A Collaboration Between Archaeology and Conservation: The Lead Coffin Project

Before Digging Begins

Every archaeological project involves planning prior to excavation. Including a conservator in the early stages will save time and money and insure objects are not damaged during removal. Knowledge of the site, its materials and the expected condition of artifacts will help the conservator plan treatment during and after excavation

In the Fall of 1992, a multi-disciplinary team that included archaeologists, archaeological conservators, forensic anthropologists, geophysicists, nuclear physicists, engineers, pollen analysts, and atmospheric scientists assembled in St. Mary's City, Maryland. Timothy B. Riordan and Henry M. Miller served as project directors. The common goal of the team was to recover these unique coffins while preserving their contents so as to answer as many research questions as possible. Within was valuable information about the colonial inhabitants of St. Mary's City and their society and environment. Before the project began, members discussed the goals of the project, the line of communication, and members' roles, including the role of the conservator and the conservation budget.

Chapel foundations exposed through archaeology.

In 1991, archaeological excavations at the site of the brick chapel [18 ST1-103] discovered three lead coffins. A plan for conservation was established before the excavations began.

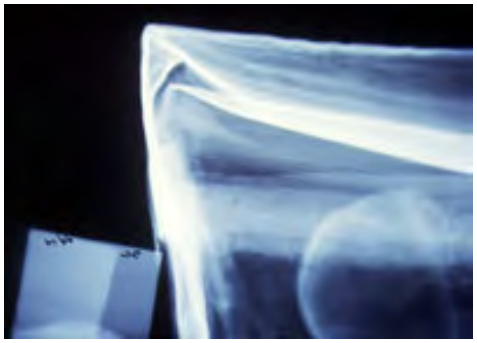
Conservation Starts in the Field

After a project plan is established, the conservator may assist archaeologists in the field in several ways. They will strategize ways to recover fragile or deteriorated artifacts from the ground, and plan packing and transportation to the laboratory. Coordination between specialists is necessary for preparing samples and artifacts for analysis, conservation treatment, and further scientific study.

Prior to sampling the atmospheric gasses in the coffins, nuclear physicists conducted gamma ray imaging that showed the location of the human remains so that the sampling of atmospheric gasses would not damage anything. Following the air sampling, chilled argon gas was pumped into each coffin to delay decay through oxygen exposure. A team from NASA performed a final inspection by measuring the lead's thickness and stability using electrical conductivity, infrared diffusivity, and ultrasonic probes. These measurements allowed the scientists to estimate the weights of each coffin. A specialized lifting apparatus was operated by a team from the Patuxent Naval Air Station to remove the

coffins from the ground and transport them to a nearby field laboratory with minimal damage. Photographers documented the entire process.

Extracting atmospheric gasses from inside the largest coffin



Gammagram through the lead coffin showing location and condition of skull. This was crucial planning information before researchers could raise and open the coffins.

Sort and Stabilize

Conservators can work with archaeologists to assign priorities to the different material groups of artifacts both during and after excavation. Some types of material may need to undergo full conservation treatment to stabilize them to withstand future handling, display, and storage. Others may only need to be documented and analyzed. The first step is identification and triage in the field.

During excavation of each of the coffins, a wide range of materials was discovered, identified and prioritized. Different members of the team took charge of caring for different materials. Some materials would need to undergo full conservation treatment in order to stabilize the artifacts for future study, handling, display and storage. To keep these materials intact until full treatment could be performed required refrigeration of organics and careful drying of metals. Other materials would only need to be analyzed, and the information they retained could be preserved through scientific study.

Understanding What You Have

Conservators Terri Schindel and Betty Seifert sort through organic debris inside the lead coffin. Sprigs of rosemary and preserved silk ribbons were discovered.

Once materials are stabilized, investigative cleaning will help retain the information objects have to offer. This task occurs in the laboratory where special apparatus are available. Decorative elements such as over-glazed painting on porcelain, tool markings on metals and waterlogged materials, and specialized coatings and plating on metals all have a story to tell. Materials are further prioritized and sorted for conservation during this initial cleaning phase and documentation of materials, both written and photographic, begins. Stabilization of materials may include testing porous materials for chlorides and desalinating artifacts that contain high salt levels. Corroded metals will be dried and stored in a dry environment until conservation treatments can begin.

The team at the William and Mary Archaeological Conservation Center worked on the lead coffins and found that they had similar corrosion patterns. The surfaces were covered in lead carbonate and lead oxide corrosion. The team agreed that the corrosion would not be removed, as it was protective, well-adhered and the pattern preserved in it offered information about how the coffins were made. Silt and minerals were removed and the lead was then coated in a stable acrylic resin.

The Canadian Conservation Institute (CCI) handled most of the organic materials. Wet textiles, rosemary sprigs, and damp rope fragments were cleaned using soft brushes and filtered water. Conservators used a stereomicroscope and tweezers to remove tiny debris, such as insect casings and plant rootlets. Objects were impregnated with a stable preservative then freeze-dried. Dry organic artifacts were too fragile to be cleaned with water so debris was removed using a stereomicroscope and tweezers. The condition of the inner wood coffins ranged from sound to highly saturated and deteriorated. The wood was mapped and numbered in the field and then initially treated by conservators from the Maryland Historical Trust from and Museum. Later, the planks were freeze-dried by Clifford Cook at Parks Canada with the assistance of CCI and Katherine Singley, a conservator in private practice.

As part of the ongoing research into the wealth of materials recovered from inside the lead coffins, HSMC has undertaken more specialized analyses.

Preserved rosemary sprigs from coffin. Rosemary is known as the herb of remembrance.

Conservator Curtis Moyer treating a fragment of lead from the smallest coffin. Treatment plans are designed to optimize the protection of the object and the recovery of information.

Fiber Fossil Analysis

Corrosion products on copper alloy shroud pins actually preserve "fossils" of the textile they once secured. Examination of these fossils either by electron microscope and extremely high magnification light microscope allow for the identification of specific fiber remains by comparison with modern examples.

Hair Today, Gone Tomorrow? The Conservation and Analysis of Philip Calvert's Hair

One of the unique discoveries of the lead coffin project was, that even though much of Philip Calvert's skeleton was very poorly preserved, his hair emerged from the coffin in extremely good condition. Read about the ongoing study of this rare discovery.

An Ounce of Prevention

Preventive care, or curation, of artifacts whether they are in storage or display, insures that information locked inside is retained. Acid-free, museum-approved material are used for storing and exhibiting objects, minimizing chemical, physical, and biological decay. A controlled environment further reduces the chance of deterioration.

At the CCI, packing and storage techniques were chosen to suit the composition and size of the organic artifacts. After treatment by Parks Canada, larger organics were positioned onto acid-free matte board lined with polyethylene batting and cotton knit and placed in clear boxes. Smaller organics were surrounded with foam and packed in clear boxes. Some small samples of debris were placed inside glass vials, while larger debris was stored inside polyethylene bags. These were installed on special mounts and housed inside acid-free boxes lined with Ethafoam®. All of the artifacts are now curated at the HSMC archaeological laboratory, which is a secure, environmentally controlled facility. After treatments were performed on the coffins, they were packed and shipped back to HSMC. The smallest lead coffin is in storage, supported by a layer of Ethafoam® in a controlled environment. The wood from the coffins is stored flat in a cushioned cabinet in an environmentally stable area.

Archivally packaged and mounted materials from inside lead coffins. In the upper left is a preserved silk ribbon. This special mount was created by the CCI.

Red cedar wood coffin lid after treatment. Numerous species of wood were used for different parts of the coffins. All of the recovered wood is stored in a special cabinet in the HSMC laboratory.

To Display or Not to Display

The exhibition of any artifact has inherent risks. Damage can be caused by light, vibrations, and fluctuation in heat and humidity. Care must be taken to design exhibitions which inform the public, without destroying the evidence of the past. A balanced approach which appreciates both needs and desires must be established.
The largest lead coffin is on exhibition at HSMC as an educational tool for the public.
Over time this artifact has begun to show signs of object stress due to sheer weight, the softness of lead, and the corroded condition.
Custom designed museum mounts brace the object but constant monitoring is needed. Lead is also sensitive to organic acids and high pH.

The case that houses the coffin had to be constructed out of inert, museum-quality materials, like glass, that do not off-gas or degrade. This dramatically decreases the rate of deterioration among archaeological collections. Many of the organic materials recovered from the coffins are very sensitive to fluctuations in relative humidity and exposure to ultraviolet radiations. The objects receive minimal handling and their cases are monitored for environmental changes with the aid of a hygrothermograph.

Light is kept low, to avoid damage to pigments, and objects are regularly inspected for mold and signs of pest infestation. The exhibition of these artifacts is limited to three months.

A special armature was built to support the largest of the lead coffins on display at St. Mary's City. The coffin was made with a top and bottom which fitted together like a shoe box.

Sharing the story

Information revealed through the conservation process is recorded and archived. Documentation may include treatment records, object reports, analyses, illustrations, photographs, magnetic media, and videos. Information on treatments is included so other researchers can understand what has been done to a given artifact. Publication is a professional responsibility of archaeologists and conservators. Project Lead Coffins produced a wealth of information concerning the cultural practices of the early citizens of Maryland's first capital. HSMC staff have delivered illustrated presentations and collaborated with others to produce articles, exhibits, and films about the lead coffin project. The entire field phase of the project was filmed by a crew from ABC News, with footage airing as a *Nightline* episode. Currently, staff are assisting in preparing an exhibit that focuses on the role of forensics in archaeology for the Smithsonian's Museum of Natural History.

Lead coffin on exhibition at the HSMC Visitors Center with special armatures and display case.