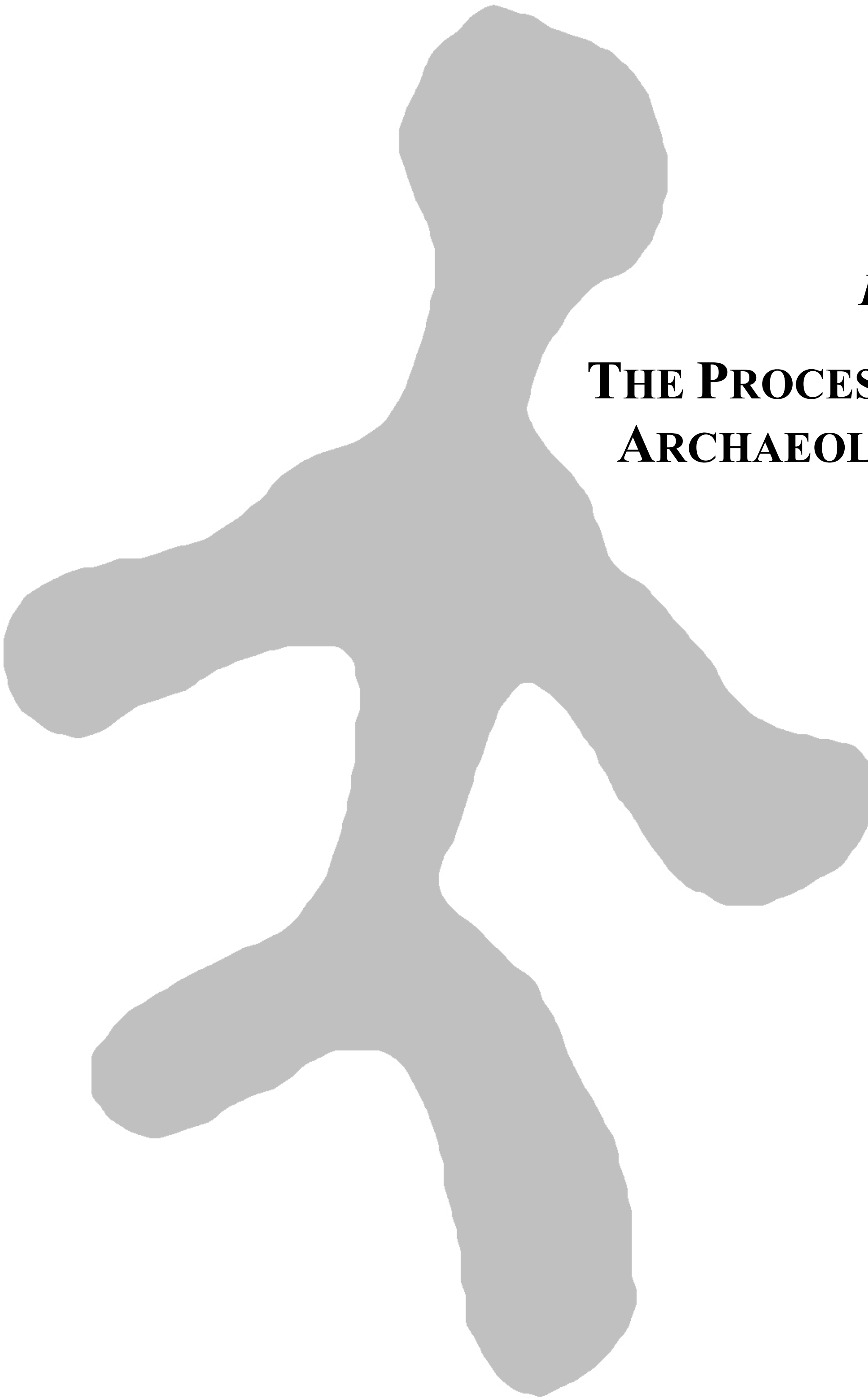
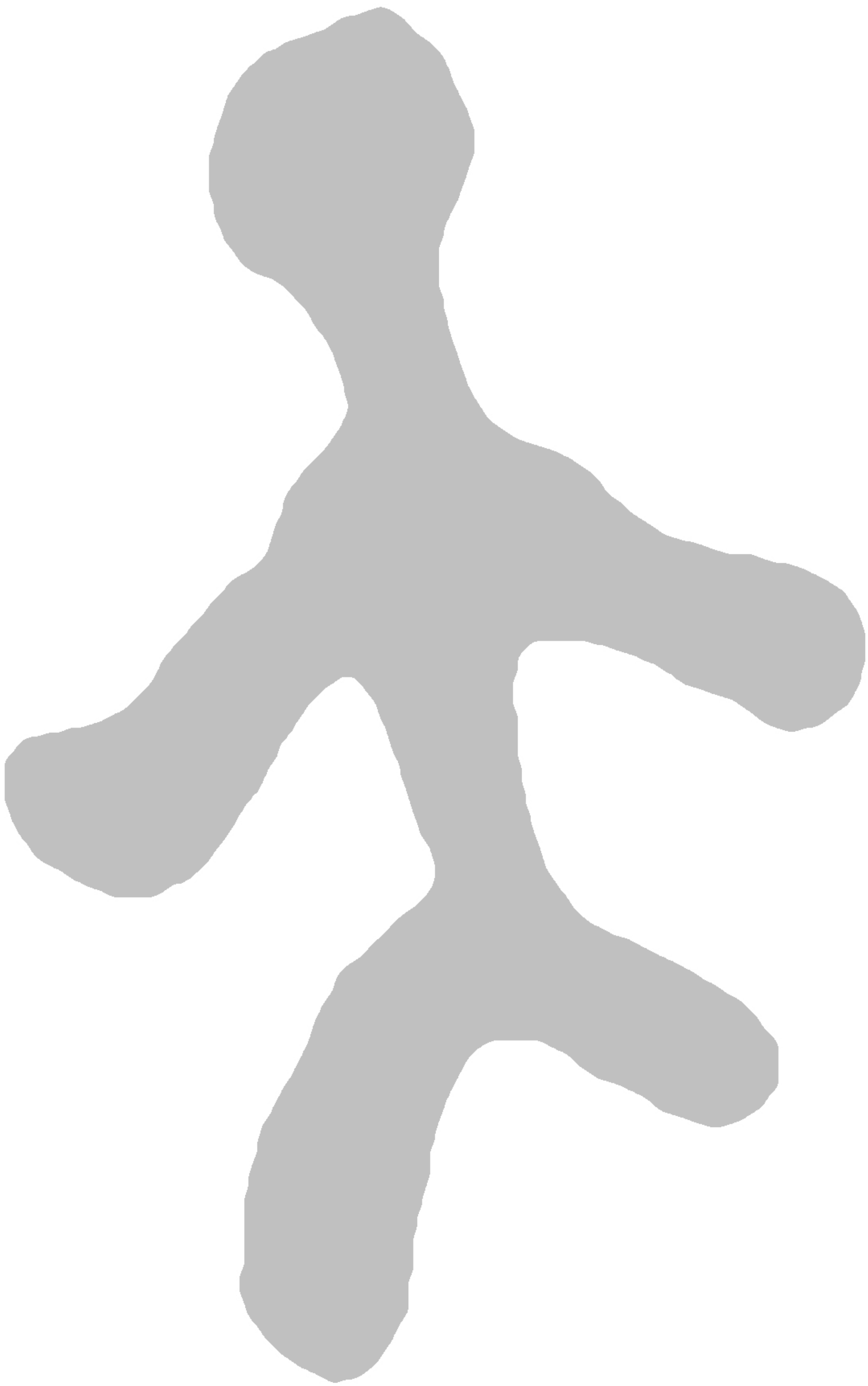


Part 2

THE PROCESS OF ARCHAEOLOGY



Part 2

INTRODUCTION

Ceramic bowl from Macon County, North Carolina, ca. AD 1500.

Archaeologists use several processes to address questions about the past. They may *gather new data* by conducting regional surveys to locate archaeological sites. Occasionally sites are partially or completely excavated to address specific research questions or to salvage information prior to disturbance by a development project. All data recovered are thoroughly analyzed following scientific inquiry procedures before conclusions are reached.

Archaeologists also *reexamine data*, such as artifact collections, site records, and published reports from previously completed projects. New techniques may allow them to learn from data and artifacts that have been curated for many years. Similarly, archaeologists often revisit old data armed with increased knowledge about the past and a new set of questions.

Archaeologists sometimes use *experimental methods* to help them understand how people may have performed tasks in the past. For example, some archaeologists recreate stone tools using manufacturing methods like those they think ancient peoples used. This experimental process gives archaeologists a better understanding of how stone tools were made and how evidence for different manufacturing stages might appear in a site.

Descriptions of North American cultures written by European colonists or explorers may give archaeologists insights into how Native Americans made tools, what they ate, what their villages and homes were like, along with other aspects of their life, such as rituals. However, archaeologists use these sources cautiously when interpreting evidence. While some early documents may contain accurate observations, the interpretations about the meaning of what was observed can be wrong. Early European cultures were different from those of Indian people, and the recorder may have misunderstood what he saw or heard.

The following overview describes how archaeologists find and excavate sites, analyze recovered data, and interpret the findings. You may use it strictly for your own background, or you may present it to students. The lessons in Part 2 illustrate many of the processes and concepts presented in the overview.

Finding Sites

Archaeologists look for and sometimes excavate sites for two main reasons. First, they may have a specific research question about the past that makes it necessary to search a certain area for certain types of sites or to excavate a site. Second, sites may be endangered by a development project or natural erosion, requiring archaeologists to salvage what information they can before the site is destroyed. In both cases, archaeologists structure the way they collect data so they can address a variety of research questions.

State and federal laws require that land use decisions take into account, among other things, the effect of a project on archaeological and historical sites. These are commonly called *cultural resources*. The laws apply to all federal and state lands, including those administered by the National Park Service, U.S. Forest Service, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and the military. They apply, too, to projects on private land that use federal or state funds or that involve issuing a permit of some kind. Any project that could disturb the land's surface requires consideration of cultural resources. Typically, the company or agency proposing the project pays for the archaeological work.

To date, only a small fraction of the country (probably less than 5%) has been systematically explored for cultural resources. Thus, the archaeologist's first step is to review existing records to see if the affected area has been examined already and if any sites are recorded for it. In North Carolina, the Office of State Archaeology in Raleigh maintains a central record for the state. The archaeologist may also check with colleagues based at universities and Indian tribes within the project area to see if they have concerns or know about areas of importance.

If an area has not been explored, the archaeologist conducts a *survey*. This is a systematic examination of the land looking for sites. Typically, archaeologists search for sites on foot, although aerial surveys are used to reveal sites that are invisible at close range and where the terrain makes walking difficult. How they conduct the pedestrian survey depends on the lay of the land. It may also depend on why the archaeologist is conducting a survey. If, for instance, a new power line is due to cut a 20 mile straight swath 60 feet wide, then archaeologists survey the straight line's area. A reservoir, whose boundaries snake within 400 square miles of several drowned rivers, needs a different approach. Because archaeologists often cannot walk every inch of land, they search where experience has taught them are likely places to find sites. Sometimes, they map out an area in sections and survey a sample of sections.

Archaeologists use several tools to do surveys. These include clipboards and paper to make notes; bags to label and contain samples of artifacts; geologic maps to learn about the lay of the land and to record site locations; a compass for orientation; and a camera to capture photographic records.

During a survey, archaeologists look for anything that is not natural to the area. They are alert to things like a row of rocks (possibly the remnant of a wall), depressions or mounds (buried structures), chips of stone (debris from stone tool manufacture), dark soil (possible middens or garbage areas, hearths, or burned structures), and pottery sherds. Because archaeologists want to know how people used resources in their environment, information about where sites aren't is also very important.

In the humid southeast, many sites are not visible on the ground's surface. Often the sites are buried, and archaeologists check eroded hills above stream banks and plowed fields for evidence. In densely vegetated areas, archaeologists will sometimes dig a small hole every 50 feet or so, sampling the area to see if evidence of buried sites shows up.

When they find a site, archaeologists make notes and record its location on maps. Back in the laboratories, they give each site an identification number and fill out a site form. Information about the vegetation, soil, elevation, and location is recorded on the form, as well as a description of the site and the artifacts present. Any photographs are attached, and a master map is made. The site is also evaluated for its information potential, and a determination is made about whether or not the site has buried deposits.

Excavating a Site

If the survey was performed because of a development project proposal, archaeologists will recommend to the agency decision-maker what should be done about the cultural resources. For sites with limited information potential, little additional work is needed. On the other hand, archaeologists may recommend that sites containing important data or having other significance (such as spiritual importance to Native Americans) be left undisturbed or, in some cases, excavated. An effort is made to move a project to avoid disturbing an important site, but sometimes that is not feasible.

If a site is to be excavated, archaeologists prepare a research design. This outlines what questions the archaeologists will try to answer and the techniques they will use to excavate and analyze the data. The agency or landowner that manages the land, the state archaeologist, and archaeologists from either a university or a consulting firm will each review the research design to assure it meets professional standards. A permit is required to excavate on federal or state-owned lands.

Before the excavation begins, the directing archaeologist assembles a team of excavators. This group may include geologists, botanists, historians, students, and trained amateurs as well as archaeologists. The first step is to clear vegetation from the site and establish a grid on the surface (Lesson 2.1: "Gridding a Site").

Establishing the grid is a key step. The grid is the primary way to maintain *context*, which is the relationship artifacts and features have to each other. The process of excavation destroys a site, and once it is dug, you can't go back and do it differently. Researchers of the future can study a site they never saw if good notes and maps are made of the excavation. Recording context is the key to interpreting the site from records.

The grid is a Cartesian coordinate system. It is established and marked off in relation to a datum, which is a stable point of reference from which all measurements occur. Archaeologists set up the grid using a survey instrument (usually a transit), measuring tapes, wooden stakes, and strings. Squares are marked on the ground using stakes for each corner and string to connect them. Usually, squares are measured in meters, 1 or 2 meters on a side. Each square has a unique identifying number based on its grid coordinates. A map is made of the site on graph paper; the graph squares correspond to the squares on the ground. Any artifacts, samples, or features (such as a hearth) that are found in a square are labeled with its grid number and the depth below the ground surface at which they were discovered. Sometimes, when there are distinct layers in the stratigraphy, the layer in which an artifact is found is recorded also.

Using shovels, trowels, screens, and measuring tapes, archaeologists uncover a site square by square. They move dirt slowly because they don't know what they will be uncovering, and they don't want to destroy something by being in a hurry. The locations where artifacts are found are carefully recorded. The excavated dirt is put through mesh screens. Some are trays you shake back and forth so that the dirt falls through, and artifacts are left on the screen. Others use water to push the dirt through a series of screens with graduated mesh size.

During excavation, numerous maps, drawings, and photos are made. Each references the grid location. Artifacts and various kinds of samples (animal bone, plant remains, pollen, charcoal) are sent to specialists for analysis.

Once the excavation is completed, the site is usually back-filled with the excavated dirt. This excavation procedure is followed regardless of whether archaeologists are doing salvage work before a development project or doing basic research funded by universities or foundations. If a development project spurred the excavation, the project would now be authorized to proceed.

Using the Data

Months after the excavation is finished, results of the analyses will be ready. Most people do not realize that the time archaeologists actually spend excavating is the least time-consuming aspect of their research. Processing samples and interpreting the data take several times as long as excavation. Artifacts, records, and photos are turned over to a university, public museum, or to the Indian tribe with jurisdiction after the analysis is complete. Regardless of where they are stored, artifacts and information should be available to future researchers, as well as for use in displays.

Tackling analysis, archaeologists make extensive use of computers and statistical data analysis. Guided by their research questions, they compare new data with that derived from other studies. They may use ethnographic analogy—studying modern groups of people for clues about what archaeological patterns might mean or how artifacts might have been used (Lesson 2.11: "Inference by Analogy"). Sometimes they experiment with replications to learn what methods of manufacturing may have been used (Lesson 2.7: "Experimental Archaeology: Making Cordage").

A strong professional ethic dictates archaeologists publish excavation results so that the information is available to everyone. While publications have often been written in the idiom of professional archaeology, there is a growing commitment by archaeologists to also present information in ways the general public can read and learn from.

Dating Archaeological Samples

Archaeologists have two ways of placing events, sites, and artifacts in chronological order. *Relative dating* orders things in relation to each other, but they are not anchored to a calendar (Lesson 2.2: "Stratigraphy and Cross-Dating"). Think of a trash can; items on the bottom were placed there prior to the items on the top. Relative to each other, the items on the bottom represent older actions than those on the top, but we don't know what day or what year the trash can was filled.

Absolute dating establishes a calendar year for an artifact, site, or event. Prior to 1948, absolute dates were mostly obtained by noting the presence of objects in sites whose age was known from some other association. For instance, Greek pottery, whose age was known from historical records in Greece, served to assign dates to other Mediterranean sites having similar pottery but no other historical support. This kind of cross-dating worked, too, for Roman coins in England, Egyptian beads in Europe, or Colonial coins in Virginia. But this procedure is only as reliable as recorded history. Archaeologists had no way to tell how old sites from earlier times were. Or, for that matter, how old historical sites were with no links to documentation.

Since World War II, absolute dating techniques have been refined by the development of several methods. Among those archaeologists use are: tree-ring dating (explained in Lesson 2.4), radiocarbon dating, obsidian hydration dating, and archaeomagnetic dating.

Radiocarbon dating (also called carbon-14 or carbon dating) is a method based on the measurement of the radioactive carbon content of organic materials. Developed in 1948 by two physicists, W. F. Libby and J. R. Arnold, the method was a byproduct of atomic technology, and it had far-reaching consequences for archaeology.

The workings of the technique are simple. Archaeologist James Deetz explains the method this way (1967, pp. 35–36): The radioactive isotope of carbon (carbon-14) is produced in the atmosphere when nitrogen atoms are bombarded by cosmic rays. This production is constant, which means a constant ratio of carbon-14 to carbon-12 (the non-radioactive form of the element) exists in the earth's atmosphere. But carbon-14 is inherently unstable. In time, it reverts to stable nitrogen-14 through the emission of a beta particle, and this is where the link to dating comes in.

Through respiration, living things (plant and animal) have a carbon-14 to carbon-12 ratio in their tissues identical to that found in the atmosphere. At death, however, the organism no longer gets carbon from the air, and the amount of carbon-14 in its tissues disintegrates due to beta particle radiation. This decay of carbon-14 occurs at a known rate. Specifically, scientists learned that after 5,568 years, only half the original amount of carbon-14 is left; after 11,136 years, only a quarter is left, and so on. Thus, the age of any organic material, such as charcoal, wood, shell, or bone, can be calculated by measuring the ratio of carbon-14 to carbon-12.

Sometimes archaeologists are reluctant to use radiocarbon dating. This is because the method destroys the sample and requires a fair amount of material. For instance, about a quarter-cup of charcoal is usually required for a carbon-14 date. If this is all the charcoal archaeologists obtain from a site, or if they don't find enough to do a standard carbon-14 date, they may hold onto the sample until more or additional evidence turns up. Fortunately, a newer method of radiocarbon dating requires very little organic material—an amount about the size of the head of a pin is enough. This method is done with an accelerator mass spectrometer, and is called an accelerator date. But the downside to this technique is that an *accelerator date* costs two to three times what a standard carbon-14 date costs.

Obsidian hydration dating is based on the principle that all glass absorbs small amounts of atmospheric moisture. Obsidian (volcanic glass) was frequently used by ancient people to make tools. When they shaped a tool from an obsidian nodule, they exposed a fresh surface as they chipped; this allowed the absorption of moisture to start on an unweathered face. With time, a hydration rind developed on the obsidian, and the rate of hydration can be determined. Therefore, by examining a thin slice of obsidian under a microscope and measuring the width of the rind, the tool's age can be calculated. Problems exist with this technique, and it is not widely used. However, research continues and may make obsidian hydration dating a more reliable method.

Archaeomagnetic dating is based on the fact that the earth's magnetic poles have changed location throughout time. The time and direction of the North Pole's wanderings is roughly known. In some instances, archaeologists can take advantage of this knowledge to date sites, particularly those with well-baked clay floors, ovens, or kilns. This is because some clays and clay soils contain tiny magnetic minerals that, when heated to a dull red heat, become loosened and align with the magnetic north (Fagan 1994, p. 122–124). When the soil cools, this alignment is fixed in place. Archaeologists collecting cubes of burned earth from sites may be able to correlate the magnetism of the sample with records of the earth's magnetic field.

Sources

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Excavating a Site