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WHEN IN ROME, DO AS THE ROMANS DO? THE CONSERVATION OF AN ITALIAN MARBLE AND MICROMOSAIC TABLETOP

ELIZABETH LA DUC

A 19th-century Italian marble tabletop featuring micromosaic scenes of Rome was the subject of technical study and conservation treatment. The tabletop, part of the collection of Historic New England, is elaborately decorated with two distinct techniques: inlaid colored stones, known as *commesso di pietre dure* or Florentine mosaic, and micromosaics, also known as *mosaici minuti*. The tabletop was broken into four large pieces with areas of loss along the breaks and required extensive treatment before going on display in the recently reinterpreted Josiah Quincy House in Quincy, Massachusetts. The materials and methods of manufacture were investigated using FTIR spectroscopy, photomicrography, and art historical research. Issues concerning best practices for treatment of the tabletop are discussed with regard to the use of traditional methods versus the use of modern replacement materials. Losses to the *pietre dure* were isolated and then filled with bulked and tinted epoxy, using techniques developed to imitate colored stone as well as to increase reversibility. The losses in the micromosaics were filled and then inpainted using methods to replicate the complex appearance of the originals. Some traditional practices, such as the use of fine abrasives and wax coatings, were determined to be appropriate and satisfactory for the treatment.

KEYWORDS: Mosaic, Micromosaic, Marble, Pietre dure, Loss compensation, Inpainting, Epoxy

1. INTRODUCTION

In 2014, an elaborate Italian tabletop (fig. 1) in the collection of Historic New England was the subject of conservation research and treatment. The tabletop, which dates to the late 19th century, combines two quintessentially Italian art forms: *commesso di pietre dure* and micromosaics. Its poor condition raised questions about extent and method of treatment, and the relative scarcity of conservation literature necessitated inventive methods of treatment and problem solving.

1.1 PROJECT BACKGROUND

Historic New England, formerly known as the Society for the Preservation of New England Antiquities, is a historic preservation organization that maintains 37 historic house museums over five states in New England. As part of Historic New England's Proactive Preservation Interpretation and Planning (PPIP) Process (Solz et al. 2012), the decision was made to reinterpret the Josiah Quincy House in Quincy, Massachusetts, from 1772, the time of the house's construction by Josiah Quincy, to the 1880s, the time of Eliza Susan Quincy, Josiah's great-granddaughter (Carlisle 2014). This multiyear project required the conservation treatment of over 100 objects performed both in the conservation lab and on site. The Italian tabletop was one of the most significant treatments in terms of time required. Although not original to the Quincy House, the tabletop and its accompanying painted and gilt wood base were chosen for exhibition because they correspond to the time period of the reinstallation. The treatment was also performed as the author's major project required as a component of a post-graduate Mellon Fellowship at Historic New England.

1.2 DESCRIPTION OF THE TABLETOP

The circular black marble tabletop, measuring 56.3 cm in diameter and 1.7 cm in thickness and weighing approximately 12 kg, is inlaid with decorative colored stones (*commesso di pietre dure*) and



Fig. 1. Before treatment. Unknown maker, *Marble and micromosaic tabletop*, 1870–1890, 56.3 cm (D) x 1.7 cm (H), Historic New England, 1933.1254. Gift of Mrs. George P. (Susan Emily Jewell) Sanger (Courtesy of Historic New England)

micromosaics. The colored stones, separated by thin black marble dividers, are placed in a band around the outer edge of the table with a narrow red stone border on either side. All of the 32 decorative stones are different, with the majority red or yellow in color. The stones include various types of marbles, breccias, lumachellas, fluorite, lapis lazuli, and other unidentified species. The lapis lazuli inlay is uniquely assembled from two pieces, most likely because of the expense and rarity of the material. The fluorite inlay also received special treatment; it is backed by a support of a thin black stone (possibly slate), perhaps intended to provide a solid background for the semi-translucent stone or to reduce its thickness and thus cost.

In the center of the tabletop is a large micromosaic of the Doves of Pliny surrounded by a malachite border. Around this are eight small micromosaics showing scenes of Rome. Alternately oval-shaped and circular, these roundels depict clockwise from top: the Pantheon, Castel Sant'Angelo, the Roman Forum, the Arch of Titus, St. Peter's Basilica, the Capitoline Hill, the Colosseum, and the Tomb of Cecilia Metella. Each of these micromosaics has a narrow border of red *smalti* (glass tesserae). On the back of the tabletop is an illegible inscription in white chalk, now partially abraded. The tabletop is mounted on a three-legged painted and gilded wooden base in the Neo-Grec or Renaissance Revival style dating to the 1870s or 1880s.

It is rare to find a tabletop that combines the techniques of *pietre dure* and micromosaic. It is the author's opinion that the tabletop was made in Rome, for several reasons. The scenes of Rome suggest local production, as does the fact that micromosaics were almost exclusively a Roman technique. In contrast, while the best *pietre dure* was produced in Florence, the technique of hard stone intarsia was practiced many places in Europe, including Rome. Also, the usage of the stone inlays differs from that of typical Florentine work: the stones do not form a picture but are instead used decoratively and as mineralogical specimens.

2. PIETRE DURE

2.1 HISTORY OF PIETRE DURE

Comesso di pietre dure (Italian: a placing together of hard stones), often called simply pietre dure or Florentine mosaic, is an ancient technique dating back to the opus sectile mosaics of the ancient Mediterranean. The technique was revived in Rome in the 1500s and was further developed by the establishment of the Galleria dei Lavori, the official court-supported workshop, by Federico I de Medici in 1588. The Galleria flourished for a few centuries, producing elaborate works of art, including pictures, tabletops, and cabinets, as well as large-scale architectural revetments such as the Capella dei Principi at the Church of San Lorenzo. Rival courts, especially in Prague, Dresden, and Madrid, set up their own stone-working factories (Massinelli 2000). With the decline of the Medici family and its patronage in the early 19th century, the workshop was renamed the Opificio delle Pietre Dure (OPD). By the end of the 19th century, commissions and patrons were waning, and the OPD changed its focus to restoration. The OPD is now one of the premier centers for conservation and conservation training in Italy, focusing not just on stone conservation but also on paintings, textiles, and other objects (Koepepe and Giusti 2008).

2.2 TECHNIQUE OF PIETRE DURE

Creating pietre dure objects is an intricate, labor-intensive process. Pietre dure objects are usually made on a black stone substrate. The best pietre dure objects use *paragone*, a black siliceous stone; black Belgian marble and slate are also commonly used. Depending on whether the support material itself is integrated into the design, recesses are chiseled into the support to receive the inlays. On Historic New England's tabletop, the circular nature of the tabletop and the channels suggests the use of a lathe, both to cut the support and to create the recesses. Meanwhile, slabs of stones—either pietre dure (hard stones) or pietre tenere (soft stones, with a Mohs hardness less than 6, including marble)—are cut to an appropriate thickness, usually 2–4 mm but occasionally thinner. The design, drawn on paper, is pasted onto the stone. The stones are then cut into pieces known as *formelle* using a wooden bow saw fitted with an iron wire coated in damp emery powder. The cut pieces of stone are assembled on the substrate using a heated mixture of pine rosin (colophony) and beeswax, in a 4:1 ratio by tradition (fig. 2)



Fig. 2. Break edge of the tabletop illustrating the manufacturing technique of pietre dure. From bottom to top: the black marble substrate, the rosin layer, and the decorative stone slab. Note the thickness of the adhesive layer (Courtesy of Historic New England)

(Chastang 2012). After the adhesive has set, the top of the work is polished with progressively finer abrasives and the object is coated with wax. An important distinction between *pietre dure* and other forms of mosaics is that in *pietre dure*, the pieces are cut so they fit tightly together without any adhesive or mortar visible (Acidini 2008).

3. MICROMOSAICS

3.1 HISTORY OF MICROMOSAICS

Micromosaics, also known as *mosaici minuti* or Roman mosaics, are what their name suggests: mosaics in which the tesserae are very small. Like *pietre dure*, the history of micromosaics dates to the 16th century in Rome, but the term micromosaic is modern, coined in the late 20th century by the famed collector Sir Arthur Gilbert to describe mosaics that require magnification to see the tesserae. In 1578, the Reverenda Fabbrica di San Pietro (RFSP), also known as the Studio del Mosaico Vaticano, was founded to create mosaics to decorate the interiors of St. Peter's Basilica. Starting in the early 18th century, the studio began to make smaller works using minute glass tesserae. By the end of the 18th century, most commissions were no longer from the Vatican but instead from private clients. In the 19th century, artists such as Michelangelo Barberi created masterworks for wealthy patrons, while dozens of Roman studios mass-produced micromosaic souvenirs for visitors on the Grand Tour (Gonzales-Palacios 1982).

Along with scenes of Rome, the Doves of Pliny is almost certainly the most common image produced in micromosaics. It is found on six different objects in the Gilbert Collection alone (Gabriel 2000). Based on the famous mosaic uncovered at Hadrian's villa in 1737 and now in the Capitoline Museum, the name comes from the description of the subject by Pliny. The image was reproduced in micromosaics on objects ranging in size from tabletops to paperweights to jewelry; the objects vary widely in quality as well.

3.2 TECHNIQUE OF MICROMOSAICS

To make micromosaics, opaque, matte glass tesserae known as *smalti* are fabricated by drawing out pieces of colored glass cakes into strips (*filati*) of varying thickness by heating with a flame. At the high point of micromosaic production, over 28,000 colors were used in a wide range of shapes (fig. 3). Specialized *smalti* known as *malmischiato* (badly mixed) are made by fusing multiple colors together with heat. The *filati* are shaped while still hot and then snipped into small pieces. The cut pieces are placed on a substrate of black stone, copper, or glass using *mastice*, a combination of linseed oil, chalk, and other materials but which confusingly does not contain mastic resin (fig. 4). Once the *mastice* has hardened, the micromosaic surface is polished using fine abrasives. In order to create a seamless surface, gaps between the *smalti* are filled with colored wax applied with a spatula. The mosaic is then polished a final time (Rudoe 2000).

The extent of colored wax used is more easily determined with ultraviolet radiation, as seen in the detail of the sky behind the Pantheon (figs. 5, 6). This also reveals how much wax has been lost through use or cleaning. Examination of micromosaics in Historic New England's collection showed this to be a not unusual phenomenon.

4. SCIENTIFIC ANALYSIS

Very little analysis has been published on *pietre dure* and micromosaic objects, with information about materials used almost entirely based on historical records and craft tradition. Analysis undertaken by

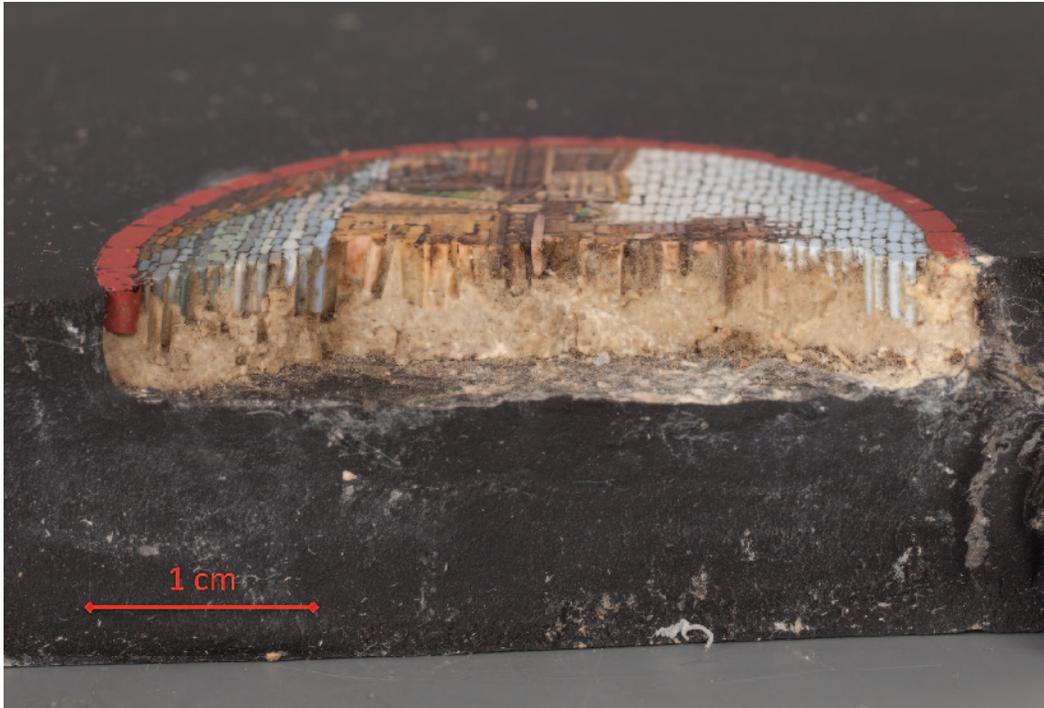


Fig. 3. Detail of the micromosaic of the Doves of Pliny, showing the wide range of colors and shapes of smalti (Courtesy of Historic New England)

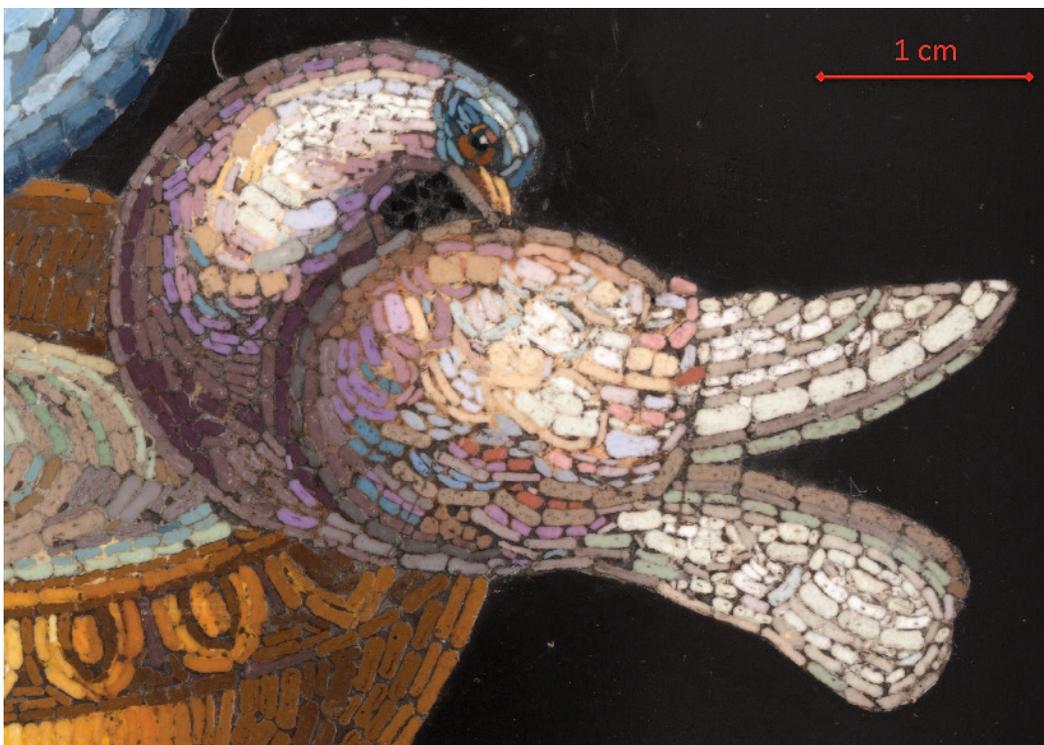


Fig. 4. Side view of the break edge of the tabletop, showing manufacture of the micromosaic: the black marble base, the mastic (traditional mixture of linseed oil, lime, and marble dust), and the opaque glass smalti (Courtesy of Historic New England)



Fig. 5 and 6. Micromosaic of the Pantheon under normal and UVA radiation. The remains of colored wax in between smalti show ultraviolet-induced visible fluorescence. Also note the malmischiato smalti used for the columns of the Pantheon and the small figures (Courtesy of Historic New England)

Chastang (2012) of a late 17th-century *pietre dure* cabinet used gas chromatography-mass spectrometry (GC-MS) to identify the adhesives as pine rosin and beeswax. To learn more about Historic New England's tabletop, samples were taken of the adhesives used for both techniques and of the wax in the micromosaic. Analysis by Fourier transform infrared (FTIR) spectroscopy¹, with results supported by polarized light microscopy (PLM)², provided some answers but left some questions.

The adhesive under the *pietre dure* consisted of a natural resin, most likely pine rosin, and had significant amounts of calcium carbonate, either from contamination from the marble of the tabletop or from chalk used as a bulking agent. Despite references in the literature to the use of a wax-rosin mixture, no wax was detected. The results for the adhesive underneath the micromosaic were less conclusive. The spectrum was dominated by peaks for calcium carbonate, with only traces of an organic material detected. The lack of a carbonyl peak suggested the organic material was neither a drying oil nor a natural

resin. Future analysis, either with additional separation and extraction steps or with another technique such as GC-MS, could be performed to identify the material. The sample of red-colored wax used between the smalti was found to be a mixture of a natural wax (most likely unrefined beeswax) and hematite (red ochre), matching expectations.

5. TREATMENT

5.1 CONDITION OF THE TABLETOP

The tabletop was in poor condition, with major structural and surface issues. It was broken into four sections; previous restoration resulted in the misalignment of one large section and several of the decorative stone inlays (fig. 7). Two of the stone inlays were missing large portions, and one stone inlay and two and a half black stone dividers were missing entirely. Along the central break, there was substantial loss to the micromosaics in the scenes of the Capitoline Hill and the Doves of Pliny, and more



Fig. 7. The tabletop photographed under raking illumination showing misalignment, losses, and surface dirt (Courtesy of Historic New England)

than half of the scene of Castel Sant'Angelo was missing. Finally, the tabletop surface was very dirty and etched in places.

5.2 TREATMENT OBJECTIVES

The objectives of the treatment were to stabilize the condition of the table, preventing further damage, as well as to make the table suitable for display. As an organization of historic house museums, Historic New England often takes a minimal approach to treatment. The institution prefers that objects undergoing treatment retain their patina or sense of age in order to harmonize with their period setting. On the other hand, decorative objects like the tabletop require a high level of finish to recreate their intended appearance. For this reason, a highly restorative approach, including aesthetic reintegration, was chosen for this treatment.

5.3 SURFACE CLEANING

The tabletop was cleaned with calcium-saturated distilled water with the pH raised to 8.5 using ammonia. A small amount of Triton XL-80N was added to improve detergency. The water was saturated with calcium by adding precipitated calcium carbonate until no more would go into solution in order to reduce leaching and change in surface gloss (Lauffenburger et al. 1992). A pH of 8.5 was chosen because although a higher pH has been proven to reduce etching of the marble, a pH higher than 9 might affect the glass tesserae. Sections of *pietre dure* were then rinsed with ethanol and mineral spirits to remove grease or other residues. Sections of micromosaic were rinsed with ethanol only, because of the potential solvent sensitivity of the colored wax between the *smalti*.

5.4 DISASSEMBLY AND REASSEMBLY

The misaligned sections were disassembled by wicking acetone into the joins using a pipette, as the adhesive from the previous restoration dissolved quickly in acetone while the original adhesive only swelled. The pieces were then reattached with a 30% (w/v) solution of Paraloid B-72 in acetone, heavily bulked with glass microballoons. Despite some overlap in solubility with the original adhesive, B-72 was chosen because it is much more readily reversible in acetone than the original adhesive, and because the glass microballoons make the new adhesive easily distinguishable. The colored marble pieces were reset by first applying the bulked B-72, then gently pressing the stone fragments until level with the surface of the table, and finally removing any excess adhesive from the surface using acetone. Gaps around the re-set stones were filled with Modostuc and then inpainted with Gamblin Conservation Colors.

The four sections of the tabletop were reassembled using a 35% (w/v) solution of B-72 in acetone. Alex Carlisle, Supervising Conservator, Historic New England, made curved wooden gluing cauls and designed a complex clamping system to distribute the pressure evenly around the table (fig. 8).

5.5 TREATMENT OF PIETRE DURE

5.5.1 Past Approaches to the Treatment of Pietre Dure

The OPD is the leader in the conservation of *pietre dure* objects. Their conservation approach is rooted in their expertise in craftsmanship; they state that “restoring Florentine mosaic with the original materials and techniques is the ideal method, the one most suitable for giving back to these works of art their decorative value and material worth (the two being closely connected) in the way that was originally conceived by their makers” (Giusti 1994, 146). While utilizing newly created stone inlays for treatments, the OPD follows modern conservation principles of documentation, distinguishability, and reversibility (Acidini 2008). For example, in the treatment of a tabletop from the Palazzo Ducale of Mantua, new stone pieces were cut in the traditional manner, then adhered to slate and screwed into the original table,



Fig. 8. Clamping system used to join the tabletop sections (Courtesy of Historic New England)

with a minute gap between the original and the repair, thereby remaining reversible and distinguishable. In some cases, the OPD uses non-stone materials for fills. To recreate a Greek breccia that was no longer available, the OPD used a mixture of marble chips, pigment, and polyester resin cast in a mold and then cut to shape. On an object belonging to the Prado where the color and patterning of the missing stones were not known, the OPD used *scagliola* (polished, tinted plaster) to fill losses (Griffo 2009).

Outside of Italy, a combination of traditional and new methods has been used to conserve *pietre dure* objects. In his treatment of ebony cabinets with *pietre dure* panels, Chastang (2012) considered using other adhesives such as Paraloid B-72 and hide glue but ultimately used a 2:1 mixture of beeswax and colophony, a modified version of the original adhesive, to reattach lifting stone inlays. Because of the difficulties in sourcing stones that would exactly match the remaining originals, Chastang filled losses with a mixture of carnauba wax, shellac wax, dammar, and pigment, which replicated the original color and gloss yet remained reversible. For his treatment of a Czech *pietre dure* panel, Schott (2000) used pigmented polyester resin, which was cast out as a sheet on a plate of glass, cut to shape using a jeweler's saw, and finally adhered with fish glue over a paper barrier. According to Chastang (2012), the difficulty of making fills has led some to take alternate approaches that many conservators would not consider acceptable: trimming rough break edges for easier repair or removing entire broken sections and then completely replacing them with new stones.

In the case of the Historic New England tabletop, while it might have been desirable from an aesthetic viewpoint to replace the missing stone inlays with newly cut stone, this method was impractical for several reasons. First, the conservation department at Historic New England did not have access to the materials, equipment, or specialized expertise to do lapidary work. Second, two of the stone slabs were only partially missing. It would have been difficult to cut a piece to exactly fit the rough break edges and even more unlikely to find a replacement slab that matched the coloring and pattern of the original.

Having ruled out filling the losses with real stone, the question became what to use instead. Scagliola and tinted wax-resin mixtures have been used by the OPD and Chastang, respectively, but both lack the translucency of natural stone. Polyester resin has been used by the OPD and Schott. While translucent, polyester resin has issues of toxicity and permanence, with a susceptibility to yellowing. Instead, conservation-grade epoxy was used, which is translucent, of relative low toxicity, of high lightfastness, and can be easily mixed with lightfast pigments.

5.5.2 Treatment of the Missing Stone Inlay

The stone that was missing entirely allowed the most freedom in compensation. A pink and yellow inlay was chosen because similarly colored stones appeared on comparable tables, because the colors harmonized with the rest of the table, and because it was different from what was extant on the table, as each stone sample is unique. An imitation of a veined marble was selected because it was easier to replicate than a conglomerate stone such as breccia or lumachella (although the OPD has successfully replicated breccias by using marble chips). In order to be historically accurate, the design of the stone was based on an example, Corsi 200, from the Corsi Collection of Decorative Stones (Oxford Museum of Natural History 2012). The shape of the colored stone was traced onto a piece of wood that had been planed to an appropriate thickness; the wood was sawn to shape, sanded further, and then coated with shellac. A silicone rubber mold was made of the wood blank. The first mold had the top surface facing down, with the intention of reducing the need for sanding or finishing, but this made it impossible to see the veining and mottling during creation of the fill. A new mold was made with the open face of mold being the “show face.” This made it easier to manipulate the appearance of the fill, but the fill did require some polishing after curing. The fill itself was made by mixing various shades of epoxy (EpoTek 301) tinted with dry pigments and bulked with fumed silica (fig. 9). After the epoxy cured, the fill was adhered with a 30% (w/v) solution of B-72 in acetone. Minor gaps along the edges were filled with Modostuc and then inpainted with Gamblin Conservation Colors (fig. 10).

5.5.3 Treatment of the Black Dividers

Replacement black marble dividers were made by casting epoxy, heavily tinted with black pigment and bulked with glass microballoons, into a polyvinyl siloxane (PVS) putty mold made from an original divider (which had been temporarily removed during the rejoining and realignment process described above). After the fills set, they were polished with progressively finer Micro-mesh to replicate the original gloss. The fills were shaped and then adhered in place with a 30% (w/v) solution of B-72 in acetone.

5.5.4 Treatment of the Orange and Black Stone

To fill the losses of the orange and black stone, tentatively identified as a breccia with white quartz druzey overgrowth (cf. Corsi sample 781), a multistep process using previously cured pieces of epoxy was used. First, a layer of 30% (w/v) solution of B-72 in acetone bulked with glass microballoons was applied in the area of the loss to create a flat base for the fill. A 15% (w/v) solution of B-72 in acetone was used both to isolate the edges of the loss and to protect temporarily the surface surrounding the fill. A liner of Japanese tissue, previously toned with acrylic paint and coated with a 10% (w/v) solution of B-72 in acetone, was inserted in the loss above the bulked B-72 to increase reversibility (fig. 11a). Small pieces of dental plate wax were placed in the fill to act as resists for sections chosen to be filled with another color later (fig. 11b). Epoxy (EpoTek 301) was allowed to partially cure then mixed with dry pigments and bulked with fumed silica. Gray-, black-, white-, and beige-tinted epoxy along with cured black epoxy chips were placed in the fill in imitation of the original stone. After the epoxy cured, the wax was removed mechanically and with mineral spirits. Previously cured orange-tinted epoxy



Fig. 9. Fabrication of the tinted epoxy fill in its silicone rubber mold (Courtesy of Historic New England)

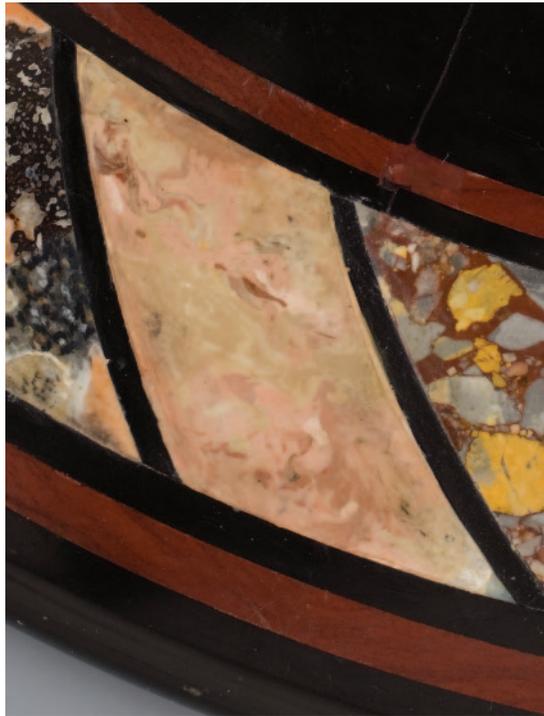


Fig. 10. The completed replacement stone inlay (Courtesy of Historic New England)

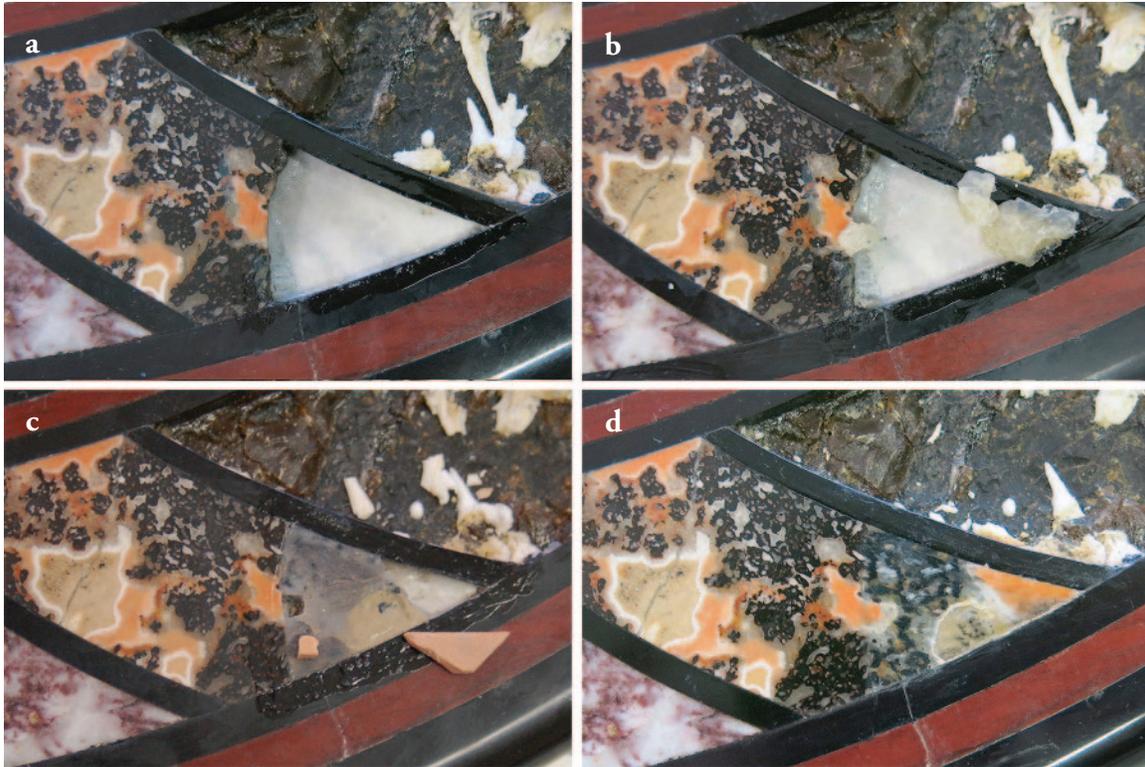


Fig. 11. Steps in the filling and inpainting of the orange and black stone: 11a. applying a paper barrier layer; 11b. reserving areas with wax; 11c. placing orange epoxy chips into the reserved areas after the gray-, beige-, and white-tinted epoxy cured; and 11d. the completed fill (Courtesy of Historic New England)

was shaped with a jeweler's saw and scalpel then placed in the reserved areas (fig. 11c). White-tinted epoxy was used to fill the gaps between the orange pieces and the rest of the fill in imitation of the quartz druze effect. After the epoxy cured, the surface was smoothed with sandpaper and Micro-mesh, and the temporary B-72 barrier surrounding the fill was removed. Fine details which couldn't be achieved with epoxy alone were added with Gamblin Conservation Colors in an isopropanol diluent. After curing, the epoxy fill was polished with Micro-mesh then coated with Acrysol WS-24 to create a high gloss (fig. 11d). The same high gloss could have been achieved with continued Micro-mesh polishing alone, but using Acrysol WS-24 saved time. This fill demonstrated that the translucency and depth of the original stone could be more closely matched by using tinted epoxy with painted details than by using paint alone.

5.5.5 Treatment of the Purple and Green Stone

A similar multistep approach was taken for the loss to the green and purple stone, which resembles a diopside-containing metagabbro from Corsica (cf. Corsi sample 964). The area of loss was prepared in the same way as the orange and black stone (see section 5.5.4). Striated purple epoxy (EpoTek 301) chips were made by mixing multiple shades of purple-tinted epoxy, casting the epoxy onto polyester sheet, and carefully drawing the colors across each other with a toothpick to create patterns (fig. 12). After the epoxy cured, it was broken into chips with irregular edges; these were placed onto the Japanese tissue liner and adhered with epoxy bulked with fumed silica. Then various shades and opacities of green-tinted epoxy were dribbled around the chips, with clear, untinted epoxy added as necessary. The fill was finished as above (fig. 13).



Fig. 12. Creating striated epoxy chips (Courtesy of Historic New England)



Fig. 13. The purple and green stone after treatment (Courtesy of Historic New England)

5.6 TREATMENT OF MICROMOSAICS

5.6.1 Approaches to the Treatment of Micromosaics

The simplest approach for Historic New England's tabletop would have been to create toned fills for the areas of loss, but the damage was located directly in the center of the table. As mentioned above, micromosaics are mass-produced objects, with a fairly limited visual repertoire. Certain scenes like the Doves of Pliny are produced over and over again. As another copy of a print can inform the replication of lost sections, it was both possible to recreate the missing portions using other examples and desirable to eliminate the visually distracting damage by using a more restorative treatment approach.

Although several books have been written on the history of micromosaics, almost nothing has been published on their conservation, aside from an unpublished German dissertation (Welsch 2011) and an article on the present-day work of the Studio del Mosaico Vaticano (Di Buono 2014). Craft-based approaches are still used by some. For example, in her treatment of an object from the Gilbert Collection, Laura Hiserote, a micromosaic artist, removed any broken or chipped smalti, replaced lost smalti with new glass smalti, filled in between smalti with colored "grout," and then polished the entire surface (Hiserote 2003).

Like the conservation of the *pietre dure*, using a traditional craft-based approach was both impractical and undesirable. The conservation department lacks the equipment and the skills to make new

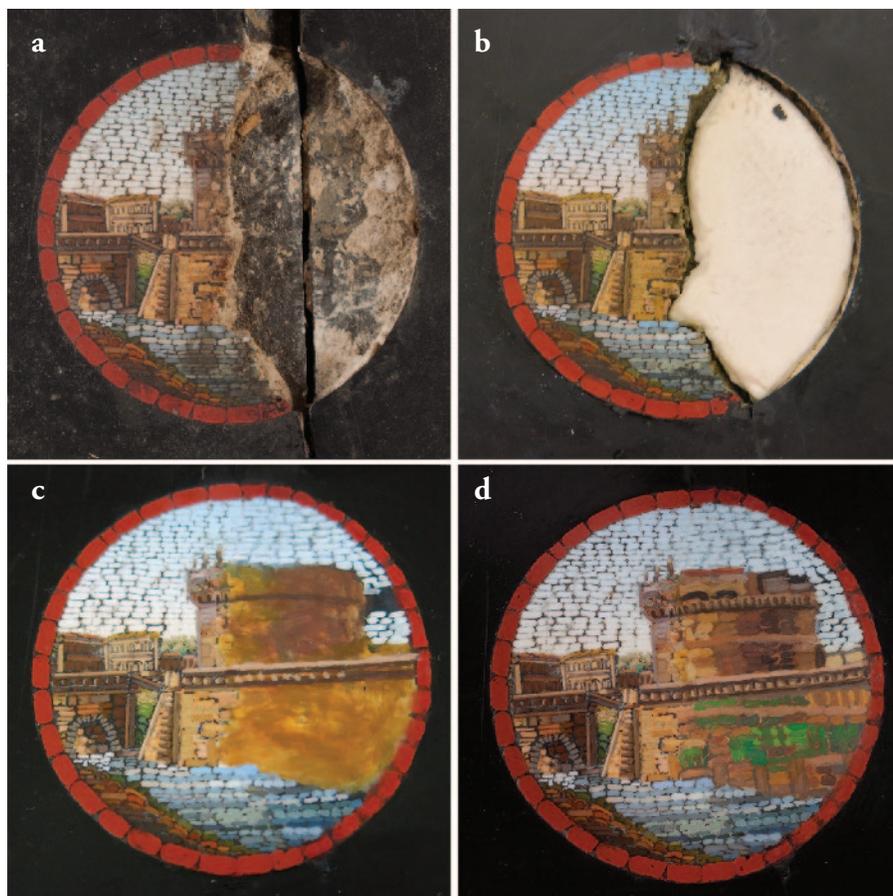


Fig. 14. Steps in filling and inpainting the micromosaic of Castel Sant'Angelo: 14a. the micromosaic before treatment; 14b. filling the bulk of the loss with matboard; 14c. during inpainting; 14d. after inpainting (Courtesy of Historic New England)



Fig. 15. The micromosaic of the Doves of Pliny, before treatment (Courtesy of Historic New England)



Fig. 16. The micromosaic of the Doves of Pliny, after treatment (Courtesy of Historic New England)

smalti, and even with the best documentation, the use of new glass smalti doesn't fit current conservation standards of distinguishability and reversibility. The idea of making smalti out of tinted epoxy or Paraloid B-72 was briefly considered but then dismissed due to time constraints. But this possibility should be kept in mind for the future, especially if only a small range of colors and shapes is needed.

5.6.2 Filling for the Micromosaics

Instead of using new smalti made of glass or resin, it was decided to replicate the look of the smalti using a multistep filling and inpainting approach. The first step in compensation was to fill the lacunae. Acid-free matboard was used to fill the bulk of the large, deep losses in the micromosaics of Castel Sant'Angelo and the Doves of Pliny. The shaped matboard was consolidated with dilute B-72 and adhered in place with a 10% (w/v) solution of B-72 in acetone bulked with glass microballoons (figs. 14a, 14b). Then for all the micromosaics, the remainder of the loss was filled with Modostuc. Tinted washes of Gamblin Conservation Colors in isopropanol were applied over the Modostuc in order to replicate the colored wax and dirt surrounding the original smalti.

5.6.3 Inpainting the Micromosaics

The inpainting of the micromosaic designs was based on similar examples found online and in published references. In order to recreate the micromosaics' appearance, individual lines were painted over the tinted background fills using small but medium-rich strokes of Gamblin Conservation Colors in



Fig. 17. The tabletop after treatment (Courtesy of Historic New England)



Fig. 18. The tabletop and its base after treatment (Courtesy of Historic New England)

an isopropanol diluent (fig. 14c). Gamblin paints were chosen because of their high refractive index, easily controllable gloss (adjusted with Laropal A-81), and low color shift compared to acrylics. Micro-mesh was used to tone down excess gloss or bumps in the brushstrokes. The two-step inpainting process recreated the gloss and height difference between the smalti and the colored wax background (figs. 15, 16).

5.7 POLISHING AND COATING THE TABLE

The table was coated to increase gloss, unify the surface, and provide some protection against wear and handling. Different coatings were tested: 7% B-72 in Cyclosol, 10% Regalrez 1126 in Shellsol 340 HT, and Butcher's Paste Wax. Butcher's Paste Wax gave the best results, saturating the surface without looking artificial. However, the wax did not hide the fine damages to the surface. Micro-mesh was used to reduce the most noticeable etching of the black stone near the center of the table. The table was then given a coat of Butcher's Paste Wax, taking care to avoid rubbing the wax over the micromosaics because of the solubility of the colored wax. After the wax dried slightly, the surface was buffed to increase shine (Figs. 17, 18).

6. CONCLUSIONS

This project provided an opportunity to research the materials and methods of two fascinating but rarely encountered techniques. Approaches to their conservation, especially as practiced in Europe, were explored. Some aspects of these conservation methods, such as using resin to recreate stone, were adapted for this project, but others, such as using glass smalti, were found to be impractical and unsuitable. The finished treatment demonstrated that using a modern conservation approach instead of a more traditional craft-based approach could be both aesthetically successful and meet current standards of reversibility and distinguishability between original and new materials. This project also showed the need for continued research and practical projects on micromosaics and pietre dure. For example, more research needs to be done into the materials of micromosaics, especially the “mastic.” Future treatment projects could optimize the use of epoxy to replicate decorative stones, including complex stones like breccias.

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NOTES

1. For Fourier transform infrared (FTIR) spectroscopy, each sample was analyzed using an IlluminatIR infrared microspectrometer (SensIR, now Smiths Detection, Danbury, CT), in combination with an Olympus BX50 polarized light microscope. The IlluminatIR is equipped with an MCT (mercury telluride, cadmium telluride) detector and interchangeable objectives including a contact attenuated total reflectance (ATR) objective with zinc selenide focusing crystal and diamond ATR window. The samples were placed on a Low E-glass slide (Smiths Detection) and analyzed using the contact ATR objective. A total of 64 scans were gathered for the background spectrum and 128 scans for the sample spectrum in the 4,000–650 cm^{-1} region at a resolution of 4 cm^{-1} . Spectra were captured in absorbance mode, processed according to a 1st derivative absolute value, and searched against a number of spectral libraries, including the IRUG Spectral Database Edition 2000. Spectral software included QualID 2.51 (Smiths Detection), as well as GRAMS 7.01 and Spectral ID 3.02 (Thermo Galactic, Waltham, Massachusetts).
2. Polarized microscopy was performed using an Olympus BX-50 microscope under visible light and UV epi-illumination. Photomicrographs were taken with an Olympus Q-Color 5 digital camera using a 10X objective. The visible light source was a halogen lamp (750W, 120V, polarizing filters); the ultraviolet source was a mercury xenon lamp (OSRAM Xenophot Longlife HLX 64623 100W 120V) in combination with an Olympus 11000 filter cube (excitation filter = 320–380 nm, suppression filter = 420 nm).

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SOURCES OF MATERIALS

Acrysol WS-24, EpoTek 301, fumed silica, glass microballoons, Paraloid B-72

Conservation Resources

5532 Port Royal Rd.

Springfield, VA 22151

800-634-6832

<http://www.conservationresources.com/>

Butcher's Bowling Alley Paste Wax

The BWC Company, Inc.

15559 Union Ave. Ste. 208

Los Gatos, CA 95032

800-569-0394

<http://www.bwccompany.com/>

Calcium carbonate (precipitated chalk), Gamblin Conservation Colors, Modostuc

Talas

330 Morgan Ave.

Brooklyn, NY 11211

212-219-0770

<http://www.talasonline.com/>

Dry Pigments

Kremer Pigments

247 W. 29th St. C

New York, NY 10001

212-219-2394

<http://www.kremerpigments.com/>

Triton XL-80N (no longer available; Surfonic JL-80X is a replacement)

Museum Services Corp.

385 Bridgepoint Dr.

South Saint Paul, MN 55075

651-450-8954

<http://www.museumservicescorporation.com/>

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