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# THE TREATMENT OF TWO TERRACOTTA ARCHITECTURAL RELIEFS BY ANDREA DELLA ROBBIA AT THE METROPOLITAN MUSEUM OF ART

CAROLYN RICCARDELLI AND WENDY WALKER

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The Metropolitan Museum of Art has among its extensive collection of Renaissance-period glazed terracotta sculpture two masterpieces by Andrea della Robbia that have recently undergone major conservation treatment. The *Saint Michael the Archangel* lunette, which sustained extensive damage after a tragic fall in 2008, returned to The Met's galleries in 2015 after years of meticulous reconstruction, filling, and inpainting of losses. While daunting, the treatment of the damaged lunette was relatively straightforward, and culminated in the creation of an elegant mounting system designed to secure each of the sculpture's original 12 interlocking sections independently. More recently, a large tondo with a central representation of the cardinal virtue Prudence was treated in preparation for the exhibition *Della Robbia: Sculpting with Color in Renaissance Florence*, returning the piece to public view after being kept in storage for more than a generation. The massive *Prudence*, made of 15 molded and modeled sections comprising a central tondo surrounded by a colorful garland, was found to be structurally unstable in its 150-year-old mount as well as having many aesthetic issues due to previous restoration campaigns. Conservators disassembled the sections with the goal of remounting this large work in preparation for travel. Following disassembly, surfaces were cleaned, revealing a previously unknown numbering system. This discovery led to a dramatically different arrangement of the tondo's garland. To prepare *Prudence* for travel, an innovative mounting system was created using an aluminum honeycomb backing panel combined with carbon fiber clips.

KEYWORDS: Terracotta, Glaze, della Robbia, Conservation, Cleaning, Terracotta repair, Carbon fiber, Mounts, Tool marks, Gilding, Ceramics

## 1. INTRODUCTION

Luca della Robbia (1399/1400–1482), a Florentine sculptor working in bronze, marble, and clay, invented the technique of glazing terracotta sculpture, giving rise to an entirely new and widely valued art form. Luca trained his nephew Andrea della Robbia (1435–1523) in the secrets of the trade. Andrea, a brilliant artist and sculptor in his own right, advanced the family business to include the production of glazed terracotta sculpture for architectural use on a grand scale. In time, the business was passed to Andrea's sons, of which Giovanni and Girolamo were most notably active. The family business continued successfully until these descendants passed away, Giovanni in 1530 and Girolamo in 1566. Soon thereafter, the della Robbias' carefully guarded technological secrets were lost (Cambareri 2016).

The Metropolitan Museum of Art began acquiring its collection of della Robbia glazed terracotta sculptures in the early 20th century. Among the many magnificent pieces at The Met, *Saint Michael the Archangel* and *Prudence*, both created by Andrea della Robbia in 1475, are among some of his finest works. This paper will cover the treatment of these two sculptural reliefs, which arose for very different reasons: one following a tragic accident and the other on the occasion of an exhibition focused on della Robbia sculpture. Prior to their treatments, these two masterpieces drew little attention from the general museum visitor. The Saint Michael lunette was installed above a doorway in a gallery that many visitors consider a conduit to other areas of the museum. *Prudence* was in deep storage and had not been exhibited in more than 25 years. Whatever the story that led to their treatment, these two works have rightly regained their position as some of the finest expressions of Renaissance-period sculpture at The Metropolitan Museum of Art.

## 2. OVERVIEW OF DELLA ROBBIA MANUFACTURING TECHNIQUES

*Saint Michael the Archangel* and *Prudence* were made by Andrea della Robbia when he was 50 years old and only in the middle of his long career. Andrea was working in his uncle Luca's workshop, which was located on *Via del Guelfa* in Florence, about a 10-minute walk from the Duomo. Luca had been living and working there approximately 30 years and was already famous for his novel use of glazes to decorate terracotta sculpture (Raggio 1961). Our lunette and tondo are large, both around 155 cm (5 ft.) in diameter, and weigh 100 and 350 kg (220 and 775 lb.), respectively. They were created as architectural elements to be installed above doors or mortared into exterior walls. One of the most extraordinary features of della Robbia's glazed terracotta is its durability, even in outdoor environments; many of the della Robbia pieces found throughout Florence have been in place for over 500 years.

In order to produce large glazed sculptures such as these, many steps are required to transform raw clay into a strong ceramic body covered in fields of shiny, colored glazes so characteristic of the della Robbia workshop. In 2013, one of the authors of this paper, Wendy Walker, had the opportunity to visit a factory outside Florence that reproduces della Robbia works in the traditional manner. Daria Dolfi, Director of N. D. Dolfi, in Scandicci, Italy, gave Walker an extensive behind-the-scenes exploration of her factory. At N. D. Dolfi, as the della Robbia workshop did 500 years ago, clay is pressed by hand into plaster molds and left to dry for several hours. Then the piece is unmolded, the seam lines removed, details refined, and additional sculpting is done. The completed piece is left to dry slowly over a period of weeks. Once bone dry, the sculpture is fired in a kiln to about 1,000°C for the first of two firings. The bisqued piece is then ready to be decorated; blue and white glazes are applied by brush as separate color fields. After glazing, the piece is fired again, the second and final time (Dolfi, pers. comm.). When this technique was first developed in the 15th century, the resulting stunning blue and white glazed terracotta with a slightly uneven gloss—dimpled and satiny—made the della Robbia workshop famous, establishing a family practice that would be active for over 100 years.

### 3. SAINT MICHAEL THE ARCHANGEL LUNETTE

Saint Michael the Archangel is the leader of all angels and of God's army against evil; one of his responsibilities is to help the faithful on Judgment Day. His qualities are courage, strength, and mercy. He is depicted in our lunette with wings outstretched, a sword in his right hand. In his left hand, he holds a set of scales to weigh the virtue of souls. The *Saint Michael the Archangel* lunette is composed of 12 interlocking sections, made to be installed over the main entrance on the exterior of the church of *San Michele Arcangelo* in Faenza. The church was deconsecrated in 1798; a few decades later, the lunette passed into private collections. It was first owned by Count Pasolini dell'Onda, a nobleman from Florence. Eventually, in 1875, the lunette was acquired by German collector Heinrich Vieweg of Braunschweig. In 1930, the lunette was purchased by Myron C. Taylor of New York and, in 1960, acquired by The Met at auction (Marquand 1922; Raggio 1961).

The lunette was mounted on a heavy plywood panel with a gilded frame (fig. 1) and was installed on a ledge above a doorway in The Met's Quattrocento Gallery for 12 years. In the early hours of July 1, 2008, it fell and crashed to the floor. Through some miracle of gravity, the piece landed on its back, still contained within the wooden mount. The lunette's sections were secured by T-shaped nails, preventing them from bouncing off the mount on impact. Even so, the lunette suffered terrible damage and fragments were strewn everywhere (fig. 2). A systematic recording and retrieval system was employed; the



Fig. 1. The lunette set into a modern gilded frame, shortly after it was acquired by The Met in 1960. Andrea della Robbia (Italian, 1435–1525), *Saint Michael the Archangel*, ca. 1475, glazed terracotta, 79.1 × 157.2 cm, The Metropolitan Museum of Art, Purchase, Harris Brisbane Dick Fund, 60.127.2. (©The Metropolitan Museum of Art)



Fig. 2. The lunette as it was found in the gallery on the morning of July 1, 2008 (Courtesy of D. Stone, ©The Metropolitan Museum of Art)

area was mapped and hundreds of fragments were bagged and labeled according to where they were found. This extra precaution proved to be extremely helpful in locating where the fragments belonged once it was delivered to the conservation lab.

The old mount included heavy layers of plaster located between the plywood panel and the lunette, functioning as a sort of shim to level out the ceramic sections. While it undoubtedly helped to soften the impact, the plaster layer was completely smashed and mixed with the ceramic fragments, which ranged in size from tiny glaze flakes to large pieces, many of which were riddled with cracks. Fortunately, major elements such as the head, hands, and even the little souls remained remarkably intact.

### 3.1 Treatment

The conservation treatment was lengthy but relatively straightforward. The first step was to sort through the fractured plaster to find the ceramic fragments and glaze flakes. The fragments were covered in plaster dust that had infiltrated even the smallest cracks in the ceramic body. Thorough and careful vacuuming, dusting, and then surface cleaning with ethanol and deionized water were carried out before consolidating hairline cracks and sealing break edges with 10% Paraloid B-72 in acetone.

Bonding fragments was accomplished section by section using a 3:1 blend of B-72 and B-48N.<sup>1</sup> This adhesive mixture was researched, tested, and used successfully on Tullio Lombardo's marble sculpture *Adam*, making it an excellent choice for repairing an object the size and weight of *Saint Michael the Archangel* (Riccardelli et al. 2014). The adhesive was wonderful to apply, and the conservators were able to achieve extremely close joins between the fragments—often a challenge with terracotta. Fragments were held in position with low-tack tape or small clamps and left undisturbed for 2 weeks for the adhesive to set completely (figs. 3a, 3b). Once the sections were assembled, the multitude of glaze flakes could be placed and bonded.

The missing areas were filled with Modostuc (a proprietary filling material composed of calcium carbonate and barium sulfate in a polyvinyl acetate copolymer binder). Completed fills were inpainted with Golden Acrylics followed by layers of Primal WS24 (a water-based acrylic colloidal dispersion) applied by brush to replicate the gloss of the glaze. On one of the larger fills, the surface of the somewhat uneven, dimpled glaze was recreated by applying a thin layer of HXTAL NYL-1 on the already inpainted fill, then laying on a thin layer of Zhermack Elite Double 8 silicon rubber that had been previously cast from an adjacent undamaged glazed area. The silicon rubber sheet imparted the texture of the dimpled glaze to the HXTAL NYL-1, making the fill seamlessly blend into the surrounding glazed ceramic surfaces. The blue glaze color proved to be challenging to replicate due to the metamerism of many modern blue pigments. However, we found that mixtures of Golden Acrylic's ultramarine blue, Naples yellow, raw umber, and occasionally titanium white had less of a metamerism shift than others, and remained successfully color matched even under gallery lighting.

### 3.2 Mount

In 1475, the sections of the lunette were created using a combination of plaster molds and hand modeling, and were carefully designed to fit tightly together in one specific sequence. Della Robbia clearly meant to hide the gaps between sections because, once assembled, the joins are barely noticeable (fig. 4). To maintain this illusion, the new mount had to be low profile and unobtrusive while holding securely each section of the lunette.

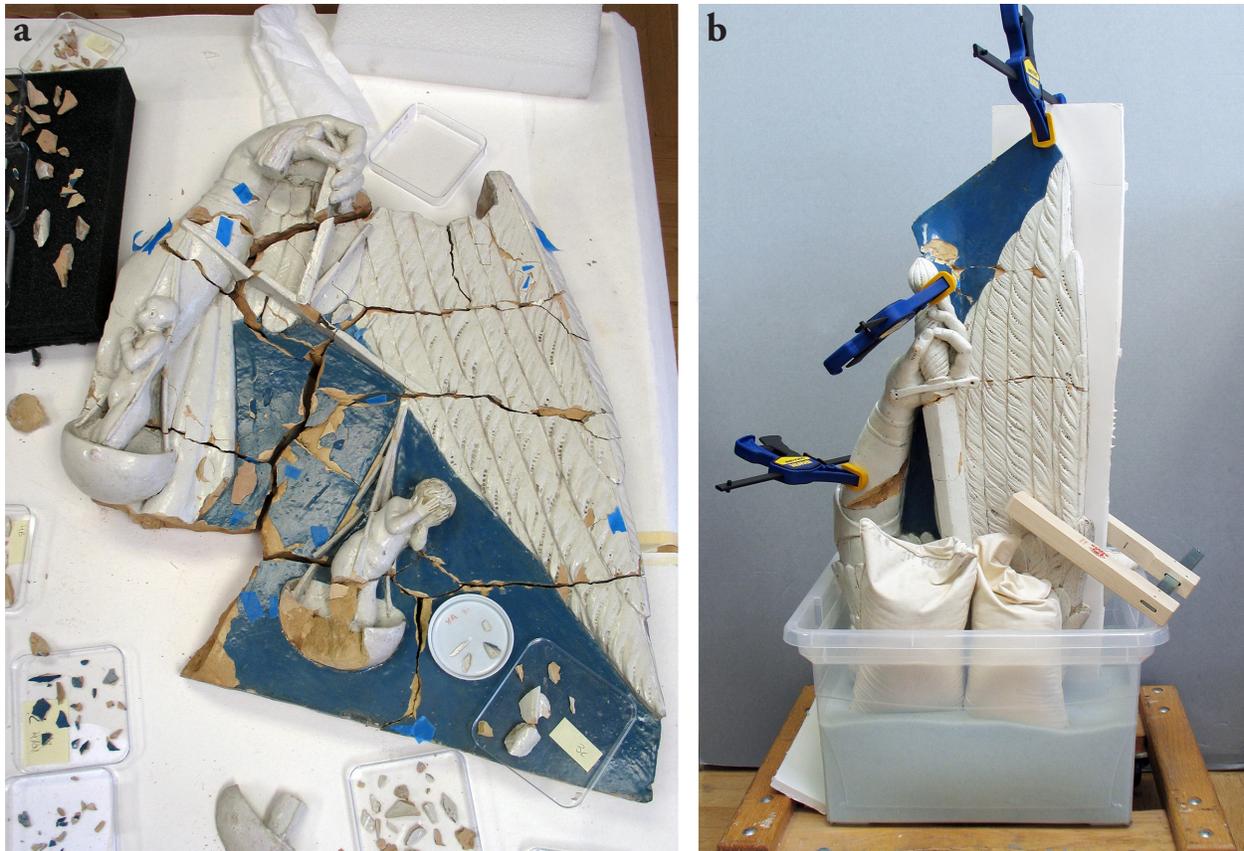


Fig. 3. (a) Sorting and locating fragments of *Saint Michael the Archangel* lunette. (b) Bonding and clamping. (Courtesy of W. Walker, ©The Metropolitan Museum of Art)

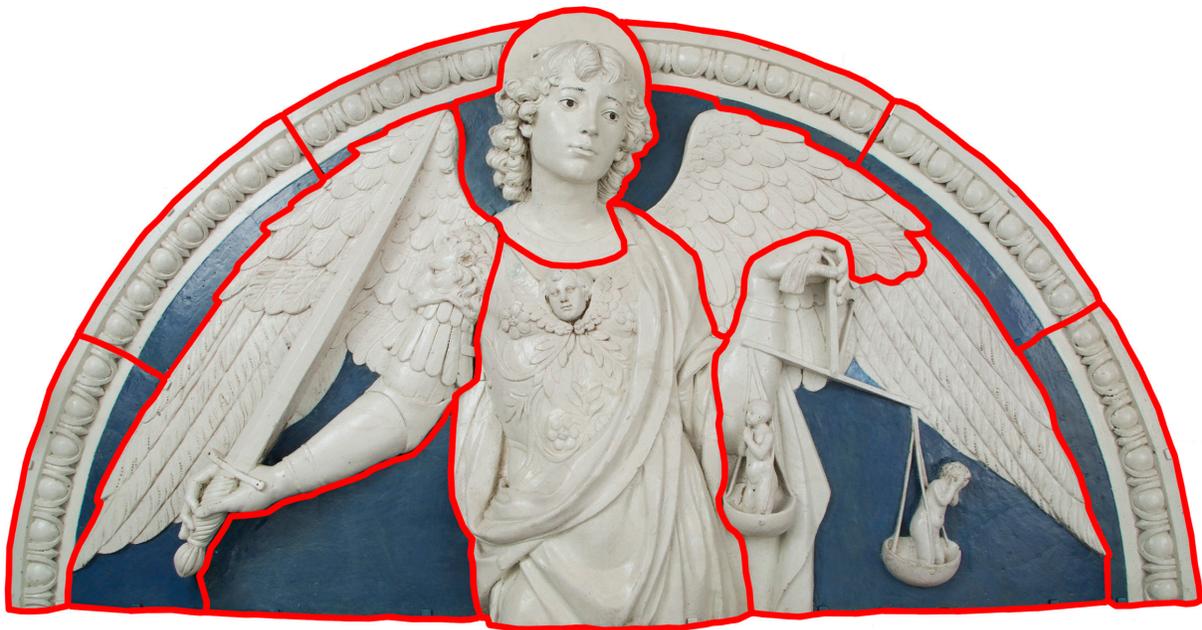


Fig. 4. Diagram highlighting the 12 sections of the lunette (Courtesy of W. Walker, ©The Metropolitan Museum of Art)

A custom mounting system was designed and fabricated by Fred Sager, supervising conservation preparator at The Met. Approximately 30 brass clips, each one uniquely designed to accommodate the varying heights and curving sides of the lunette sections, were placed in strategic and discreet points. The location of each clip, some of them simultaneously supporting three sections, was first planned on a plywood backing board. Then, the clip locations were transferred to a solid ½-in.-thick aluminum backing panel. Each brass clip, lined with acrylic felt to protect the object, was attached to the backing panel using countersunk machine screws that fed into holes tapped into the aluminum. Finally, the visible portions of the clips were inpainted with acrylics to match the surrounding glaze color. When fully assembled, the lunette and its backing plate were secured to a reinforced wall with an interlocking cleat. *Saint Michael the Archangel* has now returned to the same gallery in which it was displayed before the accident, but with a more prominent placement, closer to eye level.

### 3.3 Discoveries Made During Treatment

#### 3.3.1 Clay Body and Glaze

The fragmentary nature of the lunette allowed us to view the interior clay structure, providing us with a rare glimpse into the working methods and expertise of the della Robbia workshop. One of the most striking features was on the right arm, where the presence of large air pockets and folds suggests that the wet clay was pressed into the mold or sculpted with seemingly little care (fig. 5a). Distinct color variations and lumps observed in other fragments indicate that the clay was not thoroughly wedged before use (fig. 5b). As any student of ceramics would know, properly wedged clay produces a compressed matrix with a smooth consistency and even color. Wedging is done to reduce risk of firing flaws that can be caused by the rapid and destructive expansion of water vapor contained inside air pockets. It was surprising to discover that the della Robbia workshop, known for producing large-scale sculptures, was not meticulous in the handling of their clay. This ostensibly cavalier workmanship reveals that they had an intimate understanding of their clay and of how far the boundaries could be pushed while still producing a good result.

The clay that the della Robbia family used has been studied extensively. Legend persists of a secret clay source at a property that they had along the Arno River. This chalky clay, also referred to as “marly clay,” fires to a pale buff color (as opposed to the usual terracotta red) and has the effect of making the overlying glazes appear especially luminous. It also fires well at a wide range of temperatures and is a good “fit” for

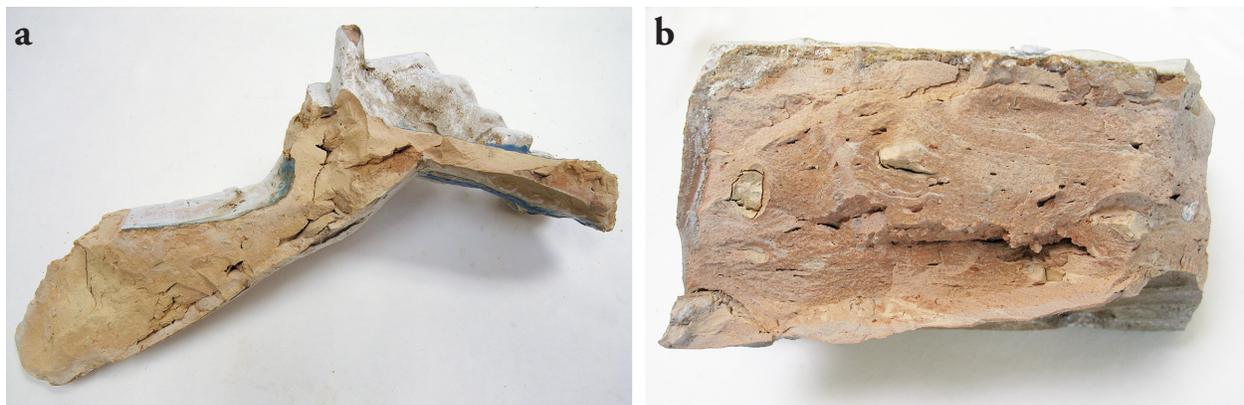


Fig. 5. (a) Air pockets revealed in the clay body under the right hand. (b) Lumps and color variations in the clay visible in a cross section of a large fragment. (Courtesy of W. Walker, ©The Metropolitan Museum of Art)

the della Robbia glazes in that the clay and glaze expand and contract at the same rate throughout the firing. The della Robbia family carefully guarded the secrets of their clay preparation as well as their glaze recipes, much to the chagrin of contemporary sculptors attempting to produce similarly glazed works (Hykin 2016).

SEM-EDS analysis of the Saint Michael lunette and the Prudence tondo found the clay bodies to consist of a high-lime, or calcareous, clay with relatively small amounts of sodium, magnesium, and potassium. On both objects, the white glaze is a tin-opacified glaze; the blue is the same white glaze with cobalt, iron, copper, and nickel added (Wypysky 2013, Basso et al. 2015).

### *3.3.2 Tool Marks and Other Impressions*

During a visit to La Torre Ceramica d'Arte, another ceramic factory producing della Robbia reproductions in Scandicci, Italy, a man demonstrating the process of pressing clay into a mold explained, "Pressing the clay into the mold, I can feel the resistance of the plaster below and can therefore make the walls even." This modern-day account had a direct connection to our observations of the Saint Michael lunette. In sections like the torso, which are in high relief, a great deal of care was taken to press the clay into the mold evenly (figs. 6a, 6b). In contrast, the head was sculpted by hand as a solid form, then hollowed out to achieve even wall thickness and to reduce its mass. Generally speaking, consistent wall thickness is critical to avoid cracking and warping as an object is dried and fired. Throughout the lunette, each section that had areas of high relief had been hollowed out from the back for this reason.



Fig. 6. (a) The torso section. (b) The torso from behind showing even wall thickness. (Courtesy of W. Walker, ©The Metropolitan Museum of Art)

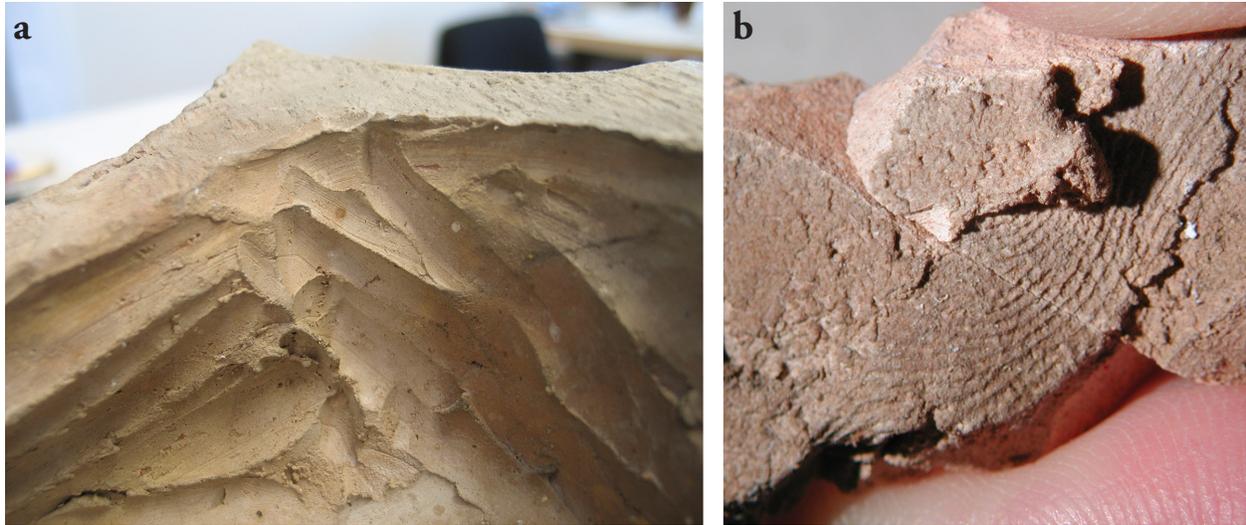


Fig. 7. (a) Finger marks from pressing soft clay into the mold. (b) Fingerprints found on the back of the Saint Michael lunette. (Photographs by W. Walker ©The Metropolitan Museum of Art)

Figure 7a illustrates how the process of pressing clay into the mold left numerous fingermarks. There is some discussion among scholars as to whether the clay was pressed into the mold or the mold filled completely and then scooped out. Examples supporting both strategies have been observed, but it is clear from these marks that the clay was quite wet when introduced into the mold. Occasionally, clear impressions of fingerprints are preserved on unglazed surfaces (fig. 7b). A variety of tool marks are present along the sides of the lunette's sections, including incised graffiti, paddling marks, and impressions of wood planks pressed against the clay (figs. 8a, 8b). These marks give one a sense of the physical labor involved in forming, handling, and maneuvering large terracotta sculpture.

### 3.3.3 Glaze Repairs

One interesting discovery made during the treatment concerns a large firing flaw in the torso section. When the lunette fell from the wall, a large section of the drapery broke away, exposing a large area of the

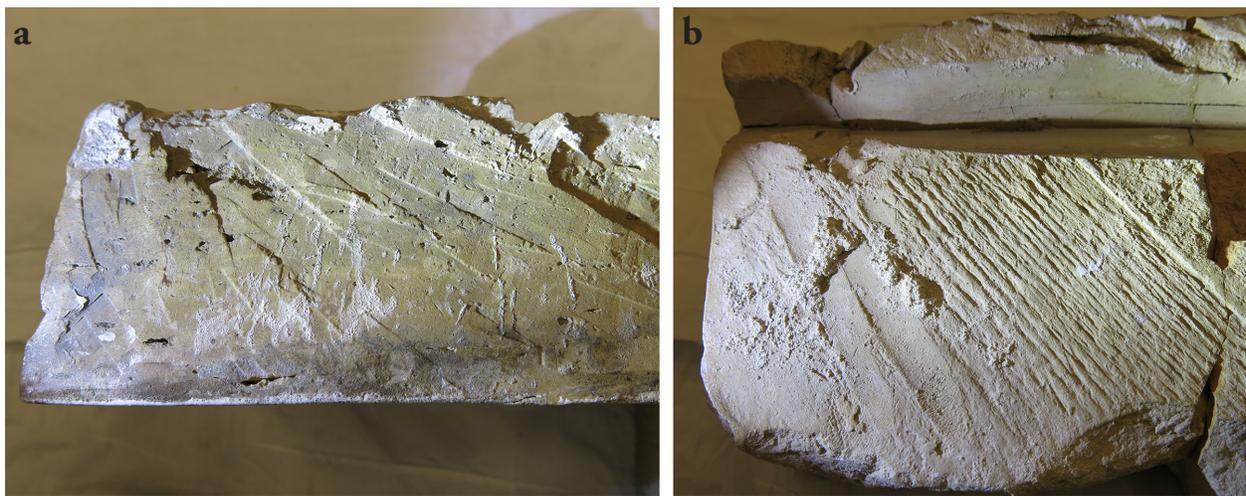


Fig. 8. (a) Tool marks along the side of a section. (b) Wood impressions in the clay. (Courtesy of W. Walker, ©The Metropolitan Museum of Art)

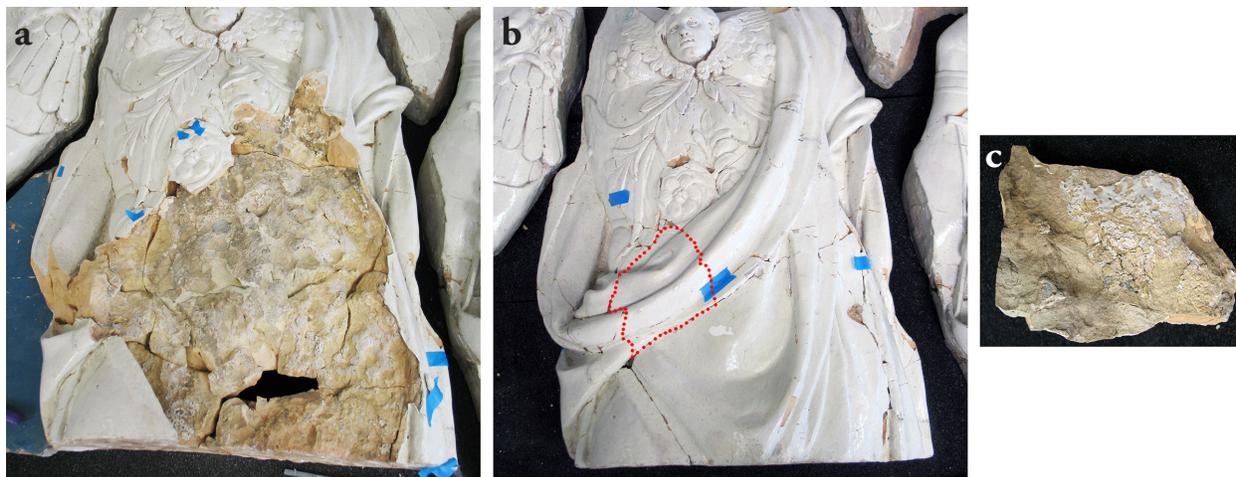


Fig. 9. (a) “Abdomen” area exposed after drapery fragment detached. (b) Torso section with drapery fragments in place; dotted red line indicates location of fragment seen in next figure. (c) White glaze on the underside of a portion of drapery fragment, revealed after the accident. (Courtesy of W. Walker, ©The Metropolitan Museum of Art)

clay body (fig. 9a). Upon close examination, we found that the matching surfaces of the exposed “abdomen” and the detached fragment were not fractured; they were, in fact, smooth, and it was clear that they had never been whole. This revelation suggests that the torso came out of the mold in a basic form and was then further sculpted by adding slabs of clay to create the drapery (fig. 9b). Probably in this case, the clay was too dry to adhere well; as a result, it split away during the first firing.

To salvage the piece, della Robbia applied white glaze to the area exposed after firing and then put the drapery fragment back in place; some of this glaze is visible in figure 9c. A thicker paste of glaze and fired clay was used to fill gaps around the edges.<sup>2</sup> Finally, the whole section was glazed in white and blue in the usual manner and fired a second time, during which the “glaze glue” melted and bonded the separated fragments together. In this example we see how the workshop’s proficiency with clay enabled them to perform successfully this potentially risky repair. The glaze repair secured the fragment in place for over 540 years until the impact of the recent fall caused it to detach. There is evidence that the della Robbia workshop often did glaze repairs, but to see it as we did on Saint Michael’s torso is rare.

### 3.3.4 Other Observations

Another detail that became apparent while the lunette was dismantled was that the sides of each section slant inward, creating V-shaped voids. This alteration was done after the sections were removed from their molds when the clay was still somewhat pliable. The voids provided extra space for mortar, thus more effectively securing the object to the wall while minimizing the visible gaps between sections once installed.

## 4. PRUDENCE TONDO

The second della Robbia work covered in this paper depicts the cardinal virtue, Prudence. *Prudence*, like *Saint Michael the Archangel*, was made in sections: seven sections for the inner tondo and eight vibrant garland sections framing the piece. In a field of blue, a three-quarters-length young woman is portrayed floating among clouds or water; she is looking to the right. She holds a mirror in her right hand and, coiling vertically along her torso, a snake is gripped by her left hand. The surrounding garland is a

colorful and realistic depiction of citrons, oranges, grapes, quince, cucumbers, and pine cones accompanied by their associated foliage, all grouped and separated by blue ribbons.

The figure of Prudence represents the mother of all virtues. She is entirely good—the measure of justice, temperance, and fortitude. The snake represents wisdom and careful thought, and the mirror refers to the Delphic inscription “Know thyself.” One of *Prudence’s* most striking attributes is her second face—that of an old man—implying wisdom of the past. Prudence herself looks into the future (Wardropper 2011).

Apart from knowing the tondo’s date of manufacture in 1475 by Andrea della Robbia, there are only vague records of where it resided in Italy. There is an 1888 photograph showing the tondo prominently displayed at the Georgian country house, Badger Hall, in Shropshire, England, where it remained until it was sold in 1905 (Knox 2007). The tondo was then owned privately by various collectors, ending up in Paris before being purchased at auction by The Met in 1921 (Raggio 1961; Wardropper 2011). Following its acquisition, the tondo was installed in The Met’s galleries for many years. It eventually was placed in storage, where it stayed out of sight for a generation until a request came from Marietta Cambareri at the Museum of Fine Arts, Boston to borrow the tondo for her groundbreaking exhibition *Della Robbia: Sculpting with Color in Renaissance Florence*. We had a year to prepare the tondo for this exhibition with venues in both Boston and Washington, DC.

#### 4.1 Treatment

When *Prudence* first arrived in the Department of Objects Conservation, the tondo was relatively unchanged from when it first came into the collection in 1921 but for the addition of significant quantities of grime. On the front surface were old discolored restorations and extensive plaster fills (fig. 10a). The 15 sections of the tondo were mortared into a heavy iron ring surrounding the piece; on the back were the remains of a brick wall from a previous installation (fig. 10b). These remnants were



Fig. 10. (a) Front of *Prudence* before treatment. (b) Back of tondo showing remains of brick wall. *Prudence*, Andrea della Robbia, glazed terracotta, ca. 1475, 164.5 cm dia., The Metropolitan Museum of Art, Purchase, Joseph Pulitzer Bequest, 1921, 21.116. (Courtesy of S. Levin, ©The Metropolitan Museum of Art)

attached to the tondo with hard, red-tinted concrete (some of which contained slabs of slate, bits of tile, and marble chips) and a substantial amount of plaster, among other materials. The components of the tondo were held in compression by the iron ring, but some sections were so loose that it was possible for light to pass through.

The assembled tondo was too unstable to travel on loan; thus, we decided it would be prudent to completely dismantle the piece and create a new mount. Conservator Michael Morris joined us on this project. We began by taking the piece apart, first removing the inner tondo and then working our way around the garland. Sections were released from the mortar by carefully chiseling between them with tiny improvised chisels, like mini-screwdrivers. Occasionally, the mortar was perforated by making a series of drill holes with small-gauge bits. The garland sections were removed one at a time, always securing the adjacent areas with ratchet straps to prevent any accidents as we worked (fig. 11). Dismantling the tondo was a slow and deliberate process that took place over several months.

With the sections separated, we turned to cleaning away centuries of accumulated dirt. The grime was quite intractable and had created a brittle film covering much of the surface. In addition, there were large areas of oil-based overpaint. This old paint not only covered areas filled with plaster but also covered significant areas of perfectly preserved glaze. By repeating a sequence of steam, solvent, and mechanical cleaning, the layers eventually gave way, revealing a beautifully preserved surface. A mixture of 25% Triton XL 80N, 50% mineral spirits, and 25% deionized water, applied in a gentle scrubbing motion with natural bristle stencil brushes, proved useful in removing surface grime. The brittle film was removed after repeated campaigns of steam cleaning, followed by careful mechanical action with a scalpel blade.



Fig. 11. Michael Morris and Carolyn Riccardelli dismantling the tondo (Courtesy of C. Riccardelli, ©The Metropolitan Museum of Art)

### 4.1.1 Mount

One of the most time-consuming aspects of this project was the development and fabrication of a mounting system. The basic concept of the mount was taken from the one made for the Saint Michael lunette: support each individual section of the tondo independently using a system of conforming clips connected to a backing panel. However, because the weight of each garland section exceeded 36 kg (80 lb.), brass clips were not sufficient to support the components. Carbon fiber fabric proved to be a versatile material that allowed us to create thin, tightly conforming, and strong supports that would have been impossible to make out of brass or steel. Because we had used this material on the Tullio Lombardo *Adam* sculpture project, the solution provided some efficiency as we could fabricate the clips ourselves in the conservation studio (Riccardelli et al. 2014).

The foundation of the mount is a custom honeycomb backing panel designed to support the pieces as well as to be a means for lifting the entire object during installation. Removable carbon fiber straps, at least three per section, were made for each piece.<sup>3</sup> Specialized flanged and threaded metal components called “weld nuts” embedded into the base of each strap served as the method by which they were attached to the backing panel. The threaded component of the weld nuts protruded anywhere from  $\frac{1}{4}$  to  $\frac{1}{2}$  in. from each strap, and seated into holes drilled through the aluminum honeycomb. Once each section was properly positioned on the panel, they were held in place mechanically using bolts fed through from the back of the panel (fig. 12).

At strategic moments during the mounting process, the panel and any attached sections were raised to a vertical position to test the efficacy of the straps against the forces of gravity. There were areas where the straps flexed slightly, causing some sections to drift out of place. In those locations that needed extra support, we made small Magic-Sculpt epoxy “bumpers” that were also attached through the panel using weld nuts (figs. 13a, 13b). After all the sections were secured, the black carbon fiber clips were painted to disguise them. The combination of the clips’ low profile and the expert painting by Met



Fig. 12. Cross sectional diagram of *Prudence* clip system for a garland section; a weld nut (rendered in red) was embedded into the bottom of each carbon fiber clip. (Courtesy of C. Riccardelli, ©The Metropolitan Museum of Art)

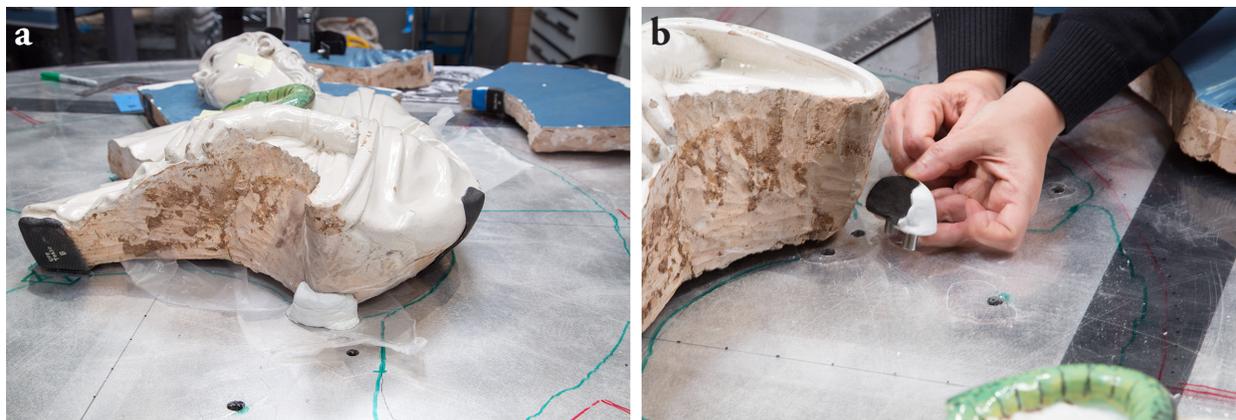


Fig. 13. (a) The bottom of *Prudence's* torso, where an additional support made of Magic-Sculpt epoxy was placed. (b) An epoxy “bumper” showing weld nut attachment points protruding from the bottom. (Courtesy of C. Riccardelli, ©The Metropolitan Museum of Art)

Preparator Matthew Cumbie created a mounting system that was virtually invisible from both the front and side views of the tondo. Because we consider both the lunette and tondo to be architectural fragments that are displayed outside of their original contexts, we opted to leave the gaps between the sections unfilled.

#### 4.1.2 Fills and Inpainting

As the sections were cleaned, we began the work of making fills. Large areas of loss were executed in plaster after applying a barrier coating (15% Paraloid B-72 in acetone) to the fractured terracotta surface. Smaller losses were filled using Modostuc. Completed fills were sealed using dilute shellac. As with the Saint Michael lunette, we used Golden Acrylics for the inpainting, followed by layers of Primal WS24 to replicate the gloss of the glaze. Most of the inpainting was accomplished after the tondo was fully mounted on its backing board (fig. 14).

When inpainting with acrylics, many conservators in the Department of Objects Conservation use Sta-Wet palettes. The palette surface is a piece of specialized paper that sits on top of a wet cellulose sponge sheet. These components are housed in a plastic box that, when properly closed, can keep the paints alive for several days. One of the drawbacks of the Sta-Wet pallet is that colors can flow together over time (fig. 15a). If the inpainting project will take place over a long period, the palette will need to be refilled occasionally. To help make this process more efficient, snapshot photos were taken of the fresh palette and the jars of colors used (fig. 15b). These photos served as a quick visual reminder when it was time to make a new palette. Figure 15 gives an idea of the range of colors that were used to inpaint *Prudence's* vibrant glazes. To match the blue field of the inner tondo, we used a combination of ultramarine blue, Naples yellow, and a bit of raw umber. Sometimes, titanium white was needed as well. The star of the show turned out to be the Golden Acrylic color “light turquoise,” which we found to be the solution to almost any color-matching problem we encountered while inpainting the many shades of green of the garland’s leaves. Mixing Primal WS24 into the colors on the palette was helpful in replicating the flowing multicolored glaze of the foliage. The extra medium extends the paint and allows for more accurate layering and blending of glaze color.



Fig. 14. Carolyn Riccardelli, Janis Mandrus, and Wendy Walker in-painting *Prudence* after it was mounted on its backing board (Courtesy of D. Sastre, ©The Metropolitan Museum of Art)

## 4.2 Discoveries Made During Treatment

### 4.2.1 *Garland Numbering Sequence*

A fascinating feature of the tondo was uncovered as we cleaned the white molding that frames the inner tondo, located on the inward-facing sides of the garland sections. As the layers of overpaint and grime were removed, we noticed numbers carved into the clay, underneath the glaze layer (figs. 16a, 16b). As we continued to clean off the obscuring layers, we found that each section was similarly numbered. It was then we realized that these numbers were related to the arrangement of the garland. Figure 17a shows the garland as it originally came to The Met; we believe it was mounted in this configuration during the late 19th century. The primary feature of this arrangement is that it groups similar elements together: a pair of pine cones at the top, the grapes below, and the yellow fruits grouped at the sides.

We found that each garland section was furnished with a consecutive pair of numbers, one at each edge of the white molding. The numbering system was not consecutive overall, but rather relied on an interesting method of matching like numbers at the edge of the sections. The first section was marked “1” and “2.” The adjacent section was marked “2” and “3,” the next “3” and “4,” and so on. The final section was marked “8” and “1.” Because of the large scale of the tondo (which was, at this time, in mid-treatment), we dashed to our computers to rearrange the garland digitally. We found that, rather than grouping the similar sections together, the rediscovered sequencing system *alternated* them. The result was a much livelier arrangement.

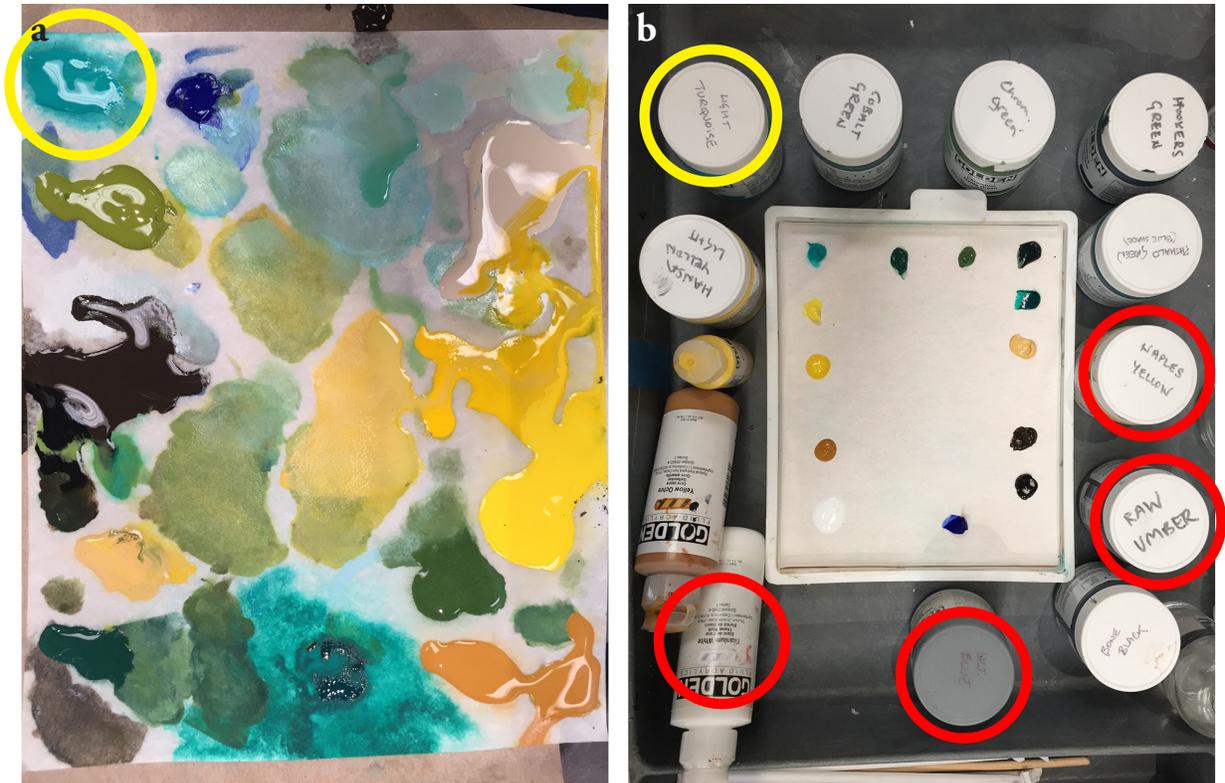


Fig. 15. (a) Sta-Wet palette showing colors; light turquoise is circled in yellow. (b) Snapshot of fresh palette and jars of paint (red circles indicate colors used to make della Robbia blue). (Courtesy of C. Riccardelli, ©The Metropolitan Museum of Art)

Uncovering the numbering sequence was quite an exciting moment in this project, and led to fruitful discussions between conservators and curators, particularly about what join to place in the top position. Could we simply assume that “1” started at the top? We reached out to colleagues in Florence for help. Laura Speranza, Director of the Department of Conservation of Terracotta and Wooden Sculpture at the *Opificio delle Pietre Dure*, and Conservator Daniele Angellotto, both in Florence, Italy, had experience dismantling in situ della Robbia works with similar numbering systems. They confirmed that they consistently found a 1 to 1 or equivalent join oriented at the top. Our colleagues also reported that they

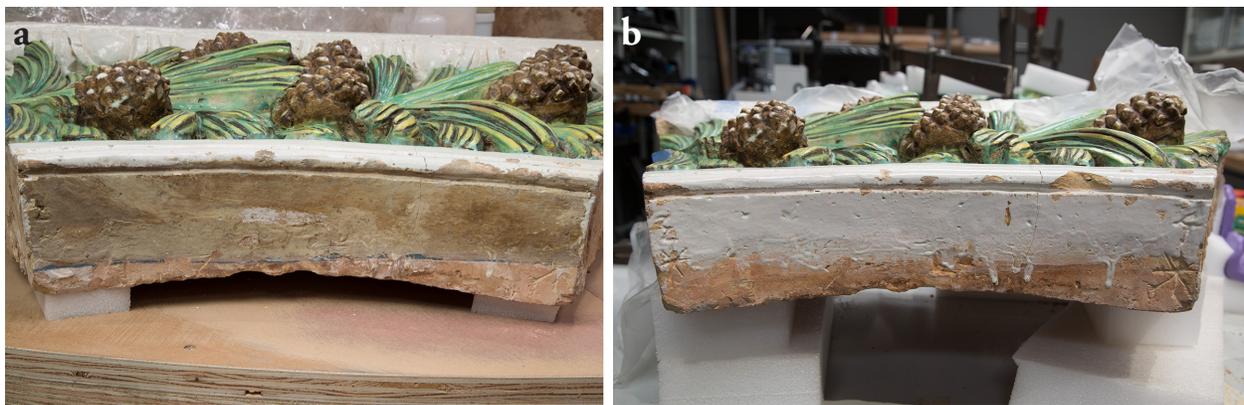


Fig. 16. (a) Pine cone section of garland during cleaning. (b) Same section after cleaning revealed sequencing numbers 3 and 4 (Photographs by C. Riccardelli, ©The Metropolitan Museum of Art)



Fig. 17. (a) *Prudence* garland as arranged before treatment. The blue lines indicate the divisions between the sections, along with tracings of the numbering system found on each piece. (b) Garland arranged according to rediscovered numbering system (Diagrams by C. Riccardelli ©The Metropolitan Museum of Art)

have often encountered Roman numeral sequencing systems. Thus, based on our discussions at The Met and with our colleagues in Florence, we decided to go with the 1 to 1 join at the top (fig. 17b).

#### 4.2.2 Tool Marks and Impressions

While many interesting impressions and tool marks came to light during the treatment of the *Prudence* tondo, the most unexpected ones were found around the outside of the garland. These only became clear to us once the tondo was fully mounted and we could view the continuous unglazed outer surface created by all of the sections. At the intersection of each pair of garland sections are markings that matched up and are unique to each join. Where the quince and pine cone sections meet, there is a clear impression of three fingers dragged across the join between two pieces (fig. 18a). At the connection between the pine cone and the orange, there are two round impressions that were clearly made by the same tool (fig. 18b). The marks are undoubtedly deliberate, and suggest that there were two phases of organizing the garland sections. The marks on the outer surfaces were executed in the wet clay, probably as a way to keep the sections in order as they were being made, and the numbering system on the inner sides were meant to direct the orientation of the garland during installation in its architectural setting.

#### 4.2.3 Gilding

In the blue field of the inner tondo, we observed the faint remains of bands radiating out from *Prudence*. Della Robbia terracottas were often gilded, but the nature of the embellishment is impermanent, leaving us today with a ghost of where the gilding once was. With that in mind, we suspected that the radiating bands were the remains of mordant from gilding. During our examination of the piece, we located a tiny spot of what appears to be gold tucked underneath *Prudence*'s right hand where it connects to the blue field, adding further support to our theory. Unfortunately, the location of the gold was in a deep recess and did not allow access for an analytical instrument. FTIR analysis of the rays showed that the residual material is primarily calcium oxalate (whewellite). Research Scientist Adrianna Rizzo (2015) reported

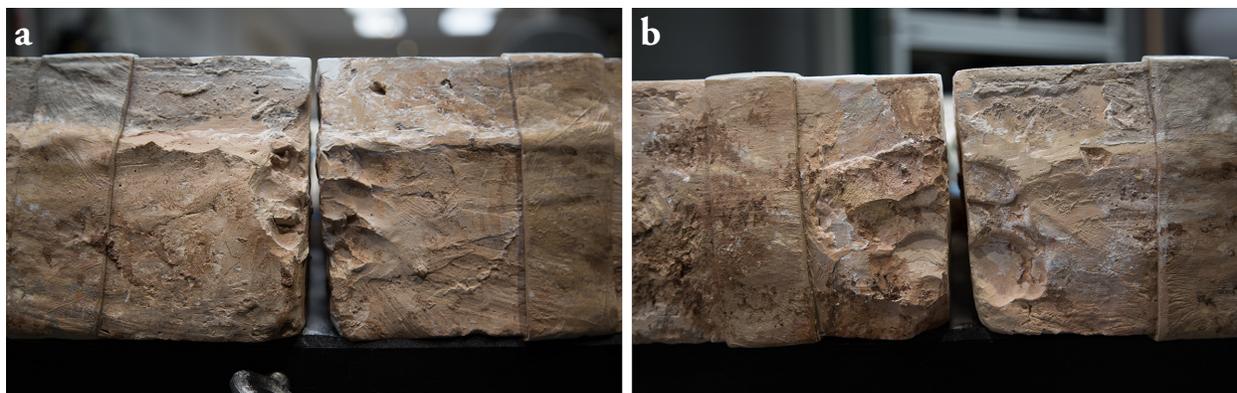


Fig. 18. (a) Finger markings on the outer surfaces of the garland might have helped keep sections in order during fabrication. (b) Impressions of a round tool made in the wet clay. (Courtesy of C. Riccardelli, ©The Metropolitan Museum of Art)

that this compound could be derived from an oil or proteinaceous layer, which is consistent with the theory that the bands are mordant from gilding. At this stage, it is not possible to speculate on when the gilding might have been applied.

To provide an impression of what Prudence may have looked like with gilding, we turned to Photoshop to create a digital reconstruction. Inverting the blue color of the inner tondo helped to visualize the remnants of the gilded rays; translucent lines of color were then added over the blue field (figs. 19a, 19b). After some experimentation with the length of the rays, we settled on a varying pattern based on contemporary comparisons for this aesthetic. Met Curator Denise Allen suggested works by Botticelli from the 1480s, *Madonna del Magnificat* and *Madonna del Melagrana*, both in the Uffizi Gallery, to provide inspiration for reconstructing the golden aureole. The beautiful final result made quite an impression on conservators and curators alike.

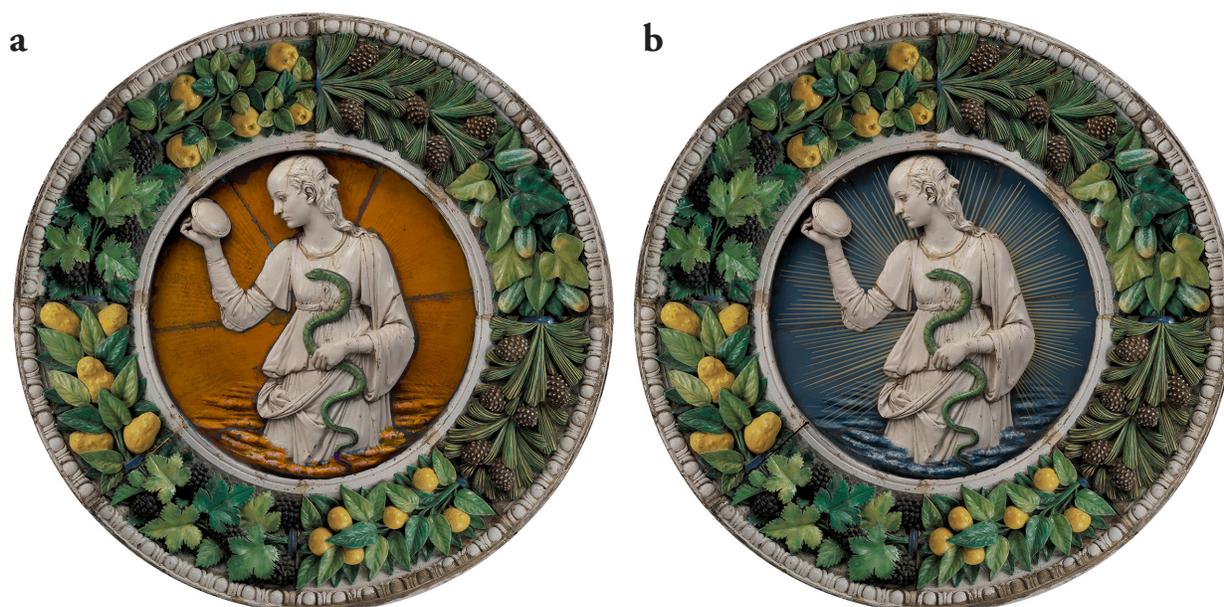


Fig. 19. (a) Prudence tondo with color of blue field inverted to highlight the presence of mordant lines. (b) Digital reconstruction proposing how gilded rays might have appeared. (Courtesy of C. Riccardelli, ©The Metropolitan Museum of Art)



Fig. 20. (a) *Saint Michael the Archangel* after treatment, and before mounting. (b) *Prudence* after treatment, secured on the new mounting system, [Photograph in (a) by Joseph Coscia, Jr.; photograph in (b) courtesy of C. Riccardelli, ©The Metropolitan Museum of Art]

## 5. CONCLUSION

Working on *Saint Michael the Archangel* and *Prudence* was a wonderful opportunity to explore and become quite intimate with these great works. It led to study trips in Florence and further afield, and to marvelous collaboration with our own curators and colleagues at The Met, the Museum of Fine Arts, Boston, and in Italy. Yes, the technology of these pieces is interesting, and the conservation process absorbing, but the wonderful thing that results from this sort of in-depth work is that you cannot help but develop a sincere interest in and connection to the pieces, to the artist, and to a time so completely unlike our own. It is these things that make the field of art conservation so endlessly interesting and fulfilling. Andrea della Robbia was certainly skilled in working the material, but the expression of emotion that he achieved through the medium of clay is remarkable. We look at Saint Michael and see compassion in his face and a sense of burden as well. Prudence is serene, with a quiet confidence. The longer we spent time with these pieces, the more enchanting they became (figs. 20a, 20b).

## ACKNOWLEDGMENTS

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Both authors are grateful to conservators Janis Mandrus and Michael Morris for their help with *Prudence*: Janis for the hours of filling and inpainting, which helped us to meet a tight deadline both with *Saint Michael the Archangel* and *Prudence*, and Michael for his expertise in dismantling and mounting *Prudence*. Thanks also go to preparators Fred Sager and Matthew Cumbie for their impressive work throughout both projects. Many interns contributed to this project: Sara Levin, Ashley Jehle, and Camille Beziere carried out the initial research, documentation, examination, and cleaning tests on *Prudence*—to them we extend a special note of gratitude. We thank our curators Denise Allen, Peter Bell, James Draper, and Luke Syson for their enthusiasm and support throughout the project. We thank Collections Manager Denny Stone for her fortitude following the accident. Finally, we are indebted to Marietta Cambareri for bringing the art of della Robbia into our lives.

## NOTES

1. The “Tullio Blend” is a 40% solution mixed by weight, and is created as follows: make one batch of each adhesive (40 g Paraloid B-72, 54 g acetone, 6 g ethanol; and 40 g B-48N, 54 g acetone, 6 g ethanol) and then combine by volume 3 parts B-72 and 1 part B-48N.
2. These materials—a combination of white glaze and fired clay used to fill in gaps around the torso fragment—were confirmed by recent analysis by Mark Wypyski in The Met’s Department of Scientific Research.
3. The process of making the carbon fiber straps is covered in detail in “Carbon Fiber and its Potential for Use in Objects Conservation,” also in this volume (Riccardelli 2019).

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## FURTHER READING

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Marquand, A. 1922. *Andrea della Robbia*. Princeton, NJ: Princeton University Press.

Pope-Hennessy, J. 1980. *Luca della Robbia*. Oxford: Phaidon.

## SOURCES OF MATERIALS

Carbon fiber fabric

FibreGlast

385 Carr Dr.

Brookville, OH 45309

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

Composite panels for *Prudence* mount

Composite Panel Solutions (No longer in business)

7167 Rte. #353

Cattaraugus, NY 14719

Golden Acrylics, Sta-Wet Palette, Paper, and Sponge

Dick Blick Art Materials

P.O. Box 1267

Galesburg, IL 61402

<https://www.dickblick.com/>

HXTAL NYL-1, Primal WS24 (also sold as Rhoplex WS24), Paraloid B-72, and Paraloid B-48N

Conservation Resources International

5532 Port Royal Rd.

Springfield, VA 22151

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

Magic-Sculpt epoxy putty

The Compleat Sculptor

90 Vandam St.

New York, NY 10013

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

Modostuc

Talas

330 Morgan Ave.

Brooklyn, NY 11211

<http://www.talasonline.com>

Weld nuts

McMaster Carr  
P.O. Box 5370  
Princeton, NJ 08543  
<https://www.mcmaster.com/>

Zhermack Elite Double 8

Chase Dental & Medical Supply  
40480 Grand River Ave. G  
Novi, MI 48375  
<http://chasedentalsupply.com/>

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