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CONSERVATION AT 33 1/3 RPM: THE TREATMENT OF AN ATTIC TREFOIL OINOCHOE

ANTHONY SIGEL

ABSTRACT

Ancient vessels that have a third of their original fabric missing present complex ethical and technical challenges to conservators; such was the case with a fifth century BCE oinochoe in the collection of the Harvard Art Museums. The decorative painting features a woman playing a *barbitos*, a type of lyre associated with leisure and revelry. This vessel’s modern history begins sometime before 1903, when Henry Hucks Gibbs, Lord Aldenham of England, acquired it and lent it that year to an exhibition at London’s Burlington Fine Arts Club. The vase scholar John Beazley described it in 1939 as having “a mouth and neck hardly original, which had disappeared when I saw it, in bits, some years ago; was sold at Sotheby’s the year before last; and has since been cleaned and restored.” It is likely that he was describing the condition in which the vessel entered the Harvard Art Museum’s collection.

Before the treatment described in this article, the vase was unstable with loose joins and had substantial, broadly overpainted losses in the body. Close examination revealed that the neck, shoulders, and handle were all poorly shaped plaster fabrications from an earlier restoration. Removal of the overpaint also revealed considerable damage inflicted by previous restorers to the original slip painted decoration, who filed down the surfaces and edges of many sherds during their reconstruction in an effort to make them fit together.

In different kinds of institutions and collections, an object with such substantial losses could legitimately be treated in several different ways, ranging from simple removal of the flawed earlier restorations to full restoration. Curatorial research and documentation of a similar vase by the same potter in the collection of the British Museum helped establish convincing evidence of the vessel’s original form. Armed with scale drawings and photographs, the oinochoe was reconstructed to a high state of completion and finish. A combination of conventional and novel techniques were used to re-create the complex neck, trefoil spout, and handle, based upon a close study of their original material and techniques of formation. These techniques will be discussed here and also demonstrated in linked video clips. They include methods for the assembly and alignment of poorly fitting sherds; shaping and forming of replacement elements using a 1970s record turntable—complete with pitfalls to be avoided; the mold-making and casting of elements with complex inner and outer shapes in simplified, one piece molds; and inpainting strategies and techniques. The rationale and methods of loss compensation for damage caused by earlier restorers will also be discussed.

1. HISTORICAL BACKGROUND AND CONTEXT

Ancient vessels that have a third of their original fabric missing present complex ethical and technical challenges to conservators. Such was the case with a fifth century BCE oinochoe acquired by the Harvard Art Museums in 1960 (1960.354, fig. 1).

Its shape is unusual, with elements of both a wine pitcher and an oil flask. The decorative painting features a woman playing a *barbitos*, a type of lyre associated with leisure and revelry. There has been some question as to whether this woman is the famous poet Sappho of Lesbos (Yatromanolakis 2007). Its modern history begins sometime before 1903, when Henry Hucks Gibbs, Lord Aldenham of England, acquired it and lent it that year to an exhibition at London’s Burlington Fine Arts Club. The exhibition catalog referred to it as having been “put together out of several fragments” (Burlington Fine Arts Club 1903). The vase scholar John Beazley described it in 1939 as having “a mouth and neck hardly original, which had disappeared when I saw it, in bits, some years ago; was sold at Sotheby’s the year...
before last; and has since been cleaned and restored” (Beazley 1939). It is likely that he was describing the condition in which the vessel entered the Harvard museum’s collection. David Moore Robinson, most known for the discovery and excavation of the ancient city of Olynthus, bequeathed it to the Harvard Art Museums in 1960.

2. CONDITION

Scheduled for installation in the renovated Harvard Art Museum’s Ancient Art galleries in 2014, the oinochoe was brought to the laboratory. It had indeed been broken into many pieces and restored in the past. Visible cracks now appeared along the old join and fill lines. Clearly loose and unstable, the vessel “rattled” when tapped. The previous reconstruction was poorly executed, with sherds joined out of plane, and the fills rough, poorly shaped, and colored (fig. 2).

The missing and restored neck, trefoil spout, and handle, also broken, were clearly incorrect in shape, size, and profile. In addition, the placement of the neck on the vase shoulder appeared angled rearward, giving the vessel an unstable-appearing “leaning back” posture (fig. 3).
Fig. 2. Loose, out of plane joins and abrasions (Courtesy of Tony Sigel, © President and Fellows of Harvard College)

Fig. 3. Plaster neck, trefoil spout, and handle before treatment (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
3. TREATMENT OPTIONS

In different kinds of institutions and collections, an object with such substantial losses could legitimately be treated in several different ways, and several different possible approaches to treatment were considered, involving the degree of restorative intervention. In this case, the vessel’s unstable joins and unattractive, poor quality restorations necessitated treatment. One strategy might simply have been to remove the unattractive and inaccurate restorations and display the vessel without them. This approach has been advocated (Koob 1998) and has the advantages of absolute fidelity to the original and no chance of misinterpretation by scholars. It is also the least time-consuming—often a consideration when time and resources are limited. Another less severe but equally rigorous approach would be to fully restore the losses, but in a purposefully visible fashion. This practice, commonly seen on archaeological sites or in strictly archaeological collections, involves re-creating the missing elements in colors or textures that allow them to stand out as restorations. For example, one might leave fills white, or color them to an approximation of the adjacent original surfaces, and perhaps also modify them in tone; a shade lighter is common. Other strategies for disclosing restored areas of ancient vessels have included recessing the fills slightly, or incising their edges. It must be said that these approaches can be distracting and are less commonly seen on finely potted figural ceramics.

The Harvard Art Museums’ collections represent fine and decorative arts as well as strictly archaeological materials, and a level of interpretive, aesthetic treatment is expected in our galleries. Our approach to finely potted and painted archaeological ceramics has been to bring them to a higher state of restorative “aesthetic reintegration” than a strictly archaeological museum might choose to undertake. This allows our audience a more straightforward and understandable reading of the scenes depicted on these works. However, I also feel that Attic vase painting is one of the highest expressions of ancient Greek decorative arts and that we must balance the presentation of these spectacular and highly refined works of art against a strict archaeological approach whose primary concern lies only with their artifactual, evidentiary value. Scholars seeking to clarify the level of restoration may examine curatorial and conservation files with careful “during treatment” photography, and we hope that this type of photographic treatment documentation will soon be available online.

Another factor influencing our decision was that Beazley had identified a “twin” vessel to ours, an oinochoe in the British Museum (1836.0224.11 London E-15, see Green 1978). Scale drawings and photographs were made and generously provided by the British Museum, and after discussing the options, our curator of ancient art, Dr. Susanne Ebbinghaus, and I agreed that we should restore the losses in accord with the evidence provided by the British Museum twin (fig. 4).

The techniques I used to re-create the complex neck, trefoil spout, and handle were based upon a close study of their original material and techniques of formation.

4. TREATMENT

4.1 DISASSEMBLY

The use of PVA emulsion glue dated the present restoration to the early to mid-20th century. The vessel was immersed in acetone and then water to swell and soften the PVA restoration adhesives, which allowed for the vessel’s controlled disassembly. Overpaints, fill materials, and adhesive remnants were removed with steam, water, and acetone. Following the disassembly, a soak in deionized water and conductivity testing for soluble salts revealed levels below 100 micro-mohs, well within the acceptable range of ceramics in a climate controlled environment.
4.2 THE HORROR

As the disassembly and cleaning progressed it became clear that during an earlier restoration, the surfaces and edges of many sherds had been aggressively filed down with a rasp like tool, no doubt to fit them into an increasingly poorly aligned reconstruction (figs. 5a, 5b).

The result was not only the loss of ribbons of ceramic and slip-glaze surface along affected edges and broad swathes of glaze surface, but widespread, fine scratches to the glaze elsewhere from rasping down projecting fills and glaze surfaces. Later in the treatment, when I was reconstructing the vessel, these edge and surface losses made it very difficult to achieve proper alignment of the sherds. Even on joins that had not been so damaged, most break edges were rough and chipped, a testament to the numerous campaigns of restoration the oinochoe had endured. In the more delicate red-ground design areas of the female lyre player, the miltos, or fine ocher slip, had become abraded, with loss of surface sheen and areas of the fine light brown drapery folds. Also lost through earlier carelessness were many of the fine, raised black slip lines that made up her image (fig. 6).

Fig. 4a–b. Greek, Trefoil-mouth oinochoe, terracotta. Height: 26.67 cm (Courtesy of and © Trustees of The British Museum, 1836,0224.11 London E515); drawing by Kate Morton (© Trustees of The British Museum)
Fig. 5a. Filed down edges; 5b. Filed down surfaces (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
4.3 HOW NOT TO LOSE PIECES

Immediately after disassembly, following my typical practice, I laid out all the disassembled sherds, photographed them, and printed the images out at slightly over 1:1 scale. I taped the photographs to a corrugated cardboard support, which became a place for me to index and store the sherds during the lengthy treatment process (fig. 7). This method helps to keep track of the sherds during the adhesive and overpaint removal, cleaning, poulticing stages. It ensures that you will notice immediately if any sherds are misplaced!

I primed and consolidated the break edges with a 10%–15% coating of B72 and coated other areas to provide protection during the filling of losses (see fig. 6). I reconstructed the vessel with an adhesive formula of 45% B-72 in acetone/ethanol following the Koob recipe (Koob 2009). I filled spaces between sherds where the ceramic was lost with Paraloid B-72 bulked with micro-balloons. For theory, techniques, and detailed descriptions of cleaning, joining, and filling losses, see Sigel and Koob (1997) and Sigel (2003).

4.4 ALIGNMENT

While the fingertip remains a very sensitive means of ensuring the proper alignment of two sherds, for this treatment I also used a piece of aluminum venetian blind material (figs. 8, 9).

Following reassembly, I used a Leister hot air tool to adjust the final alignment of the sherds. Very often when assembling vessels with sherds missing joining surfaces (and also over losses where one or more sherds are missing altogether), one can only approximate the proper positioning, and it is only after the adhesive is cured that a final adjustment of position can be made. Though it may seem counterintuitive, subtle adjustments can easily be made to the hardened B-72 adhesive joins by the local application of heat. Using a Leister hot air tool or other means, when the Tg of the adhesive is reached, signaled by a slight

Fig. 6. During treatment: detail of abraded and lost black slip surfaces and lines. Note glossy, protective temporary B-72 coating. (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
Fig. 7. During reconstruction, sherds placed on a photograph of the sherds laid out (Courtesy of Tony Sigel, © President and Fellows of Harvard College)

Fig. 8. Cut piece of flexible aluminum window-blind material (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
bubbling in the join, the alignment of the sherds can be corrected. A helper can then rapidly cool the join to retain the new position by spraying frozen propellant gas onto the surfaces from an inverted can of Dust-Off.

4.5 FILLING LOSSES

Before filling the losses, I coated absorbent break edges and adjacent surfaces with 15% Paraloid B-72 to prevent them from absorbing moisture or being stained by the Newplast Plasticine, a nonhardening commercial modeling clay used as a backing material during filling. I backed loss areas with Newplast sheet and filled the losses with plaster of paris. When the plaster was hard but not dry, I shaped the slightly overfilled surface to the proper contours with scalpels, files, and waterproof sandpaper, always being extremely protective of the adjacent original surfaces. Water was used as a lubricant through successive grades of sandpapers. During this process, the protective B-72 coatings on these surfaces are invaluable. After the fills dried completely, I sealed them with 15% B-72 (Sigel and Koob 1997; Sigel 2003).

5. RE-CREATING THE SPOUT, NECK, AND HANDLE

When re-creating losses or elements in a variety of types of objects, I have found it useful to follow the materials and techniques of the artist as closely as possible. In this case, for example, I chose to throw the neck and spout on a potter’s wheel, guided by the measured drawings and photographs of the twin in the British Museum. Nonhardening clay, often referred to as “Plasticine,” was an ideal modeling material, as it is essentially clay mixed with paraffin rather than water. I would then cast the modeled elements into a stable material—plaster of paris—and attach them to the vessel body. Rather than a potter’s wheel, I employed a record turntable.
I scaled up the drawings provided by the British Museum by enlarging them on a photocopier (see figs. 20a, 20b). This allowed the use of calipers to directly measure and compare critical diameters at several points on the spout. I also cut a Plexiglas sheet template to measure and correct the profile of the neck and rim of the spout before pinching it into the final three-lobed, or “trefoil” shape. This profile was interpolated from the four-view drawings by measuring the diameter of the spout at its widest point.

5.1 TURNING THE SPOUT

I cut a square Plexiglas sheet and center drilled it to receive the turntable spindle, attaching it temporarily to the platter with balls of Plasticine. I began initially by forming a hollow tube of Plasticine as the basis for the spout, thinking that after warming it with a hair dryer to render it more pliable, I would be able to shape it with my fingers much as the original potter did on his wheel (fig. 10).

Unfortunately, things did not quite work out as I had hoped, and the Plasticine was too rigid and unyielding to “throw,” resulting in a wrinkled, heaped mess.

Reconsidering, I decided that rather than working like a potter, with a wheel, I might shape the spout the same way a woodworker would shape a wood bowl on a lathe – subtractively. In this method, I would start out with a larger mass of clay and use sculpture and modeling tools to remove clay until I achieved the desired shape (fig. 11).

This turned out to be a very successful approach (see fig. 12, video of lathing the spout). Using principally wire-loop tools for controlled clay removal, making frequent references to the British Museum
Fig. 11. Successful subtractive method—“lathing” element out of a solid clay mass (Courtesy of Tony Sigel, © President and Fellows of Harvard College)

Fig. 12. Video showing the process of lathing the spout (Courtesy of Tony Sigel, © President and Fellows of Harvard College) [https://www.youtube.com/watch?v=OzOHgwXVSF4](https://www.youtube.com/watch?v=OzOHgwXVSF4)
drawings with calipers for measurements, and using the Plexiglas template as a guide, I was able accurately to form the exterior contours of the neck and spout. I made use of a Manfrotto Magic Arm, a photo equipment support that clamps onto the table top and has a flexible 2-1/2 ft. long arm that locks with one knob. With one end clamped to the tabletop, I attached a large metal loop clay modeling tool to the other end. I secured its position with the locking knob, and then used the Magic Arm both as a steady rest for other smaller tools (not unlike a wood turning lathe) and also as a tool holder for the modeling tool (fig. 13).

Fig. 13. Using the Magic Arm as a steady rest and tool holder (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
When the exterior shaping was complete, it was time to hollow the interior to its final thin wall thickness. The rigidity of the tool clamped in the magic arm allowed me to take light skimming cuts. This minimized the risk of digging the tool tip in too far and thus tearing or distorting the model. The arm itself, used as a steady rest, allowed me to make minute controlled movements, which were also essential in creating the fine detail of the decorative raised line in the mid-section of the neck (see fig. 16).

When the final form had been achieved, I completed the surface finishing with smooth wooden modeling tools and a piece of silk wrapped around my fingertip and held against the spinning form, leaving fine wheel-thrown textures and smoothing marks.

5.2 FORMING THE TREFOIL SHAPE

After much study of the British Museum photographs, drawings, and numerous other trefoil spouted vessels in our collection, I realized that toolmarks within the tight folds of the spout indicated that the original potters used a tool to push the opposing outside edges inward to form the rather sharp interior corners of the three-lobed spout.

After warming the Plasticine under a halogen light for several minutes, I took a deep breath and plunged into shaping the spout, beginning to push inward on the rim approximately one-third of the diameter away from the tip of the spout on either side, using my fingers and wooden tools shaped for the purpose (fig. 14).

Careful not to damage or distort the delicate rim, I coaxed the Plasticine into shape, to a point where I was satisfied with the results. I also lifted and molded the back edge of the rim, which was to receive the handle, into its final shape with my fingers.
I added the small “rotelles,” or circular knobs, to either side of the handle attachment area following the drawings and photographs. When all was complete and smooth, I cut the neck and spout free from the turntable using a tightly stretched cutting wire of a design by Benner Larson in his superb mold-making and casting course (fig. 15). Many things I learned in his course informed this treatment.

5.3 Scribing the Join

After freeing the neck and spout from the turntable, I placed it on top of the projecting break edges atop the shoulders of the vessel, propped level with small balls of Plasticine. I used a small pair of dividers to scribe the projecting neck remnants into its base, so that the Plasticine could be trimmed to allow an accurate seating (fig. 16).

After trimming the excess Plasticine with a scalpel, I joined the neck to the body of the vessel with gentle pressure, then dressed and smoothed the join between the Plasticine and ceramic with small modeling tools and a piece of silk wrapped around my finger (fig. 17).

5.4 Forming the Handle

The D-shaped profile of the handle of this vessel would in ancient times have been extruded through a die or shaped by pulling and stretching the wet clay through the potter’s fingers (Schreiber 1999). This was not possible for my re-creation because (as before with the spout) the Plasticine was simply too hard. I needed to devise another method of creating the subtle contours of the handle.
Fig. 16. Scribing the joining break edge with dividers. Note the delicate, raised line. (Courtesy of Tony Sigel, © President and Fellows of Harvard College)

Fig. 17. Smoothing the joining surface with modeling tools (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
I rolled Plasticine out on a glass plate using a pair of equal-sized battens to maintain the desired overall final thickness, lightly misting the Plasticine with water to prevent its sticking to the glass (fig. 18).

This technique can be used to prepare Plasticine sheet to any given thickness for such uses as creating mold walls, or backing sheets for filling losses on a vessel. I cut a strip from the Plasticine sheet of the width needed, and beveled its long edges with a scalpel to the approximate D-section of the handle as provided on the British Museum drawing. After some experimentation, I found that by sandwiching the handle blank between two sheets of glass I could form even, smooth radii by tilting the glass sheets under pressure, back and forth along the length of the handle blank repositioning the blank at different angles (see fig. 19, video of rolling the handle).

Having formed a nicely shaped strip of Plasticine with the correct dimension and profile, I formed the distinctive curves of the handle directly on the drawing (figs. 20a, 20b).
Fig. 20a. Forming the handle curvature; 20b. trimming each end with a razor sharp blade to the joining angle to attach the handle to the spout and oinochoe body (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
I joined the handle to the oinochoe with additional clay to form smoothing fillets to its receiving surface at each end (fig. 21).

I made subtle adjustments to the angle and position until it conformed precisely to the photographs and drawing (see figs. 22a–d).

6. MOLD-MAKING

I judged that it would not be possible to cast the neck, spout, and handle all in one piece; the mold would have been too complex and unlikely to yield a successful cast. I decided to remove the handle from
the neck and body first, by making a self-aligning V-cut to the handle just above its attachment to the back rim of the spout (see fig. 23, video of preparing the handle). A temporary clay strut served to stabilize the Plasticine handle during removal, which was removed before casting.

After removing the handle, which involved some stress on the pliable material, I gently replaced it on the vase momentarily to correct any distortions that might have crept in during the removal process. I created a simple Plasticine wall mold, forming a thin sheet to the correct shape and attached it to a glazed ceramic tile base. I attached several balls of clay to one side of the handle to act as spacers to keep it off the floor of the mold, so that it could be surrounded by the mold-making material.

To remove the considerably more delicate neck and spout (see fig. 24, video of removing the spout), I used a can of “Dust-Off,” inverted so that the frozen propellant would spray out, to freeze the Plasticine hard so that it could be eased away from the vessel without causing distortion, particularly along the joining areas where the Plasticine was irregular and feather-thin. Again after removal, I gently replaced the spout and corrected any small distortions that had occurred.

Once more, I chose to make the most expedient type of mold possible, and after much discussion with colleagues and sketching designs on paper, came up with a plan to form a four-part, one-piece mold, made in a single pour. A multipart piece mold/mother mold system would certainly have worked, but was rejected as being needlessly complicated and too time-consuming for a “one-off” production.
Fig. 23. Video of preparing the handle (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
https://www.youtube.com/watch?v=jyTcw-GM9HU

Fig. 24. Video of removing the spout (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
https://www.youtube.com/watch?v=MMvmyuWt0UY
I first made a small X-shaped support out of Plasticine sheet to hold the spout level and off the tile floor of the mold, as I had done with clay balls for the handle. I then rolled out thin Plasticine sheet and formed the outer mold walls, sealing them to the base with modeling tools to prevent leakage. I mixed Smooth-on Mold Max 30, a room temperature vulcanizing (RTV) tin-cure silicone rubber (shore 30A hardness) and poured it in to fill the molds. This more rigid molding rubber is better suited to this type of mold.

After the rubber set, I cut the mold block almost completely in half with a large carving knife, stopping 1 cm before reaching the bottom. The same large knife served to cut the mold block free from the ceramic tile. I peeled off the Plasticine walls of the mold and pulled the two halves open to disclose the two halves of the Plasticine spout contained within, the un-cut RTV remaining at the bottom serving as a hinge.

The Plasticine spout halves, however, were still trapped in the mold, so I made further cuts with a scalpel. These cuts were made from the top of the mold down to intersect with the Plasticine. This allowed me to open the mold completely, remove the halves of the spout, and then prepare the mold for casting. Normally, somewhat irregular cuts rather than straight are preferable, as they aid in accurate registration of the mold sections when closing.

I drew a paper template to describe the approximate position of the spout within the mold, and the location of the additional cuts needed to free it (see fig. 25, video of de-molding the spout). I transferred this outline to the top of the mold and used a scalpel with a slender no. 11 blade to carefully cut down into the mold along the line. To my relief, the cuts intersected the spout rim, and after completion it proved quite simple to spread the now four sections of the flexible mold open and extract the Plasticine model. Now a four-part mold, each segment was still held in proper registration—the inner

Fig. 25. Video of de-molding the spout (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
https://www.youtube.com/watch?v=HgmqKF5204
and outer halves of each side of the piece—by the uncut mold material at the bottom. I cut open and emptied the much simpler handle mold in the same way.

7. CASTING

I cut entrance “sprues” channels into the walls of both spout and handle molds to inject the plaster and exit “vents” to exhaust air as they filled. A sheet of silicone release Mylar inserted between the mold halves served to separate the casting into two pieces. I cleaned, closed, and secured the mold with rubber bands and a small clamp. I mixed plaster and injected it with a curved tip “ear” syringe (fig. 26).

After the plaster had cured, the mold was opened (fig. 27).

Removing the delicate convoluted shapes was difficult, and I needed to further cut the interior “lobes” into halves, while still retaining the bottom attachment (fig. 28).

In all, several sets of neck/spout halves were cast, and I chose only the two best—those with the fewest air bubbles and other defects—for use. An RTV mold of this type can be reused numerous times before the material begins to degrade.

I trimmed the two plaster halves and cut small keys into each joining surface to provide a mechanical attachment for the joining plaster (fig. 29).

After soaking in water to avoid premature setting from pulling moisture out of the fresh plaster, they were assembled using additional plaster as an adhesive. While simply gluing would have been

Fig. 26. Closed and filled molds (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
Fig. 27. Opened mold showing filled plaster halves, and filled sprues and vents. (Courtesy of Tony Sigel, © President and Fellows of Harvard College)

Fig. 28. Molds propped open, showing additional cuts in rubber (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
simpler, I have found it best to use plaster rather than adhesive for this purpose. When dressing and sanding the joins, it is difficult to achieve a smooth surface when the harder glue-line is encountered. After drying, final shaping, and sanding, I consolidated the neck/spout and handle in 15% B-72 in acetone. When dry, they were finally assembled to the vessel with B-72 adhesive.

Finally intact and in one piece, all of the remaining fine losses, mold and join lines, and air bubbles throughout the vessel were filled with Modostuc acrylic spackle tinted with dry pigments and applied with fine tools and flexible plastic spatulas. Several techniques were used in this process. I applied the Modostuc with spatulas cut from polyethylene container lids and plastic sheet (see fig. 30, video of filling and scraping the oinochoe). As the water-based Modostuc shrinks, several thin applications are often needed. When dry, I scraped the break-line fills level and smooth with slightly harder ABS (acrylonitrile butadiene styrene) plastic and other “credit”-type cards (fig. 31). The plastic being harder than the fill material but softer than the ceramic surface allows for absolute safety. I periodically dressed the edges of the card at a 90° angle on fine sandpaper to make a sharp, square edge.

I also used a modified sanding block to adjust and level the break-lines and broader fill areas. This is a technique I use frequently with water-resoluble fill materials such as Modostuc and Flugger acrylic. To be both accurate and protective of the original surfaces, I use a block of a piece of flexible but stiff eraser material such as a Staedtler Mars white vinyl/plastic eraser. A piece of dampened silk wrapped around the block, rather than an abrasive sandpaper, serves to abrade and level the fill. I cut the eraser to thickness with a razor knife and make a further two cuts on the top. A small sheet
Fig. 30. Video of filling and scraping the oinochoe (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
https://www.youtube.com/watch?v=o5wZuFNI0Bg

Fig. 31. Leveling fills with a plastic scraper (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
of fine silk is wrapped around the block and secured by tucking it into the slot on each side with a spatula (fig. 32).

Alternatively, the silk can be fastened by wrapping it around the block and anchoring it with a small bulldog clip.

I dampened the block on a wet sponge and lightly played it over the fills, smoothing and leveling, as you can see in the images illustrating treatment of this oinochoe (figs. 33a–c).

As the silk became clogged with material, I cleaned it by blotting on a wet sponge (fig. 34).

Care should be taken not to overwet the silk, or the fill will soften and dissolve too readily. Toward the end of the leveling process, I used the silk in an increasingly drier state, to remove less material and impart a final smoothing, polishing effect.

Very small, fine scratches in the surface of the vessel were also effectively filled in this way (fig. 35). When complete, the fills were sealed with 7.5% B-72. Any remaining haze of fill material on adjacent original surfaces was then easily removed with swabs and water, without risk of damaging the now consolidated fill. The eraser itself also works well to clean any remaining haze. Micromesh-coated
Fig. 33a–c. Sequence of three images showing smoothing process (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
Fig. 34. Cleaning silk on a sponge (Courtesy of Tony Sigel, © President and Fellows of Harvard College)

Fig. 35. Leveling broad fill areas and filling fine imperfections (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
abrasive sheets were also used for final smoothing, often laminated in strips to small wood sticks of the coffee-stirring variety (Sigel 2003).

8. INPAINTING

8.1 COHERENCE AND BEAUTY VS. PRESERVATION OF VISUAL EVIDENCE

After completion of filling (see fig. 36), the vessel was requested for inclusion in a temporary exhibition at short notice.

With insufficient time to properly complete the inpainting as envisioned, the losses were temporarily inpainted using black and ocher gouache with the airbrush (fig. 37). The colors were uniform

![Fig. 36. The oinochoe after reassembly and filling, ready for paint (Courtesy of Tony Sigel, © President and Fellows of Harvard College)](image)
Fig. 37. During treatment. The temporary, removable gouache inpainting follows a strict archaeological approach. (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
and approximate, and the gouache provided only a matte surface. None of the figural design areas were completed, and only necessary contours were added to separate color areas—necessity dictated a strict archaeological approach to the interim inpainting.

This temporary treatment was instructive, as it provided a basis for comparison and only confirmed our desire to complete the treatment using a more restorative approach. Following the exhibition, the vase was returned to the laboratory and I removed the temporary, water-soluble gouache inpainting with water, cotton pads, and swabs. The break-lines and fills on the vessel body were inpainted by brush using Golden Fluid Matte acrylic paints and gloss, satin, and matte Golden Polymer UVLS varnishes as needed to adjust surface sheen. I made an effort to match the adjacent original surfaces as closely as possible in color, while leaving the surface slightly differentiated in sheen. I feel that this still allows a discerning viewer to visualize the restored areas without being overly distracted by more purposefully visible restorations that can draw attention to themselves.

8.2 MASKING TECHNIQUES

Fill areas on the vessel's lower, original surfaces were masked with Iwata Stretch Mask, a flexible “frisket” material, and Parafilm M, a stretchy, wax-based film material used to seal containers in the laboratory. Unlike the Parafilm masking techniques described in an earlier publication (Sigel 2003), I used a new method, creating “soft” mask at the neck and handle joins to avoid leaving a hard paint edge, typical of conventional frisket and tape masking techniques. First, I cut ribbons of Parafilm approximately one-quarter to one-half inch wide and stretched to lengthen and render them more thin and flexible.

In this method, the Parafilm strip is rolled between the fingers to make a string, then another strip is rolled over it to create a smooth outer surface (figs. 38a–c). I applied the Parafilm string to the base of the neck and handle and stretched Parafilm sheet to protect the shoulders and lower areas of the vase, overlapping the Parafilm strings (figs. 39a–c).

Another advantage of the system is now apparent; trimming the excess Parafilm sheet mask can be done with a scalpel directly over the solid strings without fear of scoring or scratching the underlying inpainting or original surface.

8.3 INPAINTING TOOLS AND METHODS

I painted the neck, spout, and handle restorations with the airbrush, spraying several thin layers of a black color sympathetic to, but not imitative of, the original highly “brushy” and variegated black slip surfaces found elsewhere (fig. 40).

Their more uniform color and texture subtly but clearly announce their status as nonoriginal replacements. As I removed the Parafilm, the other advantages to this masking technique became apparent—no adhesive residues, no lifting of underlying fill and inpainting, and no hard, raised paint edges of the kind found when using masking tapes or conventional frisket film. Only a gentle “soft-edge” graduation of paint from original to fill (fig. 41).

The size of the transition is governed by the diameter of the Parafilm string and the spray angle and can be easily governed by altering both. Afterward, to reduce the “sprayed” look to the surfaces, I lightly sanded, burnished, and smoothed the paint with fine sandpaper (Micromesh-coated abrasives) and quick linear brushstrokes of neat acetone to recover some of the surface gloss. Care is needed with this last technique, as flooding the paint with acetone can be disastrous! A coat of microcrystalline wax can also be used to adjust the gloss/matte characteristics.
Fig. 38a–c. Preparing Parafilm strings (sequence of three images) (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
Fig. 39a–c. Applying the Parafilm string and sheet mask (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
Fig. 40. Applying thin layers of paint with the airbrush (Courtesy of Tony Sigel, © President and Fellows of Harvard College)

Fig. 41. The completed neck and spout (Courtesy of Tony Sigel, © President and Fellows of Harvard College)
I inpainted the losses in the figural blackline areas with a fine sable brush and black gouache. This allowed for corrections to be made in the water soluble paint, and when satisfied, I sealed the lines with 3% B-72 in acetone. Although this proved effective, I did not feel I had enough control over the drawing process, and since this treatment I have successfully experimented with other methods for re-creating fine blackline decoration, including the methods used by the original vase painters (Artal-Isbrand and Klausmeyer 2013), and by testing both proprietary nonrefillable drafting pens and Rapidograph style refillable pens. The last method proved quite successful—but that is a subject for another article. While inpainting the losses to the design areas closely matching in color, I again allowed slight tonal and gloss differences to remain visible (fig. 42).

Finally, I inpainted many of the smaller damages—especially the very visible fine scratches and abrasions in black slip areas from the tools of careless restorers, which greatly increased the visual coherency and beauty of the vase. It is my opinion that damages inflicted by modern restorers should be rendered as invisible as possible (figs. 43a–b).

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Oh, and especially Steve Koob.
Fig. 43a–b. The oinochoe after treatment (Courtesy of Tony Sigel, © President and Fellows of Harvard College)

REFERENCES


**SOURCES OF MATERIALS**

Deroter steam cleaner  
Preservation Equipment Ltd  
Vinces Road, Diss  
Norfolk IP22 4HQ England  
[https://www.preservationequipment.com](https://www.preservationequipment.com)  
+44 (0)1379 647400

Dust-Off (or similar), Manfrotto 244 variable friction magic arm with camera bracket and 649 quick action release clamp  
B&H Photo  
420 9th Ave. at 34th St.  
New York, NY 10001  
(800) 606-6969  

Flugger acrylic spackle (fine surface filler), glass microballoons, Newplast (formerly Harbutts) Plasticine, Paraloid B-72 (acrylic resin)  
Conservation Resources International, LLC  
5532 Port Royal Road  
Springfield, VA 22151  
(800) 634-6932  

Modostuc  
Peregrine Brushes and Tools  
1211 South 60 West  
Wellsville, UT 84339  
(267) 888-6657  
[http://brushesandtools.com](http://brushesandtools.com)

Flexible frisket film  
Iwata Medea  
1336 N. Mason  
Portland, OR 97217  
(503) 253-7308 x2000  
Golden fluid acrylics, matte and gloss, and gloss, satin, and matte Golden polymer UVLS varnishes
Golden Artist Colors, Inc.
188 Bell Road
New Berlin, NY 13411-9527
(800) 959-6543
http://www.goldenpaints.com/

Leister hot air tool, Modostuc (fine surface filler), Staedtler Mars white plastic/vinyl eraser
Talas
33 Morgan Ave.
Brooklyn, NY 11211
(212) 219-0770
http://www.talasonline.com/

Micromesh micro-surface finishing products
Micro-Mark
340 Snyder Avenue
Berkeley Heights, NJ 07922
(800) 225-1066
http://www.micromark.com

Parafilm M
Sigma-Aldrich
3050 Spruce St.
St. Louis, MO 63103
(800) 325-3010
http://www.sigmaaldrich.com

Smooth-On mold-max 30RTV rubber
Smooth-On, Inc.
2000 Saint John Street
Easton, PA 18042
(800) 762-0744
http://www.smooth-on.com/

ANTHONY SIGEL is conservator of objects and sculpture at the Straus Center for Conservation and Technical Studies, Harvard Art Museums. He was trained through a 10-year unofficial museum apprenticeship at the Art Institute of Chicago, followed by an Advanced-Level Internship at the Straus Center. He gained his initial experience treating ancient ceramics under the tutelage of Stephen Koob during four summers at the Archaeological Exploration of Sardis, Turkey. His training in clay sculpture while a student at the Art Institute of Chicago led him into the technical study of Gian Lorenzo Bernini’s works in terracotta. In 2004–2005, he spent a year as a Fellow of the American Academy in Rome studying these works in situ. His training in clay sculpture and the treatment of Islamic and other ancient ceramics. Most recently he co-curated and co-authored the catalog for the 2012–2013 exhibition “Bernini; Sculpting in Clay” at the Metropolitan Art Museums. Address: Straus Center for Conservation and Technical Studies, Harvard Art Museums, 32 Quincy Street, Cambridge, MA 02138. E-mail: tony_sigel@harvard.edu