Keeping a Promise to the Past

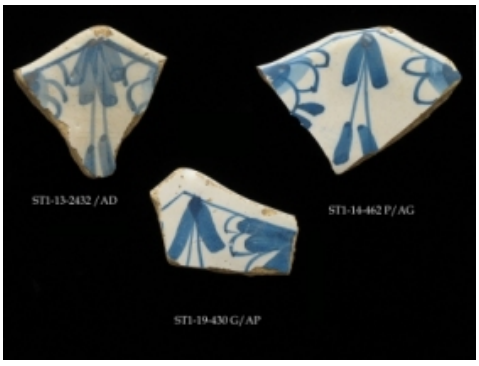
Glass and Ceramic Artifacts

Ceramics are found in abundance on 17th-century archaeological sites in St. Mary's City. Large quantities of a wide variety of types are often found on domestic sites. Typically, ceramics are well preserved and require little work to stabilize them after excavation. High fired ceramic bodies like porcelain, stoneware, and earthenware are more durable than other materials and can be more resistant to many of the agencies of decay found in the ground.

Ceramics can suffer from years of being buried in the ground. Physical damage is the most common problem. Ceramics are almost always broken, sometimes into very small fragments, making recovery of an entire vessel difficult. The glaze may remain intact, but it will often be scratched, flaking, crumbling, and/or stained.

glass bottle seal

The biggest conservation problem with ceramics is damage from salts. Ceramics that are low-fired or very porous, such as delftwares found in the 17th-century contexts at St. Mary's City, are most susceptible to these agents. Soluble salts, carried in solution by water, enter the pores of the ceramics during burial and are deposited throughout the ceramic structure. As wetting and drying occurs, the salts dry out and expand, causing physical damage to the ceramic body. If the a buried or excavated ceramic is dampened again, remaining salts move in and out of solution, causing more damage to the artifact. The salt ions, which can be quite large, cannot always flush back out of the artifact in the water in which it is dissolved. If the ions are carried out with the water, there is little damage. But if the salt crystals cannot get out through the ceramic body, they force their way out anywhere they can, such as through the glaze and other decorative areas on the ceramic surface, causing the glazes to pop off and be lost. Thus more areas are open and exposed on the ceramic body, which can in turn be affected by more soluble salts.



tin-glazed plate fragments

Glass can range from highly stable to highly unstable, depending on the chemical make-up of the glass and the nature of the burial environment. Chemical damage as well as physical damage is similar to that with ceramics.

Glass is liquid silica that is cooled to form a 3-D network. Modifiers are added to the glass to lower its melting point and give the glass specific properties. Fluxes, like sodium or potassium (soda ash/potash glass), are added to interrupt the network and thereby lower the melting temperature. Stabilizers, such as calcium, are added to stabilize the glass and make sure it is not water soluble. Minerals are added to give color. Lead renders glass clear; manganese lends a purple color, and cobalt leads to blue.

Degradation of buried archaeological glass depends on ground conditions. Glass is very susceptible to alkaline attack –- the ions leach out of the glass matrix and leave spaces in the glass. The K+ and Na+ ions in particular leach out. When this happens they are replaced with smaller H+ ions, leaving spaces for decay to enter. Salts and water may bond inside the glass and be held there.

Glass decays from the exterior inwards in layers. Lamination of the layers, is evidenced when the glass surfaces look like different colors, because the refractive index of the glass changes -- i.e. it is no longer transparent). Glass suffers from pitting as well -- just like metals and ceramics-- and chlorides can be held in these pits within the surfaces of the glass and cause acidic attack later while the glass is in storage.

The primary goal of glass conservation is to preserve the morphology of the glass by removing harmful salts and agents of decay, and keep the decayed, (flaking) layers intact. Additional treatments may include removal of staining and adhesion of broken fragments. All of these steps require professional training and should not be performed without careful consideration for the fragility of the glass artifact.

Case Studies in Glass and Ceramic Artifact Conservation

Glass Bottle

glass bottle

Conservator's Notes

A recent grant from the IMLS allowed HSMC to evaluate and treat any unstable and previously treated glass in the collections. Stabilization and consolidation of fragile glass was carried out by trained staff members until the museum hired its first professional conservator in the late 1980s. This professional conservator refined procedures. Now, the standard process includes dewatering glass post-excavation and drying, using solvent baths followed by vacuum impregnation of a stable acrylic resin system.

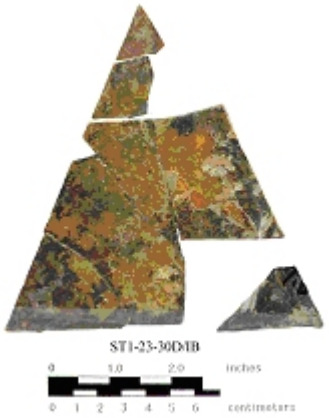
Some of the glass treated using yesterday's "best practices" were showing signs of deterioration The resin used was beginning to fail, lifting off the surfaces as the unstable material continued to decay.. Pieces of glass mended together were pulling apart.

This bottle base was suffering from such damage. The unstable adhesive used to mend the piece over 30 years ago, plus the weight of the glass base, was causing the piece to pull apart over time. To conserve the piece, the old adhesive was removed, the glass edges were cleaned and treated in the laboratory and then a new, stable adhesive was used to re-mend the glass bottle base. The increased stability and strength of modern adhesives should prevent the same damage from occurring in the future. The vessel can now be handled, studied and exhibited without further damage.

Curator's Notes

Round glass bottles were introduced around 1650, and shortly thereafter begin appearing on colonial sites in the Chesapeake. Before that time, the only glass bottles available were square bottles, referred to as case bottles since they could be fitted into special wooden cases with square compartments. Once introduced, round bottles became one of the most common of glass containers. These vessels could be made rapidly since they are simply formed by free-blowing the bottle. Case bottles required the use of molds.

Glass Window Fragment



glass before treatment

Conservator's Notes

Several triangular glass window panes were recovered from the St. John's Site. These windows were cross-mended, treated in the early 1990s, and stored with the collections. The windows were pulled for exhibition at St. John's in the newly constructed St. John's museum and were once again examined by the staff of HSMC. Although the windows remained intact and the pieces were still oriented in their original packaging, the windows needed to be removed from their storage mounts and stabilized for display vertically. The windows underwent conservation treatment to accomplish this.

The windows were previously treated and mounted using Mylar with a paper backing to hold the pieces in order while in storage. Over time, the paper adhered to the back of the glass fragments, and they could not be removed without more treatment. The glass was soaked and immersed in solvents, and carefully removed from the paper while carefully keeping all the pieces in order.

The fragments were then cleaned and treated separately, removing any fragments of paper from the surfaces and consolidating the fragile surfaces with an acrylic co-polymer system. The glass was then re-mended to their original orientation, and strengthened for display.

The glass windows are displayed in the newly constructed St. John's museum on the property of HSMC. The staff worked with the mount makers to display the windows vertically as they would have originally been used in the house at St. Johns.

Curator's Notes

Glass windows were a symbol of considerable economic status. Many houses lacked glazing, while those that did have windows often had small, simple diamond shaped panes. The builder of St. John's, John Lewger, was the colony's secretary, essentially the second in command of the colony. His house wasunusual in both its size and level of finish. His house had not only glass windows, but windows with elaborately shaped window panes also called quarells in the 17th century. These glass pieces were held in place with narrow, "H" shaped pieces of lead, not unlike modern stained glass windows.

window leads from St. John's

St. John's was one of the largest and best-built structures in the early Maryland colony. As colonial secretary, Lewger often hosted the Assembly at his house.

Ceramic Porringer

ceramic porringer

Conservator's Notes

Tin-glazed earthenware that was discovered and excavated at HSMC was particularly fragile when it was discovered. A large fragment of delftware was unearthed and several large sherds were found in association with one another in the ground. The field staff was aware of the fragility of delftware and the problems they suffer in relation to their porous structure and soft glaze. As the ground was damp, it was decided to lift the large ceramic sherds as one group together in the soil matrix in which it was found.

The ceramic and soil were lifted carefully in the field, supported using foam and containers and brought into the conservation laboratory to undergo examination and cleaning. Because the surrounding soil was moist, it was necessary to keep the ceramic and soil moist until further work could be completed. This was accomplished by inserting moist toweling inside the bucket with the artifact and soil, and sealing the entire thing in polyethylene plastic. A careful watch was kept to ensure that the artifact and soil did not dry out, yet the growth of mold and other fungi was not imminent.

A mini-excavation was performed in the conservation laboratory to slowly remove the soil from around the ceramics. Small tools, including wooden picks and water were used to remove as much soil as possible without scratching or damaging the ceramic. At no time were metal tools used this close to the glaze of the ceramic. As more and more soil was removed, it became evident that salt damage was causing flaking glaze and some loss to the glazed areas. In order to keep the glaze intact, a stable resin (consolidant) was applied to keep the glaze from moving and getting lost. As time progressed, more and more soil was removed and more and more of the ceramic was revealed.

Some of the larger pieces of the ceramic were not attached nor could they be mended. Missing fragments have not been identified as of yet, in order to finish piecing the object together. Each fragment was cleaned of dirt, consolidated and stabilized so they could be further handled and archived with the archaeological collection.

Curator's Notes

Tin-glazed earthenware was one of the most lavishly decorated table wares of the colonial period. Tin glaze is essentially a lead glaze with tin added that results in a thick white opaque layer of very glassy material. Tin glazes are applied to pottery that has already been fired to an earthenware temperature and then it returns to the kiln for a second firing at a lower temperature which fixes the glaze. Tin glazed earthenwares are variously known as tin enameled, delft, delftware, majolica, faience, or maiolica. For simplicity sake we will refer to it as tin glazed earthenware. In the colonial period, with the exception of Hispanic production, tin glazes are a European manufactory.

The specimen described in the conservation treatment above is in the form of a porringer. Porringers were essentially bowls with handles in the form of a flat projection from the rim and were designed for consuming semi-liquid foods such as porridge.