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MANUSCRIPT GUIDELINES
FOR THE METROPOLITAN MUSEUM JOURNAL

Founded in 1968, the Metropolitan Museum Journal is a double-blind peer-reviewed scholarly journal published annually that features original research on the history, interpretation, conservation, and scientific examination of works of art in the Museum’s collection. Its scope encompasses the diversity of artistic practice from antiquity to the present day. The Journal encourages contributions offering critical and innovative approaches that will further our understanding of works of art.

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ABBREVIATIONS
MMA The Metropolitan Museum of Art
MMAB The Metropolitan Museum of Art Bulletin
MMJ Metropolitan Museum Journal

Height precedes width and then depth in dimensions cited.
Recent conservation treatment of two Della Robbia architectural reliefs in The Metropolitan Museum of Art revealed fingerprints, tool marks, coded numbering systems, and an apparent nonchalance with handling clay that provided fresh insight into the dynamic human engagement and mastery of the material that is characteristic of the Della Robbia workshop. The backs and sides of reliefs that are often hidden from the viewer—because they are framed, situated in niches, or mortared into a wall or ceiling—contain information that can lead to a deeper understanding of the creative process, perhaps more directly than any other source. During the critical early stages of conservation treatment, which are predominantly activities of observation and examination, conservators may rely on microchemical tests or
high-tech imaging techniques to aid the eye. They also
depend on their apprehensive knowledge to assess an
object. By feeling the weight, the texture, the relative
temperature of a surface, or the sound an object makes
when tapped, they gain insights into how things are
made and have been treated over time.

As the observations in the following sections will
show, this concept of combining technical and
hands-on knowledge relates not only to the work of
the conservator, but also to the workshop practice of
Della Robbia. While their artisanal tradition had some
technological basis, it was heavily rooted in practical
knowledge, an understanding of materials based on
vast experience that was passed down from master to
apprentice, perhaps with the most closely guarded
secrets expressed orally.

During the Renaissance, clay used for sculptures
did not originate from standardized combinations of
raw materials as it does today; it was excavated from the
earth and processed manually before using. The famous
Della Robbia blue glaze, a technological wonder at the
time, can vary significantly in hue even within the same
object, indicating that mixing the glaze, perhaps one of
the most technical aspects of ceramics, was based more
on experience than precise formulas. Firing the kiln was
done completely by eye, and depended on the skill of
the kiln master who could judge the firing temperature
by the color of the kiln’s interior. Technical innovations
were sprung from artisanal traditions and a reliance
on craft—not on science in the modern sense of the
word. Successful completion of each step in the ceramic
process was required before moving on to the next.

**ANDREA DELLA ROBbia AT
THE METROPOLITAN MUSEUM**

The Metropolitan Museum began acquiring Della
Robbia glazed terracotta sculptures in the early twenti-
eth century. Among the many magnificent pieces at
the Museum, *Saint Michael the Archangel* (fig. 1) and
*Prudence* (fig. 2), both created by Andrea della Robbia
about 1475, are two of his most exceptional works. The
present article describes discoveries made during the
conservation treatment of these two sculptural reliefs,
which arose for very different reasons: one following an
accident, and the other on the occasion of an exhibition
focused on Della Robbia sculpture. Before coming to the
conservators in the Department of Objects Conservation,
the Saint Michael lunette was installed above a doorway
in a gallery of fifteenth-century sculpture and decorati-
ve arts. *Prudence* was in storage and had not been
exhibited in more than twenty-five years. Through the
circumstances of their treatments, these two works
have rightly regained their position as some of the finest
expressions of Renaissance sculpture at the Museum.

**Overview of Della Robbia Workshop and Practice**

Andrea della Robbia (1435–1525), the second in the long
line of the distinguished Florentine family, was trained
by his uncle Luca and furthered the development of their increasingly famous glazed terracotta sculpture. While Luca della Robbia (1399/1400–1482) invented the technique, giving rise to an entirely new and widely valued art form, Andrea expanded their production to include works for architectural use on a grand scale. In time, the workshop was passed to Andrea’s sons, of whom Giovanni and Girolamo were most notably active. The family business continued successfully until these descendants passed away, Giovanni in 1530 and Girolamo in 1566. Within a relatively short time thereafter, the Della Robbias’ carefully guarded technological secrets were lost.

Luca was a leading Florentine sculptor initially trained and celebrated for his work in stone and bronze. Sometime in the 1440s he began to experiment in clay and became famous for his novel use of glazes to decorate terracotta sculpture. His first important commission was The Resurrection (1442–45), followed by The Ascension (1446–51), each located above the northern
and southern sacristy doors in the Cathedral of Santa Maria del Fiore, more commonly known as the Duomo, in Florence.

When *Saint Michael the Archangel* and *Prudence* were produced, Andrea was about forty years old and had been working alongside his uncle Luca for more than twenty years. The workshop, which was also the Della Robbia residence, was located on Via Guelfa in Florence, about a ten-minute walk from the Duomo. By then Luca had stopped working due to ill health, and when he died in 1482, Andrea inherited half the house and the business, eventually becoming sole owner. Even before Luca’s death, Andrea took the operation to the next level, increasing the fame and productivity of the workshop and passing the knowledge to his own children.²

About 1475, Andrea and his workshop were in the midst of several major commissions, two of which were the Museum’s *Saint Michael the Archangel* and *Prudence*, the latter of which was likely part of a larger decorative scheme including the other cardinal virtues, Justice, Temperance, and Fortitude.¹ The lunette and tondo are large, both about 5 feet (155 cm) in diameter and weighing 220 and 775 pounds (100 and 350 kg), respectively. They were created as architectural elements to be installed above doors or mortared into walls, for example. One of the most extraordinary features of Della Robbia’s glazed terracotta is its durability, even in outdoor environments. Many of the Della Robbia works found on facades throughout Florence have been in place for more than five hundred years, such as those of the Ospedale degli Innocenti and Orsanmichele. In fact, the glazed surface of the Saint Michael lunette is in remarkable condition despite having been installed on the exterior of a church and exposed to the elements for more than three hundred 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. The Della Robbia clay was mined from a secret location along the banks of the Arno River and carefully processed. Larger works were initially modeled in one piece, in a simplified form suitable for mold making, importantly, without undercuts. The work was then strategically cut into pieces. For example, the Saint Michael lunette was cut into twelve sections in such a way that the divisions run inconspicuously along drapery folds or at elevation changes within the relief’s composition.

Next, a plaster mold was made from each clay section. Once the plaster hardened, the clay model was removed from the mold, a process that destroyed the original work. Then, an even layer of fresh, soft clay was pressed into the molds, and over the course of several hours water from the clay was absorbed by the porous plaster, causing the clay to shrink slightly and separate from the mold. The newly molded sections were extracted from the plaster and the surface was smoothed, adding clay where needed to build out relief not provided by the mold forms, then worked with tools to bring expression to the composition.

The still-soft sides were paddled inward to create V-shaped voids between sections. The sections were then dried slowly to lessen the risk of warpage, and once bone-dry, they went into a kiln and were fired to approximately 1,832°F (1,000°C). The sections emerged from the bisque firing as baked clay at this stage; raw glaze slurries could be applied by brush in separate fields of blue and white. Finally, the prepared sections were fired again, to a slightly lower temperature this time, as was necessary for glazed terracotta. The work emerged with a blue and white glaze, dimpled and satiny with a slightly uneven gloss.⁴

Regarding *Saint Michael the Archangel* and *Prudence*, it is likely that Andrea conceived, sculpted, and divided the original sculptures, then added finishing touches to complete the masterworks. His workmen fulfilled the tasks of making the plaster molds, filling, and removing the clay when set, perhaps even glazing and firing. When this entire process was first accomplished in the fifteenth century, the brilliant blue-and-white glazed terracotta made the Della Robbia workshop famous, establishing a family practice that would be active for more than one hundred years.

**Saint Michael the Archangel**

Saint Michael is presented with wings outstretched, wearing the armor of God, a mighty sword in one hand and in the other, a scale weighing the virtue of souls. He gazes off to the left with a serene yet sorrowful expression. Modeled in high relief, Saint Michael’s graceful stance, his wings, the dramatic lion’s head on the pauldron, the winged head embellishing the cuirass, and the naturalistic folds of his garment convey a sense of physical presence and spiritual power. The simple yet dazzling palette of blue and white further accentuates the exquisite rendering of the work.

Saint Michael the Archangel is the leader of all angels and of God’s army against evil; his qualities are courage, strength, and mercy (for those who deserve it). He is regarded and prayed to as a protector against evil as well as a healer of the sick. Depictions of Saint Michael have evolved through the ages. Often presented
in full armor valiantly battling and defeating the dragon as described in the Book of Revelation (12:7–8), he was also known as the angel who would weigh the souls of the dead for their ultimate judgment and verdict. Here, Saint Michael is depicted simply with his sword and scales. Andrea chose to represent him this way, no longer as the angel at war against Satan, but rather the angel of divine justice and compassion.5

The Saint Michael lunette was made about 1475 to be installed over the main entrance on the exterior of the church of San Michele Arcangelo in Faenza, Italy.6 Set over a doorway through which the faithful would pass, the figure’s serene expression could be interpreted in two ways: the repentant may be comforted, but a sinner might feel his dispassion and potential judgment.

When acquired by the Museum in 1960, the lunette’s twelve interlocking sections were mounted on a heavy plywood panel with a gilded frame (fig. 3). It was displayed in various galleries, until its most recent setting above a doorway in Gallery 500, also known as the Quattrocento Gallery, where it stayed for twelve years. In the early hours of July 1, 2008, it fell to the floor and 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 upon impact. Even so, the lunette suffered extensive damage and its fragments were strewn across the gallery floor (fig. 4). A systematic recording and retrieval system was employed to gather the fragments, which proved helpful in locating where the broken pieces belonged once the reassembly process began. The lunette was broken into pieces ranging in size from tiny glaze flakes to larger pieces weighing up to five pounds, all of which were riddled with cracks. Fortunately, major elements such as the head, hands, and even the little souls remained remarkably intact.

**TREATMENT**

The conservation treatment was lengthy but relatively straightforward. The first step was to sort through the debris to find all the glaze flakes and ceramic pieces, separating them from damaged mount components, including plaster and wooden shims. Plaster dust had infiltrated even the smallest cracks in the ceramic body. Thorough and careful vacuuming and surface cleaning prepared the pieces for the next step. Loose pieces contained within the frame after the fall were grouped according to where they were found on the object. Disassociated pieces that had flown across the floor had to be relocated by finding clues in the color and surface texture details to help put the puzzle back together; this step was painstaking and continued for months. Many internal fragments without glaze were set aside and not used because they were impossible to relocate. Furthermore, when fired clay breaks and is reassembled, the overall dimensions of an object can increase after bonding. If all the internal fragments had been used, the accumulation of such minute increases would have resulted in an imperfect alignment of Andrea’s sculpted, glazed surface.

Several dry runs (assembling pieces without adhesive) were carried out to determine the correct sequence of assembly and to avoid lockouts (fig. 5). Pieces were bonded with a reversible acrylic resin and held together with clamps while the adhesive set, usually over a two-week period (fig. 6). Assembling a large section all at once was avoided, as the weight of the pieces could cause slippage and misalignment during the slow setting time. Such sections were done in several stages, adding a smaller group of bonded...
fragments to a larger piece, and so on, giving the adhesive time to fully set before bonding the next fragment group. It was crucial not to rush the process so as not to leave out any necessary pieces. Once the sections were assembled, then the multitude of glaze flakes could be placed and bonded. Such a three-dimensional puzzle was challenging, as the infinite variety of shapes and surfaces of the pieces demanded an assembly unique to each section. The characteristics of the clay pieces dictated how they interlocked, and assembly was carried out accordingly.

Missing areas were filled with reversible conservation materials, and inpainted with acrylic paints. The famous Della Robbia blue proved to be challenging to replicate due to a well-known but vexing characteristic of many modern blue pigments. The same blue pigment can appear to be quite a different hue depending on the color temperature of the ambient light source, a phenomenon described as “metameric shift.” However, we found that mixtures of Golden Acrylic’s ultramarine blue, Naples yellow, raw umber, and occasionally titanium white had less of a metameric shift than others and remained successfully color-matched to the original Della Robbia blue even under gallery lighting.8

After assembly, we turned to creating a new mount for the object. The sections of the lunette were carefully designed to fit tightly together according to a specific sequence of assembly. Della Robbia clearly meant to hide the gaps between sections because, once the relief is assembled in this way, its joins are barely noticeable (fig. 7). To maintain this illusion, a new low-profile and unobtrusive mount was fabricated from a solid aluminum panel and custom-made brass clips to hold each section of the lunette securely. 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.

DISCOVERIES MADE DURING TREATMENT
The detachment of the lunette from its frame allowed us to study—for the first time in decades—the back and sides of the sculpture in great detail. Even more unusual was the opportunity to examine the interior clay structure of the fragments, providing us with a rare glimpse into the working methods and expertise of the Della Robbia workshop. The following describes some of the most informative details discovered during the conservation treatment.
Tool Marks and Impressions

In 2013 at La Torre Ceramica d’Arte, a ceramic factory producing Della Robbia reproductions in Scandicci, Italy, one of the workers 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 contemporary account bears a direct connection to our observations of the Saint Michael lunette. In sections like the torso, which is in high relief, a great deal of care was taken to press the clay into the mold evenly (fig. 8a,b). In contrast, the head was sculpted by hand as a solid form, then hollowed out to achieve even wall thickness and reduce 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 has areas of high relief was hollowed out from the back for this reason.

Figure 9a illustrates how the process of pressing clay into the mold left numerous finger marks. 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.uden distinct impressions of fingerprint
marks on unglazed surfaces (fig. 9b). A
variety of tool marks is present along the sides of the
lunette’s sections including incised graffitis, paddling
marks, and impressions of wood planks pressed against
the clay (fig. 10a, b). The marks not only provide a sense
of the physical labor involved in forming, handling, and
maneuvering large clay sculptures before they were
fired, but also betray the direct touch of the workers—
the immediacy of the malleable material responding to
a proficient hand.

Clay Body and Glaze
Looking along the edges of each broken piece provided
a cross-sectional view of the Della Robbia terracotta
clay body itself. One of the most striking findings
revealed how seemingly little care was taken while
working the clay. On the right arm, for example, large
voids and folds suggest that the wet clay was hastily
pressed into the mold (fig. 11a). Distinct color variations
and lumps observed in other pieces indicate that the
clay was not thoroughly wedged before use (fig. 11b).
As students of ceramics know, properly wedged, or
kneaded, clay produces a compressed matrix with
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 con-
tained inside air pockets. It was surprising to discover
that the Della Robbia workshop, known for reliably pro-
ducing large-scale sculptures, was not meticulous in
handling its clay. This ostensibly cavalier workmanship
reveals that the workers had an intimate understanding
of their clay and of how far the boundaries could be
pushed while still achieving an excellent result.

The Della Robbia clay has been studied extensively.
Legend persists of a secret source at a property 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 the Della Robbia glazes, in that the clay and
glaze expand and contract at the same rate throughout
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.

**Glaze Repairs**

One unexpected discovery made during the treatment concerns a large firing flaw in the torso section originating from the time of manufacture. When the lunette fell from the wall, a large section of the drapery broke away, exposing an area of the clay body (fig. 12a). 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 they had never been whole. This observation suggests that the torso was molded as a basic form and was then further sculpted by adding more clay to create the drapery with its many undercuts (fig. 12b) and other details such as the lion’s head pauldron on Saint Michael’s right shoulder. Probably in this case, the underlying clay was too dry to adhere to the supplementary layer, and as a result, they separated during the first firing.

To salvage the piece, Della Robbia applied white glaze to the exposed ceramic substrate and the drapery fragment was put back in place; some of this glaze is visible in figure 12c. A thicker paste of glaze and fired clay was used to fill gaps around the edges. 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 and ability to adapt to the unexpected enabled them to execute this potentially risky repair in order to save an extraordinary work. The glaze repair secured the fragment in place for more than 540 years until the impact of the recent fall caused it to detach. There is evidence that the Della Robbia workshop often executed glaze repairs, but to see it as we did on Saint Michael’s torso is rare.

**DISCUSSION**

The Della Robbia workshop was an industrious place. Apart from *Saint Michael the Archangel* and *Prudence*, many other works dating to about the same time have been attributed to Andrea, for example *The Madonna of the Architects*, as well as the *Annunciation*, which was the first of many commissions of large-scale altarpieces for the sanctuary church associated with Saint Francis.
of Assisi in La Verna. One might think that in such a prolific environment, attention to detail might lapse. However, despite the volume of work, the Saint Michael lunette is a result of carefully performed steps, starting with planning the composition and structure, and continuing through all stages of sculpting and glazing.

Decisions on how to divide the work into sections so they fit together relatively invisibly were made early in the manufacturing process. For example, Michael’s left wing is divided into two vertical sections, but the gap between them is disguised by the high relief of his hand and sleeve. At that time, the sides of each section were modeled to slant inward, creating inverted V-shaped voids that would help secure them to the wall. The cavalier approach to wedging clay with the resulting heave clay. Glaze repairs indicate a commitment to saving a damaged piece and the subsequent adept use of the materials at hand to achieve a successful result. *Errare humanum est* is exemplified in one small triangle where blue was accidentally painted over white and fired turquoise—a tiny error in a sea of excellence. Above all, Saint Michael’s face carries a sublime and transcendent expression born from Andrea della Robbia’s genius.

Here we see how the combination of artistic mastery with artisanal tradition produced a magnificent work.

**Prudence**
The Prudence tondo provides another opportunity to appreciate Andrea and the glorious consistency of his work at a time when the workshop was creating numerous commissions. One of the largest Della Robbia works at the Museum, the tondo depicts the cardinal virtue Prudence and, like *Saint Michael the Archangel*, is composed of multiple parts: seven sections for the inner tondo, and eight vibrant garland sections framing the piece, each containing hand-modeled and molded components. In a field of blue, a three-quarter-length young woman is portrayed floating among clouds, looking to her right. She holds a mirror in her right hand and, coiling vertically along her torso, a snake is gripped by her left. The surrounding garland is a colorful and realistic arrangement of citrons, oranges, grapes, quinces, cucumbers, and pinecones accompanied by their associated foliage, all grouped, and separated by blue ribbons.

The figure of Prudence represents the mother of all virtues; she is morally 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.

Apart from documentation of the tondo’s modern provenance, there is little known of its origins in Italy. Most of the literature on *Prudence* has focused on attribution, wavering between Luca and Andrea. The relief was attributed to Luca until the 1980s when John Pope-Hennessy argued for Andrea based on stylistic details such as the posture of the figure, treatment of the garments, and the position of the eyelids. *Prudence* is closely associated with two other tondi depicting the virtues Temperance and Faith. However, details of the Faith tondo indicate that it may be from a separate decorative scheme depicting the theological virtues (Faith, Hope, and Charity). Art historical dating of *Prudence* to about 1475 appears to have been based on an association between its creation and the time when Andrea became the de facto leader of the workshop due to his uncle’s failing health.

After *Prudence* was purchased by the Museum in 1921, the tondo was displayed in the galleries for many years, but eventually it was placed in storage, where it stayed out of sight for a generation. The decision to conserve *Prudence* came in 2014, in preparation for Marietta Cambaceri’s exhibition “Della Robbia: Sculpting with Color in Renaissance Florence,” which was notable for reframing these works as true sculpture rather than merely decorative arts.

**TREATMENT**
When conservators examined *Prudence* and associated archival images they found the tondo was relatively unchanged from when it was acquired by the Museum. On the front surface were aged and discolored restorations and extensive plaster fills (fig. 13a). The fifteen sections of the tondo were mortared into a heavy iron ring surrounding the relief, and on the back were the remains of a brick wall from a previous installation (fig. 13b).

Our examinations determined that the tondo was too unstable to travel safely on loan, and we decided to completely disassemble it and create a new mount. The tondo was dismantled in a slow and deliberate process that took place over several months. With the sections separated, we turned to removing the remnants of its previous installation and cleaning away centuries’ worth of accumulated dirt. We also removed oil-based restoration paint that covered not only plaster fills, but
also significant areas of perfectly preserved glaze. After cleaning, any losses were filled and inpainted as done with Saint Michael the Archangel.

One of the most time-consuming aspects of the project was the development and fabrication of a mounting system. The basic concept of the mount was adapted from the one made for the Saint Michael lunette. Each section of the tondo was independently supported using a system of conforming clips made of carbon fiber fabric and connected to an aluminum honeycomb backing panel.21

DISCOVERIES MADE DURING TREATMENT
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 (fig. 14a, b). We found each section similarly marked; it was then that we realized these numbers were related to the arrangement of the garland.

Each garland section is furnished with a consecutive pair of numbers, one at each vertical edge of the white molding. Accompanying them are what could best be described as asterisks (the purpose of which is unclear) located below each number except in the case of “2,” where they appear above. Figure 15a shows the garland as it originally came to the Museum. This arrangement ignores the numbering system and instead groups similar elements together: a pair of pinecones at the top, the grapes below, and the yellow fruits grouped at the sides.

After uncovering all of the numbers, a pattern emerged. The first section was marked 1 and 2. The adjacent section was marked 2 and 3, and the next 3 and 4, and so on. The final section was marked 8 and 1,
completing the sequence. Because of the large scale of the tondo, we initially used digital images to rearrange the garland into its proper numeric order, finding that, rather than grouping similar fruits together, the rediscovered numbering system alternated them. The result was a much livelier composition (fig. 15b, and see fig. 2).

Uncovering the numbering sequence was an exciting moment in the 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? Or, did the upper position of the asterisks above the “2”s provide a clue? We contacted colleagues in Florence who had experience dismantling in situ Della Robbia works with similar numbering systems, and they confirmed that they consistently found a 1-1 or equivalent Roman numeral join oriented at the top.22 Taking these factors into consideration, we decided to go with the 1-1 join with quinces and pinecones at the top.

This type of numbering system was not Andrea’s innovation, as complex works of art that require assembly from a large number of parts were commonly numbered, like Andrea Riccio’s nearly thirteen-foot-tall bronze Paschal candlestick located in the Basilica di Sant’Antonio, Padua, Italy.23 More significantly, numbering systems are found in architecture throughout history, where stone blocks were notated to aid in construction.

**Tool Marks and Impressions**

While many interesting marks from fingers and tools came to light during the treatment of the Prudence tondo, the most unexpected were found around the outside of the garland. They only became apparent to
us once the tondo was fully mounted in its intended configuration and we could view the continuous surface of the unglazed outer edges. 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 distinct impression of three fingers dragged across the join (fig. 16a). At the connection between the pinecone and the orange, there are two round impressions that were clearly made by a single tool (fig. 16b). 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 was meant to direct the orientation of the garland during installation in its architectural setting.

Gilding

In the blue field of the inner tondo, we observed the faint remains of rays emanating from the figure of Prudence. Della Robbia terracottas were often gilded, but the nature of the embellishment is impermanent, often leaving us today with a “ghost” of where the gilding once was. With that in mind, we suspected that the rays were the remains of mordant, or drying oil, from the gilding process, which was confirmed by scientific analysis.24 However, at this stage, it is not possible to speculate on when the gilding might have been applied as there is ample evidence that glazed terracottas were often regilded many times over the years.25 Furthermore, because mordant gilding techniques have not changed significantly since the Middle Ages, it is difficult to pinpoint a date based solely on the materials used.

To provide an impression of how Prudence may have looked surrounded by a golden aureole, we created a digital reconstruction. Various techniques were employed to enhance the contrast of the digital image, which helped to visualize the remnants of the gilded rays and provide a guide for where to place golden lines over the blue field. After some experimentation with the length of the rays, we settled on a varying pattern based on contemporary comparisons with which Andrea would have been familiar (fig. 17). For example, his uncle’s group of roundels (1461–62) in the Chapel of the Cardinal of Portugal in the basilica of San Miniato al Monte in Florence introduced gilded rays as a pictorial element, as did Luca’s The Ascension over the door of the South Sacristy in the Duomo in Florence. Other contemporary gilding references that would have been known to Andrea include Botticelli’s paintings dating to the 1480s, such as Madonna del Magnificat and Madonna della Melagrana, both now in the Galleria degli Uffizi, Florence.26

CONCLUSION

Art historians of the mid-nineteenth century considered Della Robbia terracottas to be mass-produced works. Although there are a few scientific investigations dating back to the 1870s that attempted to uncover secrets of the glaze,27 early art historical studies were overwhelmingly focused on attribution and symbolism and not on fabrication methods. Thus, interest in the appearance of the object and its meaning drew focus away from what the object itself could reveal about Della Robbia’s workshop methods.

The technique and immediacy of working the clay, from the moment of pulling it from a vat to the final glazed terracotta splendor is preserved in the dimensional surfaces of Saint Michael the Archangel and Prudence. Starting at the back and working around to the front, evidence of the process unfolds before us. The act of pressing heavy wet clay into plaster molds left behind fingerprints and rutted grooves still as crisp as the day they were made. The sides of the reliefs, with their paddled, manipulated, and intentionally coded
surfaces, bridge the transition from the rough terracotta to the refined glazed front. Here, form and color are displayed in the teeming garland arrangements and sublime emotion expressed in the faces of Saint Michael and Prudence. The back represents process and the front, artistic vision. The work was carried out by the expert hands of Andrea della Robbia and his workmen, with the knowledge and virtuosity to transform such humble materials as clay and glaze into works of artistic mastery.

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NOTES

2 Cambareri 2016, p. 145.
3 Ibid., pp. 145–46.
4 For a thorough description of the Della Robbia manufacturing process, as well as technical details about the clay and glazes, see Hykin 2016.
5 Raggio 1961, pp. 142–43.
6 Although the commission of Saint Michael the Archangel for the church of San Michele Arcangelo is undocumented, Olga Raggio (1961, pp. 135–36) connects the date of manufacture for the relief with that of the church’s maiolica consecration roundel which dedicates the building to Saint Michael and is inscribed with the date 1475. Additionally, she emphasizes the stylistic similarities between the lunette of Saint Michael and other works by Andrea from the 1470s as “undeniable evidence of its date and authorship” (ibid., p. 138). The church of San Michele Arcangelo was deconsecrated in 1798, and a few decades later the lunette was transferred into private collections. It was first owned by Count Pasolini dell’Onda, a nobleman from Florence and 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 Metropolitan Museum of Art (Riccardelli et al. 2014).

7 The acrylic adhesive mixture used on the lunette 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. The “Tullio Blend,” a 3:1 mixture of paraloids B-72 and B-48N, is prepared as follows: make one batch of each adhesive (40g B-72, 54g acetone, 6g ethanol; and 40g B-48N, 54g acetone, 6g ethanol) and then combine by volume 3 parts B-72 and 1 part B-48N (Riccardelli et al. 2014).

8 For more details about the conservation treatment of Saint Michael the Archangel, see Riccardelli and Walker 2017.

9 On a 2013 research trip to Italy, Wendy Walker visited ceramic factories outside Florence that manufacture Della Robbia reproductions. She spoke to a worker at La Torre Ceramica d’Arte who spoke about his process. This quote is translated from Italian.

10 Exactly how the Della Robbias filled their molds with clay was a topic of discussion at a Della Robbia study day at the Walters Art Museum, Baltimore, in May 2015, attended by Wendy Walker. Scholarly debate on this matter has not yet been published.

11 Scanning electron microscope-energy dispersive X-ray spectroscopic (SEM-EDS) analysis of the lunette and tondo found the clay bodies to consist of a high-lime, or calcareous, clay with relatively small amounts of sodium, magnesium, and potassium. The white glaze is tin-opacified; the blue is the same white glaze with cobalt, iron, copper, and nickel added. For more detail about this analysis, see Wypyski 2013 and Basso, Carò, and Wypyski 2015. For a technical review of Della Robbia clay and glazes, see Hykin 2016.
12 These materials—a combination of white glaze and ground fired clay used to fill in gaps around the drapery fragment—were confirmed with SEM-EDS and wave dispersive X-ray spectroscopic (WDS) analysis. See Wypyski 2013 for more detail.

13 For more on glaze repairs, see Hykin 2016, pp. 142–43.


15 Wardropper 2011, pp. 31–33.

16 The earliest documented acquisition of Prudence was that of Edward Cheney in the mid-nineteenth century. There is a photograph dated to 1888 that shows the tondo prominently displayed at his Georgian country house, Badger Hall, in Shropshire, England (see Knox 2007, p. 9). It remained there until 1905. After Shropshire, the tondo was owned by various private collectors, then sold at auction, ultimately ending up in Paris before being purchased by the Museum from Jacques Seligmann and Company in 1921. See Wardropper 2011, pp. 31–33.


18 Temperance is in the Musée National de la Renaissance, Château d’Écouen (ECL 2068). Faith is in the Museu Calouste Gulbenkian, Lisbon (540). See Marquand 1912, pp. 169–74.


20 *Della Robbia: Sculpting with Color in Renaissance Florence* opened at the Museum of Fine Arts, Boston, in August 2016, then traveled to the National Gallery of Art, Washington, D.C., in February 2017.

21 For a detailed description of the backing techniques used on Saint Michael the Archangel and Prudence, see Riccardelli and Walker 2017. For a description of how the carbon fiber clips for Prudence were made, see Riccardelli 2017.

22 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, were helpful in understanding the orientation of the numbering system.


24 Fourier transform infrared micro-spectroscopy (FTIR) analysis of the radiating lines showed that the residual material is primarily calcium oxalate (whewellite). Research scientist Adriana Rizzo (2015) reported that this compound could be derived from an oil or proteinaceous layer, which is consistent with the theory that the bands are the remains of mordant from the gilding process.

25 Hykin 2016, p. 139.

26 These contemporary references, both in the Galleria degli Uffizi, Florence, were suggested by curator Denise Allen. *Madonna del Magnificat*, inv. 1890, no. 1609; general catalogue number 00188562; *Madonna della Melagrana*, general catalogue number 00188563.

27 Hykin 2016, p. 135.

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