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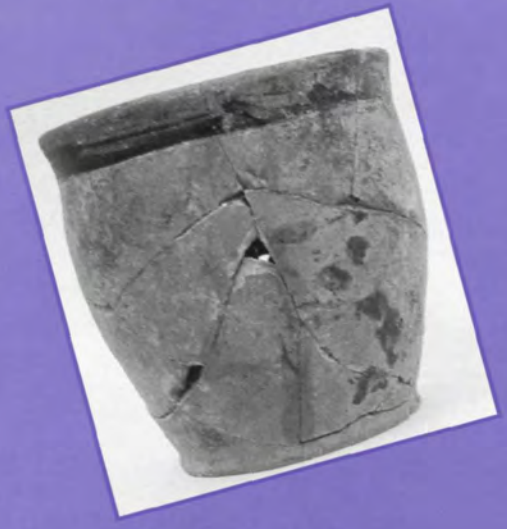
Conservation and Archeology



Case Studies in Collaboration

U.S. DEPARTMENT OF THE INTERIOR
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Information for parks, federal agencies, Indian tribes, states, local governments, and the private sector that promotes and maintains high standards for preserving and managing cultural resources

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 Send articles and correspondence to the Editor, *CRM*, U.S. Department of the Interior, National Park Service, 1849 C Street, NW, Suite 350NC, Washington, DC 20240 (U.S. Postal Service) or 800 North Capitol St, NW, Suite 350, Washington, DC 20002 (Federal Express); ph. 202-343-3411, fax 202-343-5260; email: <crmmag@nps.gov>, to subscribe and to make inquiries; <rongnps@starpower.net> to submit articles.

Jessica S. Johnson

The Improving Collaboration Between Conservation and Archeology

Collaboration between conservators and archeologists has been discussed and analyzed numerous times in print over many years.[1] Gradually, some conservators and archeologists are developing effective collaborative projects that improve the preservation of objects and architecture while adding information for the interpretation of the site. This issue of *CRM* focuses on the contributions of conservators to archeology during fieldwork, analysis, and long-term preservation of curated collections. Articles by a number of conservators, working throughout the world, have been collected. Their descriptions illustrate the wide range of projects conservators are involved with, including:

- treating objects in the field
- insuring their preservation and availability in repositories
- collaborating on research
- preserving architecture and objects as part of larger preservation/tourist development projects[2]
- working with federal and state agencies and Native peoples on a collaborative approach to preservation.

In the United States, conservation has long been a part of underwater and historical archeology. The article by Claire Peachey about on-going work on the *Housatonic* and *Hunley* shipwrecks is one example. Colonial Williamsburg has had a laboratory for archeological conservation since the early 1930s, and the current conservator, Emily Williams, discusses how the information gained from treatment has recently added to the knowledge and interpretation of one site. Howard Wellman shows how the particular skills of conservators can generate information that improves interpretation.

American conservators and archeologists have begun to collaborate more on long-term preservation of Native American materials in repositories such as the human remains rehousing project described by Vicki Cassman, et. al. Native American communities are also being included in the decision-making process, such as the rock art preservation program at Petroglyph National Monument described by Claire Dean.

However, field experience for student conservators is still limited on U.S. excavations and most go abroad to work on site in places such as the Mediterranean or Middle East where archeological conservation has a long history. Kent Severson's paper describes the object and architectural conservation projects that give training opportunities to both American and Turkish students at the site of Aphrodisias. More field opportunities in the U.S. are needed. Only then can students learn about the particular problems of archeological conservation in the U.S.[3]

Other authors in this issue discuss how conservation can be better integrated into archeological fieldwork. Lisa Young describes how careful planning and the use of supervised students

Fieldwork requires imaginative adaptation of typical conservation techniques.

Cleaning and stabilization of objects in the field allow for faster and better interpretation and improved long-term preservation.

allowed for conservation of objects recovered from a historic site in Philadelphia. Catherine Magee describes the different roles she has filled on excavations depending on need. Rae Beaubien uses her considerable experience in Mesoamerica to describe how conservation can be better integrated into field archeology anywhere.

Finally, three short pieces describe how the profile of archeological conservation is being raised through the support of archeological organizations. Jeff Maish describes a traveling poster that was co-sponsored by the Society for Historical Archaeology (SHA) and the American Institute for Conservation (AIC). Catherine Sease gives information on the Archaeological Institute of America's (AIA) Conservation and Heritage Management Award. A website produced by Terry Childs of the National Park Service Archeology and Ethnography Program incorporates conservation into training to care for archeological collections.

Bit by bit, archeologists and conservators are finding ways to collaborate to improve interpretation and to better preserve the archeological objects and structures for re-analysis and other uses. Archeological professional organizations such as SHA and AIA are supporting this collaboration. As more conservation students are trained in the specifics of field conservation, and more archeologists become acquainted with how the inclusion of a conservator can help with their concerns in the short and long term, this collaboration will only expand. Though theoretical perspectives have radically changed since 1904, W.M. Flinders Petrie's admonition still holds:

> The preservation of the objects that are found is a necessary duty of the finder. To disclose things only to destroy them, when a more skillful or patient worker might have added them to the world's treasures is a hideous fault.[4]

More collaboration will help ensure the preservation of our archeological resources for continued use in research and interpretation.

Notes

1 See for example, B. J. Borque, "Conservation in Archaeology: Working toward Closer Cooperation," *American Antiquity* 45:4 (1980): 794-99; K. Morris, "Conservation of Archaeological Collections," *North American Archaeologist* 2:2 (1980): 131-36; J. Johnson, "Conservation and Archaeology in Great Britain and the United States: A Comparison," *Journal of the American Institute for Conservation* 32:3 (1993): 249-69.

2 See also, "A Unity of Theory and Practice Bridging to the Past: The University of Pennsylvania and the NPS," *CRM* 20:10 (1997). This issue describes a number of architectural conservation projects on archeological sites.

3 There is a new training program in Ethnographic and Archaeological Conservation in development at the Cotsen Institute of Archaeology at UCLA in collaboration with the J. Paul Getty Trust. For information see <http://www.sscnet.ucla.edu/ioa/academic/conservation.html>.

4 W.M.F. Petrie, *Methods and Aims in Archaeology* (London: Macmillan, 1904).

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Photos courtesy the author.

Lisa Young

Mending the Past One Fragment at a Time

Archeological Conservation as a Scholarly Resource

In 1997, archeologists from the National Park Service (NPS) and John Milner Associates uncovered three well and privy features during an archeological testing and monitoring phase on Independence Park in Philadelphia, Pennsylvania. The archeologists decided to fully excavate these features, as they were to be impacted and destroyed when later development of the site took place. A contract conservator was consulted during the excavation phase of the project, and the artifacts were recovered, sorted, and stabilized in the field for transport to the laboratory. The more sensitive, or unstable artifacts, were routed directly to a professional conservator for treatment. Other waterlogged artifacts such as wood, leather, bone, and tin-glazed ceramics were packaged and transported in containers of water and were set aside for possible conservation in the future.

Leather after conservation treatment.

After the initial artifact processing stage, the materials were transferred to the NPS Applied Archeology Center in Silver Spring, Maryland, for further examination and analysis. Mr. Paul Inashima, project director, recognized the need to further conserve and analyze many of the materials, and approached the NPS for funding to perform conservation on particular groups of artifacts. Initially, a small contract was awarded to specifically conserve and reconstruct 25 ceramic vessels. The facility in Silver Spring was fully outfitted with a working archeological conservation laboratory, although it lacked a permanent conservator. For this project, much of the needed equipment, supplies, and materials was already in place, and only a few additional chemicals and disposable supplies had to be purchased. For more than two years, conservation of the collection was carried out and over 7,500 objects were treated. Each material group was examined by the archeologist and the conservator prior to beginning any treatments, and an estimate for time, labor, and supplies was prepared and submitted for approval. While the park archeologist was fortunate to receive funding to support each step, there was always the uncertainty of knowing whether or not funding would be approved for each individual contract and whether we could move to the next stage of the project. For this reason, conservation tasks were carefully planned and implemented to fit into each individual "contract" ensuring that treatments could be completed with the funding available.

From a conservator's viewpoint, all of the artifacts undergoing conservation needed to receive the same standard of treatment to ensure long-term preservation. However, the archeologists and project managers wanted to treat as many artifacts as possible quickly and inexpensively. Close cooperation between all the project team members allowed us to find ways to meet these goals, while not jeopardizing the standard of treatment performed on any one group of artifacts. This standard meant that for every artifact treated, a before-and-after-treatment photograph was taken, an illustration of the artifact was produced, and conservation documentation was completed and archived with the site records.

The majority of the artifacts treated consisted of ceramics and glass. Many of the vessels cross-mended, and could be fully re-constructed, missing only a few, very small fragments. While many archeologists do not typically spend this amount of time reconstructing vessels, this collection is rare in that it provides a unique look into the socio-economic lifeways of Philadelphians during the 18th century. Many of the vessels were manufactured from local clays and the vessel forms have been linked to local potters who have been documented as having traveled and worked in other neighboring cities such as Alexandria, Virginia.

Approximately two-thirds of the ceramics were treated during the first year of the project. An early assessment of the collection indicated that many of the ceramic vessels were composed of like materials, suffered from the same degree of degradation, and often required similar conservation treatment. Therefore, it was feasible to train laboratory technicians and student interns to assist with both the documentation and reconstruction of the vessels. As the project grew, and more archeologists began to hear about the ceramics being mended at the Applied Archeology Center, other NPS employees and archeologists began to volunteer their time on the project. In return, hands-on conservation training was provided to volunteers as a means of treating more vessels.

Exhibit on conservation at Independence National Historical Park, Philadelphia, Pennsylvania.

The next two largest groups of materials treated consisted of waterlogged leather and wood. Over 500 leather objects required conservation including items such as nearly complete shoes, shoe soles and uppers, cut fragment, and pieces of larger garments. The wooden artifacts varied more in size and function, as well as being manufactured from different types of wood species. Typically, whenever a large amount of one material is discovered in a single archeological feature, the conservator makes decisions regarding the appropriate treatment method, while considering other issues, such as time management, and the space and resources available to treat large quantities. When over 1,000 pieces of waterlogged wood undergo conservation treatment, it may seem advantageous to batch-treat the objects, but this may not always be possible if a variety of woods has been used or if there are significant differences in deterioration between objects.

During the second year of the project, four conservation assistants were hired to work part-time to assist with conservation of the waterlogged wood and leather, as well as the remainder of the ceramics. Minimally, each artifact had to be safely removed from water, dried out with minimal shrinkage, identified, and curated. Experiments were conducted in order to find a way to bring the artifacts out of the water while minimizing loss to the artifacts and the technological and historical information they contain. Various drying methods including controlled slow drying, air-drying, solvent drying, and freeze-drying were conducted on both wood and leather samples from the site. Initial results indicated that controlled slow drying after initial surface cleaning and desalination could be an acceptable drying method for those wood and leather samples that would not undergo full conservation treatment. This type of research information is invaluable to the conservator or archeologist who may be working in remote countries or less than ideal laboratories even here in the United States where equipment such as freeze-dryers and even fume hoods are not available for conservation work.

Conservators who work with large, diverse collections of archeological materials are presented with challenges and issues that are unique. With many archeological projects, particularly in the United States, a conservator is often brought into the archeological process after excavation has

already begun. Frequently a budget for conservation work has not been included within the overall project budget, leaving the archeologist and project managers to seek out other funding sources and creative ways to secure money for conservation of the artifacts. As described above, volunteers, student interns, and laboratory technicians were used throughout the project to assist with conservation tasks, documentation and treatments. This arrangement was primarily made with the archeologists in an attempt to keep overall project costs down. The necessity to train volunteers and students, with different experience levels, must be taken into consideration when preparing a budget at the beginning of a project. Both the archeologist and the conservator must address these challenges before the first shovel enters the ground, and communication throughout the entire process is essential for both the good of the project as well as the artifacts.

Lisa Young is a private conservator and owner of Alexandria Conservation Services, Ltd., Annandale, Virginia.

Photos by the author.

Jeffrey Maish

Archeological Conservation Display

The American Institute for Conservation (AIC) and Objects Specialty Group presented a staffed display on archeological conservation at the annual meeting of the Society for Historical Archaeology (SHA) in Long Beach California, in January 2001. The display was funded jointly by the AIC and the Intersociety Relations Committee of the SHA. Entitled "Gone with the Wind (but it doesn't have to be)," it presented some of the main areas of involvement of object conservation within archeology. The display also attempted to address some of the conceptions/misconceptions held about conservation. The central panel included sections on some principal areas of conservation concern: the definition(s) of conservation; planning for conservation; on-site participation, including stabilization; lifting and transport; laboratory conservation and research; and storage. The "urban myths of conservation" panel presented conservation not as in competition, but as a complement to archeology. A segment of the excavation responsibilities could therefore be turned to a conservation team member who could perform tasks that contribute to research while at the same time freeing time for the archeologist to perform his or her research. A third "did you know?" panel presented some general knowledge facts about sites, such as microenvironments and their potential effects on materials, and subsequently, the interpretation of the site material.

The project evolved and was organized through the efforts of the Archaeological Conservation Discussion Group of the Objects Specialty Group. This group has a principal goal of establishing a continuing dialogue with the archeological community. The poster presented archeological conservation in a general and approachable manner with the aim of informing attendees of issues involved in conservation on site while also presenting the goals of the AIC. Conservators were on hand to discuss the poster and also to receive feedback from archeologists on conservation needs and challenges. The display itself was made with portability and flexibility in mind so that it can be modified to fit specific archeological audiences.

Conservators at the SHA display reported a high level of interest and received many helpful suggestions. It is hoped that the small display can travel to future regional and national archeological conferences and provide a further point of contact with the AIC and conservation community. Currently, brochures are also being developed to provide the same information to a much wider audience. For more information please contact the AIC office at AIC, 1717 K. St. NW Suite 200, Washington DC 20006, 202-452-9545, or visit the AIC web site at <infoaic@aicfaic.org>.

Jeffrey Maish is Associate Conservator of Antiquities, the J. Paul Getty Museum, Los Angeles, California.

Claire Peachey

Field Conservation on the *Housatonic* and *Hunley* Shipwreck Excavations

I dove every day, two times a day for two weeks in October 1999, on the site of the Civil War submarine *H.L. Hunley,* and did not see the submarine once. It was there; we were not in the wrong place. However, such was the blackness of the muddy South Carolina coastal waters that we could only feel the iron vessel, not see it. It takes a little time to get used to doing archeological conservation essentially blindfolded. As a diving archeological conservator, I was removing layers of rock-hard concretion—a mixture of marine organisms, sediment, and metal corrosion that had formed over time—from small areas of the submarine's surface in order to get information about the condition of the metal beneath. It was certainly one of the more challenging condition reports I've had to write.

Doing conservation with underwater archeologists means a conservator might work on a cramped and lurching boat, on a sandy beach, on a noisy platform miles offshore, or even 30 feet down in black, muddy water. Working underwater requires some adapting of traditional conservation methods and materials to get the job done. The problems are the same as on-land excavations: we need to identify, strengthen, support, lift, and stabilize fragile artifacts. But a slightly different tool kit is needed. For example, the water-based and solvent-based adhesives and consolidants that are the staples of on-site archeological conservation on land sites are useless underwater! Instead we use materials such as underwater-setting epoxies, plumber's pipe-repair tape, plaster of Paris, sand, mud, resin-impregnated medical bandages, silicone rubber, aluminum foil, dental molding putty, polysulfide rubber molding compound, scraps of wetsuits, and expanding polyurethane foam, to name only a few of the substances that can help to gather information or provide support and strength to objects underwater.

Working on the *Hunley* site in October, we could not see, we could only feel. Therefore, to gather condition information that was more than verbally descriptive and subjective, we used dental molding putty to take molds of the metal plates and rivet heads in the small areas of the submarine's surface from which we removed concretion. The two-part putty could be mixed underwater, pressed onto the metal surface, and pulled off after five minutes of curing. The molds were finely detailed, and provided technological and corrosion information the Oceaneering International engineers needed to refine their plan for raising the submarine from the seabed the following year, 2000.

During this short project, we did not raise any artifacts, so the conservation requirements were quite minimal. However, underwater arche-

Hunley *suspended in its lifting cradle after it was raised from the seabed. The backbone of the cradle consists of a steel framework with four legs. On the seabed, one at a time, 32 heavy nylon slings were placed under the submarine and attached to the steel framework. Extruded foam inserts, or "pillows" were formed-fitted to the hull surface for maximum support.*

Typical concretion from USS Housatonic.

ology can be a conservation-intensive undertaking if artifacts are raised, or even if structures and objects are only uncovered, studied and reburied, or are managed *in situ*. Materials that have been immersed in underwater environments for long periods have undergone significant chemical and physical changes, and generally do not react well to being brought into a new environment rich in oxygen, light, and heat. The deterioration problems are often not fully understood, and the required conservation treatments can be long and complex. Many times, an object is not even visible before some kind of conservation treatment is performed on it, so the conservator may be the first one to learn of the materials and details of an object. Underwater archeology is dependent on conservation procedures, so the two disciplines are closely intertwined. The archeologist cannot identify, and therefore cannot interpret, many objects before conservation.

Earlier in 1999, working a few hundred yards from *Hunley* on the site of USS *Housatonic*, the Union vessel sunk by *Hunley*, our team (from the Naval Historical Center, National Park Service, and South Carolina Institute of Archaeology and Anthropology) excavated nearly 100 artifacts from three small test excavation areas. These included leather shoes, a rubber gasket, zinc artillery fuses, wood fragments, a pistol of wood, brass, and iron, and several amorphous, heavily concreted objects ("concretions") that were unidentifiable—even after we brought them up to the surface and could see them. One long, curved concretion was almost certainly a sword. This project required a full-time conservation commitment, not only in the water, but also back on land, and long after the excavation season was over.

We knew that the *Housatonic* wreck would probably contain typical shipboard artifacts of many different sizes, shapes, materials, and conditions, and we had planned carefully for the excavation. This planning is the crucial first step in any excavation project, and always includes the archeologists and conservators, and possibly other specialists such as engineers, microbiologists, or geologists, depending on the scale and nature of the project. Working on shipwreck sites can involve handling objects from the tiniest button or textile fragment to enormous cannon, anchors, and ship timbers, or even entire ship structures. For the task of raising the 40-foot long, 16-ton *Hunley* intact from the seabed in August 2000, intensive planning by archeologists, conservators, engineers, corrosion scientists, geologists, architects, and many others began years before the operation.

For the *Housatonic* project, I had brought everything that would be needed for on-site conservation. This meant dozens of plastic, sealable, Tupperware-type containers and self-seal, Ziplok-type bags of every shape and size for individual artifacts, as well as larger, sturdy, stackable containers for bulk storage. Other essential waterproof supplies include Tyvek for tags, Mylar frosted drafting film for drawings, non-corroding brass nails for tagging wood or for custom-building crates, Sharpie permanent markers for waterproof and fade-proof writing, stainless steel tools that won't rust in the salt air and water, hard plastic slates for drawing underwater and for object supports, thin polyethylene foam for padding and support, and rolls of plastic sheeting for covering work tables, wrapping large artifacts, and lining makeshift storage tanks.

Leather shoe from USS Housatonic.

X-raying USS Housatonic *artifacts at the Medical University of South Carolina.*

Anchored four miles offshore over the wreck of *Housatonic,* our dive boat was small and was filled almost entirely with people, dive equipment, and the excavation dredge motor. There was little room for artifact storage, and artifact drawing was impossible on the choppy seas. The most that could be done on the boat was to keep a running log of artifact numbers, write identification tags as the artifacts were brought up, and store the artifacts safely in a box of sea water. When possible, the objects were immediately photographed. At the end of the diving day, we motored back to port, and then the conserving day began and continued into late evening. The objects were brought back to the dig house, where the conservation lab consisted of the kitchen sink and the back porch, both frequented by hordes of fire ants.

Usually the routine consisted of gently rinsing off loose mud and sand, then fully describing, drawing, and photographing each object. This is always the first priority for the objects: record, record, record. Objects from underwater environments can undergo rapid changes after excavation, sometimes with a loss of information. After the objects were cataloged, they were stored in basins of clean fresh water or sea water, depending on the material, in containers that would be used to transport them to the laboratory at the end of the field project.

On the *Housatonic* project, several days of rough seas kept us from going offshore to excavate, so this allowed time to do some active conservation on the artifacts and get some of them fully treated by the end of the six-week excavation season. I had brought a deionizing column and portable conductivity meter, so I began desalination (salt removal) of some materials such as coal, ceramics, glass, and copper-alloy. I also did some short chemical treatments of the ceramics that had organic and iron staining on them. When possible to do so without damage, I removed obscuring concretion to identify an object to help the archeologists interpret the excavation areas. This did not include the unidentified "concretions," which we knew would become damaged and unstable if we began breaking them apart without knowing what was inside.

Most of the conservation treatments could not be done without laboratory facilities. Many of the objects needed to be x-rayed for preliminary identification, followed by technological research, and then long treatment times sometimes using specialized equipment. Examples of typical treatment needs are desalination, concretion removal, polyethylene glycol impregnation and freeze-drying of organic materials, and electrolytic reduction of metals to remove corrosion agents. An added concern for the artillery fuses was that they might still be explosive. Many of the *Housatonic* objects are still being conserved and studied, with the archeologists and conservators working together to reveal and interpret the objects throughout the long processes.

On the *Housatonic* project we were extremely lucky in that the Medical University of South Carolina agreed to x-ray our concretions for us shortly after we had excavated them, so we could begin site interpretation that much sooner. That is when all the bets got paid up. The long, curved concretion that I just knew was a sailor's sword… was a plain old bent iron bolt.

Claire Peachey is Head Conservator, Underwater Archaeology, Naval Historical Center/National Park Service, Washington Navy Yard, Washington, DC.

Photos courtesy U.S. Naval Historical Center.

Vicki Cassman, Kristen Martine, Jennifer Riddle, Sali Underwood

Neglect of an Obvious Issue
The Storage of Human Remains

For museums and universities, the care and housing of Native American human remains recovered from archeological contexts have become an issue of the utmost importance since the enactment of the Native American Graves Protection and Repatriation Act (NAGPRA) in 1990. While anthropologists, museum managers, and Native American communities negotiate and struggle with NAGPRA issues, a publicly available housing standard has yet to be devised and agreed upon by these diverse communities. Published information regarding the care and storage of human remains is vague at best, and assessment of appropriate housing for human remains is compounded by a lack of communication between the different parties within anthropology and the Native American community. This lack of communication is especially apparent within anthropology, where each sub-discipline has a different and often informal "code of ethics" regarding the preservation and respectful housing of human remains, and no public consensus exists between sub-disciplines. The following article considers the issue of long-term storage and care of human remains in terms of preservation, NAGPRA requirements, and research needs.

Our discussion is inspired by a recent opportunity that was presented to the Department of Anthropology and Ethnic Studies at the University of Nevada, Las Vegas. Our existing building, which houses classrooms, a laboratory, and storage facilities, will be demolished, and a new building erected in its place. Planning a new building allows those of us working in the storage facility, which contains archeological and forensic collections, to make recommendations for upgrading storage. During our evaluation, we gave special attention to the housing of all human remains in the care of the Department.

Our primary goal was to identify and balance the concerns of Native Americans, the needs of researchers, and the cost and space limitations of storage. In light of this goal, we sought two specific genres of information. We first searched for published literature that would guide us in our assessment of preservation, storage, and size constraints as they related to the storage of human remains. Professional literature seems to focus mainly on excavation, transportation, and reconstruction (Bass, 1995; Ubelaker, 1989; White, 2000). Unfortunately, the literature neglects the issue of long-term housing of human remains. The second component of our evaluation involved assessing the needs of Native Americans, physical anthropologists, museum curators, and collection managers, conservators, and archeologists.

Discussion of Perspectives

Native Americans. Different tribes have different needs when it comes to demonstrating proper respect for a deceased individual. Therefore, it is important to consult with the appropriate tribes when considering specific housing needs. Consultations specific to our collections revealed that, in general, it is important for human remains to resemble a human form in storage. The bones should not be randomly scattered throughout the box, nor should different parts of an individual be stored in separate areas or containers. For example, crania are sometimes housed separately from the post-cranial skeleton. We have found that this arrangement is offensive and disrespectful to Native Americans and others. It is preferable that the body be presented in a manner that is as close to its position prior to excavation or retrieval as possible, keeping in mind that a box for a fully extended adult is too large and awkward to be safely handled. Finally, bone should be in contact only with inert organic materials.

Collection Managers and Conservators. The main concern of collection managers and conservators is preservation. They often make decisions about box materials, size, durability, organization, cataloging, and registration. Because our collective experience has shown that

handling causes the most damage to human osteological remains, it is vital to create an environment that allows access, while simultaneously reducing damage caused by excessive handling.

Limited space is also a major issue. Space constraints often require boxes to be placed or stacked on high shelves. With this in mind, it is important to realize that boxes may be tilted at sharp angles as they are removed from shelves. Proper storage must allow for tilting, while also preventing the contents of boxes from rolling around and becoming damaged. Providing sturdy, wide, platform-ladders is recommended to facilitate access under such circumstances.

Keeping collections clean is yet another challenge to collections managers. It is essential to have storage containers that are made of materials that are easy to clean. Dust tends to collect in the best of environments, so it is good to have the boxes and shelves made of a material that can quickly and easily be cleaned.

Archival housing at the most basic level starts with a storage box made from inert and acid free materials. The box must also be durable and able to support the weight of larger individuals, yet not be so heavy that it is difficult to maneuver.

Organizing collections in numerical order by catalog number greatly reduces the amount of time it will take to locate individuals. It is preferable to organize individuals numerically by catalog number rather than by age, sex, race, or some other variable because catalog numbers represent a clear and understandable system that does not make presumptions about a researcher's interests or specific questions. Having a sortable electronic database containing a biological profile (i.e. age, sex, and race information) as well as a bone inventory is recommended to reduce initial handling.

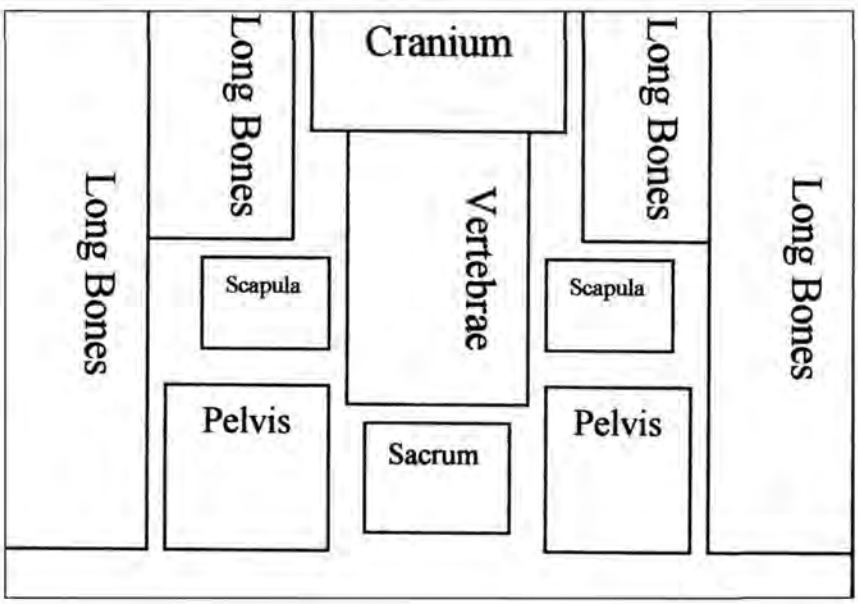
Physical Anthropologists. Time constraints and accessibility are two prominent concerns of physical anthropologists. Researchers often have a limited amount of time in which to study a given collection. Fiscal constraints related to the cost of conducting research limit the amount of time a researcher can spend with a given collection. The operating schedule of a repository, the time constraints of museum personnel, and the needs of other researchers may also restrict time.

Accessibility also influences the amount of time a researcher spends with collections. In addition to proper organization, it is essential that the storage container be of adequate size. Researchers often find it frustrating to waste valuable time trying to fit an individual into a box that is clearly too small. It is also helpful to have bones grouped together within a box. For instance, keeping the hand bones together and sorted by right and left sides, keeping the ribs together, and keeping the vertebrae together reduces the amount of time a researcher spends looking for and placing specific bones. Grouping also reduces the amount of handling a skeleton is subjected to and reduces damage to the bones.

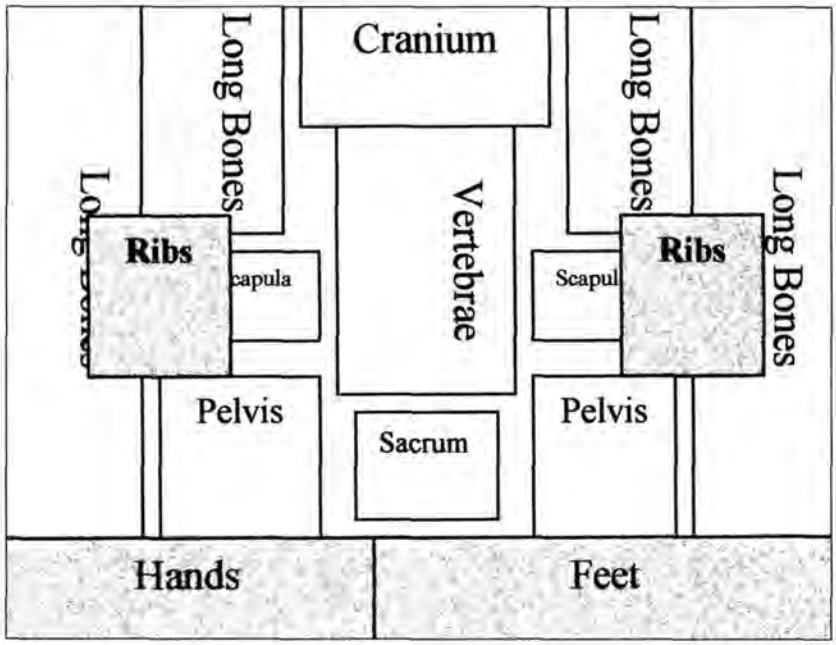
Conclusions

After reviewing the needs of the various groups interested in the long-term housing of human remains, we designed a storage box that we hope satisfies at least the most important concerns of these groups. We have focused on the issues of size, materials, and layout.

Size is an important aspect of box building. If the box is too small, there is a tendency to either split up the individual or to force remains into a space in which they do not fit. If the box is too large, then there is movement of material



Box without trays. Bones are separated by foam wedges that also keep the bones from shifting while the box is being moved.



Box with trays. There are separate trays for the right and left hands as well as separate trays for the right and left feet bones. The trays for each set of bones stack on top of each other.

within the box, which is damaging to the bone. Large boxes are also unwieldy and impractical for storage and handling purposes. Through continual experimentation, we have concluded that a box size of 31" x 24" x 6" is the most appropriate size given all the listed constraints. The box size is based on maximum long bone lengths of a complete male as defined by Ubelaker's stature table (Ubelaker, 1989:146).

We suggest the use of inert materials, as recommended by conservators. A corrugated polyethylene sheet, such as Corex, is an inert acid-free material that is reasonably priced, durable, flexible, lightweight, and easily cleaned. We also suggest adding a layer of open cell polyethylene foam, such as Ethafoam, to the bottom (and possibly sides) of the box for cushioning. To accommodate the concerns of Native American groups, we recommend placing a layer of well-washed and rinsed unbleached and undyed cotton muslin fabric over the Ethafoam to ensure that bone is in contact with organic material.

The layout of a box should accommodate both Native American concerns and the needs of physical anthropologists. We have compartmentalized and compressed the placement of bone elements, while prioritizing anatomical order. The cranium is placed at the top of the box and flanked by all long bones on either side. Below the cranium are the vertebrae and the pelvis. Scapula and clavicle are placed below long bones on the appropriate side. Sorted ribs, hand, and foot bones are organized according to right and left sides, and are placed in open trays above the long bones. This layout facilitates research by improving access and reducing the amount of time spent locating and placing bones, while also approximating the original anatomical position of the individual. Such a layout also minimizes handling and reduces the amount of damage to bones.

Summary

The housing of human remains, regardless of cultural affiliation, is a basic issue within anthropology that has not been standardized or actively discussed in current literature. Despite the indispensable function of a box, the issue of how to best create satisfactory housing has been sorely neglected. There is a tendency to see the box as an easily resolved non-issue. However, as we hope we have shown, there are many issues to consider when designing proper storage. The box we have designed is part of an ongoing project related to storage and housing issues. We plan to continue intercultural and interdisciplinary negotiations and further modify our design. We welcome feedback and would appreciate suggestions.*

Note

* Send feedback to <cassmanv@nevada.edu>.

References

Bass, William. *Human Osteology: A Laboratory and Field Manual.* Fourth edition. Columbia, MO: Missouri Archaeological Society, 1995.

Ubelaker, Douglas. *Human Skeletal Remains.* Manuals on Archaeology. Second edition. Washington, DC: Taraxacum Press, 1989.

White, T.D. *Human Osteology.* San Diego, California: Academic Press, 2000.

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Illustrations drawn by Jennifer Riddle.

Harriet F. (Rae) Beaubien

Integrating Conservation and Field Archeology

Insights from Central America

The over-arching reason to foster the integration of conservation and archeological field practices is to ensure that newly excavated materials, both moveable and immovable, are safeguarded for the future as meaningful sources of information about the past. While it would seem a natural fit, this collaboration has in fact been all too rare in field archeology in Central America until relatively recently. My experiences as an artifacts conservator with U.S.-sponsored projects in El Salvador, Honduras, and Guatemala[1] have given me an opportunity to reflect on the integration process, which in these cases began from scratch. Several factors that appeared to affect progress are presented and matched with some suggested strategies to increase the level of conservation-mindedness in field archeology. Although focused on the situation in Central America, many of these strategies are appropriate for excavations elsewhere, including the United States.

Copán, Honduras. Structure 16 showing tunnel access to excavation areas.

Factors Affecting Integration

Team structure. Most U.S.-trained archeologists working at Mesoamerican sites come out of a strongly anthropological tradition, grounded in a practice that emphasizes scientifically valid method to produce a fresh, well-controlled data set. As a result, the professional team may be composed primarily of research area specialists, without individuals specifically designated to carry out coordinated research functions such as artifact registration and conservation, as it was initially at Cerén (El Salvador) in 1989. Such a team structure may take a cue from funding sources that only support research.

Field preparation. The typological and chronological sequences underpinning current research in Central America have typically utilized ceramics and lithics, for these are the materials that survive in abundance in the American subtropics. Their relative hardiness, however, may have served to give archeologists a false sense of preparedness, when faced with particularly fragile examples or unexpected materials in complex deposits. Conservation approaches are still not regularly part of an archeologist's field training, either in textbooks, techniques classes, or field school situations, where new archeologists typically learn the practice. So, it is not surprising that they might rely on out-of-date sources for stabilization solutions or reconstruction materials, such as molten paraffin wax or white glue, without understanding the consequences.

Conservators, meanwhile, are still often trained with a bias toward singular items deserving specialized attention. This can be a limitation for a conservator working on site, who may be unaware of, choose to remain isolated from, or be ill-equipped to deal with, the full artifact inventory and its research needs, site preservation issues, or project information systems of which conservation records should be an integrated part.

Copán, Honduras. Conservator stabilizing basketry remains in a royal burial offering chamber within Structure 16.

Governmental guidelines. All of the Central American countries have endorsed cultural patrimony preservation and protection, e.g., by ratifying various conventions of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in national legislation. The specific application of these concepts to archeological practice is generally articulated in the permit regulations, drawn up by governmental authorities overseeing excavations (typically a national institute within a ministry). Currently, the regulations primarily address architectural actions, but thus far guidelines are not provided for situations necessitating conservation *in situ*, and curation standards for lifted artifacts are rarely mentioned.

It is notable that a heightened awareness of preservation issues exists at sites with World Heritage designation, such as Cerén and Copán (Honduras). UNESCO specifies that a management plan be developed, which balances the preservation needs of the site's cultural property, with tourism development and on-going research; but it offers no direct assistance to governmental authorities in formulating or implementing details of such a plan.

Conservation resources. The primary conservation resource in most Central American countries is a central laboratory, typically part of the national institute and often in the national museum. Since most projects lack a participating conservator, central laboratory personnel may be brought in to provide advice when conservation issues arise in the course of excavation. Generally, more expertise is available for architectural issues, in part because of a longer history of focus on this aspect and the existence of professional architecture programs. Conservators of other materials are typically apprentice-trained, with occasional access to regional workshops whose focus is museum practice, such as aesthetically-driven approaches to ceramics conservation. As a result, recommendations in an archeological setting may not be framed with regard to their impact on research priorities, and experience in dealing with issues posed by material *in situ* is still limited.

Strategies to Promote Integration

On-site integration. The particular issues presented by archeological materials should be part of a conservator's training, just as conservation issues should be part of an archeologist's training. Courses and workshops may be adequate to convey specifics, as a starter, but it has been my experience that the lessons and benefits for both sides are best realized through sustained contact during the course of a field season.

At the outset, planning the finds processing path—from excavation, handling, bagging, washing, and reconstructing to packing away in storage—offers an important opportunity for dialog between archeologist and conservator. Because choices made at each step have the potential to impact research value, by alterations (good or bad) that are potentially introduced, this is a chance to clarify research goals and procedures for every type of material, as well as priorities for more focused conservation attention.

The project's information system is another arena for integration. Details about how an artifact was processed should be part of its record, along with provenience and other technical observations and analysis; all of these form its research value. An integrated documentation system, along with a well-thought-out finds processing system, and project documents that report these aspects,[2] promote awareness of the conservation component of responsible archeological practice at a time when ethics and curation standards are increasingly being discussed.

Collaborative research. A conservator brings considerable diagnostic skills to a preservation problem, which include characterizing component materials, elucidating technology and recognizing traces of use in artifacts that have altered significantly with time and burial. This information, often more extensive because specialized lifting techniques were used, forms the basis of one of the most powerful strategies for promoting integration on site: materials-based research that is carried out and published collaboratively by archeologists and conservators.[3]

Copán, Honduras. Conservator working in a royal tomb within Structure 26.

Funder priorities. Those who have experienced the benefits of such collaborations might consider advocacy at the funder level for active support of conservation as part of project budgets. An argument could certainly be made on the basis of research contribution, such as the Cerén, Copán, and Aguateca (Guatemala) projects have found, until such point as responsible archeological practice is acknowledged by granting agencies as reason enough to provide support.

Governmental standards. One final strategy involves working with key personnel in the national institutes that oversee archeology activity. Countries such as El Salvador and Guatemala have negotiated bilateral agreements with the U.S. to impose import restrictions on cultural material. These agreements include facilitated access to technical expertise and training related to cultural patrimony protection and preservation. With assistance of U.S. conservators, the national institutes could develop improved standards for projects seeking permits, such as artifact curation requirements or mandated conservation participation. Conservators working in the field, in turn, would be positioned to train others whose access to knowledge about field conservation may be limited.

Photos by the author.

Conclusion

The ripple effect of any of these strategies should never be underestimated. Whether from visits to projects that happen to have conservation labs, talks at professional meetings, chapters in field season research reports, or co-authored publications, those archeological projects without conservators often find parallels with their own excavation situations—ones that could have been handled differently or could be anticipated—and thereby discover a resource network to tap. These new opportunities increase the number of available work sites for field conservators. Ultimately, it is the excavated materials that benefit from the integration of our work, through improved recovery, enriched research, safer display, and better storage, for a longer future as sources of meaningful information about the past.

Notes

1 Archeological projects cited, with principal investigators, and dates of authors involvement:
Cerén Research Project, Cerén, El Salvador [Dr. Payson D. Sheets, University of Colorado/Boulder], 1989-1997; Early Copán Acropolis Program, Copán, Honduras [Dr. Robert J. Sharer, University of Pennsylvania Museum], 1992-1997; Copán Acropolis Archaeological Project, Copán, Honduras [Dr. William L. Fash, Harvard University], 1993-present; Aguateca Archaeological Project, Aguateca, Guatemala [Dr. Takeshi Inomata, University of Arizona], 1998-present.

2 Examples of conservation chapters in field season research reports: Beaubien, H., S. Hornbeck, and E. Robertson, "La conservación de artefactos." In T. Inomata, ed., *Informe del Proyecto Arqueológico Aquateca: La Temporada de 1998* (Instituto de Antropología e Historia de Guatemala, December 1998), 67-72; E. Kaplan and H. Beaubien, "Artifact Conservation 1994." In P. Sheets and L. Brown, eds., *Preliminary Report of the Cerén Research Project, 1996 Field Season and 1994 Study Season* (Boulder: Department of Anthropology, University of Colorado, 1996), 18-25.

3 Examples of published research collaborations between archeologists and conservators:
Fash, W., H. Beaubien, C. Magee, B. Fash and R. Williamson, " The Trappings of Kingship among the Classic Maya: Ritual and Identity in a Royal Tomb from Copán." In P. Drooker, ed., *Fleeting Identities: Perishable Material Culture in Archaeological Research* (Carbondale, IL: Center for Archaeological Investigations, Occasional Paper No.28, 2001), 152-169; Beaubien, H. and M. Beaudry-Corbett (forthcoming spring 2002), "Artifacts Made from Plant Materials." In P. Sheets, ed., *Before the Volcano Erupted: the Ancient Cerén Village in Central America* (Austin: University of Texas Press), Chapter 17.

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J. Claire Dean

Rock Image Conservation at Petroglyph National Monument

Rock images, also known as rock art, are usually found as petroglyphs (images incised, pecked or abraded into a rock surface), pictographs (drawn or painted images), or images created combining aspects of both forms within a single glyph. A third category are geoglyphs, or ground figures— designs created by placing rocks on, or removing them from, a ground surface resulting in alterations in texture, dimension, and color that form an image.

Due to the inherent nature of rock images—their size, location, and historical and contemporary use—their conservation presents some unique problems for the conservator and land manager. With the exception of individual images collected in the past (when to do so was considered acceptable practice), rock images are no longer collected, reducing them to objects that are gathered and placed in museum collections to be managed and conserved as individual articles of cultural heritage. Today, such actions are not accepted as ethical, except under the most extreme situations, such as a site's imminent destruction due to land development. Even then it is common for strenuous efforts to be made to find an alternative to the demolition of the site.

Thanks to recent re-evaluation of the archeology, the ethnographic record, and consultation with Native Peoples, we now better understand the importance of context with regard to the meaning and function of rock images—information that is vital when planning appropriate conservation. The images and their context are culturally inseparable. They are an integral part of the landscape in which they were created, often placed in carefully chosen locations associated with, even incorporating, natural features. A petroglyph of an animal might be created to include a ridge in the rock to form its spine, giving it a three-dimensional quality, or images might be deliberately placed so as to appear to emerge or disappear through natural holes or fissures. In southern California, a site depicting water creatures is situated in the path of a seasonal spring that when active, flows over the images—an association which is hard to pass off as coincidental.

Since rock images are located outdoors, the nearest preservation comparison might be the conservation of buildings and monuments. Although the conservation approach and materials applied to structures are often of use with rock images, they also are frequently not applicable because, unlike most structures, rock images are more intimately executed on and into living landforms. Buildings and monuments are most commonly constructions that stand alone, inserted into a space and retaining a certain amount of physical independence from the surrounding natural terrain. Put simply, they are giant objects. If you were to try to define rock images in terms of being "objects," then their demarcating boundaries would be those of the geology, biology, and environment of an entire geographic region.

The sheer size and physical complexity of rock images make cooperative work between various entities essential for a conservator. The need for this integrated approach to treatment is further emphasized by the continued use of rock images by Native Americans. The concerns of these traditional owners must also influence how the conservation of these places is undertaken.

Petroglyph National Monument in Albuquerque, New Mexico, authorized in June 1990, has demonstrated a proactive approach to conservation since its earliest days. The monument, managed through a partnership between the National Park Service and the City of Albuquerque, Open Space Division, and mandated to protect over 15,000 petroglyphs within its boundaries, has a long history of working with conservators to preserve the images. In 1992, the Open Space Division asked me to provide general conservation advice.

Conservation treatment began soon after with the enthusiastic support of staff from both managing agencies. Painted graffiti was dealt with first, as it was the most visually obvious and roused the most public outcry. Soon afterward, efforts were expanded to tackle the scratched graffiti. Re-integration methods already commonly in use were adopted, but met with mixed success due to the extreme environmental conditions at the monument. Recently, the monument has supported a five-year-long project to develop and field test longer-lasting re-integration methods and materials for the treatment of scratched graffiti. This has involved a second conservator, John Griswold, of Griswold Conservation Associates.

Since the beginning of the project, monument staff members have been actively involved working with the conservator to attain a certain level of skill in-house, thus enabling staff to tackle some of the problems themselves, especially when new graffiti occurred. In 1995, I was asked to hold a training workshop for the monument staff, thereby providing formal instruction in both materials and methods, and as importantly, background information about the basic principals and approaches of professional conservation practice.

Throughout the conservation work at the monument, treatments have been undertaken with careful consideration of the concerns of Native American communities in the area, with whom the monument staff are involved in on-going consultation. This project provides an excellent case study of conservation treatment not being approached as a "quick fix as needed" answer to the care of cultural property, but rather as an integral part of the on-going management of a major cultural resource.

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Managing Archeological Collections Distance Learning

This online technical assistance and distance learning effort covers a wide range of issues and activities involved in caring for archeological collections. These include planning strategies, conservation, ownership of collections, accessioning and deaccessioning objects, curation costs, digital records, and many others. The course focuses on the objects, records, reports, and digital data in the field, lab, office, and repository. This "one-stop shopping" effort is designed to help archeological professionals and students learn more about preserving and managing archeological collections over the long term.

Managing Archeological Collections <www.cr.nps.gov/aad/collections/> consists of 10 sections, such as "Relevant Laws, Regulations, Policies, and Ethics," "Today's Key Issues," "Curation Prior to the Field," and "Access and Use of Collections." Each section has an extensive bibliography, a page of links to related web sites, and a review quiz. There is also a large glossary of key terms that is linked throughout the site.

This distance learning effort covers issues related to conservation of archeological material remains and records in several sections, including "Curation Prior to the Field," "Curation in the Field and Lab," "Repositories: Functions and Policies," and "Collections Management." Unfortunately, the conservation of materials from submerged contexts is not adequately discussed due to a lack of subject matter expertise by the web site creators. They hope to work with conservators to fill this important gap in the near future.

This web site is the product of the Archeology and Ethnography Program, National Park Service. It benefited enormously from extensive review by many colleagues who generously gave their time and expertise. It will be updated as colleagues provide additional, pertinent information for publication.

Terry Childs
Archeologist
Archeology and Ethnography Program
National Park Service

Kent J. Severson

Archeological Conservation at the NYU Excavations at Aphrodisias

Aphrodisias lies in southwestern Turkey, in a fertile valley 100 miles southeast of the port of Izmir. Famous for its sanctuary of Aphrodite, the city enjoyed a long and prosperous existence from the 1st-century B.C. through the 6th-century A.D. Professor Kenan Erim began the modern archeological exploration of Aphrodisias in 1961, under the aegis of the New York University Department of Classics. In the course of his work at the site, he uncovered many well-preserved buildings in the city center, including the Bouleuterion, Theater, and Sanctuary of the Emperors (Sebasteion).[1] These excavations also brought to light the numerous marble sculptures for which Aphrodisias is famous.

After the death of Professor Erim in 1990, the New York University Institute of Fine Arts assumed sponsorship of the exploration of Aphrodisias in cooperation with the Faculty of Arts and Science. Current work at Aphrodisias includes the study and conservation of sculpture and structures, as well as new fieldwork. The goals of the new program of fieldwork are to record and conserve the excavated buildings of the site and to investigate the ancient city plan and urban development.[2] As the fieldwork progresses, new artifacts and decorative elements are uncovered, and previously excavated artifacts are again the subjects of study, all of which require conservation.

Sculpture workshop/depot at Aphrodisias with draped female portrait sculpture (1996).

Conservation activities at Aphrodisias focus on three main areas, all of which share personnel and facilities:

- sculptures
- buildings and *in situ* decorative elements, and
- small finds

Trevor Proudfoot, of Cliveden Conservation Workshop, Ltd., England, supervises sculpture conservation. Many of the sculptures at Aphrodisias were hastily reassembled shortly after excavation using epoxy and polyester resin adhesives, iron or steel dowels, and resin mortar or plaster of Paris compensation. There is very little documentation related to these early treatments and in many cases the sculptures were incorrectly assembled and are now unstable. Removal of these materials and the development of new installations for the Aphrodisias Museum are essential for long-term preservation and better understanding of the sculptures by both scholars and the general public.

In 1994, a new workshop/depot for sculpture conservation was completed in the excavation house compound. Major projects undertaken in this building have included treatment of a well-preserved portrait sculpture of a young noble and an associated draped female portrait, a large Himation statue, and life-sized portraits of two boxers. In 1999, the first panel of a series of approximately 60 sculpted panels uncovered in the Sebasteion was treated; these reliefs will be the focus of sculpture conservation activities for several years to come.

In 1993, personnel from Cliveden Conservation initiated a program of wall stabilization and maintenance for standing structures on the site. Most of the buildings discovered in the early years of excavations have remained exposed with little or no protection for the last 20-30 years. Using lime mortar that nearly duplicates the mortar used in the original construction of typical wall fabric, as well as materials and local workers, the system was first implemented in the conservation of a late Byzantine church between 1994 and 1995. Since then, a late

Reconstructed monumental gateway, or Tetrapylon, during maintenance operations in 1998.

Roman house north of the Temple of Aphrodite and the public buildings to the east of the Bouleuterion have been treated. This work is currently supervised jointly by Cliveden staff and myself as senior field conservator. During the 2000 season, with the generous support of a Samuel H. Kress Foundation award through the World Monuments Fund, work was begun on the conservation of the Bouleuterion, beginning with the stabilization of the massive limestone piers of the stage building. This program will continue in coming seasons and include treatment of marble revetments and replacement of the numerous aging repairs to the seats.

Concurrent with the wall stabilization program, *in situ* decorative elements, such as wall paintings, revetments, opus sectile floors, and mosaics, are regularly treated. Mosaics are cleaned and, where necessary, consolidated and edged using lime mortars derived from the modern lime mortar used in wall stabilization. The current program of research at Aphrodisias does not include development of new roofing structures that would allow for display of *in situ* mosaics to the public. Therefore, both newly discovered mosaics and those from earlier excavations that have been cleaned for study are usually protected by reburial, with geotextiles next to the original materials, followed by layers of clean sand and soil. Between 1996 and 2000, wall paintings in the apse corridor of the Basilica Church of Aphrodisias (the converted Temple of Aphrodite), in the substructure of the stadium, and in the Theater and the Theater Baths were consolidated and edged.

One of the most prominent monuments at Aphrodisias is the reconstructed Tetrapylon. The building was reconstructed during the late 1980s, but had not been inspected or maintained since completion of the work in 1989. The Tetrapylon was scaffolded one half at a time in 1998 and 1999, and inspected by the restoration architect, Tomas Kaefer, and myself. Together with this inspection, the condition of the monument was documented, surfaces cleaned, and repairs made to joints between the elements.

Since 1996, small finds, such as coins, ceramics, smaller sculptures, iron and bronze artifacts, and glass, have been treated in a new, well-equipped laboratory located in the yard of the expedition compound. Student trainees, primarily from the New York University Institute of Fine Arts Conservation Training Program and, in recent years, from Ankara University's conservation training program and the Middle East Technical University (Ankara) archaeometry program, have been a welcome addition to the Aphrodisias conservation team. Under my supervision, these students work primarily on small finds, but also participate in other projects as the need arises.

At Aphrodisias, conservators are charged with the care and preservation conservation of the accumulated artifacts, sculptures, and exposed buildings of 40 years of exploration, together with new finds yielded by ongoing research and excavation. A project that sometimes feels like an overwhelming burden is made possible through teamwork and the pleasure of living and working in a beautiful setting with materials from a beautifully preserved ancient city.

Photos by the author.

Notes

1 Professor Erim's work is summarized in: Kenan T. Erim, *Aphrodisias: City of Venus Aphrodite* (New York and Oxford: Facts on File, 1986).

2 For the most recent account of ongoing work at Aphrodisias, see: R. R. R. Smith and Christopher Ratté, "Archaeological Research at Aphrodisias in Caria, 1997 and 1998," *American Journal of Archaeology*, 104: 2 (2000): 221 – 253.

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Catherine E. Magee

The Diverse Roles of an Archeological Conservator

Most people I meet think my work as an archeological conservator simply involves reassembling broken pottery or stabilizing materials post excavation in a museum. While these are a few aspects of archeological conservation, they really are only a very small part of my work. A conservator's involvement can vary widely from archeological excavation to excavation. The role a conservator plays depends on the site conditions and the condition of the artifacts and their intended use by archeologists, researchers, and native communities. I have chosen three excavations I have been involved with in Israel, Egypt, and Honduras to highlight the diverse roles a conservator can play on excavations.

Advanced planning is part of each excavation whether it is overseas in remote areas or minutes from a metropolis. No matter the type, scope, or length of work an excavation involves, all digs require consultations between the conservator and archeologist to ensure goals can be met and any specialized equipment or supplies are purchased. Additionally, advanced planning streamlines work in the field and ensures the appropriate care of our cultural heritage during and after excavation.

The author excavating the burial dais in Copán, Honduras.

Tel Zeitah, Israel

The work at Tel Zeitah, Israel, may be what many people consider a typical involvement of a conservator in an excavation. In a continuing project such as this, the conservator's role is to establish and refine a working field laboratory for a multi-year seasonal excavation. Establishment of a working field laboratory involves the advanced planning mentioned above. The conservator can determine necessary analytical equipment by research on nearby sites to determine typical burial conditions in the area. For example, at Tel Zeitah the salinity of the soil was a concern because the site is adjacent to agricultural fields. Ceramics and metals were expected; when excavated from saline soils these materials will deteriorate without treatment. With knowledge of soil conditions and expected artifacts, a conservator can plan and budget for appropriate materials used to safeguard the long-term preservation of the archeological record.

Once on site, the conservator sets up the lab and reviews previous season's finds, documentation, treatments, analyses, and storage and then begins on artifact backlogs and newly excavated finds. In conjunction with lab work, the conservator is often called into the field to lift fragile artifacts or identify materials prior to excavation.

In addition to artifact treatment, the conservator works with other staff, including the ceramic specialists, registrar, photographer, computer specialist, botanist, and faunal analyst as well as volunteers and students to aid in their work and research. They can also establish protocols for the current and future seasons.

Once the season ends, it is the responsibility of the conservator to ensure that the artifacts are stored properly and to document all work conducted on artifacts in the form of treatment records and a final report for future records.

The "Conservation Lab" at Giza.

Howard University Giza Cemetery Project, Giza Plateau, Egypt

The second project to be highlighted was conducted at the Western Cemetery of the Giza plateau in Egypt. This one-season project's main purpose was to record and check an area previously excavated in the early 1900s. Because few artifacts were expected, a minimal conservation lab was set up on site. However, as the season progressed, numerous tomb shafts overlooked in the early 1900s were located and excavated yielding human remains and re-used painted limestone blocks. The conservator aided and advised in the excavation of the human remains while working closely with the physical anthropologist to clean the bones for examination. Organic material associated with one body was preserved. This material was examined *in situ* and post excavation, and it was lifted both separately and with some areas consolidated with a polymer to allow for further examination and research if authorized by Egyptian authorities. As with most excavations overseas, removal of samples for analysis is strictly controlled by government agencies and in the case of Giza no samples can be taken from the plateau for analysis even within Cairo. These unexpected finds highlight the need for foreknowledge of potential artifacts because a good microscope and a few chemicals can allow for preliminary analyses and identifications to be made on site.

Photos courtesy the author.

Structure 10L-26 Tomb Excavation, Copán, Honduras

The final example represents comprehensive involvement by conservators, and is illustrative of the wide-ranging benefits a conservator can provide. The main aim of the work conducted by the author in Copán, Honduras, in 1996 and 1997, based on work begun by conservators and archeologists in 1990, was to excavate, analyze, and house materials from the burial dais from a late classic royal Maya tomb. This project is illustrative of the collaboration between conservators, archeologists, and numerous other professionals in order to address ethical considerations, deal with safety issues during excavation, and synthesize past documentation and research.

While it is uncommon for a conservator to completely excavate a deposit, it is within the realm of our expertise. The Copán project encompassed not only establishing excavation protocols and procedures but also completing analyses on excavated materials, properly storing excavated materials, and ensuring the health and safety of co-workers in a hazardous area working with hazardous material. A careful and collaborative approach was used to ensure the maximum information was gained and recorded before, during, and after excavation. Excavated materials were stored using appropriate storage materials for both the artifacts themselves and the tropical climate, while maintaining accessibility for researchers and native communities. In combination with this, the conservator also redesigned, cleaned, and painted the storage space for excavated materials including designing, creating specifications, and overseeing the fabrication and installation of metal storage units. Additionally, the conservator planned, designed, transported, and installed a new exhibit in the local museum, and instructed conservation and archeology students in field conservation theory and techniques.

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Howard Wellman

Conservation and Materials Identification in the Field

A Maryland Case Study

Any archeologist can tell you that the scarcest commodity in any project is time in the field. It stands to reason, then, that timely identification of critical materials found during excavation is well worth the expense, since it can have a direct impact on the interpretation of past activities at the site, direction of the digging, and the focus of resources.

The modern academic-trained conservator, with grounding in chemistry, art, physics, and material sciences, has training in instrumental analysis, photo-documentation, and microscopic examination. Conservators also have a whole suite of manual and artistic skills and their hallmark attention to detail. Armed with a few simple tools common to most labs and many field schools, conservators can bring these skills to any field project, and make a valuable contribution.

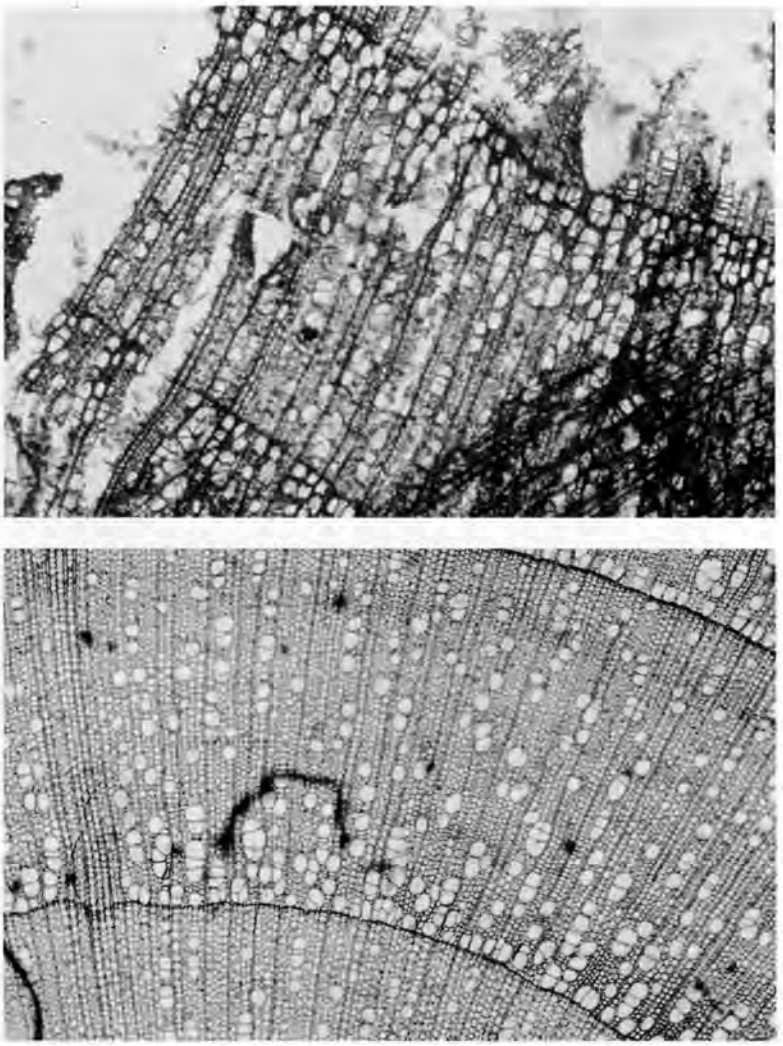
Identifying charcoal samples using a reflected light stereomicroscope. Note the photographic attachment for documenting features, and the reference materials to aid identification.

One major contribution can be the examination and identification of excavated materials on site. For example, different metals and their alloys can be identified by means of their corrosion products, specific gravity, or chemical reactivity. This requires only simple microscopy, or a sensitive balance, or a small kit of reagents. The potential benefits are great: determining the level of a culture's metallurgical sophistication or identifying conservation issues before they become problems (and artifacts are lost to poor handling and tardy treatment). Organic materials can also be identified; the animal from which a fragment of leather came can be identified with low-power microscopy. Since different leathers are used for different purposes, this could have bearing on the interpretation of site use, understanding husbandry practices, and past environmental conditions.

This article, however, will focus on the identification of wood species from archeological samples, and the contribution of this specialized skill to archeological fieldwork. Wood is one of the most widely used materials throughout history. It can typify the environment in which humans lived and worked. It is used to make household items, tools, shelters, and transport. As fuel, it is used for cooking, home heating, or in industrial processes. Some trees provide necessities other than wood: seeds, nuts, and fruits for the sustenance of humans and livestock, bark or leaf fibers for textiles, and cordage. Resins are used for incense, coatings, adhesives, and sealants. And the internal structure of wood contains information about changing environmental conditions and the passage of time. The identification and examination of wood samples in the field, therefore, can make significant and timely contributions to the interpretation of the site.

Wood Structure and Identification

Wood has a structure that is heterogeneous in three dimensions, and this structure is signifi-



Comparison of a degraded archeological sample (top) to a reference sample of alder (alnus spp).

cantly different between individual genus and species of tree. This means that with at least one, and more often two or three views of a sample, the genus and species of wood can be determined.

The detail (genus or species) to which a sample is identified may be justified by the information needed. Family or genus identification may be enough to describe the environment in which the tree was growing (temperate conditions favor different trees over tropical or sub-arctic climates) and annual temperatures and rainfall can affect the width of annular rings, leaving a permanent record of climatic trends. On the other hand, specific species of wood were preferred for different technologies, e.g., shipbuilding versus food bowls. Analysis of the variety of woods found at a site can determine the use to which they were put (e.g., ash or maple shavings might suggest small item manufacture; oak shavings might suggest larger, sturdier items like barrels or structures), or may determine the use of a piece within a larger structure (e.g., the hull planking of a ship might be made of oak and the deck planking of teak). The presence of exotic species could also have implications of trade, since some woods are highly valued for their strength, weather resistance, or their appearance when used in decorative arts. Samples of wood or charcoal that are intended for dendrochronological analysis should also be identified as minutely as possible, since not all woods are suitable. Many dendrochronological records (particularly in Europe and the Mediterranean region) are derived from oak, and cannot be easily compared to other species of wood. Proper identification before submitting them for analysis can save both time and money.

While some wood can be identified directly from the artifact, removing samples is necessary for precise identification, and for high magnification viewing. This is a destructive process, since the samples cannot be replaced. With freshly cut or worked wood, the macroscopic and low-magnification (x2-10) features (annular rings and vessel groups) can be enough to determine genus, and sometimes species of some distinctive woods. Other important macroscopic features may also include the color and odor of the wood. Unfortunately, archeological samples often are obscured and decayed, and these features, especially color and odor, cannot be used easily. Good references or reference collections are crucial, since decayed wood can differ significantly from new wood, obscuring critical features.

Case Study

Recent Phase II excavations at the Old Chapel Field sites in St Mary's County, Maryland (18ST233 and 18ST329), found direct evidence to identify this location as the site of one of the first Jesuit missions in Maryland.[1] One of the features investigated was the cellar of a late-17th- to early-18th-century structure. Among the diag-

nostic artifacts were two fragments of building timbers—a post and a sill.

The wood samples from Old Chapel Field were brought to the Maryland Archaeological Conservation Laboratory, which was both "home" for the archeological team and the ultimate repository of the artifacts recovered. There, the wood was identified by thin-section microscopy as one of the species of southern yellow pine, known variously as loblolly, shortleaf, longleaf, slash, and pitchpine.

The architecture of Chesapeake farmsteads is increasingly well documented, and the settlers themselves left clear descriptions of what building styles and materials survived best in this semi-tropical climate (Carson, et al. 1981; Stone, 1982; Stone, et al. 2000). Vernacular architecture developed in response to the poor survival rate of traditional English framed houses that succumbed quickly to rot and termites. Additionally, the settlers' tool kits helped determine the wood used, as different woods are easier to work with different tools.

Despite its common use today, pine was not a favored wood for construction in Colonial America. The high resin content made pit-sawing extremely difficult as compared with poplar, and it did not shape well by splitting or ax-shaping as compared with oak. As a softwood, it was easily destroyed by rot and termites when left in contact with the ground, compared with chestnut, black locust or cedar (also a softwood, but with particular rot resistant properties still valued today). To find pine in use as both post and sill has several consequences.

The vernacular architecture in the Chesapeake area often relied on heavy posts, rather than earthfast sills, to support the rest of the structure. Any sill will rot quickly in contact with the earth, and posts relied on their larger volume (but smaller surface area) to increase their life span. The presence of pine in both post and sill strongly suggests that this was a cheaper, more expendable structure. Even if the building had dated from the post-Revolutionary period when mill-sawn pine was more common as a building material, pine as an earthfast member still suggests that "the builder was not thinking of a very permanent solution...a rare, but not unheard of occurrence."[2]

The identification of the wood helps to confirm the archeological interpretation of this building as an impermanent structure. It also adds to the growing body of information about architecture and building styles in the late colonial period of Maryland's history.

Conclusion

Wood identification is only one of many conservation procedures that can be easily transferred to a field project. For quick diagnostic purposes, basic laboratory tools like balances, microscopes, and simple chemistry can be used to examine, identify, and interpret many artifacts. Conservators, trained to be multi-faceted with the experience and practice in performing precise, delicate tasks, can be crucial to enhancing the data recovered during those all-too-short field seasons.

Notes

1 Julia King, personal communication, 2001.

2 Willie Graham, personal communication, 2001.

References

Carson, C., Barka, N.F., Kelso, W.M., Stone, G.W., and Upton, D. "Impermanent Architecture in the Southern American Colonies," Winterthur Portfolio 16 (1981), 135-196.

Stone, G.W. 1982. Society, Housing and Architecture in Early Maryland: John Lewger's St. John's. Unpublished Ph.D. dissertation, Department of American Civilization, University of Pennsylvania. University Microfilms International, Ann Arbor, Michigan.

Stone, G.W., H.J. Heikkenen, W. Graham, and J.A. King. Early Chesapeake Housing and the Evolution of the Virginia House, c. 1607-1730, unpublished paper presented at the Annual Meeting of the Society for Historical Archaeology, 6 January 2000, Quebec, Canada, .

Bibliography

Hoadley, R. Bruce. *Identifying Wood: Accurate Results with Simple Tools.* Newtown, CT: The Taunton Press, 1990.

Odegaard, N., Carroll, S., and Zimmt, W.S. *Material Characterization Tests for Objects of Art and Archaeology.* London: Archetype Publications, 2000.

Panshin, A.J. and De Zeeuw, C. *Textbook of Wood Technology*, 4th ed. San Francisco: McGraw-Hill Book Company, 1980.

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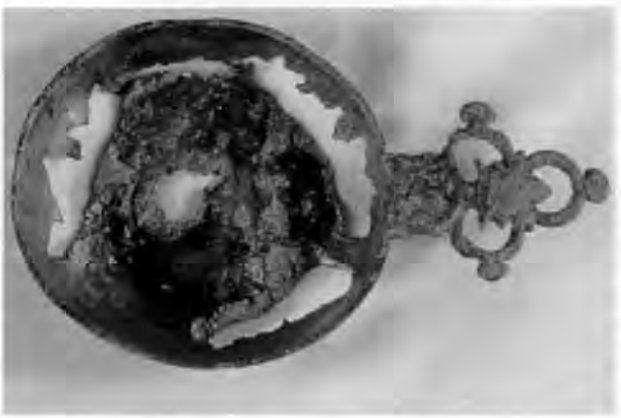
Photos by the author.

Emily A. Williams

Documenting an Early Cooking Disaster
The Conservation of the Meaux Site Porringer

In the past, archeologists, and others outside the conservation profession, have often viewed archeological conservation as an exercise aimed simply at preserving the morphology of an artifact.[1] This definition has often overlooked the profound contributions that a trained conservator can make to the interpretation, or re-interpretation, of both artifacts and sites. Re-interpretation of an artifact may occur as a function of the condition assessment carried out in the course of deciding on a treatment method, or it may be based on information that becomes obvious during the treatment process, such as evidence of a coating. The conservation of the Meaux site porringer illustrates this process and demonstrates the information that conservation can add to the story of the site as a whole.



Meaux site porringer after treatment with remnant of pewter spoon visible in base. Photo by the author.

In 1991, while the then landowner was landscaping his property, a feature was revealed on the Meaux site, a 17th-century domestic site located on the banks of the Pamunkey River in New Kent County, Virginia. Several artifacts were unearthed, including a metal porringer, which were brought to Colonial Williamsburg for identification. The artifacts were placed on long-term loan to the Colonial Williamsburg Foundation and it was arranged that Colonial Williamsburg's Department of Archeological Research would excavate the feature, and analyze and conserve any artifacts found therein. The feature, excavated over the course of two weeks, proved to be a cellar, containing over 2,000 artifacts, the majority of which dated to between 1680 and 1690.

Historical research, carried out in tandem with the excavation, indicated that John Meaux, the first known owner of the site, and his sister immigrated to Virginia from England sometime prior to 1707. He was granted 200 acres in 1713 and the land remained in his family until the 19th century. The research appears to suggest that the cellar predates Meaux's ownership and was perhaps filled in as a result of his acquisition of the land.

The porringer initially went to the Department of Collections for study and examination and remained there for approximately two years. During this time it was classified as a pewter porringer of a specific type, according to Ronald Michaelis's classification scheme for pewter porringers.[2] This identification was made, despite the thick layer of beige colored clay that covered the artifact, partly on the basis of a small amount of white metal visible in the bowl, partly as a result of the porringer's close conformation to known pewter porringer types, and partly because of a rectangular extension between the body of the porringer and the handle which, although exaggerated, had parallels in other pewter porringers.

By the time conservation began on the porringer, small amounts of dirt covering the object and, in particular, the handle, had been lost and the dirt beneath exhibited a greenish color generally associated with copper corrosion. Although copper corrosion will precede that of either tin or lead, the volume of copper present in 17th-century pewter was rarely higher than 10% and generally less than 3%, an amount that would be unlikely to account for the degree of discoloration seen in the soil.[3] Two small test areas, one on the handle and one in the bowl, were mechanically cleaned. The size of these areas was kept to a minimum as 17th-century pewter could con-

tain up to 26% lead, and it was felt at the time that the lab was not equipped to accommodate the safe cleaning of large amounts of this material by mechanical means. The test area on the handle revealed a tinned metal surface with some indications of a copper substrate, although due to the size of the area it was difficult to make out. Small amounts of fibrous malachite, a corrosion product occasionally seen on cast copper alloy objects, particularly Chinese bronzes, were visible in the dirt overlaying the handle. The test area in the bowl was located near, but not directly adjacent to, a patch of the silvery metal and revealed yet more of the silvery metal. The object was also x-rayed. The x-radiographs showed pools of dense, radio opaque material in the bowl surrounded by areas of medium density material. The walls and handle of the porringer were significantly less dense.

At this point, both curators and conservators were mystified. The handle of the porringer showed signs of being copper alloy, while the bowl appeared to be pewter. Not only was this not a recorded type, but it would also have been hard to construct particularly as the x-ray showed no signs of rivets between the bowl and handle.

With the owner's permission, a small splinter of metal, roughly one millimeter by one millimeter was removed from an area of loss, mounted in a resin block, and polished for metallurgical analysis. Compositional analysis using Energy Dispersive X-ray Fluorescence (EDXRF) was undertaken at the Freer Gallery of Art in Washington, DC, on the sample and the porringer itself. Using EDXRF, primary x-rays are fired at the object/sample, displacing electrons from the inner orbitals of constituent atoms. This leads the elements to gain energy, which is released as secondary or fluorescent x-rays. Elements can then be identified by the wavelengths they produce.

The resin-mounted sample revealed that the white metal seen in the base had melted over and into another metal that appeared to be a copper alloy. The EDXRF analysis of the handle, bowl, and white metal indicated that the porringer was made of brass and that the white metal was pewter. The handle and bowl are of two different alloys (the handle contains approximately 67% copper, 9% zinc, 4% lead, and 15% tin, while the bowl contains 72% copper, 18% zinc, 4% lead and 1% tin).

Based on the evidence at this point it is believed that the most likely scenario for the porringer's current condition is as follows: while it was being used to cook or warm a meal that was being stirred with a pewter spoon, the porringer became red-hot causing the spoon to melt into it. This in turn caused the porringer to become extremely brittle so that even removing it from the fire and placing it gently on the ground would be enough to cause it to shatter. (This is a fairly well known phenomenon known as a "hot short," and the areas of loss in the bowl are in keeping with it.) As the metal cooled, it would have become less brittle preserving a record of the event. The porringer would not, however, have been repairable and as a result was probably discarded at this point.

The story of the porringer has been extremely popular with the "behind-the-scenes" tours that visit Colonial Williamsburg's conservation labs. The visitors are drawn to an object that humanizes the past. Attempts to find parallels to the porringer among brass artifacts revealed that its closest relation was a late-17th-century socket candlestick of probable English origin, which has recently been purchased by Colonial Williamsburg. Not only has our knowledge of the artifact itself been enriched, but also our knowledge of the way in which forms and styles migrated between classes of artifacts has been augmented.

Notes

1 Jessica Johnson, "Conservation and Archaeology in Great Britain and the United States: a Comparison," *Journal of the American Institute for Conservation* 32 (1993): 249-269. Emily Williams, "Sixty-Five years of History: Archaeological Conservation at Colonial Williamsburg," *North American Archaeologist* 21:2 (2000): 107-113.

2 Ronald Michaelis, "English Pewter Porringer," *Apollo* 7:2 (1976): 116-121.

3 Peter Hornsby, *Pewter of the Western World 1600-1850.* Schiffer Publishing (1983).

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Catherine Sease

Conservation and Heritage Management Award

In 1997, the president of the Archaeological Institute of American (AIA) established an annual Conservation Award. This award is made in recognition of an individual's or institution's achievement in any of four areas: archeological conservation, e.g., the conservation treatment of an artifact, monument, or site; archeological conservation science, e.g., making an advance in the treatment methodology or analysis of the deterioration of archeological materials; archeological heritage management, e.g., the overall management of a site or group of sites including their preservation and interpretation to the public; and education and/or public awareness of archeological conservation through teaching, lecturing, an exhibition, or a publication. The award is open to international individuals or organizations, public or private, that merit recognition for their contributions to the preservation of our archeological heritage.

The 1998 Conservation Award was presented to the Department of Conservation and Materials Science at the Institute of Archaeology, University of London, in recognition of its 60 years of training archeological conservators. Not only did the Institute train many generations of archeological conservators, who have practiced all over the world, it also was largely responsible for defining the discipline of archeological conservation and determining its direction.

Professor Lawrence J. Majewski was the 1999 recipient. Professor Majewski joined the faculty of the Conservation Center of the Institute of Fine Arts, New York University in 1960, becoming chairman six years later. Here he taught many generations of archeological conservators for 39 years. In addition to his teaching, Majewski was also active in a wide variety of projects to preserve our archeological heritage. In his role as chief conservator of the Sardis excavations for more than 25 years, he trained many conservators in archeological field techniques.

The Museum of London was the 2000 recipient in recognition of the museum's long-standing strong and consistent commitment to archeological conservation. The museum has promoted conservation as a vital function of all its activities, both in the field on excavations and in the museum in its displays and educational programs. The museum has taken a leadership role in presenting the various aspects of archeological conservation to the public, thereby raising public awareness of the excitement, importance, and challenge of preserving our cultural heritage.

The Conservation Award of the AIA is unusual in singling out individuals and institutions for their outstanding achievements in the preservation of our cultural heritage. As such, it is becoming a prestigious award within the archeological community. For information about the nominating procedure for future awards, contact Catherine Sease (Chair of the Conservation and Heritage Management Committee of the AIA) at the Peabody Museum of Natural History, P.O. Box 208118, New Haven, Connecticut 06480.

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