

*Dan Morse,¹ M.D., Donald Crusoe,² Ph.D.,
and H. G. Smith,¹ Ph.D.*

Forensic Archaeology

Physical anthropology has long been a necessary part of criminal investigation. Archaeology, which is another branch of anthropology, has rarely, if ever, been used even when the investigations involved a buried body. The purpose of this presentation is to demonstrate the value of using modern archaeological techniques as an aid in investigations made necessary by the search for or the discovery of burials, either skeletonized or partly decomposed.

Nearly all anthropologists and many physicians in various communities in the United States have had a law official bring them a pile of human bones, badly broken or with many parts missing, usually in a bushel basket or a plastic bag after having been removed from the ground with a long-handled shovel or a pickax, or both. On occasion there is some excuse for this because the law officers will appear on the scene after some inexperienced individual has already excavated the bones, but often the inexpert excavation occurs under the direct supervision or observation of the law official. In the past few years there have been several examples of this in the United States on a mass basis. Two of the most publicized are the Cummins Prison Farm in Arkansas and the Houston, Tex. homosexual murders.

Cummins Prison Farm

Tom Murton from Southern Illinois University was appointed Superintendent of Cummins Prison, Arkansas by Governor Winthrop Rockefeller. The purpose of the appointment was prison reform. Mr. Murton was first assigned to Tucker Prison for approximately one year and then was transferred to and took control of Cummins Prison on 1 Jan. 1968. He was fired March 1968 [1].

Shortly after his arrival a black inmate, Reuben Johnson, contacted Mr. Murton, claiming that he had witnessed three murders by a previous administration. Some of the details are as follows.

Jake Jackson was shot by a warden. Reuben was ordered to bury the body. This he did, after removing all the clothing and making a crude wooden coffin. In addition, Reuben also claimed he had helped to bury two other murdered inmates and stated that he could point out the exact location of their graves. One of the murdered inmates, named Bradley,

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¹Research associate and historical archaeologist, respectively, Department of Anthropology, Florida State University, Tallahassee, Fla.

²Research archaeologist, United States National Park Service, Office of Archaeology and Historical Preservation, Atlanta, Ga.

had had his "head chopped off" by a warden and the third was "bludgeoned to death" with rifle butts by some trustees.

About the middle of January, during an interview by a reporter for the New York Times, Superintendent Murton stated that he was convinced a number of inmates had been shot or beaten to death in the past. There was an immediate response from news media all over the world, and Murton was repeatedly pressured to dig up the bodies. His response was that he must wait for "unfavorable weather," because he couldn't take prison labor away from the crops.

Unfavorable weather came in the form of seven inches of rain and the ground became very muddy. On 29 Jan. 1968 two television crews dropped in unexpectedly, so digging started that very day. Even though the state of Arkansas employed at least twelve expert field archaeologists, none were asked to help. The only records were taken by the warden. Newsmen were everywhere and got in the way of the diggers. Murton reported that one body was decapitated and another had a crushed skull.

In summary, the excavations were done under the worst possible conditions—in the mud and with inexperienced convicts as archaeologists and Mr. Murton as note taker. As a result, any information that might have been acquired, if proper techniques had been used, was lost forever. The superintendent may have had good intentions, but he certainly displayed poor judgment in his handling of the excavation. Mr. Murton said that the Governor and the state administration had whitewashed the whole affair in order not to give Arkansas a bad name.

After analysis of the physical characteristics of the skeletons by physical anthropologists, it was decided that none of the three skeletons excavated could have been the convicts named by Reuben Johnson that were supposed to have been murdered.

Texas Homosexual Murders

Early in August 1973 a 17-year-old boy (Elmer Wayne Henley) told police in Harris County, Texas that he had killed a 33-year-old man (Dean Allen Corll). Later it was learned that Henley and another youth (David Brooks, age 18) had, over a 3-year period, supplied Corll with young boys for homosexual purposes. Many of the boys were subsequently murdered and buried [2].

To date the police have recovered 27 bodies in various stages of decomposition. Of these, 22 have been identified. Seventeen of the bodies were excavated inside a boat shed, whereas the other ten were from other locations.

Because of tremendous public interest and curiosity, large crowds accumulated, including television and press personnel. Since security became a major problem, the police used this as an excuse to remove the bodies as quickly as possible—so care was sacrificed for haste. No archaeologists were consulted and no archaeological techniques were used. At first, convict volunteers were employed in the digging. Since many became ill on account of the odor, a back hoe was used and later a bulldozer. Fortunately most of the bodies were enclosed in plastic so intermingling of the bones did not occur except when the plastic was broken or dislodged. Television programs broadcast throughout the United States showed hasty, indiscriminate removal of the bodies. One program showed a man with a long-handled shovel throwing a skull into a wheelbarrow. Later it was claimed this was staged for television. In any case, the procedure was inexcusable.

Teamwork

Whenever a homicide investigation is planned, it is the custom to involve a team of experts, including the crime scene investigator and his assistants and the facilities of a crime

laboratory. Support personnel include a physical anthropologist, a forensic pathologist, and a forensic odontologist. It should be remembered that the investigator, as chief law official, is in complete charge of the whole procedure. All others work under his supervision. It is his responsibility to decide if the case is of police interest. He will be in charge of the chain-of-possession of the evidence and the preparation of the facts to be presented to the court. If possible, the *physical anthropologist* should view the remains at graveside as well as in the laboratory. He should supervise the removal of the skeleton, the labeling, packaging, and preparation for transportation to the laboratory. His principal objective, with the help of the *forensic odontologist*, is to identify the victim. An inventory of the bones should be made at the time of removal in order that a search can be made for any of those that might be missing. The *forensic pathologist* can substitute for or assist the physical anthropologist and if there are soft tissues present, he is responsible for conducting an autopsy to attempt to determine the time and cause of death.

An *archaeologist* should be a member of the team whenever the investigation involves a buried body. The most practical solution would be to have the law enforcement agency employ an archaeologist as consultant during the short and infrequent periods his services would be needed. As an alternative, the crime scene investigator or an assistant could be trained in the use of archaeological techniques. If a need for the services of an archaeologist is anticipated, it is suggested that he be contacted well in advance of the event so as to promote mutual understanding.

Frequency of the Problem

There is a general impression that buried bodies of forensic interest are not very numerous. In a symposium held in Mexico City at the International Congress of the Americas last year, Dr. T. Dale Stewart of the Smithsonian Institution stated that of some 250 forensic cases which he had handled in the United States over a period of about 30 years, only seven came to trial. However, it is possible that if more careful removal of these burials had occurred, more of these 250 cases may have been of court interest.

A common method for criminals to get rid of a body is to bury it, so perhaps many burials have never been discovered. Regardless, the scarcity of this item does not justify the continuation of the prevailing technique, which can best be described as ineffective.

Undoubtedly there have been a few bodies excavated under the direction of crime investigators using archaeological techniques, but as far as we can tell, none of these have been published or publicized. We know of two such cases that would come under this category. One, found near Peoria, Ill., was excavated by James Gillihan of the Peoria Arts and Science Center. A human femur had been extracted from a hillside by a bulldozer while removing dirt. Excavation of the grave, already severely disturbed by the dozer, was completed. The skeleton was that of a man about 50 years of age in a coffin. The date of burial was established by the presence of buttons as around 1840. Obviously this was not of forensic interest. Another case was excavated with archaeological techniques by a National Park Service archaeologist, Dick Ping Hsu, at the request of the New York State Police in 1972. A body of a young girl, wrapped in a raincoat, was found in a shallow grave ten miles northeast of Rome, New York. The findings of the archaeologist helped to bring about the arrest of a suspect in the spring of 1974. The case is still in the courts.

Crime Scene Events

The general sequence of events on the discovery of a homicide victim is as follows: in most cases a portion of a body or the entire body is unearthed by some type of earth-moving activity, and the official personnel are then notified. At other times the law officials

may know the approximate location of the grave, usually through confession. The grave or graves can then be located by visual inspection, careful probing with a steel rod,³ and the use of the Vapor-Tect® methane gas detector as described by Jack McLaughlin [3].

Upon the arrival of the law enforcement officials, the surface of the site is searched for more or less obvious items: tire tracks, articles of clothing, and weapons and other objects that might have been inadvertently dropped or deposited during the event studied. Usually a topographical map is made of the area. Security is also a problem that must be considered. All of these activities are coordinated by the chief investigator.

Let us now confront the investigator's problem archaeologically, including the nature of the remains, dating the time of burial, and techniques of excavation.

Nature of the Remains

The first step in an attempt to identify the remains is to determine the stature, age, sex, racial origin, and the presence of disease and abnormalities. This is the responsibility of the physical anthropologist or the forensic pathologist, or both, with the help of the forensic odontologist. The details of how this is accomplished are not a part of this presentation, but two new developments which promise to be of value to the criminal investigator will be mentioned.

As an assist in determining chronological age, Ellis Kerley in 1965 [4] introduced a method of microscopic examination of cross sections of long bones. As age increases, the microscopic architecture of bone changes. These changes can be measured and thus a rather accurate estimation of age can be calculated. This procedure has been used extensively in archaeological bone [5]. Its application to forensic bone has been documented by Kerley in 1969 [6] and, with some modification, by Ahlqvist and Damsten in 1969 [7]. The details of the techniques of bone preparation and the formula for calculating the age can be found in Ref 5.

Another procedure being developed is the determination of racial origin using skull X-rays, an electronic scanner, and a computer. This research is being conducted by Geoffrey Walker and Charles Kowalski at the Dental School biometric laboratory, University of Michigan [8].

Few diseases leave telltale marks on bone. Trauma, arthritis, and bone infections are the exceptions. If a missing person is suspected of being the discovered body, then the medical records can be compared with gross bone appearance. A review of what diseases and abnormalities can change appearance of bone can be found in Ref 9.

Dating the Time of Burial

Whenever a skeleton is unearthed, the principal concern of the investigator is, is it recent or is it ancient? For the most part, the remains of individuals that have been dead for a period greater than 30 or 40 years is of minimal importance in law enforcement.

In the United States many skeletons uncovered and subsequently reported to the police are those of early or prehistoric Indians. A physical anthropologist can usually determine that a certain skeleton is Indian and not Caucasian or Negroid racial stock, but skeletons of people from eastern Asia (Mongoloids) are quite difficult to distinguish from those of American Indians. Burials of recent historic origin are frequently easy to pinpoint by the presence of associated grave goods such as buttons, belt buckles, coins, coffin nails, and clothing. Historic archaeologists can sift these out rather accurately as to century and

³The use of a probe should be avoided if at all possible. When used, it should be restricted to the determination of the degree of earth softness which could indicate the presence of a recent grave. The probe should never touch the body.

decade. Dental analysis may be of help as prehistoric Indians did not have such things as dental fillings, dentures, or inlays. If the remains were actually of forensic concern, and, as frequently happens, all clothing and other objects that might be used for identification had been removed before burial, one might have a real problem.

There have been many attempts to date bone to determine the time between death and discovery. In 1969 Knight and Lauder [10] performed some ten chemical tests on 68 bones of known date of deposition from 1 to 3000 years. We thought a few of their tests to be of value, but in their series there were several examples of wide deviation from the expected. One opinion that they expressed was that if the number of amino acids present in a bone specimen was seven or more, the bone age was most likely to be less than 100 years. At Florida State University two graduate students, with the cooperation of the Department of Chemistry, analyzed four bone samples for the presence of amino acids using the Beckman amino acid analyzer and thin layer chromatography. Two samples were from the Sowell Mound [11], one was from the Fairty Ossuary [12] and the other was from the Tabor Hill Ossuary [13]. These were found to contain 16, 18, 16, and 16 amino acid residues respectively. All of these sites have been dated as older than 500 years before the present. Another opinion of Knight and Lauder was that a "negative benzidine test (for blood)" almost certainly rules out a bone from a recent period. Two other students at Florida State University performed benzidine tests on many samples of bone of known dates. One sample which was less than nine years from deposition until testing gave a negative reaction. More work on dated samples should be done before the significance of these tests can be realized; dating an individual bone specimen by chemical means is unreliable.

One analysis that may become of interest to the forensic scientist is dating an amino acid in bone by determining the extent of racemization. Before this analysis will be of value to criminal investigation, further research and technique perfection must be accomplished [14,15].

Techniques of Excavation

Proper excavation methods are detailed in Refs 16 and 17 and outlined here. After the search team has completed the investigation of the surface of the area and the approximate location of the grave or graves has been established, the excavation of the burial pit and its contents begins. A photograph, with an identifying number, a scale, and an arrow pointing to magnetic north, should be made of the site in its original state. The vegetation over the pit should be observed as to its height, distribution, and depth of root system and compared with that of the immediate surroundings to get some idea of the time elapsed between the digging of the pit and the present. A botanist can be of help. As digging progresses, the size of any roots of identifiable trees and shrubs growing in the pit can give additional information. All samples should be tagged.

Extraneous material should be cleared from the surface and, if necessary, a small amount of surface earth can be scraped off using a trowel or shovel with a flat blade. In this manner a horizontal profile is made and the boundaries of the grave or graves now become clearly discernible.

After the extent of the area is established, a map should be made. A very satisfactory map can be made with the following basic equipment: drawing board, 100-ft (30-m) tape, cross-section paper, scaled ruler, hard lead #4 pencils, Brunton or lensatic compass, plumb bob, string, protractor, and a string level. More complicated and precise equipment may be used if a trained surveyor or engineer is available. Most county road departments do have personnel and equipment of this type. Mapping begins with the establishment of a datum point, outside the area selected for excavation but close to it, to which all measurements are referred. It should be marked by an item such as a wooden

stake with a nail in the top and should be protected so that it will not be disturbed. Vertical distance or depth will be measured from the datum point with the use of a level, a string, and a measuring tape. To get horizontal distance a grid system is established (Fig. 1) by dividing the whole area into 5-ft (1.5-m) squares. Each square is assigned a

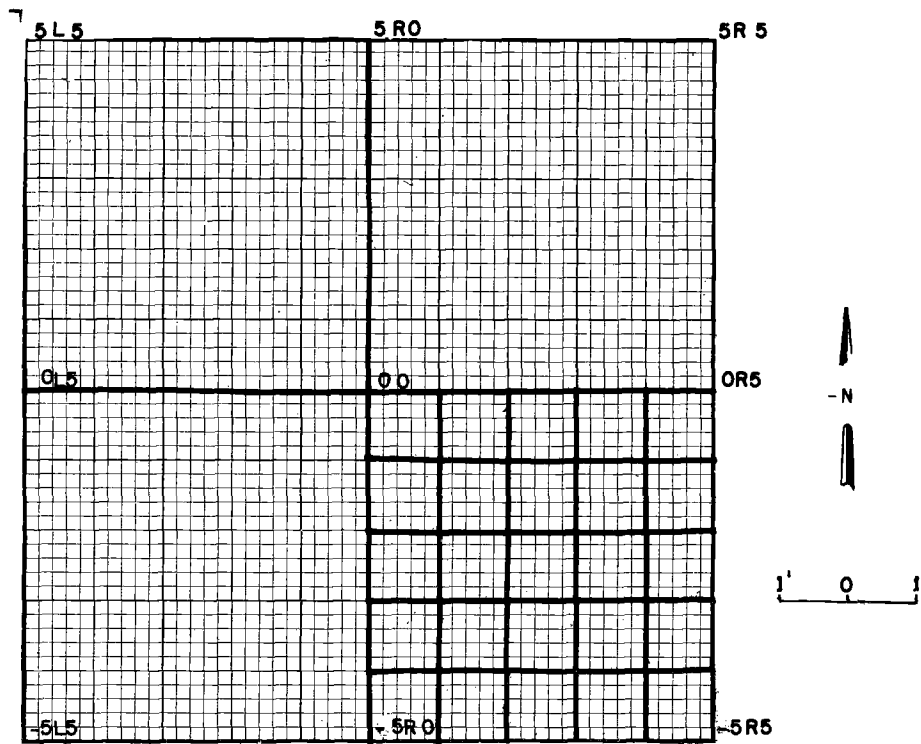


FIG. 1—A drawing illustrating the grid system. Represented here are four 5-ft (1.5-m) squares, with numbers for the squares in the lower left corner. Each 5-ft square is divided into 1-ft (0.3-m) squares, which are further subdivided into 0.2-ft (61-mm) squares. Some archaeologists prefer the letters *N*, *S*, *E*, and *W* (points of the compass) for labeling the squares: 5R0 would then be N5E0, -5R0 would be S5E0, and so on. To simplify the records, it may be desirable to map all findings in a single square, so square 00 could be 10 ft (3 m) instead of 5 ft.

number which is placed on the lower left corner. The square just to the right of and above the datum point is usually given the number 00. The corner of each square is marked by a stake. It is customary, but not essential, to have the grid lines oriented north-south and east-west. It is important that all finds and features should be accurately noted in reference to the grid coordinates as well as depth below datum. For example, because a bullet in the body will drop downward with decay of flesh, its location should be recorded in relationship to the skeleton; or, if the criminal has lost something, say a button, it is more meaningful to know if that button was in the grave or on the surface.

Now one should begin careful excavation of the burial pit, using small hand tools and visual inspection. Extreme care should be exercised to maintain the exact limits of the grave. We know that whenever pits are refilled, the earth originally from within the pit becomes mixed or mottled. Slow and careful removal of this mottled earth should reveal the nature of the scars on the peripheries, which could indicate the type of tool used by the original excavator. The earth from the grave should be removed using arbitrary levels, about every 2 to 4 in. (50 to 101 mm). Each level should be profiled and the dirt removed sifted through a ¼-in. (6.35-mm) screen and, to recover such items as small caliber bullets and shotgun

pellets, the dirt must be resifted with standard window screen. Anything found by this method should be recorded by its level number. If anything significant is found, it should be mapped and photographed in situ (Figs. 2 and 3).

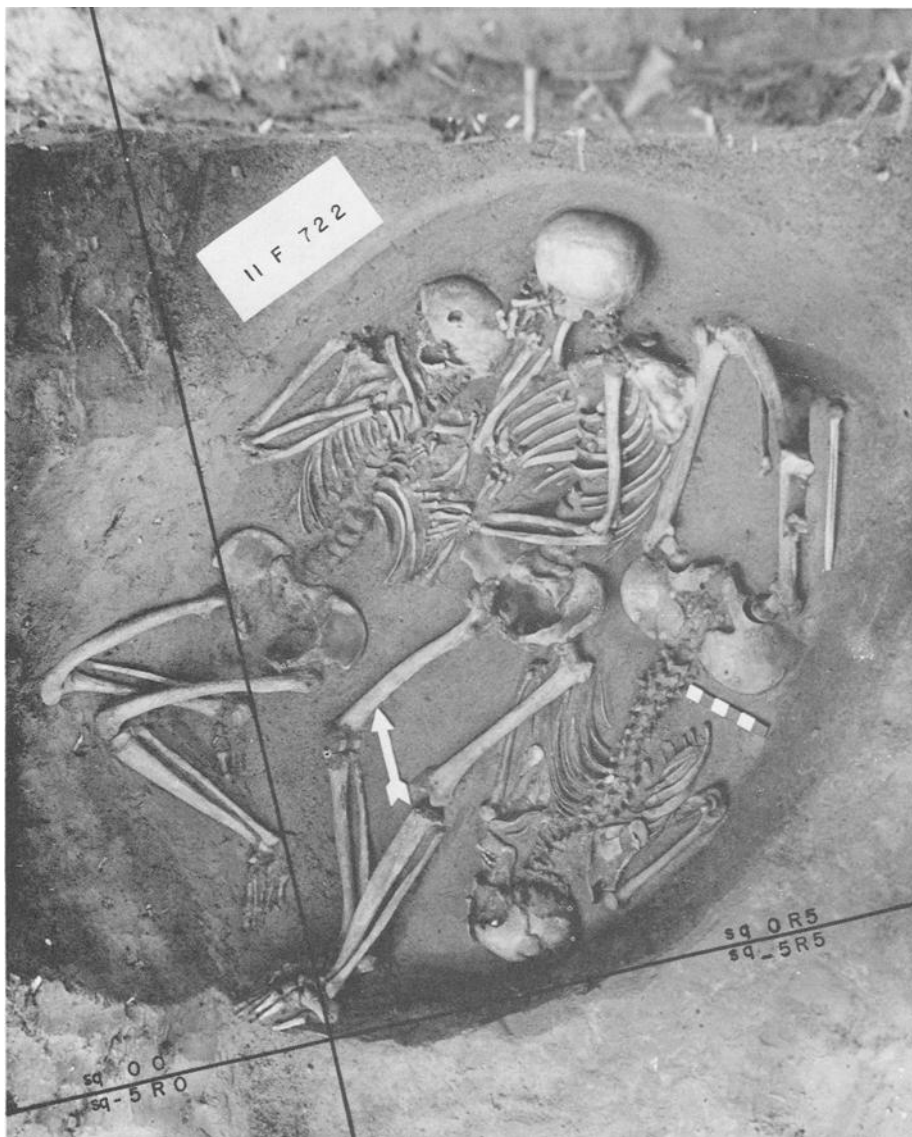


FIG. 2—Grid lines superimposed on photograph of multiple burials in a circular pit. These are prehistoric Indians [18].

When the bottom of the pit is near and a portion of the body visible, smaller and softer tools should be used. After exposure of the individual has been accomplished and the remains pedestaled, photographs and maps should be made. One should be careful when exposing the burial so as not to disturb the original floor. Sufficient records of all finds should be made throughout the entire excavation preferably in a bound notebook so that no pages can be lost. Notes should be clear and not erased. Any corrections should be lined through, by a single line so that the original can still be read, and initialed.

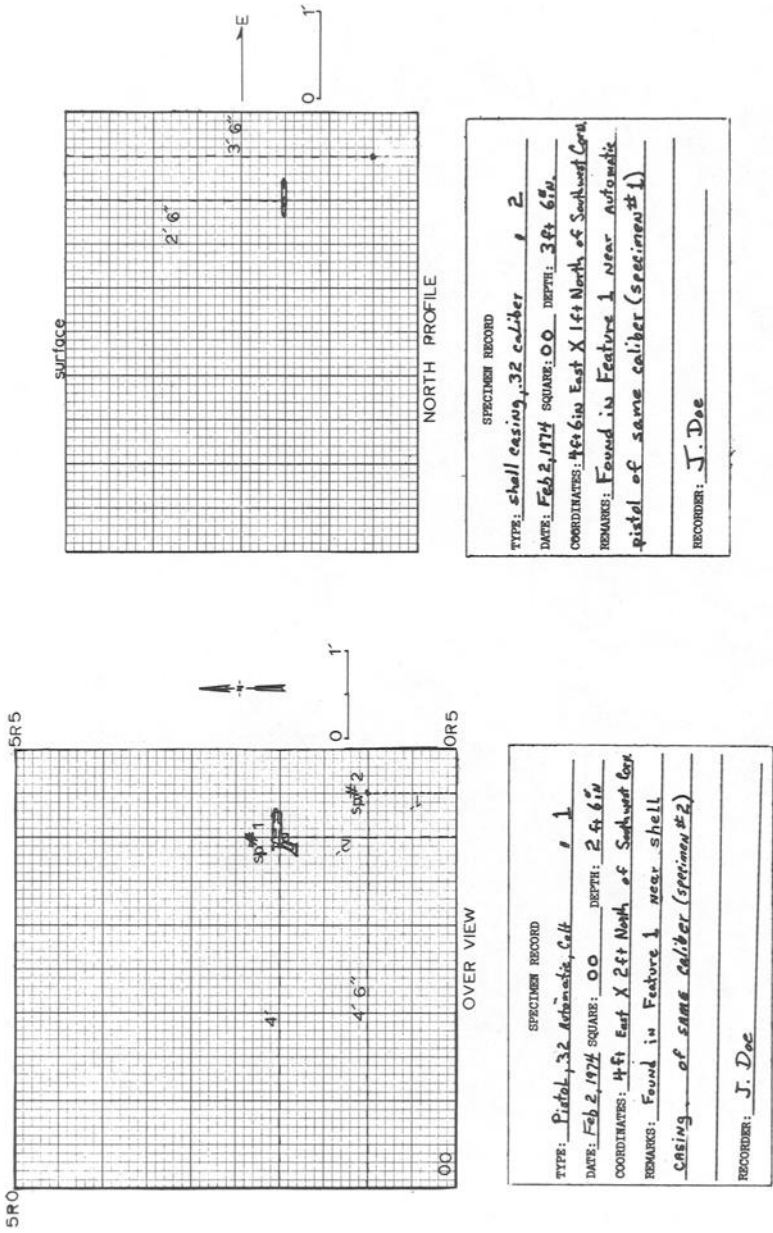


FIG. 3—Overview (left) and north view (right) showing the spatial relationship between two objects found in the ground. The depth is measured from the datum point. Each side of the smallest square represents 0.1 ft (30 mm).

After the remains have been removed, it would be advisable to excavate a portion of the pit floor to be certain that nothing has been overlooked. Injuries to the bone at time of death might be ascertained by careful examination of the skeleton in situ. This may be impossible after the skeleton has been removed to the laboratory.

Whenever a pit is dug and refilled, the dirt becomes mixed and some material originally on the surface will always be found in the bottom of the pit. A sample of dirt from near the floor should be sent to experts for examination for the presence of pollen, seeds, and insects. In this way it might be possible to tell the season of the year the event took place. More dirt from the vicinity of the stomach and intestines should be collected and sent to the toxicology laboratory for analysis.

In case a body is not completely decomposed, it may be desirable for the forensic pathologist to have the remains removed in its entirety. This may be accomplished by various methods, depending on the degree of decomposition. It may be necessary to place either plastic, sheet metal, or plywood under the body for removal.

Comments and Conclusion

The techniques outlined in this presentation can be varied to suit the case and the experience of the excavator. The degree of accuracy and the extent of recording should be determined by the criminal investigator who will have the duty of steering the evidence through the courts.

Since forensic archaeology has never been tested adequately, extensive practical experience in the field may disclose other information not mentioned in this article.

For further information concerning techniques of excavation, *Field Methods in Archaeology* by Hester et al [16] is highly recommended.

Summary

This presentation attempts to demonstrate the value of the use of improved methods in the excavation of buried bodies involved in a criminal investigation. Care in the removal of the skeleton and proper recording will document the interrelationship of all objects found in and around the grave and can, to a certain extent, recreate the event. Carelessness will result in evidence being irretrievably lost.

The crime scene investigator's problem, archaeologically, includes the nature of the remains, dating the time of burial, and techniques of excavation. Archaeological recovery techniques should be adopted in homicide investigation involving buried bodies.

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Department of Anthropology
Florida State University
Tallahassee, Fla, 32306