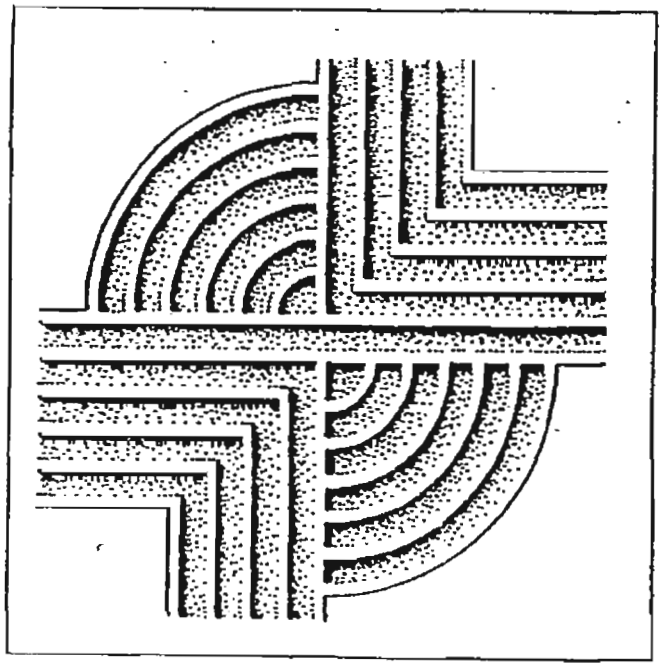
DOCUMENTATION AND CONSERVATION OF WATERLOGGED LEATHER FROM FOLLY ISLAND [CHARLESTON COUNTY, SOUTH CAROLINA]



RESEARCH CONTRIBUTION 62

DOCUMENTATION AND CONSERVATION OF WATERLOGGED LEATHER FROM FOLLY ISLAND

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Chicora Research Contribution 62

Paper Presented at the 1991
Annual Conference on South Carolina Archaeology
Columbia, South Carolina

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April 13, 1991

Following the excavation of materials from Folly Island, it was immediately obvious that many of the organic artifacts required the services of a professional conservator. Unfortunately, although the Charleston Museum had accepted the task of rescuing and curating these important artifacts, it lacked the specific funding for conservation, and had been unable to obtain an immediate commitment from other conservation laboratories in the area.

Chicora Foundation is a non-profit organization known for its archaeological and historical research. We are also well recognized for our long standing commitment to museum studies and support programs. In view of this commitment, we offered to professionally conserve four of the leather shoes as a research project, thus benefiting both the Charleston Museum and the professional community.This service was accepted by the Charleston Museum and treatment proposals were submitted on November 20, 1990 and approved on January 2, 1991.

We determined that each shoe should receive a different treatment in order to provide the Museum with the technical information to make decisions on the treatment of the remaining leather artifacts, taking into consideration cost, time expended, and safety and ease of use of materials, as well as the aesthetic quality of the final results. This approach, examining the effects of several different treatments on an essentially identical collection of objects, will be of tremendous benefit to other professional conservators in the Southeast.

There are many potential treatments for wet leather. The four chosen by Chicora reflect recent published studies, personal communication with other conservators, safety of materials, ease of treatment, reversibility, and limited use of specialized equipment. The treatments chosen provide a wide range of possibilities in terms of cost, treatment time, and procedures.

Some formerly popular treatments were considered but not chosen. For example, the proprietary compound Bavon™ has been used by conservators for nearly 30 years, due to its ability to provide flexibility to the leather. Recent studies show, however, that the initial flexibility it imparts is lost with time, often resulting in hardened, inflexible leather. Lanolin, used as a dressing to promote and restore flexibility, does not give consistent results. Methylene chloride, used as a dewatering agent, is a hazardous chemical. Freeze drying of leather without any type of pretreatment has resulted in unacceptable shrinkage and increased friability.

The goals of these conservation treatments were to stop ongoing deterioration and prevent further deterioration during

storage, handling, and exhibition, while using processes that are safe to the object and the handler, as well as totally reversible, as outlined by the Code of Ethics and Standards of Practice of the American Institute for the Conservation of Historic and Artistic Works. At this point, due to time and financial considerations, total restoration during the conservation process is not possible. However, the reversibility of all the treatments used will permit restoration or more extensive treatments in the future.

Prior to any conservation decision, each shoe was measured, drawn, and verbally described as to characteristics and condition. Industrial terminology was used in the descriptions of the various parts of the shoes, to avoid confusion on the part of future researchers. This process took approximately three hours per shoe, due to the difficulty of working with fragile leather under wet conditions. Extreme caution was taken to prevent further damage to the objects during this handling.

It was necessary to carefully clean each shoe prior to treatment, removing soil, sand particles, vegetable matter, and some staining caused by recent ferrous corrosion. No chemical cleaning was recommended because of the fragility of the material and the uncertain long-term effects of the various chemicals used; each shoe was mechanically cleaned with gently running de-ionized water, cotton swabs, and camels hair brushes. After a century of burial, vegetable matter and soil particles have worked their way into non-accessible areas. Some of the shoes still evidence intact wooden pegs, iron nails, and sewing in their construction. As it was decided to retain this structural integrity, none of these details were removed for separate treatment, resulting in the necessity of leaving some of the soil and vegetable matter in the shoes.

At this point it seems appropriate to mention that all of the shoes were in poor to very poor condition. All shoes displayed advanced stages of friability, caused by alternating cycles of wetting and drying. This has resulted in the deterioration of the leather, during which the collagen fibers are drawn together and fused, causing shrinkage and hardening. This situation cannot be corrected or reversed by any known treatments. We hope only to stabilize the shoes, preventing further deterioration.

Because of continued exposure to salty soil and water during burial and exposure, the shoes had become saturated with soluble salts. During the process of conserving other organic materials from the same provenience, a conservator would first attempt to leach out soluble salts by placing the artifacts in baths of de-ionized or distilled water.

However, since salt is used in the tanning process, and is an integral aspect of leather, leaching of the salts may actually cause increased deterioration. Thus, treatments of leather from

these soil conditions must be undertaken as quickly as possible. Where immediate treatment is not possible, the leather should be stored in water in a refrigerated unit to slow the leaching process. If stored for extended periods, water salinity should be monitored weekly to track variations. Extended soaking in water, however, will itself cause further deterioration of the leather, emphasizing the importance of treating this very significant collection.

Shoe "49-B" consists of a vamp, quarter, insole, outsole, lift and heel. The parts range from poor to good condition, and are unstable. There was active flaking and tearing of areas of leather. Construction of the shoe evidences machine stitching, as well as machine and hand pegging, using wooden pegs. After three hours of cleaning, the shoe will be placed in 30% aqueous glycerol solution for 10 days, then placed in a freeze drying chamber at -20 to -30°C for approximately 7 days. After drying, it will be reformed, if possible, with stable materials such as cotton wool and unbleached 100% cotton muslin. This shoe has not been placed in solution yet, as its freeze drying must coincide with the treatment of shoe "57-B".

The Museum of London has used this treatment successfully since 1982, reporting a shrinkage of 0-2%, with long term effects continuing to be studied.

The projected time to complete this project is approximately 3 weeks.

Shoe "57-B" consists of vamp, insole, outsole, and lift. Only the lift and outsole remain attached. Two wooden pegs are still intact in the lift, while examination of holes in the leather provided information on the use of machine pegging and stitching during construction. The shoe is in fair to good condition, but unstable and in some areas friable and torn.

After cleaning, this shoe was immersed in a 30% solution of molecular weight 400 polyethylene glycol, or PEG 400. After six weeks, it will be removed, allowed to drain, and placed in a freeze drying chamber at -20 to -30° C for approximately 4 weeks. Upon removal from the chamber, it will be reformed, if possible, again using stable materials.

Freeze drying with PEG 400 pretreatment is a very popular treatment, used by Parks Canada and the National Maritime Museum in Great Britain. However, the long term effects are unknown, and as a result, in 1982, the Mary Rose Trust chose to discontinue its use.

The projected time to complete this treatment is approximately 11 weeks.

Shoe "8-B, #3" consists of a vamp, quarter, insole, filler,

outsole, and lift. The parts range from very poor to good condition, and are unstable. Areas of leather are torn and broken, iron rivets and nail fragments exhibit active corrosion, the surface layer of the quarter is flaking, and the filler, which originally appears to have consisted of two pieces of wood, has cracked and broken into a minimum of eight fragments. An undetermined amount of breakage is hidden by the still intact pegging of the insole and outsole. Examination of holes in the leather evidences double row machine stitching, machine pegging, and the attachment of the heel to the lift by nails.

After three hours of cleaning, during which time the accessible wood filler fragments were removed, the shoe and the wood fragments were placed in a bath of sulfonated Neets Foot oil. After six weeks of immersion, it will be removed and allowed to air dry at room temperature. After drying, it will be reformed, if possible, using stable materials. The accessible iron will be treated with phosphoric acid, tannic acid, and B-72 to prevent further corrosion.

Lagerwij of Amsterdam and Biek of New York have used Neets Foot oil treatments successfully, the most common drawback being darkened, oily leather in some cases. On these aesthetic grounds, Rector of London has discontinued this treatment.

With the advice and assistance of Les Jenson of the Old Guard Museum, John Broadwater, the Virginia State Underwater Archaeologist, and Dr. Holland in Florida, I was able to contact Dr. Herndon Jenkins of Summit Industries; as technical director he has recently conducted experiments using several formulations of Neets Foot oil. He has worked with curators and conservators, including those at the Smithsonian Institute, to document the use of these formulations and their short-term and long-term effects on both historical and archaeological collections. With his cooperation, we were able to obtain the sulfonated Neets Foot oil in the quantities necessary for this treatment.

The projected time to complete this treatment is approximately 10 weeks.

Shoe "A" consists of vamp, quarter, insole, outsole, and lift. The parts range from poor to fair condition, and are unstable. Many areas are stiff, friable, and flaking; many fragments broke away prior to treatment. The shoe was constructed using double row machine stitching and machine pegging.

The vamp, originally one piece of leather machine sewn to the insole, is in very poor condition, which is unfortunate, as it has been stamped with a maker's mark: "BATES & McKAY/BOSTON". With the assistance of Les Jenson of the Old Guard Museum and David Cole of the Center for Military History, we are hoping to trace the background of this mark.

The treatment proposed by Chicora involved the soaking of this specimen in a glycerol solution. This treatment, used by Stambolov of Amsterdam, Noack of Yale University, and Carlsson of Copenhagen, and used since 1982 by the Museum of London, has been found to cause very little shrinkage, and to preserve flexibility. Given the poor condition of this shoe, these factors were felt to be extremely important. The glycerol replaces the water in the leather and also has three chemically active hydroxyl groups which are thought to be capable of interacting with the leather. In addition, glycerol is hygroscopic, acting as a humectant.

After two hours of cleaning, the shoe was immersed in a 30% v/v aqueous glycerol solution at room temperature for two weeks. Upon removal it was soaked in two successive baths of 99.5% reagent grade acetone for one and two hours, then allowed to air dry at room temperature. Portions of the vamp still attached to the sole have been reformed with cotton wool, to counteract the natural tendency to curl into the crushed position it held while buried in the soil.

The condition of shoe "A" following treatment is stable. Unfortunately, the areas that were in poor condition prior to treatment remain in poor condition, and evidence flaking with handling. This was expected since glycerol does not have the ability to alter the deterioration. Shrinkage in these areas, while not completely examined, may approach 10%, higher than anticipated based on previous studies. The areas that were in good condition, such as the insole, show no flaking and little shrinkage.

These results lead us to conclude that the glycerol/acetone treatment may not be recommended for waterlogged leather in such poor, friable condition. It has been suggested by the Museum of London that a dressing may be applied to the leather following this treatment to counter some of the problems we have noted. As additional treatments are conducted on the Folly Island collection, Chicora will recommend that this approach be tested. In addition, we will recommend that the solution of glycerol be increased to 40% v/v to determine if this higher concentration minimizes the shrinkage.

The projected time to complete this treatment is approximately 4 weeks.

As those familiar with the various treatment options for leather realize, the conservation of waterlogged objects is a complex, time consuming undertaking. Yet, if this work is not done, these objects will continue to deteriorate and eventually will be lost. We are not working with a pristine collection, but rather one which has been subjected to the extremes of drying and rewetting, suffering extensive damage prior to recovery. Chicora is working with the Charleston Museum to explore a variety of treatment options, hoping to determine those which maximize the long-term

preservation of the objects, while minimizing conservation costs. As this project is completed we will be in the position to recommend treatments for the remainder of this valuable collection. In addition, Chicora will also be able to provide valuable insights on the treatment of leather materials which are often ignored as being too unstable to warrent treatment.