videos that help explain how a site was found and what it looked like before any excavation was done.

Alone or Together?

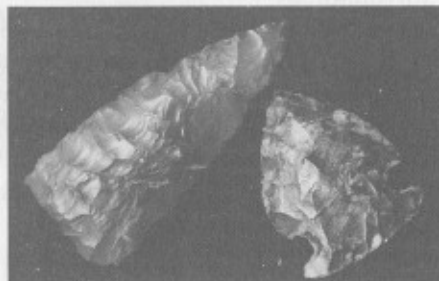
A discovery might turn out to be an isolated find—simply an artifact or two left in a place where people did not spend much time. Perhaps an ancient hunter lost a spear far from camp. Maybe a traveler along an old road threw away the container that held his lunch.



Investigators often work just ahead of the bulldozers to document sites threatened by new construction. Here, a field crew uncovers a prehistoric communal bison kill within a west Texas pipeline corridor.

Why Shouldn't You Take That Arrowhead?

You're on a Scout hike and you spot an arrowhead. Naturally, you're excited. You want to pick it up to look at more closely. You want to put that artifact in your pocket and take it home with you as a souvenir.



(Photo courtesy National Park Service, Midwest Archaeological Center, Lincoln, Nebraska)

Why shouldn't you take it? You found it. But is it yours to take?

Before you slip that arrowhead into a pocket, think of all the information that is lost when an artifact is pocketed and removed from the place where it was found.

- A *projectile point* (as archaeologists call arrowheads and spear points) found on the surface of the ground might be evidence that an undiscovered wealth of archaeological information lies waiting at that place.
- By its shape and size, the point could help archaeologists identify which culture left it.
- If the point is made of a material not found locally, it might give clues about whom the people who once lived there traded with, or where they went to quarry their stone.
- The arrowhead might be the key to dating the entire site.

This is why picking up arrowheads—or bits of pottery or any other artifact—is not as harmless as it might seem. When you take an artifact, you take away a unique clue that the archaeologist might need to determine a site's age, who lived there, or how they lived.

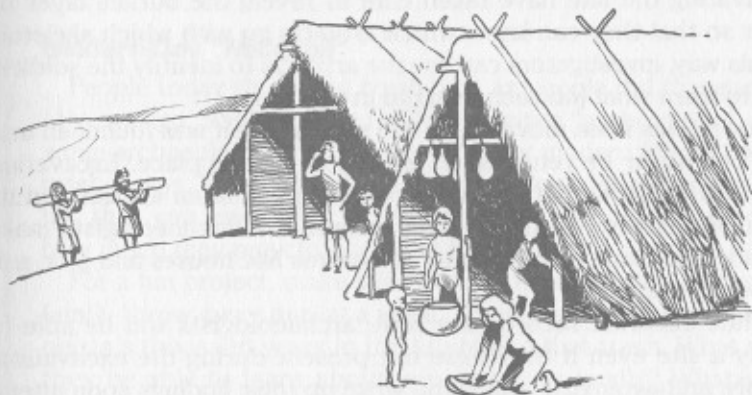
The information that can be gained from an isolated find is usually limited to the artifact itself, with little to be learned from the artifact's surroundings.

Of greater value are *sites*—locations where there are a number of objects in the same place, and perhaps the remains of fires or houses. A site might be a prehistoric camping area, a village, or a place for storing food. It might be a community that we know about from history, such as an early pioneer settlement or a fort. The artifacts found could be tools, weapons, household goods, pottery, remains of clothing, or trash.

Archaeologists are especially interested in trash heaps where people threw out what they no longer needed or wanted. Called *middens*, the piles of trash or garbage often reveal much about the people who made them. There may be shell, bone, and plant remains that show what people ate. Broken plates, bowls, and other ordinary items in middens give an idea of what things people used in their everyday lives.



An isolated artifact such as a hunter's lost spear usually provides few details about the culture that produced the object.



Compared to an isolated find, artifacts found together at a site can provide more information about the people who lived there.

Site Excavation

Although digging is only a part of the scientific process of studying and understanding a site, the work of uncovering artifacts is what many people think of when they think about archaeology. There is an excitement to clearing away centuries of dust or muck and finding artifacts that haven't been seen by humans in hundreds or thousands of years.

But along with that excitement comes a great responsibility to plan and carry out a proper excavation and to preserve every bit of information that can be gathered. Archaeologists work slowly and record everything they observe about the artifacts and the surroundings in which these items are found. If possible, they may leave a portion of the site untouched for future archaeologists to explore with new and better techniques.

The reason for taking such pains is that much of the information a site holds comes not only from the artifacts themselves, but also from how the items are found. Much can be learned from the positions of the items, how close together they are, and in what layers of earth.

For example, Confederate soldiers killed in March 1862 at Glorieta Pass in New Mexico were buried one over another. Archaeologists

excavating the site have taken care to reveal the burials layer by layer so that they can know which artifacts go with which skeleton. In this way, investigators can use the artifacts to identify the soldiers and to learn what job each man did in the army.

Once it has been moved from the spot where it was found, an artifact can never be returned to exactly the same place. Excavation destroys a site, so data must be recorded before an artifact and its surroundings are disturbed. The records that archaeologists make include site maps, photographs of features like houses and pits, and drawings of artifacts.

When accurate records are kept, archaeologists will be able to study a site even if they were not present during the excavation. Ideally, archaeologists study and write up their findings soon after a site has been excavated. Researchers of the future, however, might want to use new tools and new methods to reexamine the data from an excavation. Accurate records are essential for those future archaeologists who will rely on data gathered today, or even five decades ago, for research that might not be done until many years from now.



Scouts at Indian Writings Camp, Philmont Scout Ranch, excavate a site with great care to avoid destroying information.

Modern-Day "Middens"

People today throw out trash, just as people did thousands of years ago. Scientists who call themselves "garbologists" use some archaeological techniques to study modern landfills and trash heaps. They look at what we toss out. From such studies, they can learn what products people use, what they eat, how much they recycle, and what they value.

For a fun project, make a list of the items that you and your family throw away during a week. Then imagine that archaeologists a thousand years in the future find that trash. What will they be able to learn about you and your family? What will your trash say about the culture in which you live?



(Photo courtesy Department of Anthropology, University of Arizona)

For modern investigators, trash cans are like middens: full of information about people's lives.

The excavation tools used by archaeologists include shovels, buckets, wheelbarrows, trowels, whisk brooms, brushes, and wire screens. Surveyor's instruments are used at large sites that have many excavation areas. At some sites, excavation is done with water sprayed through hoses. Other tools that are just as important are graph paper, notebooks, pencils, cameras, and measuring equipment to record findings as they are being made.

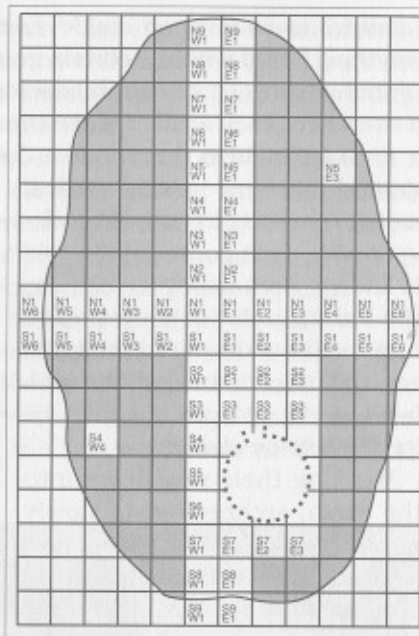
Techniques of Excavation

Archaeologists begin working at a site by establishing a *grid* over the area with lengths of string tied to wooden stakes. They may use a compass or a surveyor's transit to establish straight lines, and a tape measure to space the lines evenly.

An excavation will have a *primary datum point* that is used as a reference point for laying out the squares of the grid. Ideally, the pri-

mary datum point is marked permanently so that archaeologists of the future can measure from it and establish exactly where the earlier excavation took place. The marker might be a cement post or a steel pipe, or the datum point might be located on a permanent natural feature such as a rock outcropping.

When it is complete, the grid will look like a big checkerboard. Each square is usually one or two meters



(about 3 to 6½ feet) on a side. Each square is given a *grid number*. Anything found within a certain grid square will be given the number of that square. That way, archaeologists can record the exact spot in a site where each artifact is discovered.

Excavators also determine a datum point on the surface of the ground to use in making vertical measurements. Usually, the elevation for each corner of the grid is known. Archaeologists can use the datum point or elevation to measure how deeply in the earth each artifact is buried. An artifact's vertical depth is known as its *depth below datum*.

Working their way down into the earth, archaeologists slowly uncover a site. When they find artifacts, they use small brushes to clear away the dirt. Then they record the grid number and the depth at which an item was found, and any other information about the artifact's position, appearance, and how close it is to other artifacts.

Provenience is a word archaeologists use to describe the exact place in a site where an artifact is found. Each artifact's location can be described horizontally by its grid number and vertically by its depth below datum.

If excavators find a cluster of artifacts, a feature such as a hearth or a campfire, or a piece of a structure such as a wall, post, pit, or floor, they will document what they find even more carefully. They will make photographs and drawings to show how all of the materials relate to one another.

With proper and accurate records and measurements, it is possible to re-create a site on paper. It's also possible to use a computer



(Photo courtesy National Park Service, Midwest Archeological Center, Lincoln, Nebraska)

It is essential to measure and record how deeply in the earth an artifact is buried.

to develop a three-dimensional figure that shows the relationships between artifacts (objects that can be collected and taken from the field) and features (unmovable elements of a site such as fire pits, houses, storage areas, and burial chambers).

After all information is recorded, each artifact can be placed in a plastic or paper bag. The bag is carefully labeled with information about the object—the site number, grid number, depth below datum, date of the excavation, and names of the archaeologists. This process preserves information about what was found together.

Soil that seems to contain no artifacts is sifted through a wire-mesh screen. Sifting may reveal small artifacts, bones, charcoal, tiny flakes or chips of stone (the leftovers of stone tool making), and other fragments that might otherwise be overlooked by excavators. A sample of soil may be washed in a process known as *flotation* to



(Photo courtesy National Park Service, Midwest Archeological Center, Lincoln, Nebraska)

After all information is recorded about the exact spot where an artifact was found and the *context* in which it was found, the item can be removed from the earth, bagged, and labeled.

separate out any seeds or plant remains (clues to what plants people were eating).

Keeping Things in Context

When archaeologists excavate a site, they search for clues that can help them piece together the lives of the people who used that bit of ground. They attempt to establish the *context* of the site—where artifacts were found, how the items relate to one another, and what the site as a whole reveals about the people who were once there.

For example, an excavator who finds a clay bowl in the living area of an ancient house might conclude that the bowl was a simple household object with no special meaning. If the bowl were found in the tomb of a dead king or on the altar of a ruined temple, however, the excavator may determine that the bowl might have had sacred or ritual meaning.

By carefully recording the context of a site, archaeologists can gain information that helps to tell the full story of the people who lived there. Researchers consider lots of evidence as they establish



Soil from a site is sifted through a screen to reveal small artifacts. Here, investigators with the East Texas Archeological Society, assisted by the Dallas Archeological Society and students, screen dirt at the site of a prehistoric Caddoan village.

a site's context. Among the important factors are the *formation processes* that shaped the site.

Sites are created by the activities of everyday living and by the reuse of a site over time. Trash is tossed in the same place day after day, creating a midden. Rooms are lived in, eventually abandoned, and possibly reoccupied by later arrivals to the area. If a room is reoccupied, the new owners may clear away debris and discard artifacts some other place.

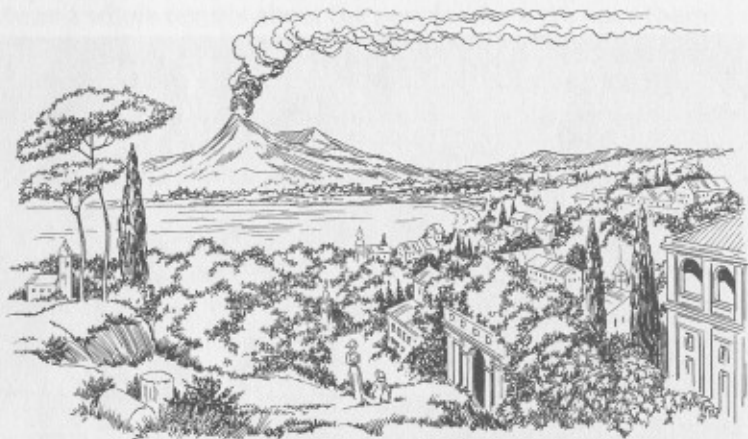


(Photo courtesy S. Alan Skinner, AR Consultants, Dallas, Texas)

Change may come gradually, as wind and erosion slowly reshape a site. Time has taken a toll on this abandoned rock house near Littlefield, Arizona.

In most cases, formation processes are gradual. New buildings are erected on the ruins of old structures. Dust carried by the wind slowly covers the remains of an abandoned homestead on the prairie. As the years pass, such factors as erosion and changes in climate can affect the appearance of an area and the locations of artifacts within a site. Though quite rare, catastrophic events such as fires, floods, avalanches, and volcanic eruptions may drastically reshape an area. By paying attention to the formation processes that have been at work, archaeologists can better understand the context of a site.

Catastrophic formation processes sometimes happen suddenly. In the year A.D. 79, the volcano Mount Vesuvius erupted above the Roman towns of Pompeii and Herculaneum. Hot volcanic ash buried the cities, killing most of the people and then hardening around their bodies. The sites were discovered in 1711. Excavations of the cities continue even today, yielding a clear picture of life in Pompeii and Herculaneum at the moment the volcano erupted.



Archaeologists excavating Pompeii have found it well preserved under the blanket of volcanic ash that buried the city when Mount Vesuvius erupted in A.D. 79.

Reading the Evidence

Two important principles in archaeology are *association* and *superposition*.

The *principle of association* says that artifacts found together were probably used together and are probably about the same age. An archaeologist who discovers a stone tool buried next to a piece of pottery can make a good guess that the tool and the pottery are about the same age, and that people probably used both items at about the same time. The principle of association would lose its value if somebody were to move the tool before recording where it lay in relation to the pottery. If that happened, an archaeologist might never know that the pot and the tool were closely related.

13,000 B.C.

12,000 B.C.

11,000 B.C.

10,000 B.C.

9000 B.C.

8000 B.C.

ca. 38,000–10,000 B.C. Stone Age people come to North America.

ca. 13,000 B.C. Stone Age artists paint animals on walls and ceiling of Lascaux cave in France.

ca. 10,000 B.C. First identifiable American Indians—the Clovis people—live in the Southwest.

ca. 9000 B.C. Desert dwellers of the American Southwest are among the first people in the world to weave baskets.

ca. 8000 B.C. begin to bury their

ca. 8000 B.C. huge animals disappear of the Ice

ca. 8000 B.C. oldest kno

ca. 8800–8200 B.C. Folsom people live in what is now New Mexico.

6000 B.C.

5000 B.C.

4000 B.C.

3000 B.C.

2000 B.C.

ca. 6000 B.C. First evidence of domesticated plants—corn, beans, squash, potatoes—in South America.

5000–1000 B.C. Some American Indian groups settle into semipermanent villages.

3500–2000 B.C. People begin farming in much of Mexico and Central America.

ca. 3300 B.C. A man dies in the Alps of Europe and a glacier covers his body.

ca. 3000 B.C. Sumerian scribes invent *cuneiform* (wedge-shaped) writing.

ca. 3000 B.C. Earliest known pottery in the Western Hemisphere.

ca. 3000 B.C. Hieroglyphic writing develops in Egypt.

ca. 2000 B.C. Earliest known pottery in North America.

ca. 2000 B.C. Bronze Age begins in Europe and the Nile Valley.

1361 B.C. Tutankhamun ascends Egypt's throne.

ca. 2800 B.C. Construction of Stonehenge begins in southern England.

ca. 2500 B.C. Egypt's rulers build colossal pyramids at Giza.

ca. 1270 B.C. Pharaoh Queen Nefertiti rules Egypt.

ca. 1250 B.C. the Hebrews enter Egypt.

ca. 1200 B.C. begin to build the first cities in Mexico's central region.

Important Events and Major Discoveries in Archaeology

These time charts show where the events and archaeological discoveries discussed in this pamphlet belong in the grand sweep of time. Notice how much longer the chronology is for the period before 30 B.C. than for the years since A.D. 30.

ca. = circa (approximately)

9000 B.C.

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ca. 9000 B.C. Desert dwellers of the American Southwest are among the first people in the world to weave baskets.

8000 B.C.

ca. 8000 B.C. Hunter-gatherers in Europe begin to build shelters, live in settlements, bury their dead.

ca. 8000 B.C. Big-game hunting declines as huge animals like the mammoth begin to disappear from North America at the end of the Ice Age.

ca. 8000 B.C. Jericho in Jordan is world's oldest known walled city.

7000 B.C.

ca. 8800–8200 B.C. Folsom people live in what is now New Mexico.

2000 B.C.

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ca. 2000 B.C. Earliest known pottery in North America.

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ca. 2000 B.C. Bronze Age begins in Europe and the Nile Valley.

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1361 B.C. Tutankhamun ascends Egypt's throne.

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2800 B.C. Construction of Stonehenge begins in southern England.

ca. 2500 B.C. Egypt's rulers build colossal pyramids at Giza.

1000 B.C.

ca. 1020 B.C. The Israelites unite under King Saul.

ca. 1000 B.C. The Adena people of the Ohio Valley in North America begin to build mounds over the graves of their leaders.

ca. 950 B.C. The Temple of Solomon is built in Jerusalem.

776 B.C. The Greeks host the first Olympic Games.

753 B.C. Rome is founded.

597 B.C. Chaldeans conquer Jerusalem.

ca. 563 B.C. Buddha is born.

ca. 500 B.C. Confucius teaches in China.

432 B.C. The Parthenon is completed in Athens.

400 B.C.–A.D. 500 Hopewell Indians bury their dead in earthen mounds in the Ohio Valley.

335–327 B.C. Alexander the Great conquers Egypt and Persia.

221–210 B.C. China's first emperor, Qin Shi Huangdi, builds the Great Wall.

30 B.C. After Cleopatra's death, Egypt becomes a Roman province.

A.D. 1–1199

ca. A.D. 30 Jesus of Nazareth is crucified at Jerusalem.

A.D. 79 Mount Vesuvius buries Pompeii and Herculaneum.

A.D. 105 The Chinese invent paper.

100–750 Civilization flourishes in Mexico, centered on Teotihuacán, the first metropolis in the Americas.

250–900 Maya civilization flourishes in much of Mexico and Central America.

476 The Roman Empire falls.

ca. 570 Muhammad is born.

ca. 800 First mounds are built at Cahokia in what is now Illinois.

ca. 900 The Anasazi build large, multiroomed pueblos in the American Southwest.

ca. 1000 Vikings establish short-lived villages on the northern coast of North America.

ca. 1040 The Chinese print books using movable type.

ca. 1100 Easter Islanders erect giant stone statues.

A.D. 1200–1699

ca. 1200 The Incas establish their capital at Cuzco in Peru.

ca. 1200 The Anasazi abandon their homes in the Chaco Canyon region.

1271–95 Marco Polo travels in China.

1325 The Aztecs establish their capital, Tenochtitlán, in Mexico.

1428 The Aztecs rule much of Mexico.

1453 Constantinople falls to the Ottoman Turks.

1492 Columbus arrives in America.

ca. 1500 Mudslides bury Makah village at Ozette in what is now Washington State.

1519 Spanish conquistadors and missionaries pressure the native cultures of the Americas.

1521 In Mexico, the Aztec Empire falls.

1532 In South America, the Inca Empire falls.

1539–42 Hernando de Soto explores parts of the Mississippi Valley.

1540 Francisco Vázquez de Coronado finds Zuñi pueblos in the American Southwest.

1588 The English defeat the "Invincible" Spanish armada.

1607 Jamestown, Virginia, the first English settlement on the American mainland, is founded.

1619 The English settle Wolstenholme Towne in Virginia.

1620 The Pilgrims establish Plymouth Colony in Massachusetts.

1686 La Salle's ship *Belle* runs aground off the Texas Gulf Coast.

A.D. 1700–1999

1775–83 The American Revolution.

1799 The Rosetta Stone is discovered in Egypt.

1816–19 Giovanni Belzoni plunders ancient Egyptian temples and tombs.

1822 The Rosetta Stone is deciphered.

1865 The steamboat *Bertrand* sinks in the Missouri River.

1911 American explorer Hiram Bingham finds ruins of Machu Picchu, Inca city in Peru.

1922 Tutankhamun's treasure-filled tomb is found in Egypt's Valley of the Kings.

1927 Folsom point is discovered near Folsom, New Mexico.

1940 Four boys find 15,000-year-old cave paintings in Lascaux, France.

1940s Radiocarbon dating is first used to determine the age of organic substances.

1947 Thor Heyerdahl sails the *Kon-Tiki* 4,300 miles from Peru to the islands of Polynesia.

1963–68 UNESCO project rescues the temples of Pharaoh Ramses II at Abu Simbel.

1968 Wreck of the steamboat *Bertrand* is discovered.

1970s Archaeologists unearth the 500-year-old Makah Indian village at Ozette, Washington.

1974 Well-diggers discover the tomb of Qin Shi Huangdi, China's first emperor.

1978–82 The Great Temple of the Aztec capital, Tenochtitlán, is excavated in Mexico City.

1980 Human remains from the Roman era are studied at Herculaneum, Italy.

1991 Hikers in the Alps find the 5,300-year-old body of the Iceman.

1995 Marine archaeologists find La Salle's ship *Belle*.

The *principle of superposition* says that the deeper an artifact is buried, the older it is. Over the years, layers of earth, debris, trash, and other materials build up in a site. *Stratigraphy* is the order in which layers have formed in a site. The oldest artifacts will be in the bottom layers, while artifacts in the layers above will be younger.

However, artifacts can move within layers. Objects are sometimes displaced by burrowing rodents. Objects may move due to movements of the soil itself, such as *frost heaving*—water in the soil freezes and pushes the earth upward. Artifacts may also be moved by later generations of people. Perhaps an Apache picked up an old spear point for his medicine pouch, or a miner used a prehistoric grinding stone to build the foundation of his cabin. Of course, if a pothunter digs into a site and makes no record of which artifacts were in which layers, vital information about the age of the items will be destroyed.



Distinct layers are visible at the prehistoric Devil's Mouth site at Amistad Reservoir along the Rio Grande. Deeper layers of a site generally hold older artifacts.

The Decision to Dig

Archaeologists do not excavate every site they locate. Sometimes they must decide which sites are most likely to answer their questions about a particular problem, and then excavate only those sites.

Perhaps there are historical records for some early settlement, like Jamestown, Virginia, but the accounts are vague or incomplete. Archaeologists may decide to excavate a site to get answers to specific questions that the written record doesn't cover.

Or maybe there are sites facing certain destruction that require careful but quick excavation. In a situation, for example, where fifty sites will be damaged by a highway construction project, archaeologists might investigate only a representative sample of those sites, and then actually excavate only a few. This is done to keep from getting a lot of the same information and to reduce the overall costs of the project.

Archaeologists also know that some finds are better left undisturbed. Museums don't always preserve archaeological finds as well as the items would have been preserved if they had simply been left in the ground. It's also likely that methods and techniques not yet developed will prove to be better than those now used.

For all of these reasons, archaeologists may decide not to excavate a known site. In any case, they have a responsibility to justify a dig—to explain why they are excavating particular sites and what they expect to learn from their investigations. Archaeologists must have specific research questions in mind before they dig, and the excavation must be guided by a well-thought-out plan of research.

Artifact Identification and Examination

The time archaeologists spend in the field finding and excavating sites is short compared to the time they must spend in the laboratory analyzing artifacts and writing about their findings. Much of the work of archaeology, and much of the excitement of discovery, happens in the laboratory.

When artifacts arrive at an archaeological lab, they are cleaned and labeled. A code number may be written directly on each item or on a tag attached to it. Code numbers allow researchers to connect the artifact to the records made during the excavation, and to compare artifacts from different layers or locations without the risk of mixing them up.



(Photo courtesy National Park Service, Midwest Archeological Center, Lincoln, Nebraska)

Archaeologists spend much of their time in laboratories, examining and categorizing artifacts. After artifacts have been sorted and analyzed, they are carefully stored.

In the laboratory, archaeologists examine each artifact and try to figure out what it is, what it's made of, how old it is, and what it was used for, among other things. New finds are compared with already-identified materials. A site may yield hundreds or thousands of artifacts—far too many for each item to be compared individually with every other item found. Therefore, archaeologists classify or categorize artifacts, grouping items into categories that are similar. They might group together stone flakes from a site, or charcoal, pottery shards, or spear points.

Then they can compare the categories with other artifact collections to see if the items found in a certain site are similar to or different from those found elsewhere. Comparisons can help archaeologists make educated interpretations about whether the people who left one set of artifacts were also active in other locations, or whether different groups were doing the same kinds of activities.

Artifacts that are similar in material and appearance might be hard to tell apart at first glance. So archaeologists look for identifying clues. For example, modern investigators have learned a great deal about how early Americans made arrowheads and spear points (or *projectile points*, as scientists call them). When a point is found,



(Photo courtesy National Park Service, Midwest Archeological Center, Lincoln, Nebraska)

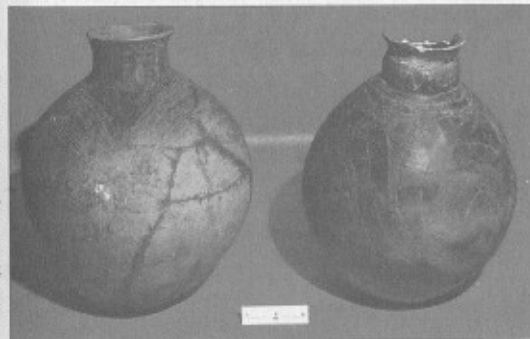
The material and the process used to make a projectile point, as well as the point's size and shape, are clues to the culture that produced it.

archaeologists can compare it against their artifact records. The shape and size of a projectile point and the stone from which it was formed (commonly flint, obsidian, chert, or quartzite) may reveal who made it and when.

Other clues to the origin of a projectile point may lie in the way it was made, a process called *flint knapping*. Typically, arrowhead makers hammered a chunk of flint with a stone tool to remove most of the unwanted material and roughly shape the point. For detail work, such as thinning, fine shaping, and finishing a point's sharp edge, they pressed a piece of bone or antler against the flint to break off small flakes. Flint-knapping methods leave distinctive marks on projectile points. To an archaeologist, these marks are almost like fingerprints in identifying the method used.

Investigators also learn much from pottery. Through the ages, people have used pots for cooking and for storing food, water, grain, and other items. When the pots broke, their owners often threw them out with the garbage. Although a pot might be fragile and easily broken, the fired clay used to make pottery can survive hundreds and even thousands of years, especially if it is buried in a trash pit or midden where it is protected from the weather.

Different groups of people made pots in distinctive ways. Archaeologists often can recognize the special shapes and markings used on pottery by various groups. Geologists can help identify where the clay used in a pot was originally found. Sometimes the pieces of a broken pot can be put back together. If not, archaeologists may be



(Photo courtesy Texas Archeological Research Laboratory, University of Texas at Austin)

The different shapes and markings of clay pottery can reveal much about the people who made the pots. These two ceramic vessels were recovered from a prehistoric Caddoan village in Cass County, Texas.

able to measure several pieces and use the measurements to determine the original size of the pot. Knowing the size can help them understand how and when the pot was used, and by what group.

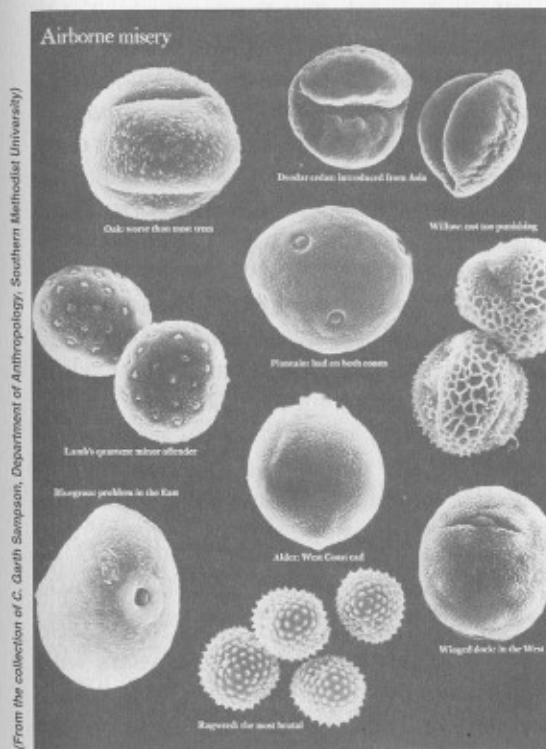
Less common than stone tools or clay pots are perishable artifacts made of wood, plant fibers, animal sinew, and other *organic* materials (materials that were once living). These objects excite particular interest because they are so rare. Dry caves occasionally yield well-preserved baskets, bits of cloth, and wood carvings. Sealed tombs may contain wooden furniture and linen fabrics. Leather clothing, natural-fiber ropes, and even entire human bodies may be preserved through a natural tanning process in peat bogs. In some cases, artifacts may be covered with a protective layer of mud or frozen in glacial ice, as happened to the *Bertrand*, *Ozette*, and the Iceman.

Perishable artifacts may crumble and turn to dust at the slightest touch, or disintegrate when exposed to air. Some objects are so fragile that efforts must be made to preserve them in the field, before investigators can begin to examine them in the laboratory. Preservation techniques will be covered in more detail later in this section.

Pollen Analysis

It might surprise you to learn that something as ordinary as the pollen from flowers, trees, and grasses can be useful to archaeologists. Pollen from different types of plants looks different and can be identified when viewed under a microscope. Carried by the wind and by insects, great amounts of pollen may settle in an area, then be covered by dust or other formation processes.

Archaeologists may use pollen to identify what people ate and what they grew in their fields. The presence of corn pollen in a site, for instance, indicates that the people grew corn for food. The presence of pollen in a burial site may suggest that the people placed flowers on the graves of their dead. Pollen analysis of a Stone Age grave site in Iraq showed that the dead man's body had been covered with eight different types of flowers, including hollyhocks.



From pollen grains, researchers can tell what plants grew in an area, what plants people used as food, or what kinds of flowers they put on the graves of their deceased. Note the various shapes and surface textures of these pollen grains.

Dating Artifacts

Archaeologists have several ways to figure out how old artifacts, structures, and sites are. If they know the date of one site, they can assume that another site with the same kinds of artifacts is about the same age. For instance, if they know that a certain kind of pottery found in site "A" was made five hundred years ago, archaeologists can be fairly certain that pieces of the same pottery found in site "B" were made at the same time.

Stratigraphy (the order of layers in a site) provides another dating method. Artifacts buried in deeper levels of a site are usually older than items above them. If archaeologists know the age of one level,

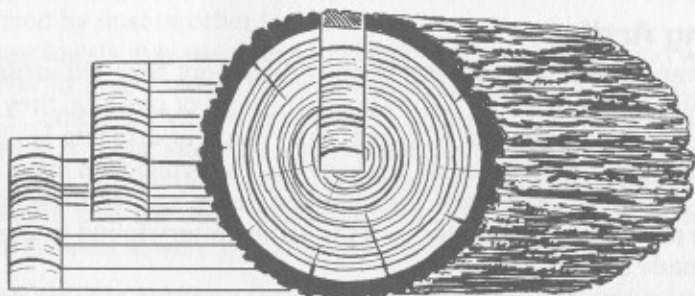
they can determine that artifacts beneath that level were probably left at an earlier date.

These ways of estimating the ages of artifacts are called *relative* dating techniques because the date of one artifact or site is related to the date of another artifact or site. Powerful scientific tools exist for more accurate dating—that is, for assigning a *specific* age to an artifact or a site. Among the most useful specific dating techniques are the following.

Radiocarbon dating. All living things have carbon in them. After a plant or animal dies, its carbon 14 (a type of carbon) decays at a slow, steady rate into carbon 12. After 5,568 years, half of the carbon 14 still remains; after 11,136 years, only one-fourth is left.

In 1949, scientists discovered a way to use this steady rate of decay of carbon 14 to measure the age of artifacts that contain carbon. Today, radiocarbon dating is one of the most accurate methods for determining the age of wood, ashes, bones, plant remains, and other items that were once living.

Dendrochronology. Look at a log that has been sawn in half and you'll see rings, one for every year the tree was alive. In years with good growing conditions, the rings were wide. If there was a drought, the rings were narrower. A fire might have left a scar on one or more rings.



By matching the rings on a wooden beam with the growth rings of a tree whose age is known, archaeologists can figure out the age of the beam. This dating technique is called dendrochronology.

Dendro means “tree” and *chronology* means “time.” Scientists can analyze the growth rings of trees in an area and use the rings to make a chart of time. They can then look at logs used long ago as firewood, or as beams to hold up the roof of a house. By matching the rings on the logs or wooden beams with the growth rings of trees whose ages are known, it is possible to tell when the wood of the logs or beams grew. That gives the age of the campfire or the house.

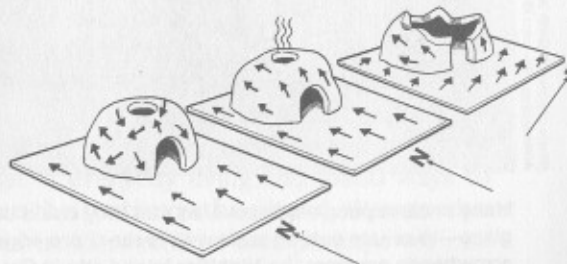
Scientists have used dendrochronology to date tree stumps taken from Sequoia National Park in south central California. Some of these trees were verified as being 2,300 years old, and others were dated as up to 4,000 years old.

Archaeomagnetism. You know that a compass needle lines up with the earth's north magnetic pole. In the same way, iron particles in heated clay or in soil such as the floor of a hearth align with the earth's magnetic field. When the clay or soil cools, the particles are locked in that alignment.

Over the centuries, the location of the north magnetic pole has drifted hundreds of miles. Geologists have charted the pole's travels, pinpointing where it has been at specific times over thousands of years. (For more about the earth's magnetic field, see the *Electricity* merit badge pamphlet.)

By analyzing a hearth found in a site, it is possible to figure out which direction the iron particles in the soil were being pulled when the particles, heated by fire, aligned with the north magnetic pole. Using the geologists' map of pole migration, archaeologists can determine the age of the hearth.

Iron particles in heated clay or soil align with the earth's magnetic field. Because the north magnetic pole changes location with time, archaeologists can use the alignment of the iron particles to figure out the age of a hearth or, as in this illustration, a clay pottery kiln. Archaeologists call this technique magnetic dating.



Documentation. Historical accounts and settlement records may contain information that pinpoints dates of artifacts. For example, in 1609 a man visiting the Jamestown settlement in Virginia drew a map of that village, the first English settlement in North America. Archaeologists today use the old map as one source to help them find the remains of the early walls and buildings of Jamestown.

Obsidian hydration. A less reliable dating method is obsidian hydration. Obsidian is a volcanic glass. Because it can be broken and shaped into cutting tools with very sharp edges, many ancient peoples used obsidian to make knives and arrowheads.

When obsidian is broken, the freshly exposed, clean surfaces absorb moisture. The rate of absorption depends heavily on the climate—some areas are more moist than others. Sometimes, scientists can study an obsidian artifact under a microscope and tell by the amount of moisture it has absorbed how old it is. Because the rate of absorption may vary greatly, however, this dating method can be unreliable.



Many ancient peoples discovered that they could use obsidian—a volcanic glass—to create cutting tools with razor-sharp edges. These obsidian arrowheads are from the Nightfire Island site in Oregon.

Interpretation

From excavating sites and analyzing artifacts, archaeologists get raw data: facts. The next step is interpretation—the process of giving meaning to the data.

Imagine an arrow point found at Cahokia, the site of a large and complex prehistoric Indian community in present-day Illinois. Analysis shows that the point was made of chert from Arkansas, but the style of the point indicates that it was made in Oklahoma. One interpretation of this data is that the Cahokians traded over long distances.

By interpreting the great body of material that has been recovered from Cahokia, archaeologists have formed many ideas about how the Cahokians traded, farmed, fished, hunted, celebrated, built houses, defended themselves, and otherwise met their basic needs. All people have basic needs, no matter when or where they live. Among the most important of people's basic needs are

- The need for water and food
- The need for shelter from the weather (housing and clothing)
- The need to understand and adapt to the world through their culture, including lifeways, philosophy, science, and religion
- The desire to pass on their culture to their children and future generations

The ways in which groups of people have satisfied their basic needs have differed from place to place and through the ages. These differences have made each culture—like the culture of Cahokia—unique. These differences have led to the rich mix of human cultures that we see around the world today.

Archaeologists studying sites and artifacts are interested in how people of the past fulfilled their basic needs. As they interpret how various groups lived, archaeologists help us better understand how our own culture has been built on the foundations of cultures that came before.

Through the study of the past, we can see how various groups of people rose to the challenge of everyday living and found ways to satisfy their needs and solve the problems they faced. We can also see how some groups failed in their efforts, and perhaps we can learn from those failures.



A Scout Troop's Archaeological Good Turn

An archaeological site in an area overseen by the Bureau of Land Management (BLM) was being damaged by livestock wandering through it. A Scout troop from a town nearby volunteered to help build a fence around the site.

For several days, the Scouts worked on the fence. To thank them for their efforts, the BLM arranged for the Scouts to spend time with archaeologists and other specialists who studied the site inside the fence. The Scouts got to practice some experimental archaeology by learning the basics of flint knapping to make arrowheads. They also learned about the Native Americans who had lived at the site hundreds of years earlier.

The fence that the Scouts built still protects the site. The Scouts also have a new respect for the ancient people whose home was not far from their own. As protectors of the past, they have enriched their own present.

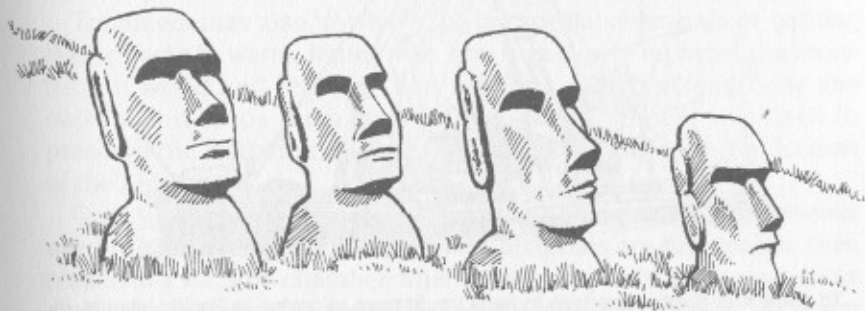
Ethnographic Analogy and Experimental Archaeology

The people archaeologists study are no longer around to explain how they made and used the artifacts they left behind. Two methods that researchers can use to interpret past lifeways are *ethnographic analogy* and *experimental archaeology*.

What's an "ethnographic analogy"? You can get an idea by looking at the two parts of the phrase. *Ethnography* is a branch of anthropology dealing with individual cultures. To make an *analogy* is to assume that if two things agree with one another in some ways, they probably will agree in other ways as well.

So, if two cultures are alike in some ways, they probably will be alike in other ways. To find clues about how people lived in the past, researchers can study the native peoples who still live in an area or who make items similar to artifacts that have been found in archaeological sites. No groups like the earliest hunters still live in North America, for example, but hunting peoples do live today in Australia and Africa. Those groups can give us information on hunting techniques and tool making, which—by analogy—we can use to interpret and better understand the habits and activities of ancient peoples.

In the second method—experimental archaeology—researchers try to re-create the items in question. Scientists can gain a greater understanding of ancient tools, pottery, fabrics, baskets, and other artifacts by trying to produce similar items themselves.

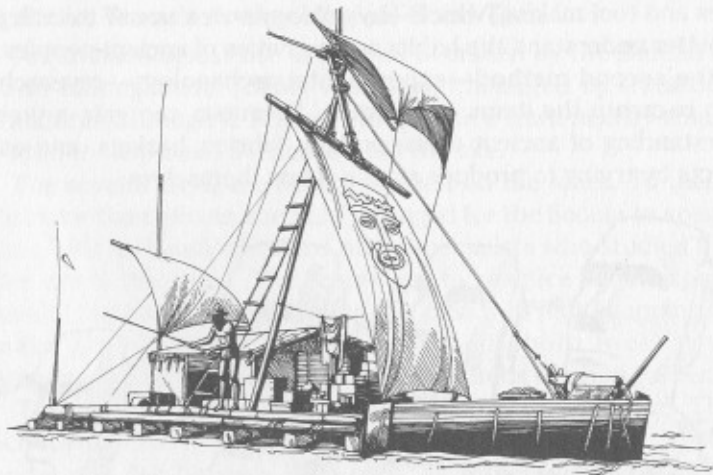


Experimental archaeologists on Easter Island set out to show how the huge stone heads might have been made and moved.

For example, experimental archaeologists might gather the same kinds of plant fibers used to make ancient baskets, then try to figure out how to weave the fibers into baskets similar to those found in excavated sites. By experimenting with plant fibers, they may discover how long it took to make a basket and which fibers were best for different kinds of baskets.

Experimental archaeologists might also try making pottery from the same clays prehistoric peoples used, to learn how hot the fire needed to be, what firewoods worked best, and how many pots typically broke during the firing. Or they might experiment with different methods of chipping flint to shape it into points for arrows and spears.

Sometimes, these experiments turn into great adventures. An explorer and writer named Thor Heyerdahl believed that, long ago, people sailed across the Pacific Ocean from South America to the islands of Tahiti, Fiji, and Easter. To test his theory, he used plans



To show that South American Indians could have migrated to Pacific islands, in 1947 Thor Heyerdahl and a small crew sailed the *Kon-Tiki* from Peru to the islands of Polynesia. The *Kon-Tiki*, made of balsa, was modeled after rafts used by Peruvians in ancient times.

more than a thousand years old to build a boat called the *Kon-Tiki*. Heyerdahl sailed the *Kon-Tiki* 4,300 miles to Tahiti. His experiment helped expand our understanding of the cultures of the South Pacific and their relationship to South America.

Preservation

Once objects have been excavated, they must be preserved so that they do not decay any further. In the field, archaeologists must sometimes act quickly to protect artifacts as soon as they are uncovered. Upon opening a 10,000-year-old tomb at Jericho, for example, archaeologists discovered that all of the wooden furniture in the tomb was crumbling to dust upon exposure to the air. To save it, they coated the furniture with wax to seal it from the air.

In cases other than emergencies, most conservation work is done in laboratories. Specialists called *conservators* use a variety of techniques to clean objects, stop the chemical and biological processes of decay, and protect the artifacts so that no more decay happens.

Conserving Organic Materials

Organic materials such as wood and leather that have soaked up water become soft and weak. They deteriorate rapidly when exposed to the air. It's important to keep such artifacts from drying out and cracking. To preserve them, conservators may place the objects in tanks of water or wrap them in plastic to keep them damp and away from the air.

Treatment may also involve applying special chemicals or bathing the artifacts in warm, liquid wax. The wax slowly replaces the moisture in wood and leather, then hardens, which strengthens the objects and keeps them from rotting. This treatment was used to preserve the leather and wood objects that belonged to the Iceman of the Alps.

Organic materials can also be freeze-dried—the same process used to make instant coffee granules. Materials are first frozen, then placed in a vacuum chamber where the ice crystals turn to gas; over a period of weeks, the gas is drawn off. Once dried, the artifacts are strong enough to be handled. Conservators use freeze-drying for preserving artifacts such as the wooden bowls soaked with seal oil

that came from the Ozette site, and items of grass that were found with the Iceman.

Some organic materials must be kept on ice to prevent decay. The Iceman's body, for example, is kept in a freezer at 21°F. A blanket of surgical gauze protects his skin; on top of that is a layer of crushed ice made from sterilized water. A plastic wrap around the body keeps the humidity next to the skin between 96 percent and 98 percent—similar to the conditions in the glacier where the Iceman was found.

An Imperfect Picture

Even in dry climates, the perfect preservation of all items that people once used is rare. Many objects rot and disintegrate, leaving no trace for an archaeologist to find. Therefore, investigators get only an imperfect picture of past cultures. Putting the picture together from an incomplete set of clues is like trying to assemble a jigsaw puzzle that has many pieces missing.

Try this: Make a list of all of the objects found in your bedroom. Then mark through every other item on your list.

If Scouts of the future could examine all of the items on your first list, what would they be able to learn about you? If they could look at only the objects on your second, incomplete list, how might their ideas about you be different? What would they learn about you and your life if they had only a partial or fragmentary set of objects from your bedroom to study? Do you think they would get an imperfect picture of who you are?

This is the same problem that archaeologists face. Large gaps often exist in the evidence they collect, making it impossible to build up a complete picture of the people they are studying.

Conserving Metal

Metals react with oxygen to form metal oxides such as iron oxide (rust). This process breaks down the structure of the metal. Most metal artifacts come out of the earth badly decayed and encrusted with oxides.

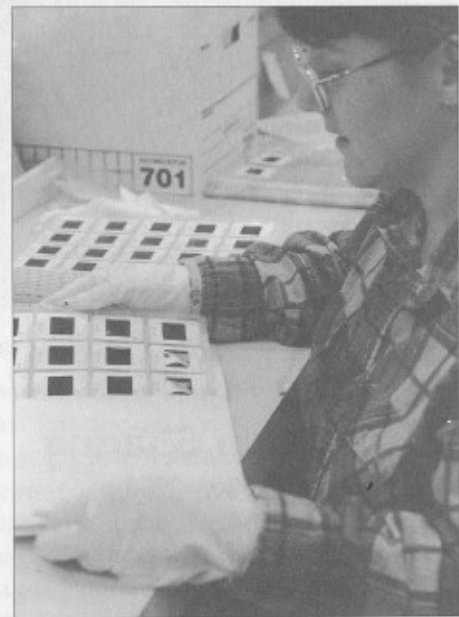
To clean metal objects, conservators may spray them with a jet of hard particles to scour away the rust. Chemicals may also be used to remove encrustations and stop further rusting. Then a sealant, such as a protective coat of polyester resin, may be applied to the artifact.

Artifact Storage

Artifacts are cataloged and stored so that they can be located easily by people who want to study them. Fragile items such as old clothing or paper documents may require storage where exposure to light and other conditions can be controlled.

Ultraviolet (UV) light is harmful to nearly all organic materials. Direct sunlight is the most damaging, but some types of artificial light can also produce UV. Special lightbulbs and lighting techniques may be used to protect artifacts from UV damage. Objects must also be protected against damage from heat, humidity, desiccation (drying out), dust, rodents, and insects.

The conservation and curation (long-term care) of archaeological finds has become a highly specialized field. If the few details given here have piqued your curiosity, you can learn more by talking with the curator of a local museum. The curator can explain the uses of special preservation materials such as acid-free paper, and show you how temperature and humidity



Paper records and photographs of excavations are preserved in special acid-free containers.

(Photo courtesy National Park Service, Midwest Archeological Center, Lincoln, Nebraska)

are controlled inside display cases, how maps and papers are stored, and how fragile objects are handled to avoid damage.

Site Protection

It may take months or even years after a site has been discovered before it is fully excavated. At times when archaeologists are not actively working at a site, the area may be in danger from pothunters illegally searching for treasures. Rain and wind might erode the soil. People in motor vehicles or on bicycles might not realize that they are going through and damaging a sensitive area.

Volunteers often are able to help archaeologists protect sites and monitor the condition of a site until excavation can be completed. Volunteers might visit a site once a month to make a written and photographic record. They might help build barriers to keep out people and animals. Or they might assist in concealing a site so that it does not attract attention.



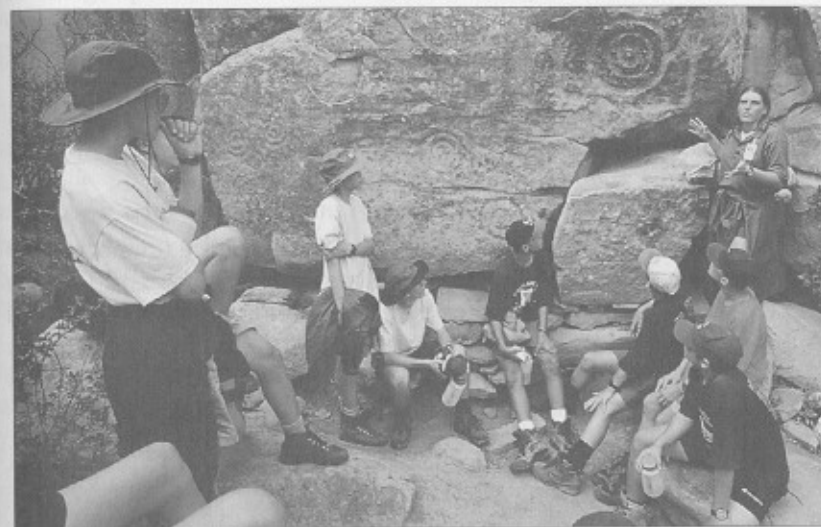
Vandalized site at Zion National Park, Utah.

(Photo courtesy National Park Service, Midwest Archaeological Center, Lincoln, Nebraska)

Information Sharing

Archaeologists have many ways to share the information they have gathered. Through academic journals and conferences, they exchange information with professional colleagues. Through books, magazine articles, educational television programs, films, and the Internet, archaeologists can reach large audiences. Displays and exhibits in museums, historical parks, and visitor centers at archaeological sites encourage the public to view artifacts and learn about the sites where the items were found.

Archaeologists may visit schools and give public lectures. As teachers in colleges and universities, they can expand the methods used to study the past and can train new generations of archaeologists.



Archaeologists often speak to groups at parks and other sites that attract visitors.

How to Learn More

Archaeologists are dedicated to sharing information. That's good news for you, because it means you should have no trouble finding experts who are willing to help you learn more about the field.

Begin by joining the archaeology club at school, if there is one. Archaeology clubs have sprung up in many junior and senior high schools across the nation. The clubs generally have ties to local colleges, universities, and museums. If there isn't an archaeology club in your school, maybe you could organize one.

Or, attend the meetings of a local history or archaeology society. Each of the fifty states has at least one archaeological society. (See the resources section of this pamphlet or ask your merit badge counselor to help you contact your local society.) The state organization

or its local chapters will probably sponsor lectures by archaeologists, tours of nearby sites, or exhibits of archaeological materials from the area.

If possible, visit a large university that has an active program in archaeology and operates its own field project. Ask to see how archaeologists work in the laboratory, study and catalog artifacts, make site maps, and prepare reports on their excavations.

Visit a local museum that displays archaeological artifacts from your area. Ask if there are museum school classes that teach interested amateurs the techniques of excavating, preserving, or displaying artifacts.

Visit archaeological sites or excavations. About four hundred archaeological sites or museums in the United States and Canada are listed in the books *America's Ancient Treasures* by Franklin and Mary Elting Folsom, and *Exploring Ancient Native America: An Archaeological Guide* by David Hurst Thomas. (See the resources section for more information on these and other books.)



Parkin Archeological State Park in Arkansas preserves the site of a Mississippian period Indian village that is dated at A.D. 1350 to 1550.

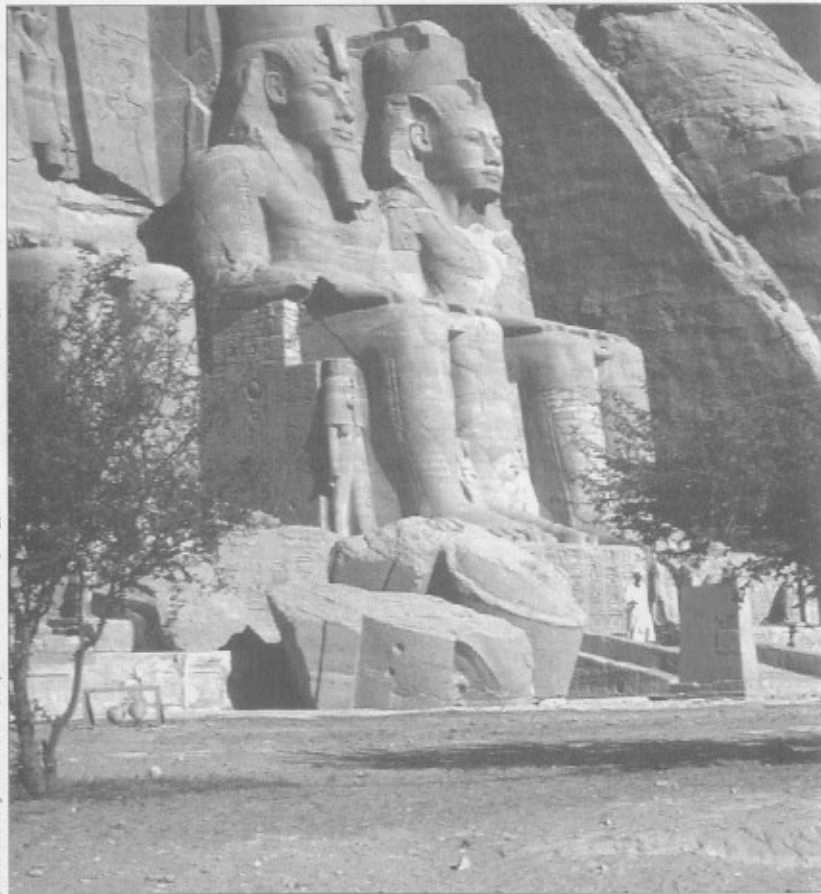
Get your entire Scout troop involved. Invite an archaeologist to speak to your troop or other group. You might invite your state historic preservation officer or state archaeologist (see the resources section), a speaker from an archaeology or history group that is active in your area, or an archaeologist who works for a private company that does archaeological research or surveys.

Better yet, your troop could arrange an archaeological outing. Perhaps the curator of a local museum or an anthropologist at a nearby college or university could give you a group tour of the facility and talk about its archaeological programs. Or arrange a group visit to a state or national historical park, an archaeological site under the jurisdiction of a land management agency such as the U.S. Forest Service or the Bureau of Land Management, or a nearby military base that employs an archaeologist.

Everywhere you go, ask about volunteer opportunities. Maybe the laboratory you visited could use a part-time volunteer. Is there an archaeological excavation in progress in your area? Find out if you or your troop could work at the site. (See the section "Going on a Dig.")



Volunteers work at a dig under the supervision of trained archaeologists.



The colossal statues of Pharaoh Ramses II at Abu Simbel in Egypt were moved to higher ground to escape the rise of the Nile River behind the new Aswān High Dam. Some scholars identify Ramses as the pharaoh of the biblical Exodus.

Abu Simbel: The World to the Rescue

The great temples of Pharaoh Ramses II and his queen, Nefertari, had stood at Abu Simbel on the Nile River for more than 3,200 years. The Egyptian pharaoh had ordered the two gigantic shrines carved into a sandstone cliff around 1270 B.C., probably to honor the thirtieth year of his reign.

The four colossal statues of Ramses II that loomed above the entrance to the larger temple looked invincible. The seated figures measured sixty-seven feet from crown to toe. It seemed impossible that anything—except the passage of time itself—could harm them.

But then, in the 1960s, the Aswān High Dam was built on the Nile 180 miles downstream from Abu Simbel. As a large lake formed behind the dam, it soon became clear that the rising waters would flood the temples if something wasn't done to save them.

Help came from all over the world. Egyptian and European artisans sawed the sandstone statues into 1,050 huge blocks, each weighing many tons. Every block was numbered so that they could be fitted together again correctly. Inside the temples, artisans cut the painted walls and ceilings away from the underlying rock.

Workers loaded the blocks onto trailers. The nineteen-ton faces of the great statues of Ramses rested on soft sand for protection. All of the cut blocks went into storage until they could be moved to higher ground.

Finally, in 1968, engineers put all of the blocks back together at a new location. They rebuilt the temples against an artificial hill, 212 feet above the original site and out of reach of the lake's rising waters.

The massive rescue effort cost almost \$40 million. It was paid for by Egypt, the United States, and dozens of other countries through an international partnership led by the United Nations Educational, Scientific and Cultural Organization (UNESCO). The rescue took four and a half years to finish. It was the most spectacular job of preservation ever seen in archaeology.

Going on a Dig

You've read about archaeology, what it is, and how the work is done. You've gone to meetings of the local archaeology society, talked with professionals, and visited sites or museums. The next step is to get hands-on experience at a professionally supervised archaeological excavation.

In other words, it's time to go on a dig. How do you volunteer?

- Check with your state archaeological society. It may have an annual field school in which you can participate. Many archaeological societies conduct workshops and other events as well as field sessions. The events generally are run by professionals or trained avocational archaeologists and are open to society members and the public.
- Call a museum or university in your area. Archaeologists on the staffs of museums and universities often need volunteers to work in the research projects they direct. Some universities and colleges are opening archaeological field schools to people who aren't enrolled as undergraduate or graduate students.
- Check with your local, county, and state governments. There may be archaeological programs in or near your community that use volunteers. The cities of Annapolis and Baltimore, Maryland, and Alexandria, Virginia, for example, have active programs in volunteer archaeology. So do Fairfax County, Virginia, and Prince George's County, Maryland. To find out if programs exist in your community, contact the local parks department, planning department, historic-preservation office, or museums.
- Subscribe to the *PIT Traveler* (Passport in Time Clearinghouse, P.O. Box 31315, Tucson, AZ 85751-1315; phone 800-281-9176). "Passport in Time" is a nationwide program in which volunteers work with U.S. Forest Service archaeologists on a variety of projects.
- Check with local units of other federal agencies, including the Bureau of Land Management, the Bureau of Reclamation, the

Army Corps of Engineers, and the National Park Service. In some areas of the country, these federal agencies offer volunteers a chance to participate in archaeological investigations.

- Look in the magazine *Archaeology*. Each year, the magazine publishes a guide to excavations in the Americas and around the world at which individuals can work. Recent guides have listed dozens of projects in more than half the states in the United States.
- See the *Archaeological Fieldwork Opportunities Bulletin*, published annually by the Archaeological Institute of America (AIA), for a listing of field schools and excavation programs that need volunteer help. If your local library doesn't have the bulletin, you can order a copy from Kendall/Hunt Publishing Company, Order Department, 4050 Westmark Drive, Dubuque, IA 52002; phone 800-228-0810. The cost for non-AIA members is \$11 plus \$4 shipping and handling.
- Research the Internet. Several projects seeking students and volunteers are listed on the Internet on the Archaeological Fieldwork server at <http://durendal.cit.cornell.edu/TestPit.html>.
- Contact one or more of the following organizations, which place volunteers and students into archaeological field projects directed by professionals. Some of these organizations charge for their services, so be sure to ask about costs. Volunteers pay for their own travel, room, and board. They must be prepared to work hard. Because of the amount of training given to volunteers, most professionals will expect volunteers to make a commitment to work for at least one week.

Anasazi Heritage Center
Bureau of Land Management
27501 Highway 184
Dolores, CO 81323
Phone 303-882-4811

Center for American Archaeology
Kampsville Archaeological Center
P.O. Box 366
Kampsville, IL 62053
Phone 618-653-4316

Crow Canyon Archaeological Center
23390 County Road K
Cortez, CO 81321
Phone 800-422-8975

Earthwatch
680 Mount Auburn Street
P.O. Box 403
Watertown, MA 02172
Phone 617-926-8200
<http://gaia.earthwatch.org>

Foundation for Field Research

P.O. Box 2010
Alpine, CA 92001
Phone 619-450-3460

Four Corners School of Outdoor Education

East Route
Monticello, UT 84535
Phone 801-587-2156

Institute for Minnesota Archaeology

3300 University Avenue, SE, Suite 202
Minneapolis, MN 55414
Phone 612-627-0315

Smithsonian Institution

Smithsonian National Associates
Research Expeditions Program
490 L'Enfant Plaza, SW, Suite 4210
Washington, DC 20560
Phone 202-287-3210

University Research Expeditions Program

University of California
Berkeley, CA 94720-7050
Phone 510-642-6586

instructor, prepare the dig and help a group properly excavate the site. Have the excavators keep notes and make maps of what they find. Have them write up their results, then compare their results with your plan for the site.

Mock Digs

In some areas, it's hard to find an archaeological site at which to volunteer. You might find it necessary to substitute an artificial site—a "mock dig"—for actual field work.

An artificial site can range in size from a clear plastic shoe box to an area that covers a few square yards. To build the site, you must understand the basic ideas presented in this pamphlet. The person or group that excavates the site will record what is found and where it's found, and then attempt to correctly interpret the findings.

Going on a mock dig should be as much like participating in a real dig as possible. The participants should accurately record all the data they uncover as they dig down layer by layer. They should make notes on site location, date of excavation, artifacts found, areas of discolored soil, and changes in soil types, different kinds of artifacts, or other clues that show use of the site during different time periods.

Ask an educational specialist at a local museum, a professional archaeologist, a trained avocational (hobbyist) archaeologist, an adviser from a local archaeological society, a science teacher, or other qualified instructor to help you find out how to plan and create a mock dig. Under the supervision of a qualified archaeologist or



(Photo courtesy Brenda B. Whorton, Dallas, Texas)

A mock dig gives hands-on experience when it's not possible to work at an actual site. As part of activities conducted by the Dallas Archeological Society for Archaeology Awareness Week, young people excavated this mock site at Old City Park in Dallas, Texas.

Careers in Archaeology



The temple of Kukulcan, a Toltec god, surmounts El Castillo, a large pyramidal mound, at Chichén Itzá in Yucatán, Mexico. The Temple of the Warriors can be seen in the background.

What does it take to be a professional archaeologist? Three important qualities are curiosity, patience, and the willingness to work hard.

Field work in archaeology is a combination of demanding physical labor and careful scholarship. It takes stamina to excavate a site, and patience to accurately record all of the information uncovered in the process of digging. An investigator in the field might wield a pick and shovel one day, then take up a trowel and brushes for the delicate, painstaking work of unearthing and cleaning fragile artifacts. Laboratory work also requires great patience, as archaeologists may spend years analyzing and interpreting their finds.

If you ask a dozen professional archaeologists why they chose their career, you'll probably get a dozen different answers. Archaeologists follow their own interests. One reason that many people find this an appealing profession is that it lets them satisfy their curiosity about a vanished culture, a remote area, a period in history, or some intriguing aspect of the human past. One trait that is common to all archaeologists is curiosity—a strong curiosity about the lost cultures and ancient ways of life that helped to shape the world we live in today.

Education and Training Required

The education and training you'll need to become a professional archaeologist depend on what kind of archaeology you want to do. To work as a field archaeologist and to do basic laboratory studies, you must have at least a bachelor of arts (B.A.) or a bachelor of science (B.S.) degree with a major in anthropology.

The anthropology departments of universities in the United States usually include archaeology as one of four subdisciplines. The other three are physical anthropology, cultural anthropology, and linguistics. Few universities have separate archaeology departments.

A major in anthropology requires courses in all four of the subdisciplines. The courses required for the bachelor's degree often include introductory anthropology and broad, general survey courses in physical anthropology (biological variation and adaptation in humans) and linguistics (human speech and language). There will also be courses in cultural anthropology (human cultures and customs). Courses in archaeology usually focus on specific areas of the world like North America or Asia, on types of human behavior such as social organization or religion, or on facets of the field such as nautical, classical, or historical archaeology.

Students of archaeology study a variety of subjects, including many sciences. The scientific analysis of sites and artifacts requires a knowledge of geology, paleontology, physics, chemistry, botany, zoology, and statistics.

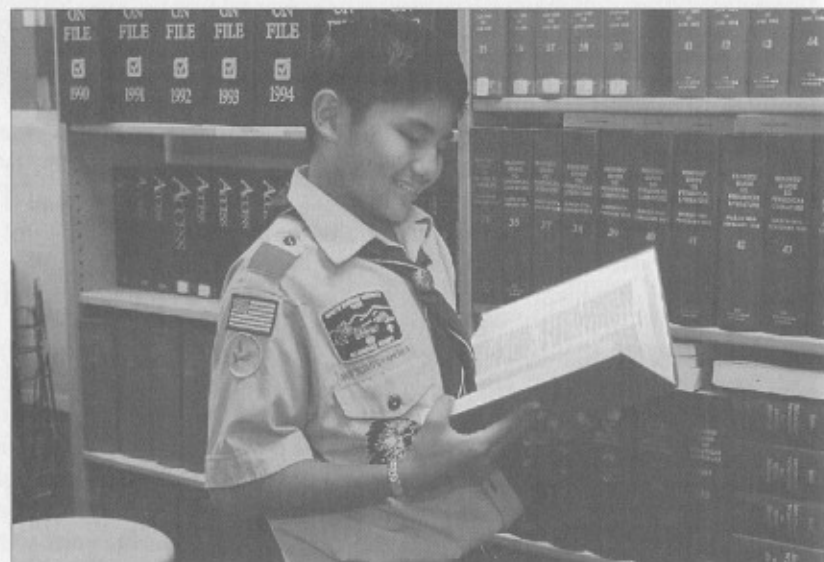
Interdisciplinary programs that combine archaeology with various other fields of study are common. Students who wish to study

ancient civilizations or historical archaeology, for example, will probably have courses in art, architecture, classics, history, ancient and modern languages, theology, and folklore.

Historical archaeologists usually major in anthropology or history. For students interested in ancient and classical civilizations, it is a good idea to begin learning several ancient and modern languages (for example, Greek, Latin, German, and French).

To work as a field archaeologist, previous experience is often required (usually obtained by spending a summer in an archaeological field school or participating as a volunteer). Archaeological field schools provide the best way to learn how to properly excavate and document archaeological sites, and also to find out if archaeology is the career for you.

You can begin now to prepare for your college coursework by taking all of the science, history, and language classes you can. Strong communication skills are vital to an archaeologist, so you'll need a good grounding in English and speech. Courses in writing, word processing, computer graphics, and desktop publishing will help in producing research papers and field reports, and writing requests for grants.



Read widely. Most libraries have many excellent books and magazines about archaeology. The resources section at the end of this pamphlet lists some recommended titles, but the list barely scratches the surface of all that is available. Visit your local library and ask a librarian to help you find information.

It's a good idea to keep a scrapbook of newspaper and magazine articles about new discoveries. Many exciting finds are so recent that they don't yet appear in the history books. At the time this pamphlet was being written, for example, excavation had just begun on the *Belle* of La Salle's last expedition (see page 87). Because the find was so new, no books had the story. The best sources of information were newspaper reports from the scene and progress reports issued by the historical commission that oversaw the work.

Graduate Study

While a bachelor's degree will qualify you to work on an archaeological field crew, it won't allow you to move into a supervisory role. Supervisory positions require a graduate degree.

There are two levels of graduate training in archaeology. The first is a master of arts (M.A.) or master of science (M.S.) degree, which takes about one to two years of coursework beyond the bachelor's degree. Graduate students may take advanced, specialized courses, such as courses in dating techniques or seminars on hieroglyphic writing.

Most master's programs require students to be able to read at least one foreign language. You should choose a language that will be helpful in your future research. If you plan to do research in South America, for example, Spanish would be the logical choice.

Earning a master's degree usually requires the student to prepare a written *thesis* that presents the results of the student's original research. A master's degree with a thesis and a year of field and laboratory experience is the minimum requirement needed for certification by the Society of Professional Archeologists.

A master's degree would qualify you to direct field crews and is enough for many government jobs in archaeology. It is also sufficient to work for a private company, to teach in a community college, and to work for some museums.

The second graduate degree is the doctoral degree (Ph.D.), which is required to teach in a four-year college or university or to work as a curator in a museum. The Ph.D. degree requires two to three years of courses beyond the master's. The student must successfully prepare and defend a *dissertation* that contains original research in the student's chosen area of specialization.

The dissertation is normally a book-length document. Researching and writing a dissertation shows that the student is able to pursue scientific inquiry by choosing a particular problem and solving it logically through field research or laboratory work.

Some graduate programs offer streamlined "tracks" for students with a B.A. degree so that they work directly toward a Ph.D. Other programs require an M.A. degree first.

Most foreign governments will issue excavation permits only to archaeologists with a Ph.D. degree. This means that opportunities to direct field projects outside the United States are limited to professional archaeologists with a doctoral degree.



(Photo courtesy Paul P. Sledz, Dallas, Texas)

Nearly a thousand years ago, Leif Ericson led Viking explorers to the eastern coast of North America. At a Viking settlement site at L'Anse-aux-Meadows, Newfoundland, Canada, this Viking-built structure from the year 1000 has been reconstructed.



(Photo courtesy Forest Frost, Lincoln, Nebraska)

Among the Mayan ruins at Uxmal, Yucatán, Mexico, is the Pyramid of the Magician.

Areas of Specialization

Most archaeologists end up specializing rather narrowly in a particular area of interest. Some work in historical archaeology. Others study the prehistoric past. Some excel at fieldwork. Others enjoy using computers to test their ideas. While one professional might specialize in ceramic technology or ancient calendar systems, another might become an expert on the cultures of the American Southwest, or an authority on nineteenth-century army posts in Montana.

It's too soon for you to think much about choosing a specialty. If you are preparing for a career in archaeology, you will be studying a wide variety of subjects from now until you earn a bachelor's degree. By the time you get to graduate school, you'll have enough experience to know what aspect of archaeology strongly interests you and appeals to you as a specialty.

Where Archaeologists Work

Professional archaeologists work for universities, colleges, museums, the federal government, state governments, in private companies, and as consultants. They teach, conduct field investigations, analyze artifacts and sites, and publish the results of their research.

Academic Positions. Faculty members at colleges and universities not only teach but also do research, including fieldwork, and publish the results. Most faculty positions are nine-month appointments. During the summer, academic archaeologists conduct field research, teach summer school, teach summer field schools, or work as private consultants. They may get the funds to do their research from their school, from federal agencies such as the National Science Foundation and the National Endowment for the Humanities, and from private foundations such as the National Geographic Society, Earthwatch, and others. Within colleges and universities, archaeologists are found in the departments of anthropology, art history, architecture, classics, history, and theology.

Museum Positions. Museum curators conduct research, publish the results, give public presentations, prepare displays, and conserve the collections of the museum. Museum positions require a graduate degree.

State and Federal Government Positions. Federal and state laws that protect the environment include protection for important archaeological sites. As a result, the government is involved in managing archaeological sites on federal and state lands such as parks and forests.

Not surprisingly, therefore, the federal government employs many archaeologists. The U.S. Forest Service, National Park Service, Bureau of Land Management, and the U.S. Army Corps of Engineers all have archaeologists. Most government positions require a master's degree.

Many archaeologists also work for state government agencies. Every state has a state historic preservation office with one or more archaeologists on staff. In addition, archaeologists work in state parks departments, highway departments, and water resource departments. Some cities also hire archaeologists to be responsible for local archaeological sites.

Construction projects often require archaeological surveys to locate prehistoric or historic sites. If sites are found, decisions must be made about excavating some or all of the sites before construction begins. Federal and state archaeologists are involved in making those decisions and supervising the archaeologists who do the work. This kind of archaeology is called cultural resources management (CRM).

Private Sector Archaeologists. Archaeologists also work for firms that direct the CRM investigations required by law. They conduct archaeological surveys, and excavate significant sites before those sites are destroyed by construction activities.

Private sector archaeologists work in the field, in the laboratory analyzing the results of their field investigations, and in the office writing reports on those investigations and preparing proposals to conduct additional work. They may work for laboratories or centers within colleges and universities, for engineering and environmental companies, for companies specializing in archaeological investigations, or as private consultants. These organizations also hire field archaeologists as temporary staff to assist with field investigations.

(Photo courtesy S. Alan Skinner, AR Consultants, Dallas, Texas)



The stone walls have collapsed at the ruins of Awatovi, the site of a Franciscan mission built in the 1700s to minister to the Hopi Indians who still inhabit northeastern Arizona.

Field positions usually require a bachelor's degree and previous experience in an archaeological field school. Supervisory positions in cultural resources management work require a master's degree.

Choosing a College or University

Each year, the American Anthropological Association publishes a guide that lists most of the undergraduate and graduate anthropology programs in the United States and Canada. The guide lists the names and research interests of each department's faculty members. You should be able to find a copy at any college or university library. It may help you to choose a program that matches your interests.

Archaeologists of the Americas, the membership directory of the Society for American Archaeology, can be helpful for locating specific archaeologists, academic programs, museums, and cultural resources programs. (See the resources section of this pamphlet for addresses.)

Archaeology in the Future

Years from now, archaeologists of the future will examine sites and artifacts from our age. What will they find? How will they interpret our cultures? What exciting new tools will they use to peer into the past?

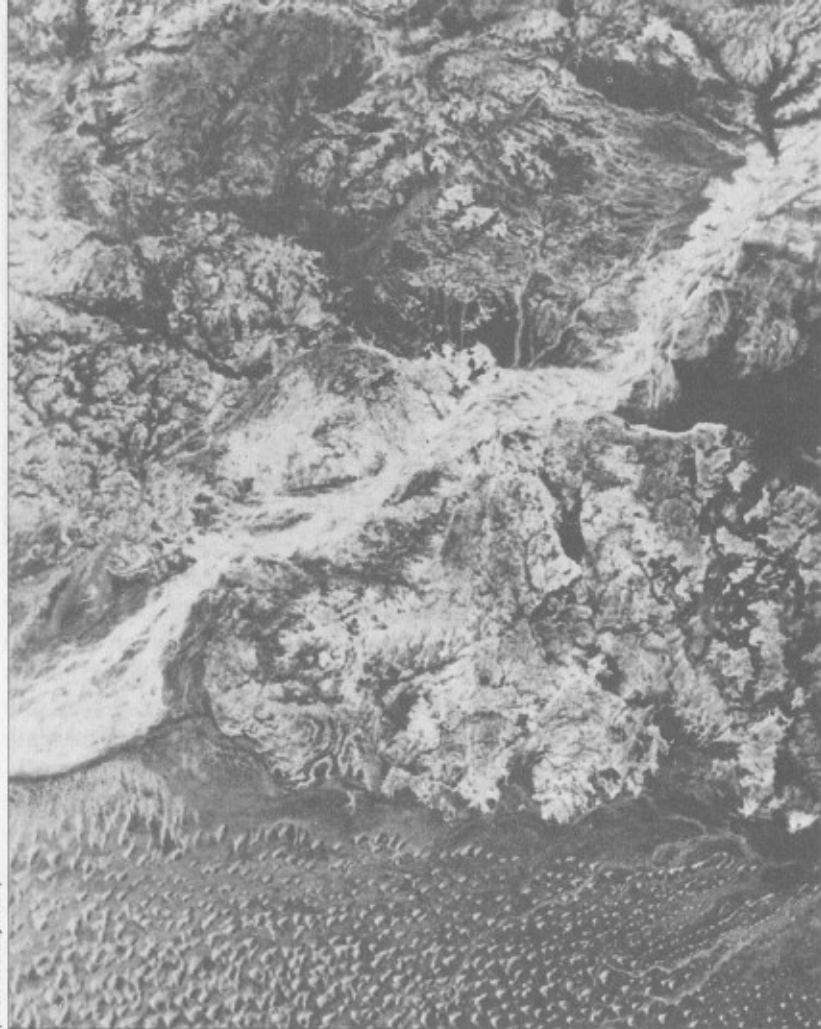
Archaeologists in the future undoubtedly will develop better and more sophisticated techniques for finding and excavating sites, examining and interpreting finds, preserving artifacts, and sharing information. New technology is likely to affect nearly everything people do, archaeology included.

Computers will be used in many ways for mapping, artifact classification, simulations, and analysis. Archaeologists in the future may use deep-sea diving suits and computer-controlled robots to investigate shipwrecks and other underwater remains in ocean depths too cold or deep for scuba diving.

Faster and more accurate dating methods may be developed. Laser beams may be used to measure distances more accurately. Breakthroughs in genetics, blood chemistry, and other sciences will continue to add to our understanding of the human past.

Aerial photography and satellites may come to play an even bigger role in locating and investigating sites than they do now. Archaeologists in the future may use photographs taken from aircraft and satellites, and other *remote sensing* techniques including radar scans and magnetic detection, to study sites without actually excavating them or collecting artifacts. Scientists call this *non-destructive archaeology*.

Much will also be learned as future scientists take another look at the artifacts, samples, field notes, maps, and other records that today's archaeologists take such pains to prepare and preserve. As archaeologists develop better techniques, they will revisit sites that have already been studied and they will learn more. Today's archaeologists are keeping intact some ancient sites and portions of sites



Aerial photographs from satellites may help future archaeologists locate and study sites in remote parts of the world. This is a radar image of the region around the site of the lost city of Ubar in southern Oman, on the Arabian Peninsula. The ancient city was discovered in 1992 with the aid of remote sensing data. This image was taken by a spaceborne radar on board the space shuttle *Endeavor*.

for exactly that reason: They expect future generations of archaeologists to have better tools for studying the sites.

Saving the Past for the Future

Archaeological sites are irreplaceable. A site destroyed by vandalism, modern development, or natural forces is gone forever. It falls to us—the people who are alive today—to take care of these valuable sites so that future researchers can add to the knowledge of the past.

If we fail in our duty, then no new pieces can ever be added to the incomplete picture that we have. What we know now is all that we will *ever* know, for all of time. That's food for thought, isn't it?



(Photo courtesy La Salle Shipwreck Project, Texas Historical Commission)

The ornate bronze cannon brought up from the wreck of the *Belle* is about six feet long and weighs about 700 pounds. The cannon has handles in the form of jumping dolphins, and bears a royal crest and the name of the Admiral of France.

The *Belle*: La Salle's Last Ship

The ship's crew could only watch in horror as the *Belle*, blown by a squall, ran aground on a sandbar and was lost. The ship was the last in the small fleet of their leader, the French explorer Sieur de La Salle. When the *Belle* ran aground in January 1686, the settlers were stranded on a marshy, snake-infested stretch of the Texas Gulf Coast.

The French worked hard to establish a settlement. But disease, deadly snakes, food shortages, and hard labor brought death to many. When the Karankawas, the native people of the area, attacked them, few of the settlers survived.

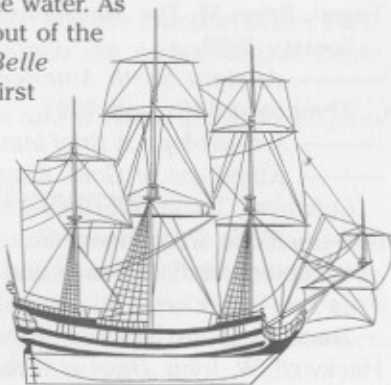
Almost three hundred years later, researchers began looking in the historical records for clues to the *Belle*'s exact location. French and Spanish documents helped pinpoint the area in Matagorda Bay where the ship was lost.

Launching their first magnetometer search in 1978, archaeologists with the Texas Historical Commission searched patiently. In 1995, they finally found the *Belle*. The ship was lying under about twelve feet of water, covered by sand and silt.

Divers brought up a large bronze cannon, pewter plates, pottery vessels, a sword hilt, brass buckles, bells, straight pins, glass beads, and other artifacts from the wreckage. The underwater archaeologists found orderly rows of wooden barrels and part of the ship's wooden hull. The wreck was unusually well preserved thanks to its long burial in sand and mud beneath the quiet, protected waters of the bay.

So that archaeologists could work on dry land as they recovered more of the ship, a steel structure called a *cofferdam* was built to encircle the wreck. The cofferdam rested on the floor of Matagorda Bay; its walls rose about eight feet above the water. As workers pumped tons of seawater out of the space inside the cofferdam, the *Belle* emerged into the open air for the first time in centuries.

The *Belle* is one of the most historically important shipwrecks to be found in North America. "Every nail, every fastening, every board, every piece of the rigging will tell us a story that's not known," said Barto Arnold, the marine archaeologist who led the excavation.



Archaeology Resources

Scouting Literature

American Cultures, American Heritage, Archery, Architecture, Art, Astronomy, Basketry, Chemistry, Geology, Indian Lore, Leatherwork, Metalwork, Pottery, Sculpture, Surveying, Textile, and Wood Carving merit badge pamphlets

Books and Pamphlets

- Ashmore, Wendy, and Robert J. Sharer. *Discovering Our Past: A Brief Introduction to Archaeology*. Mayfield, 1988.
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- . *Time Detectives: How Archaeologists Use Technology to Recapture the Past*. Simon and Schuster, 1995.
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- Hackwell, W. John. *Digging to the Past: Excavations in Ancient Lands*. Charles Scribner's, 1986.

- . *Diving to the Past: Recovering Ancient Wrecks*. Charles Scribner's, 1988.
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- Snow, Dean R. *The Archaeology of North America*. Chelsea House, 1989.
- Stuart, George E., and Francis P. McManamon. *Archaeology & You*. Society for American Archaeology, 1996.
- Thomas, David Hurst. *Archaeology: Down to Earth*. Harcourt Brace, 1991.
- . *Exploring Ancient Native America: An Archaeological Guide*. Macmillan, 1994.
- Webster, David L.; Susan Toby Evans; and Williams T. Sanders. *Out of the Past*. Mayfield, 1993.

Organizations and On-line Resources

To find out about regional and local archaeological programs and organizations active in your area, contact your state historic preservation officer (SHPO) or state archaeologist. A list of SHPOs for each state and territory is available over the Internet at <http://www.cr.nps.gov/pad/shpolist.html>. Or contact

National Conference of SHPOs
Hall of the States, Suite 342
444 North Capitol Street, NW
Washington, DC 20001-1512
Phone: 202-624-5465

A list of state archaeologists is available over the Internet at <http://www.lib.uconn.edu/NASA>. Or contact

James J. Miller, Secretary/Treasurer
National Association of State Archaeologists
Division of Historical Resources
500 South Bronough Street
Tallahassee, FL 32399-0250
Phone: 904-487-2299
E-mail: jmiller@mail.dos.state.fl.us

Recommended sites on the Internet include Southwestern Archaeology at <http://seamonkey.ed.asu.edu/swa/> and the National Park Service's "Links to the Past" at <http://www.cr.nps.gov/>. Also useful is ArchNet at <http://www.lib.uconn.edu/ArchNet/>. ArchNet provides access to archaeological resources available on-line. By following related links of interest from these sites, you can find information on professional societies and associations, governmental and nongovernmental organizations, and a wide variety of miscellaneous resources on archaeology.

Listed below are some of the major organizations related to archaeology and anthropology in the United States.

American Anthropological Association
Archaeology Section, Suite 640
4350 North Fairfax Drive
Arlington, VA 22203-1621

Archaeological Conservancy
5301 Central Avenue NE, Suite 1218
Albuquerque, NM 87108

Archaeological Institute of America
675 Commonwealth Avenue
Boston, MA 02215
Phone: 617-353-9361

Society for American Archaeology
900 Second Street, NE, No. 12
Washington, DC 20002-3557
Phone: 202-789-8200
Web address: <http://www.saa.org/>

Society for Historical Archaeology
P.O. Box 30446
Tucson, AZ 85751-0446
Web address: <http://www.azstarnet.com/~sha/>