Archeological Techniques

Used at Mesa Verde National Park

by
Gilbert R. Wenger

World Heritage Cultural Site

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Table of Contents

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Introduction

To respond to thousands of questions by visitors of all ages, who ask how we know so much about the ancient buildings and the inhabitants who lived here, we must rely on archeology. This publication describes the basic techniques used by archeologists to find out what happened at Mesa Verde between A.D. 550 and 1300.

The basic methods may seem orderly and simple. The reader, however, must understand that archeology, as any science, has many complicated aspects requiring professional knowledge and skills of highly trained persons to reconstruct the prehistory of this area.

Archeological surveys, excavations and the examination of prehistoric structures all provide clues. Since the ancient Anasazi inhabitants left no writing, the exact knowledge of what happened here may never be fully known.

Present interpretation must combine too the studies and knowledge gained from the historic Pueblo peoples of the American Southwest, who have similar life style patterns, patterns that extend back to their ancestors—perhaps some from Mesa Verde.

... Gilbert R. Wenger

On Archeology . . .

ARCHEOLOGY is the study of man-made objects. It is but one element of the broad field of Anthropology—the study of man. There are other branches: Primatology, studies upright walking mammals; physical anthropology studies the physical differences of man; linguistics refers to the languages spoken by man; while social anthropology reveals social customs and behavior; and ethnology is the study of living cultures (people).

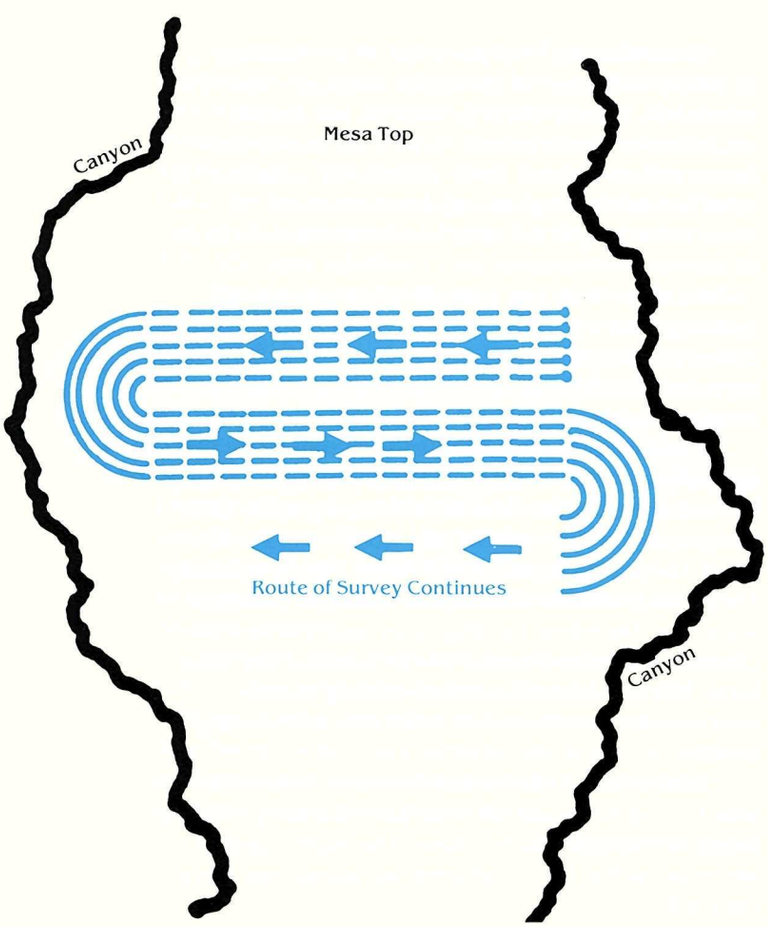
Archeology is used to reconstruct human history from earliest times to the present. By studying the fragments of house ruins and crafts such as pottery and tools, the archeologist is able to deduce how these things were made and used, how villages were built, when the people lived, as well as to some extent—their culture. The careful excavation of prehistoric sites may establish relationships important in a cultural development. Such finds help to substantiate the archeologists' theory as to what happened. Utilizing this data plus studies on the environment and existing Indian peoples help him formulate the history of the ancient people for whom no written record exists. Visitors to archeological areas such as Mesa Verde soon discover that the ancient people can be interpreted through archeological investigations, and they recognize archeology as an important science.

Theoretically the purpose of archeology is to study cultures or civilizations that came into existence, follow their growth to successful societies or civilizations; and then study the factors that caused their demise or collapse. If man learns from past experiences then, in theory, he might be able to avoid the mistakes of earlier civilizations and continue his civilization. With the world's environment so endangered it is worthwhile to study earlier cultures to see what happened to them. For the layman or scientist who really looks, there is much to be learned from Mesa Verde's past.

The ancient Anasazi survived nearly 7 centuries at Mesa Verde because of their ability to make maximum use of the topography and geography of the area. They grew crops in the most favorable zone of the Mesa Verde uplands. They made check dams and terraces to utilize water for farming. During later years when the climate was more harsh they constructed many large homes in rock alcoves facing south-southwest to utilize heat from the sun during winter.

Still, after 7 centuries their environment was failing because of over use—so they moved away. We today, do not have the same option, we must solve the problems we ourselves have created.

Archeological Field Surveys at Mesa Verde



Archeologists cross mesa in line searching for sites.

In order to learn how much of Mesa Verde National Park was used in prehistoric times, an archeological surface survey was started some decades ago. Chapin Mesa, where the major public use facilities are located first received attention followed years later by an extensive survey on Wetherill Mesa where sites and cliff dwellings are more numerous and prominent than on most of the other mesas.

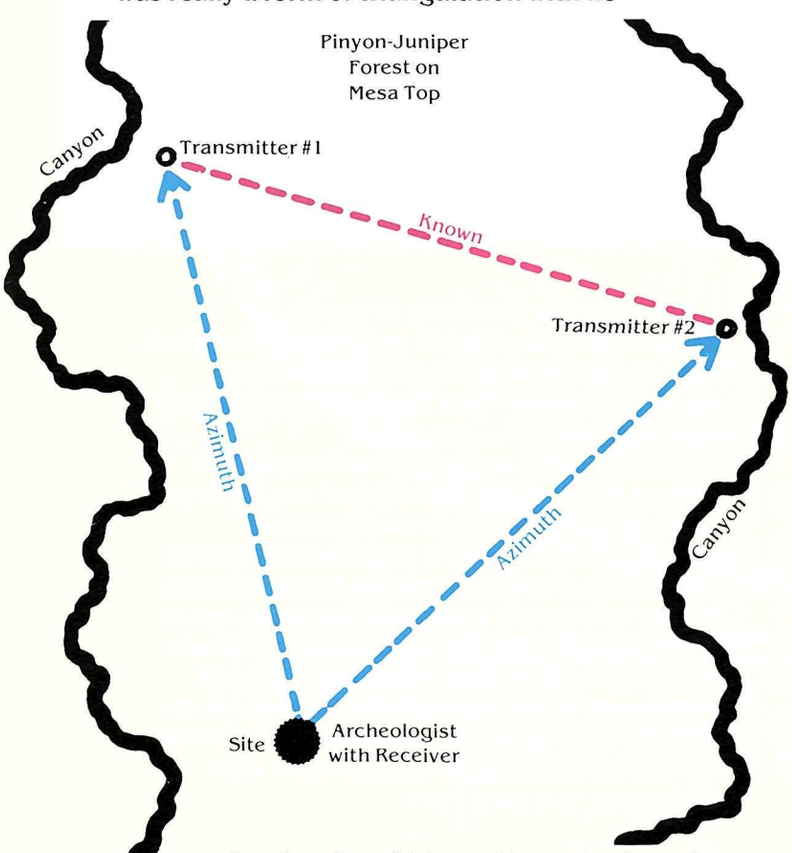
A surface survey consists of archeologists walking over the terrain using a pre-determined systematic method, looking for artifacts or house sites where someone worked or lived.

To locate the sites, seven or eight archeologists would line up about 20 feet apart and move across each mesa or unit. As they reached the opposite side of the mesa, the group would pivot in a large arc to cover the adjacent area as they moved back across the mesa in the direction they had come from. Only the end man retraced his first steps to make sure they did not miss any sites.

When a site is located, a metal stake with a number is implanted in the ground. It is necessary to locate the site on maps so the exact location will be known but this is not as simple as it may seem. At Mesa Verde the relatively flat nature of the mesas with its dense and uniform height pinyon-juniper forest makes it impossible to locate the site in relation to a known topographic feature. To solve this dilemma a rather unique technique was utilized so the sites could be accurately pinpointed to a map.

Two National Park Service archeologists, Alden Hayes and Doug Osborne, devised a radio direction-finder system utilizing two radio transmitters set up over known places. A small radio receiver was carried by the archeologists locating sites. When a site was located the receiver was turned to each transmitter. Using a Brunton compass the azimuth was noted, and the exact location was plotted on the map. This was really a form of triangulation with no topographic features visible to use simple surveying equipment. This technique saved many months of hard labor.

Some years after the Wetherill Mesa Project was completed, Dr. Jack Smith, who directed the majority of the field surveys in the park, devised another method. He placed a large aluminum foil ball on a long bamboo pole. When a site was found, the pole would be raised and a surveyor posted on a higher stretch of ground would sight on the foil ball and mark the location on a map.



Locating sites with transmitters and radio receiver.

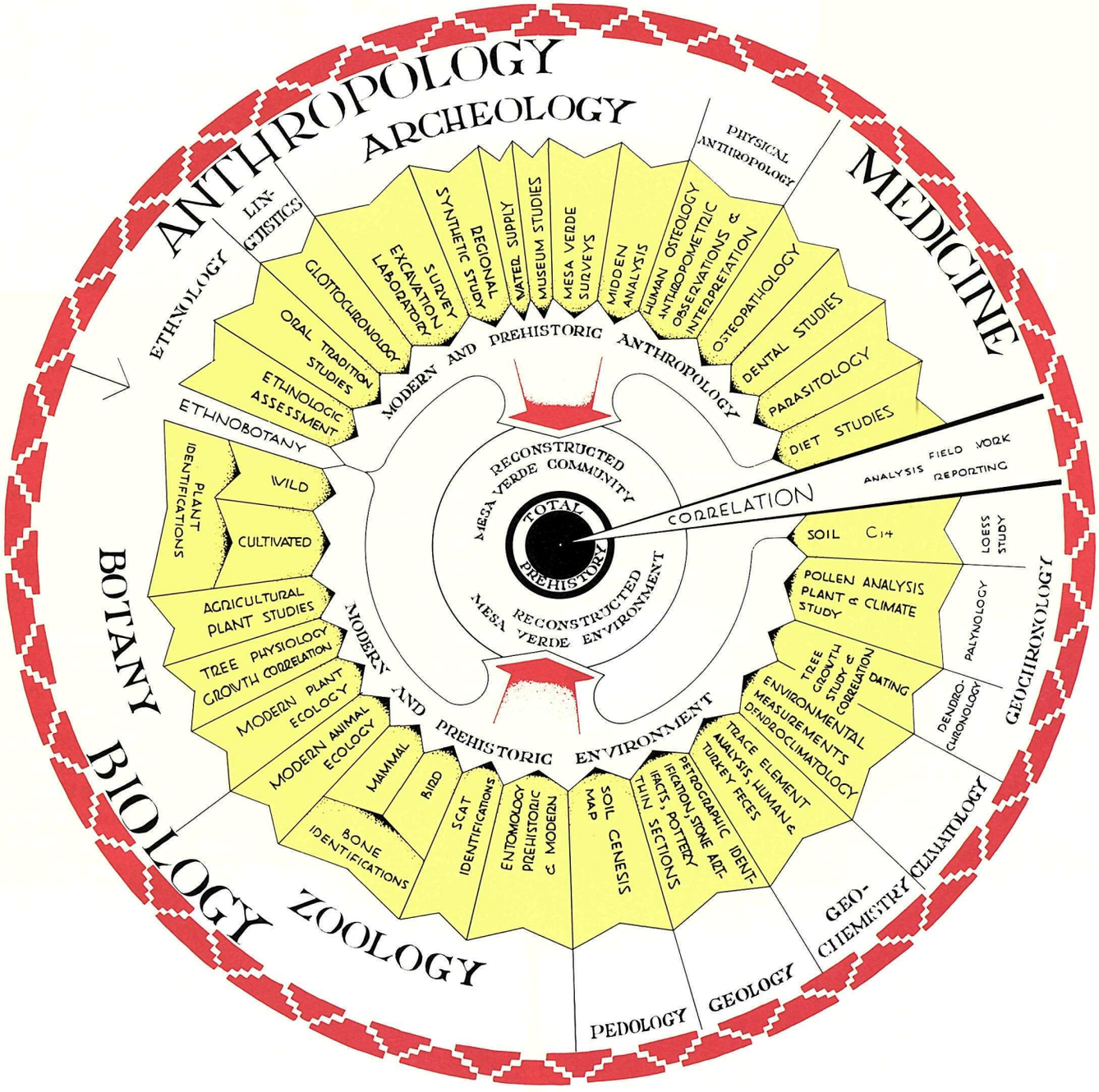
Transmitter and radio direction equipment.

The steep talus slopes in the canyon revealed little prehistoric use.

Some of the terrain at Mesa Verde National Park is nearly vertical and very dangerous to survey. It frequently required an archeologist rappelling over a cliff to study a prehistoric structure. A smaller survey team would work on the canyon benches to avoid accidently knocking a rock on another member working below. After the benches were checked the team shifted to the steeper talus below, something that requires lots of hard work and considerable time.

In 1977 the University of Colorado completed its 20 years of archeological work at Mesa Verde. Between their work and NPS surveys, a total of 3972 sites not counting cliff dwellings have been recorded.

To this point emphasis has been on the walking and close examination of the surface. To qualify as a site there must be some evidence of man's use. It might be a fireplace, a work area, a house or a water control device. Pottery is the most abundant artifact found so archeologists collect a representative sample to take back to the field laboratory. It is not uncommon for an archeologist to go out in the morning with his lunch, notebook and a tool or two and to return home heavily laden with specimens. It is hard work.



Between 1958 and 1962 a massive archeological project jointly funded by the National Geographic Society and the National Park Service was conducted on Wetherill Mesa in one of America's largest archeological efforts. Scientists representing over 30 scientific disciplines made studies to obtain the maximum data on all aspects of prehistoric man and this environment.

The Excavation of Prehistoric Sites

Not all sites are important enough to warrant excavation. Important criteria are that a site selected for excavation: should provide data for a specified period of man's use of an area, or it should yield information where few artifacts have been found in other excavations from similar time periods. Some periods of man's use on the Mesa Verde have been very limited in content so archeologists are always looking for better sites to learn more about those periods or phases.

At most Mesa Verde mesa-top sites, Big sagebrush generally covers many ruins that are not in the dense pinyon-juniper forest, and it is necessary to remove it before excavations can begin.

One can see how much vegetation has to be removed before excavations can start.

Carefully established grids guide excavators as they start digging.

Once this brush has been removed the site is carefully surveyed and photographs are taken. Excavations follow a patterned grid system so anything found will have its exact location recorded.

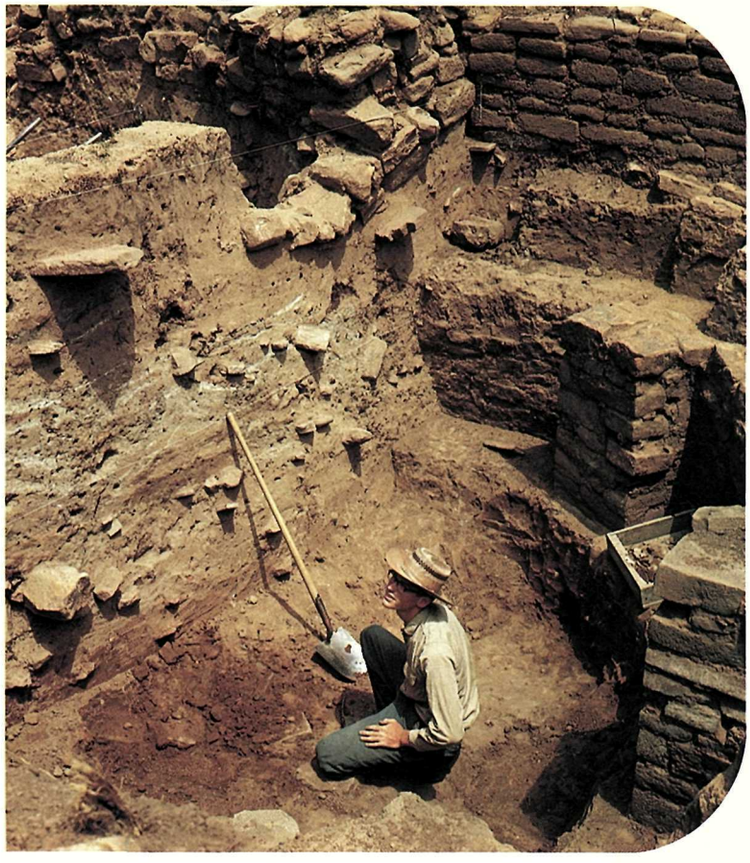
The experience and expertise of the archeologist will determine how the site will be excavated. At Mesa Verde most house sites are covered by several feet of wind blown soil. Wall features are usually well-pronounced and most artifacts are several feet deeper in the site.

In order not to have to move dirt and refuse materials several times, excavations of major ruins often are started at the center and continued outward. Excavated dirt may be needed in site stabilization, so it is piled separately from stones. Loose rock from fallen walls (but no longer associated with the walls) is piled in another location to serve as ruin stabilization material, if the ruin needs minor repair before it becomes public exhibit.

The rate of excavations will depend upon the extent of the site, the size of the archeological crew doing the work, the type of terrain, the material being removed, and the stability of the site being dug. Mesa Verde village sites of the later periods are often reasonably stable, but early Developmental Period structures which were poorly constructed are slow to be excavated and are difficult to preserve.

Both the dirt and rocks are saved for future needs.

Careful study of kiva fill can reveal if the kiva was deliberately filled during a village alteration of if it was naturally filled by erosion since the village or kiva was abandoned.



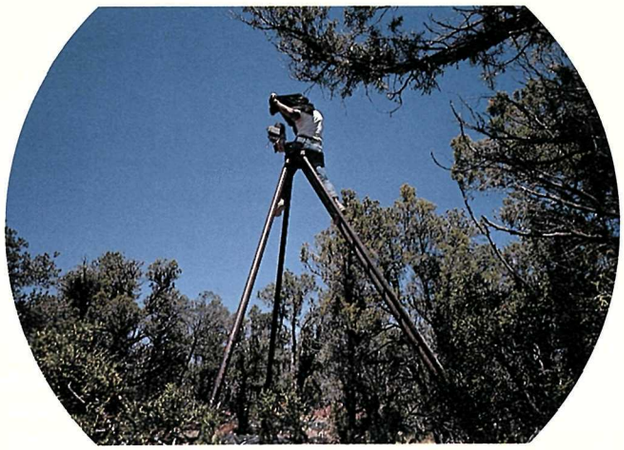
Care and great patience are required in removing fragile artifacts.

Initial removal of the topsoil is done with picks, shovels and wheelbarrows. As the excavation reaches the zones which were occupied, small hand tools such as trowels, knives, dental picks, whisk brooms, brushes, and air bellows are used to remove dirt carefully from around pottery vessels, tools, skeletons, and post holes to expose an artifact or feature of the house.

One of the most important aspects of any excavation is the need to prepare exact field notes. The site is photographed and surveyed with reference to a known location so that the precise orientation is established. The excavation proceeds according to a plan selected as best for the type of site. Each specimen uncovered is photographed in place, and measured as to its location in relation to other features or artifacts before it is removed. The photographing of all details allows researchers the opportunity to analyze material at some future time seeing the specimen's location when it was found and those features with it. Photographic records are also used in research, site assessment and artifact study as well as in reports and professional publications describing the work done. An experienced, dedicated photographer is a valuable specialist in the field as well as in the research laboratory, and is needed full time during the excavation work.

Each site is unique and represents the dwelling of a family or group of families in a given location at a given time. If an archeologist makes an error in his work, it is irreversible because another site does not exist which is exactly like the one he is excavating. Some archeological excavations are so extensive or

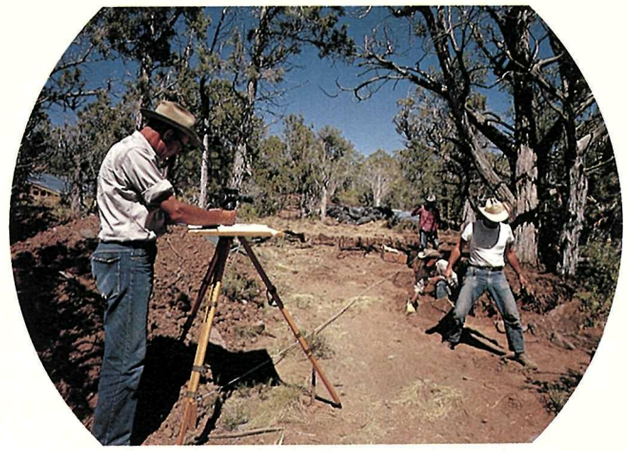
Archeologist Al Lancaster excavates three skeletons that will be carefully studied to learn more about the ancient Anasazi.



Photographs taken looking down on sites show total relationship of artifacts or house form.

consist of a number of simultaneous digs that the effort is called a project. During large investigations as many as 20 to 30 specialists from many scientific disciplines utilize their skills to recover the most data possible from the site in the most careful manner.

At Mesa Verde nearly all archeological field work is accomplished during the summer as normal winter snows restrict field work in winter. Such work in the past has been accomplished by National Park Service personnel or through contracts between universities and the National Park Service. The University of Colorado who has done nearly 20 years of field work in the park relies most heavily on advanced students of anthropology and archeology to be the field workers.



Surveying a site is vital to good records.

Both men and women serve in field archeology.

The Care and Preservation of Artifacts

Once artifacts are removed from the site they are taken with care to the Mesa Verde Research Center for protection and study. There another group of very skilled personnel become involved. These are the curatorial and preservation specialists.

Artifacts recovered in excavations or even surface items are generally dirty and must be cleaned before they are studied. Some specimens are extremely fragile when found and must be treated in the field before taken to the laboratory. Someone who is unfamiliar with excavations and the care of artifacts probably would be surprised by the great amount of work needed simply to clean specimens coming from the field. Some sites produce only a dozen or so artifacts, others produce hundreds, and large project type excavations may produce thousands of specimens.

Special cleaning techniques have been developed for all types of specimens.

When artifacts are collected at the excavation site each specimen, or a lot of pieces of broken pottery from a vessel, is placed in a sack upon which is written the identification number from the exact location where the specimens were found. This often includes grids or room numbers. Thus when a load of artifacts arrives at the Research Center, it is absolutely necessary that the specimen and its location-identity container stay together during the cleaning process. This avoids mixing or losing information which can be of major importance in interpreting a specific artifact or site.

Pottery or broken pieces of pottery called shards, often are covered by white calcium deposited during centuries of lying in the soil. This must be removed before the specimen can be closely examined for the techniques used in its manufacture or to give proper identification. As soon as a group of artifacts is cleaned, an accession and catalog number is placed upon it for permanent reference. These numbers are applied to the specimens in waterproof ink.

A catalog card is started on each artifact, which when completed, will include a minute description of it, measurements, and usually a photograph or art sketch. The cards are then classified according to material type: wood, pottery, bone, stone, plant material, and so forth. When an archeologist or visiting scientist needs to look at some artifacts, they can review the catalog cards without having to handle specimens until specific artifacts selected for their study or comparison are needed. As it is being studied each specimen is handled only while the examiner is wearing special cotton gloves to further protect the specimens from human oils.

The original card catalogs, once complete, are stored in fireproof facilities completely away from the Park, so all records would not be in a single facility should fire or other hazards damage or destroy the research facility.

The permanent assignment of a number to each specimen allows positive identification of every artifact.

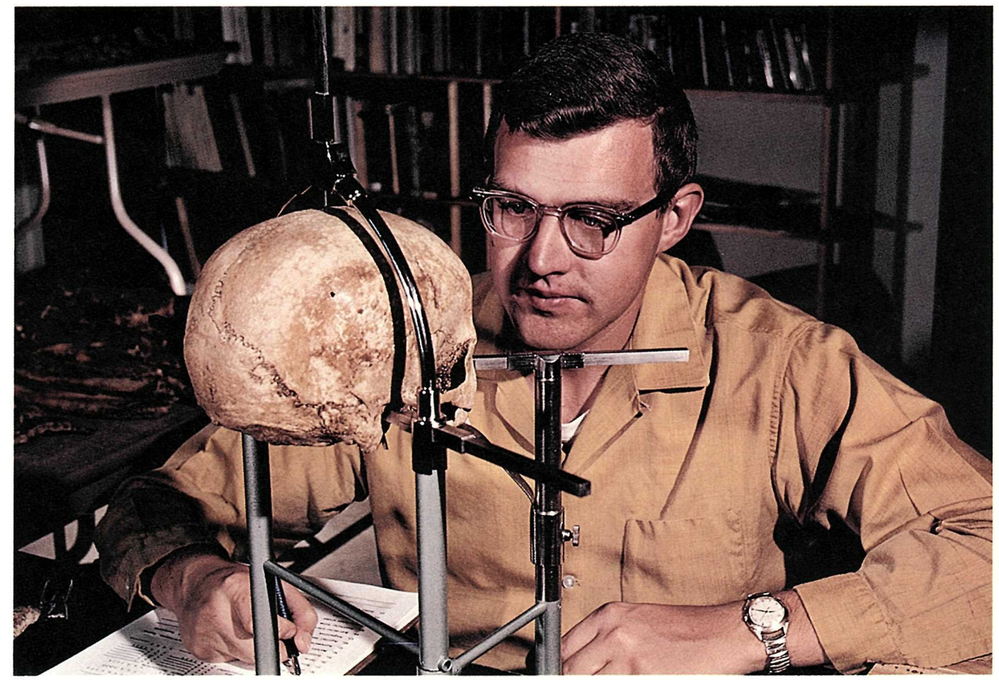
A remarkable amount of seed and other plant materials have been found in sites over 700 years old.

Because of the generally dry conditions at cliff dwellings, excavations have brought to light moderately large amounts of otherwise perishable plant foods such as corn, squash, beans and a number of native plant foods. All of these receive very specialized care to protect them from further decay or damage by insects or fungus. A careful study of plant material reveals that the ancient Anasazi used many native plants which grew in the area. Some plants which we, today, would not consider palatable were often collected for food during certain times of the year.

Laboratory specialist studies stone axes to determine type, manufacture technique and use.

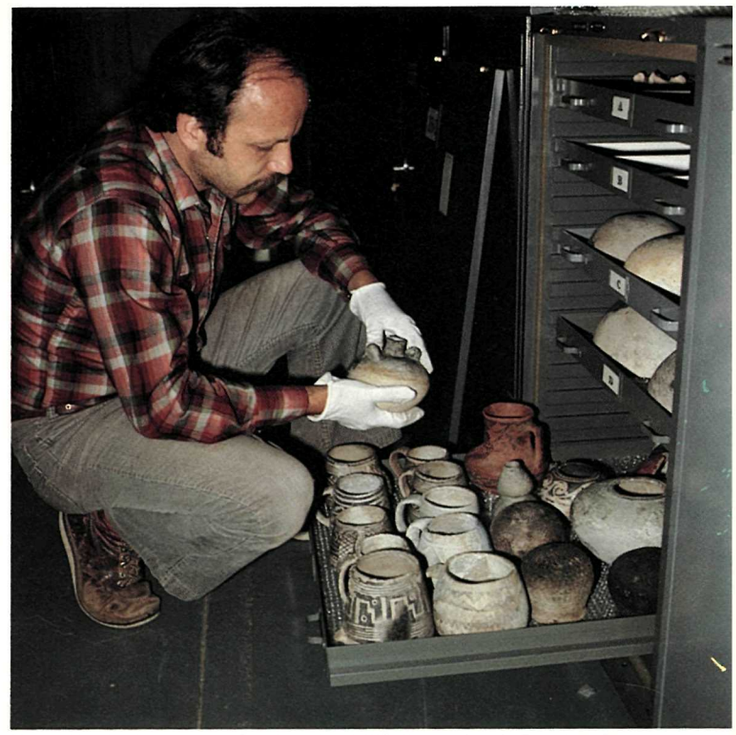
Archeologists or specialists from other disciplines can gain lots of information through close study of artifacts. For example, stone axes are generally a tool of obvious shape. Some axes though are made with a full groove, others have only a partial groove, some have no groove at all. The stone material they are made from will give clues as to how far people may have had to go to find suitable stone to make an axe. Often the Indians had to leave the Mesa Verde plateau as the stone found on it is mostly sandstone, which does not make good stone tools of any kind other than manos and metates (grinding mills). The number of axes found in a village or on a particular site might indicate the inhabitants had specialized in axe making or activities requiring more than the ordinary number of axes required. Some crafts person might have been very adept at making a particular type of stone axe. Just as axes are carefully studied, other types of specimens as hammers, pounders, scrapers and so forth would receive the same careful kind of source evaluation.

In archeological field work no deliberate attempt is made to find human remains, but when found they are examined to learn the types of health problems the people faced during their lives. We have learned that most of the Indians who lived here in prehistoric times were between 5′ 1″ and 5′ 6″ tall and of moderate build. Young people often suffered from Osgood-Schlatter disease. This is a condition where the tibia grows faster than the lower leg tendons creating very painful growth areas just below the knees. Older folks frequently suffered from arthritis.



Dr. Kenneth Bennett, a physical anthropologist, is able to determine the sex of the individual, the general physical stature of the person, the age, and—in some cases—why the person died.

Specially designed insect-proof metal storage cases are used to store specimens.



Mesa Verde has a professional, skillfully trained Curator in charge of collections.

Preservation of specimens is very important since these serve as the basis for scientific study and for documentation of the people who made them in the past. Some items, such as plant materials, can be easily damaged by insects, fungus, rot, heat or moisture. Once the specimens have completed the cycle of laboratory cleaning, examination and preservation they are stored in a type of case that will ensure lasting protection.

Once incorporated into the collections system, the specimens are available for the research needs of the park's professional staff or for visiting scientists, from educational institutions, museums or for those from state and federal agencies.

Site Dating Methods Used by Archeologists at Mesa Verde

In today's highly technical world of computers and electronics there are many techniques used in the field of archeology to date sites. Some of these are very sophisticated and require extensive laboratory equipment not often found in field offices though testing can be done in centers away from the field work. Most of the large Mesa Verde cliff dwellings were excavated over sixty years ago; some of the dating techniques used then are still very applicable to Mesa Verde archeology. Let us look at some of the methods that have been used here.

Visitors to Mesa Verde National Park will frequently ask, when they see a cliff dwelling, "How old is that?" or "How do you know when it was built?" When it is explained that a method has been found to date ruins through logs found in prehistoric dwellings, most visitors want to know more about it. Though this is the most often used technique, four methods for dating have been used extensively at Mesa Verde: dendrochronology, stratigraphy, cross-dating and paleobotany.

Dendrochronology

The science of using tree rings to determine which years these trees lived is called dendrochronology. It is used in the Southwestern United States and is a very accurate method for dating trees.

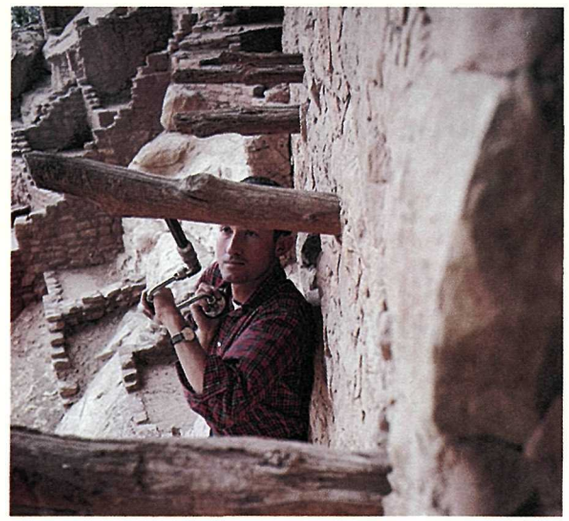
A tree adds a ring of new wood growth each year. Spring-growth wood is lighter in color than the darker wood of summer growth. This distinction makes it possible to identify each growth ring. By counting the rings the age of the tree becomes known. Growth rings however, are not all the same width. Wet

Section of a log used to date a ruin.

growing seasons produce wide rings while dry seasons produce narrow rings. Since weather conditions over a 50-year period are usually unique, there is practically no chance of the pattern ever repeating itself.

When archeologists started to use the tree-ring dating methods, they often would cut a log in half so the rings could be counted. While this worked, it left a modern saw cut that was visually distracting to a prehistoric resource.

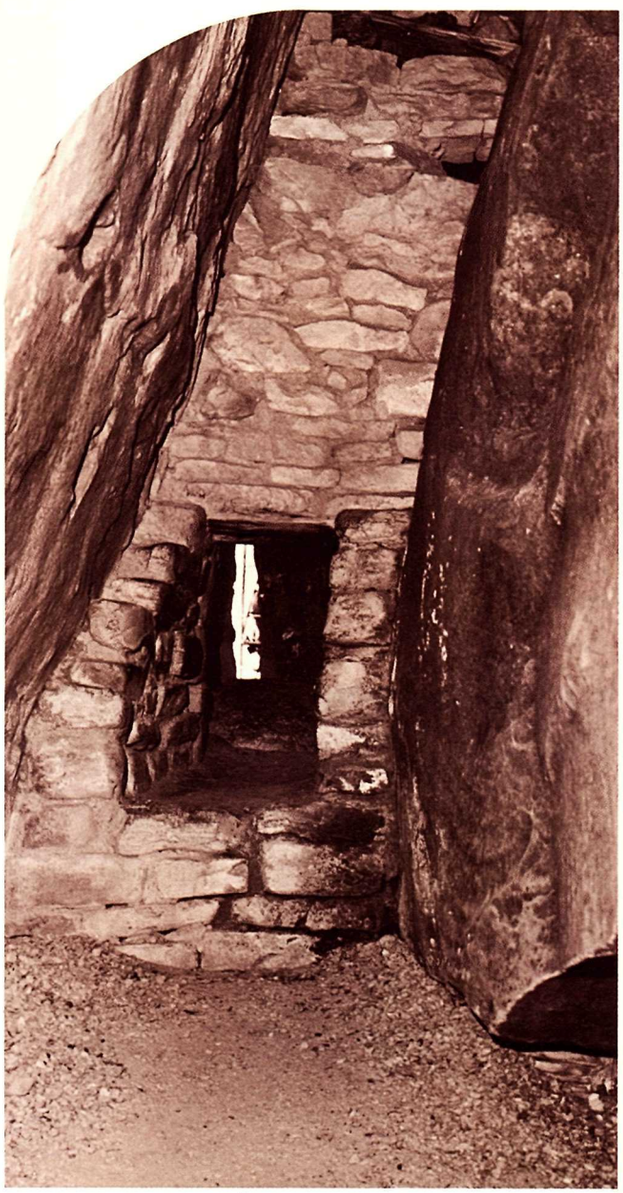
A new technique resulting in less visible damage, uses a wood drilling auger to make a cut, leaving a core which is then extracted from a log. The entire core could be studied or halved for greater ring detail. Removal of the core leaves only a small hole in which a cork can be inserted.



An archeologist removes a core from a prehistoric log to determine the date the tree was cut down to use in house construction.

Another type of auger is used to remove cores from living trees at the site to determine their ages also. Such testing might reveal the age of moderately large trees still living at a prehistoric site. Cores give good data on tree growth and provide general climatic information. Obtaining cores from room logs makes it possible to know when a particular room was constructed and when rooms were added to a large complex.

Dating living trees gives valuable information on the age of the present forest.



The most recent date of a log used in construction was found in the entry-exit tunnel at Balcony House.

The method of dating tree rings began in 1901 when astronomer A.E. Douglas was studying the effect of sun spots on climate. He began to search for large trees that pre-dated known meteorological records. Pines and Douglas fir proved most suitable as Dr. Douglas began to cut trees whose growth periods overlapped. Eventually in 1929 he found a log whose ring overlapped dates obtained from logs in prehistoric ruins from trees growing in historic times. This log was the key and link to form an unbroken record of prehistoric to present climatic conditions as revealed by tree rings for each year. The result of Douglas's research is the Tree Ring Laboratory at the University of Arizona at Tucson where cores and samples of logs from Mesa Verde are sent for date determination.

The major restriction in selecting logs for tree ring dating is that trees cut by the Indians in prehistoric times had to be cut from a mesa top or slope away from a spring or constant water supply. Trees growing near springs would have nearly equal width growth rings and would not show seasonal variations in rainfall.

In the course of searching for logs in ruins in the southwest the tree ring calendar extends from today back to B.C. 223. The earliest log found to date comes from a site 12 miles east of Durango, Colorado.

The A.D. 1278 date of a log from the very restricted entry-exit tunnel at Balcony House may reflect the tension of later years. It is possible though the timber reflects replacement of damaged logs.

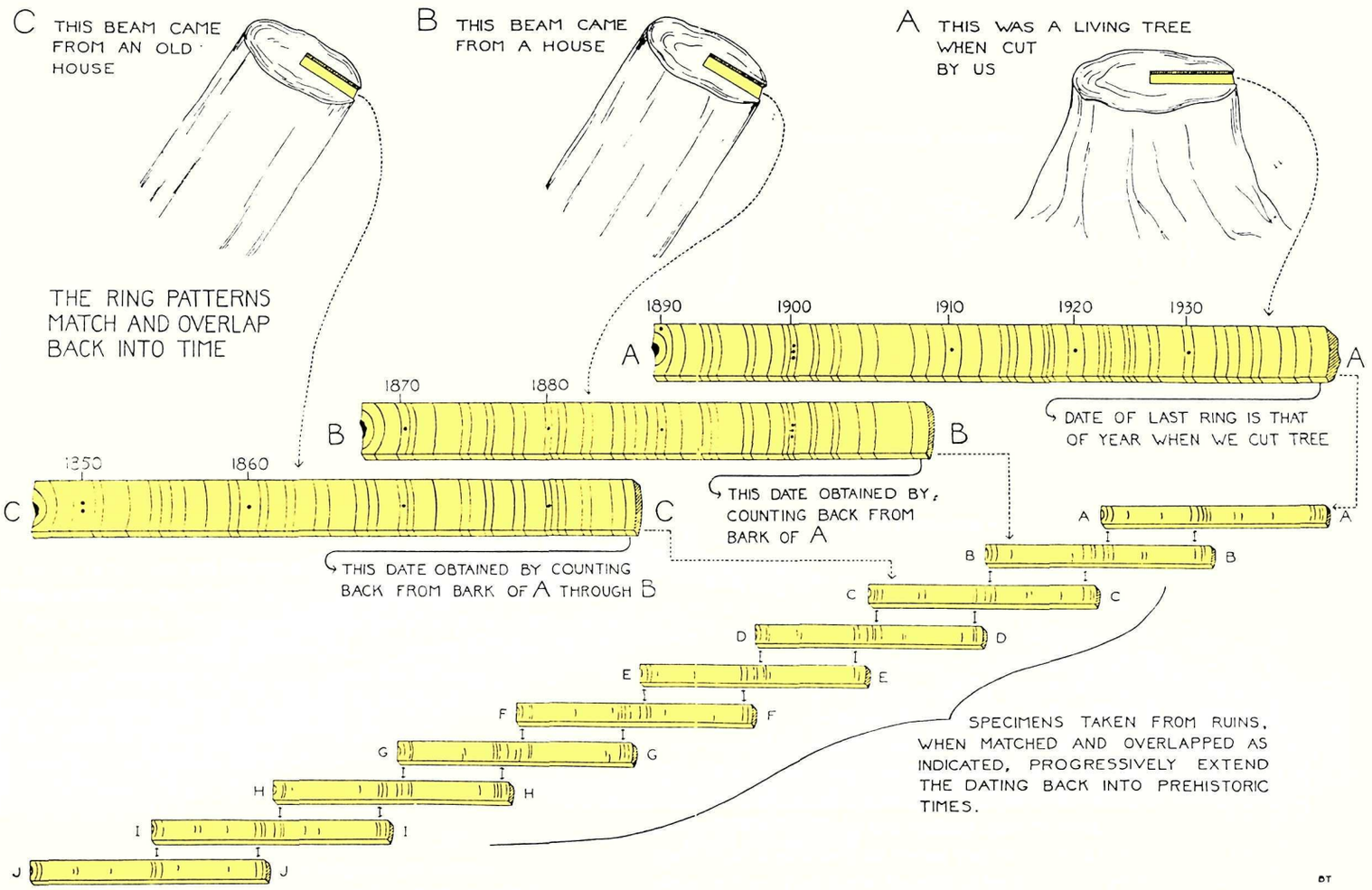
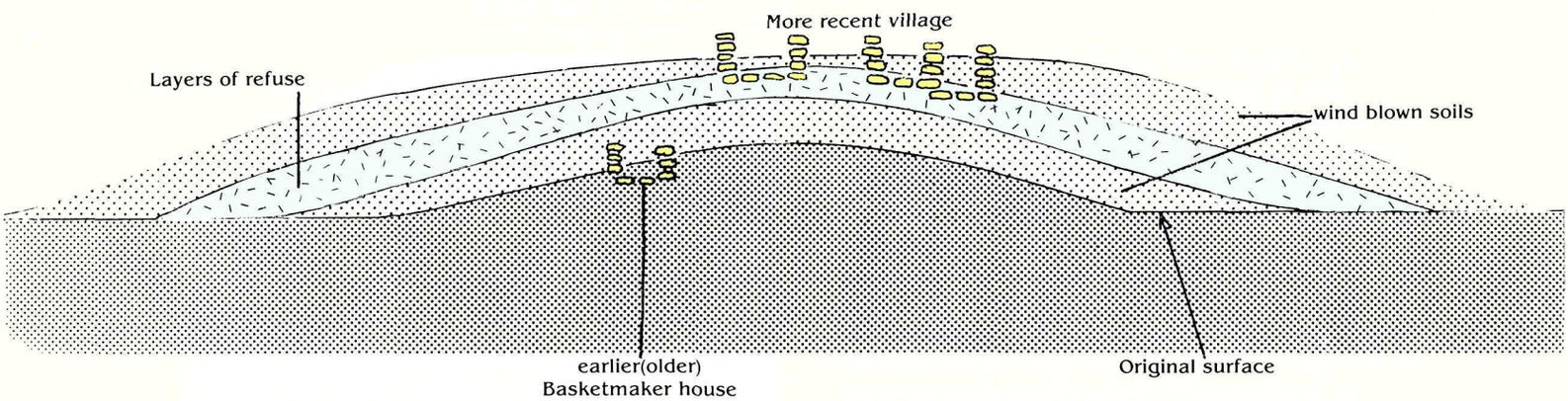


Plate III. Diagram to illustrate chronology building. Because of space limitations the number of rings in the overlapping specimens has been arbitrarily reduced.

Drawing Courtesy of Laboratory of Anthropology, Museum of New Mexico, Santa Fe, N.M.

The tree-ring exhibit in the Mesa Verde museum shows actual logs taken from major ruins in the park from which dates were obtained. The cut end of the logs give an impression of how difficult it was to cut a tree down with a stone axe.

Unfortunately, in the early days of Park exploration, many of the broken and fallen timbers that were once roof beams were lying around the dwellings. It was snowing when the Wetherill brothers visited many of the ruins, so it was only natural for them to build campfires to keep warm. The fallen timbers were a source of immediate fuel so many were burned. They undoubtedly had no idea that in some future time a method of dating ruins could be done with logs. Fortunately many other timbers that could be dated remained in place. If logs are still intact as charcoal such as in a post hole, it is still possible to send the charcoal, carefully wrapped and tied together to the Tree Laboratory for dating. Tree ring dating has been very productive at Mesa Verde National Park with most of the ruins dated through dendrochronology.



It is common in archeology to find buildings or homes built over earlier used sites so stratigraphy is very important.

Stratigraphy

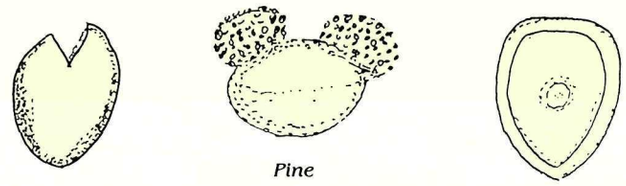
Many prehistoric sites are found on mesa-tops or in other places away from any natural protection such as an overhanging cliff. In open sites there is little chance that logs used in house construction will have survived centuries of moisture from rain and snow. With this in mind the archeologist uses several other methods, including stratigraphic examination.

Stratigraphy is a method of interpreting layers of archeological deposits; that is, a study of the position and sequence of layers in which prehistoric remains are found.

The layers (strata) may be composed of rubbish, ashes, broken tools and pottery, the remains of buildings, or they may simply be layers of natural soils with a few artifacts scattered throughout them. Generally the lowest or bottom layer of a deposit is the oldest since the first material thrown out or left on a surface will be covered by more recent material. In many ways it is like a layered cake. This technique is used not only for old living sites but also for trash dumps to get a good cross section of what the inhabitants made, used and eventually threw out.

When any site is excavated the relative location of artifacts within the site and within these layers is carefully noted. Regardless of the fact wood may or may not have been present for tree ring dating, every excavation is really a stratigraphic removal of specimens.

Pollen (Greatly enlarged)



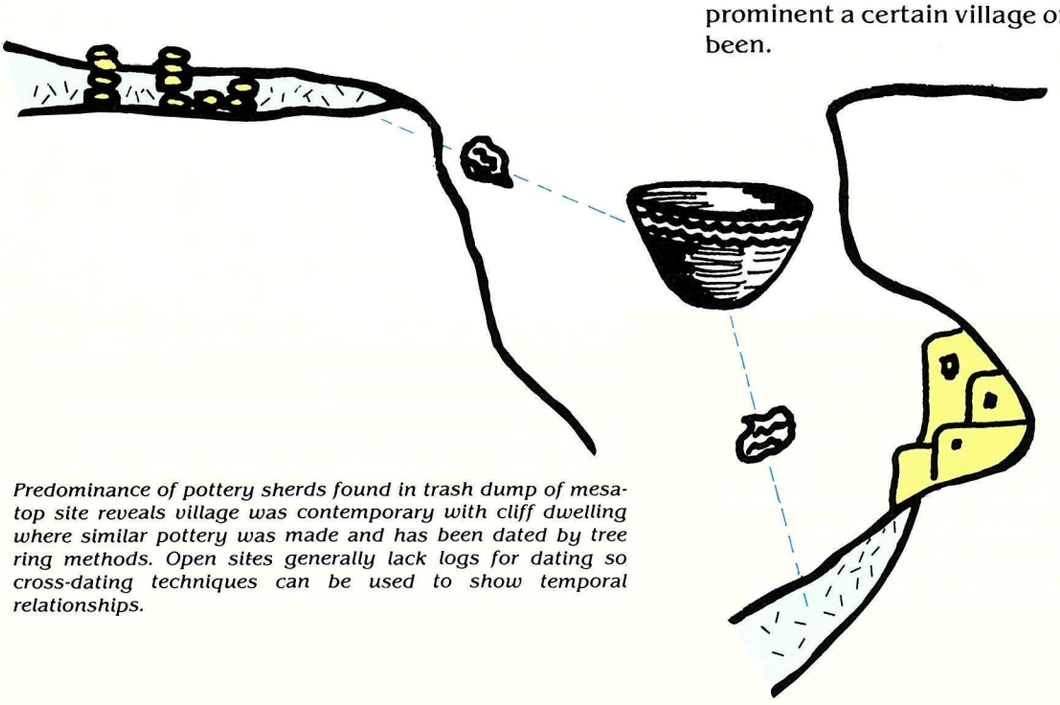
Fir *Pine* *Corn*

Cross-Dating

Cross-dating refers to a technique of establishing a position in a cultural sequence or in time, for artifacts or building structures found in a site that can not otherwise be dated. For example, a house site being excavated has no remaining logs which can be dated. In that house, though, is a large quantity of pottery whose designs, shapes and construction technique are found to be identical to pottery found in a cliff dwelling that has been dated to a certain period. The relationship of the pottery indicates the house was being lived in contemporarily as the house in the cliff structure. This method is known as cross-dating, and is frequently used for dating sites that do not have logs for tree-ring dating. While pottery or house construction features are more commonly used, most any artifact could be used if similar types were known in dated sites.

Palynology

A form of relative dating through the use of plant pollen is especially effective when the pollen is located in earth formations that can be geologically dated. Pollen is produced by all flowering plants and is easily identified. The outer coating is tough like plastic and lasts for thousands of years, even though its inner structure may have decayed long ago. Since there is a wealth of pollen the layers deposited in earth formations are called spectrums. Spectrums studied at Mesa Verde identify vegetation that grew in prehistoric times and plants cultivated by prehistoric farmers. As one can imagine, such studies are done through the use of microscope and professional training in botany. In cases it has been possible to study the distribution of cultivated crops that may have been borrowed from certain regions or inhabitants, thus giving information on how prominent a certain village or area might have been.



Predominance of pottery sherds found in trash dump of mesa-top site reveals village was contemporary with cliff dwelling where similar pottery was made and has been dated by tree ring methods. Open sites generally lack logs for dating so cross-dating techniques can be used to show temporal relationships.

Preserving the Ruins for Future Generations

The preservation of cliff dwellings and other archeological remains is of primary importance to the National Park Service who have been assigned this important responsibility. Most visitors to the park are surprised how well preserved most of the cliff dwellings are after nearly seven centuries of abandonment. Some find it hard to believe the ancient houses could still be standing, while others ask if the ruins have been reconstructed.

With the ease of transportation now, most visitors fail to remember that the ruins were found less than a hundred years ago by cowboys so there was relatively little visitation to the ruins until this century. The geographical location and terrain well protected the ruins.

Long ago the National Park Service adopted a policy to preserve prehistoric structures without rebuilding them. It simply was not logical to rebuild ruins since no plans exist to show how they actually appeared. Instead the Service planned to preserve those portions still existing and call the technique "ruins stabilization." Through this method the ruins will be preserved for future generations to see this phase of southwestern American Indian heritage.

In stabilization the goal is to retain as much of the original building as possible, yet to take those steps necessary to make sure the standing walls, rooms and roofs do not collapse from any structural failure, natural erosion or human damage.

Many decades ago the federal government recognized that if it did not restrict visitation to the ruins and stabilize the ruins from further damage, the ancient houses would soon fall apart. The federal regulation not permitting visitors into cliff dwellings without a park ranger was established years ago and remains

Many walls and roofs had collapsed so the ruins looked very cluttered in 1900.

For two decades a number of very skilled Navajo Indians have been members of the park's ruin stabilization crew to help preserve the ruins for the future.

in effect for ruins protection. All public services in the park are keyed to good interpretation within the ruins but controlled as to the number of visitors allowed in a ruin at any one time to reduce physical damage to the ancient houses of the Anasazi.

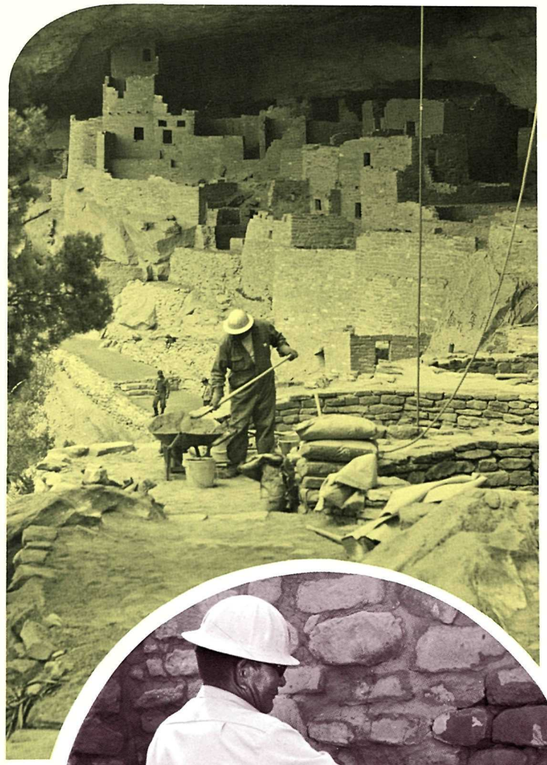
Visitors to ruins at Mesa Verde frequently see technicians working in or around the ruins doing protective maintenance. These workers belong to the ruin stabilization staff and are very skilled stone masons and technicians.

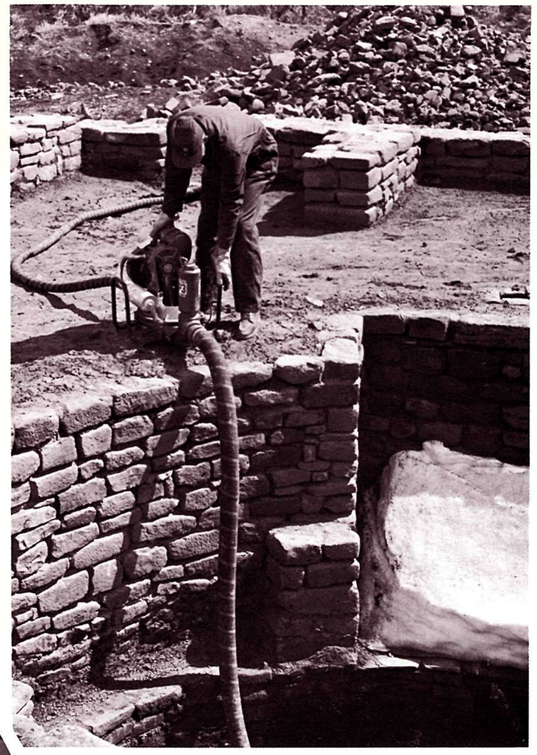
Once a prehistoric mesa-top ruin is excavated, its walls and other features are exposed to rain, wind, snow and the effects of erosion—either natural or human caused. Stabilization must be accomplished promptly or the ruin will disintegrate further. If the ruin is of exhibit quality, usually the walls will be capped with prehistoric building stone from the site set in a soil-set cement mixture. This preserves the walls below as well as to keep rocks from falling onto a visitor's foot.

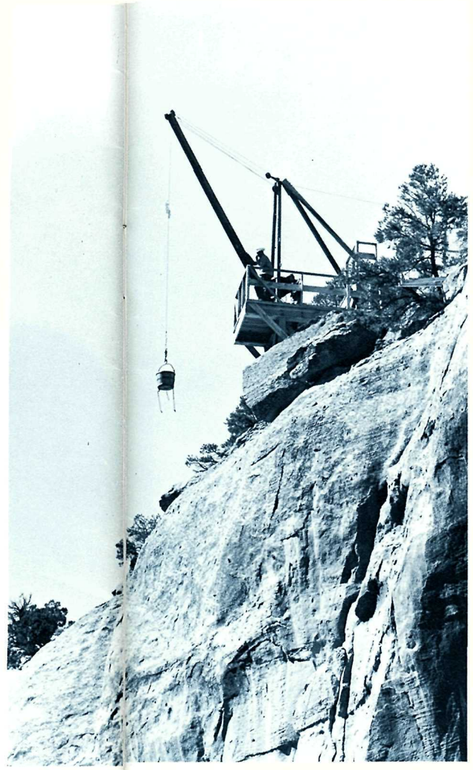
If it is necessary to match the damaged wall or to replace mud in a mesa-top ruin, the soil-cement is colored slightly differently from the original mortar so visitors can see which is stabilized work and not confuse repair work with the original.

Stabilization done in cliff dwellings involves a great deal of hard work. Sand and cement, water, and other special reinforcing materials must be lowered over the cliffs to the ruins. In this age of modern equipment helicopters are sometimes used to haul both men, supplies and equipment to the more remote ruins not easily reached by vehicles or trails. A lot can be done this way to save ruins not often seen by visitors but still needing maintenance for their preservation.

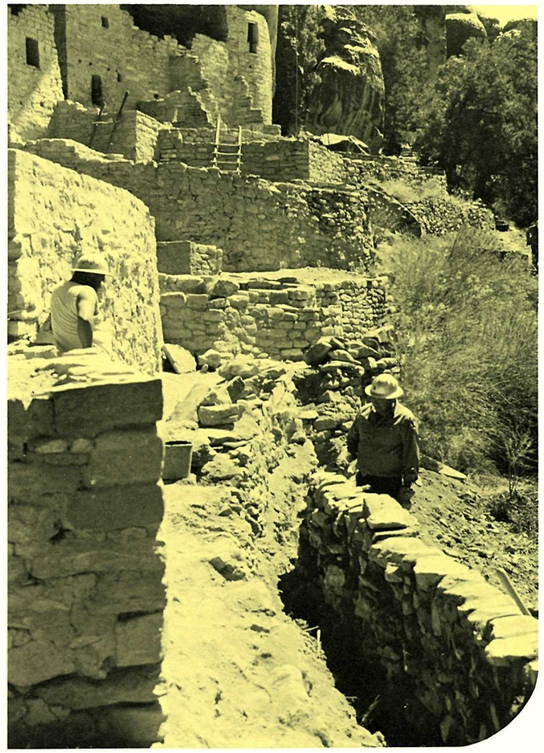
A helicopter lands supplies and material at a remote ruin that will be used to stabilize them.







Stabilizing ruins requires hard physical effort and great skill. Thanks to the work of Mesa Verde stabilization crews the ruins are being saved for future generations.



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