FOR JULIE JONES

A meticulous and probing reader who significantly broadened the *Journal’s* scope

FOR BRUCE CAMPBELL

An exceptional designer who lavished his talents on this publication
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Manuscript Guidelines for the *Metropolitan Museum Journal*

The *Metropolitan Museum Journal* is issued annually by The Metropolitan Museum of Art. Its purpose is to publish original research on works in the Museum’s collection. Articles are contributed by members of the Museum staff and other art historians and specialists. Submissions should be emailed to: journalsubmissions@metmuseum.org.

Manuscripts are reviewed by the *Journal* Editorial Board, composed of members of the curatorial, conservation, and scientific departments. To be considered for the following year’s volume, an article must be submitted, complete including illustrations, by October 15. Once an article is accepted for publication, the author will have the opportunity to review it after it has been edited and again after it has been laid out in pages. The honorarium for image costs is $300, and each author receives a copy of the *Journal* volume in which his or her article appears.

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ABBREVIATIONS

<table>
<thead>
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<td>MMA</td>
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Height precedes width and depth in dimensions cited.
Pieter Coecke van Aelst (1502–1550) was one of the most celebrated Netherlandish artists of his generation.1 An important panel painter and printer of influential architectural treatises, Coecke was above all a master draftsman-designer, and the primary medium for his artistic expression was tapestry design. Tapestry series based on his cartoons were woven up by the celebrated Brussels-based workshops directed by Willem de Pannemaker and Willem de Kempeneer, as well as lesser-known weavers like Jan van der Vijst and Paulus van Oppenem, and were acquired by the great Renaissance collectors, from Henry VIII to Francis I, Mary of Hungary, Charles V, and Cosimo I de’ Medici.

The three securely documented tapestry series that form the core of Pieter Coecke van Aelst’s stylistically attributed body of works are the Life of Saint Paul, the Seven Deadly Sins, and the Story of Joshua.2 These were all phenomenally successful and woven in multiple high-quality editions. The Seven Deadly Sins, in particular, is one of the most appealing and inventive series of Renaissance tapestries known, presenting a subversive triumphal procession of the vices across seven tapestries, each devoted to a different sin. Uniquely for tapestries of this period, a written program survives in a manuscript in Madrid, describing the “significance of the seven tapestries of the seven deadly sins by Willem de Pannemaker of which master Pieter of Aelst, painter of Antwerp, made the designs and compositions.”3

Coecke probably began designing the Sins in late 1532, pausing during 1533, when he traveled to Constantinople (in part on a tapestry-selling expedition to Süleyman the Magnificent), completing the design of the series after his return in early 1534. Of the earliest documented edition, woven before 1536, which belonged to Henry VIII, only Avarice survives; it is now in the Morgan Library and Museum in New York.4 Of the three best-preserved Seven Deadly Sins editions, one (Figure 1) originally belonged to Mary of Hungary (1505–1558), governor of the Habsburg Netherlands (1531–55). Made before 1544, it is now in the Spanish Patrimonio Nacional. Another (Figure 2), made about 1545, was first acquired by the unfortunate Count Lamoraal van Egmont, prince of Gavere (1522–1568). Following Egmont’s execution, it passed to Philip II and is now also in the Patrimonio Nacional. The third, woven about 1548–49 and probably originally in the collection of the dukes of Lorraine, is now in the Kunsthistorisches Museum in Vienna.5 Since 1957, The Metropolitan Museum of Art has owned one piece of the Seven Deadly Sins that Coecke designed; it represents Gluttony and is the only known survival from this, the fifth known edition (Figure 3).6 In a breathtakingly colorful sweep of twisting figures, fantastical beasts, and patterned cloth and trappings, the figures unfurl across the tapestry’s surface.7 The textile’s well-preserved, vivid palette enlivens the full subtleties of Coecke’s design. Owing to the

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**Redeeming Pieter Coecke van Aelst’s Gluttony Tapestry: Learning from Scientific Analysis**

**Federico Caró**  
Associate Research Scientist, Department of Scientific Research, The Metropolitan Museum of Art

**Giulia Chiostrini**  
Assistant Conservator, Department of Textile Conservation, The Metropolitan Museum of Art

**Elizabeth Cleland**  
Associate Curator, Department of European Sculpture and Decorative Arts, The Metropolitan Museum of Art

**Nobuko Shibayama**  
Associate Research Scientist, Department of Scientific Research, The Metropolitan Museum of Art

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1. Gluttony from the Seven Deadly Sins. Designed by Pieter Coecke van Aelst (Netherlandish, 1502–1550), ca. 1532–34. Tapestry woven under the direction of Willem de Pannemaker (Netherlandish, active 1535–78), Brussels, before 1544. Wool, silk, and precious-metal-wrapped threads, 14 ft. 9 ¾ in. × 26 ft. 6 ⅜ in. (450 × 810 cm). Patrimonio Nacional, Madrid (TA 22/3, A. 360-12154). Photographs of Figures 1, 2, 6 (obverse), 8 (obverse): Bruce White, © The Metropolitan Museum of Art

2. Gluttony from the Seven Deadly Sins. Designed by Pieter Coecke van Aelst. Tapestry woven under the direction of an unidentified master weaver, Brussels, ca. 1545. Wool, silk, and silver-gilt-wrapped threads, 13 ft. 9 in. × 26 ft. 6 in. (420 × 810 cm). Patrimonio Nacional, Madrid (TA 21/4, A. 257-7427)
description in the Madrid manuscript, we can recognize “Dame Gluttony without worries, holding a pot always ready” in her harpy-drawn chariot, accompanied “by cooks, taverners, entertainers, pastry chefs and all masters and mistresses of sweet cakes”; after them comes Death “like a huntsman,” chasing the dissolute and glutinous to an early grave. The procession features famous gluttons and bon viveurs from history: just in front of Gluttony’s chariot can be glimpsed “Philoxenus of Leucas wanting to have a throat as long as that of a swan in order to be able to savor and taste good wine”; seated backward on her horse is “Cleopatra, queen of Egypt”; also on horseback is “Alexander the Great, the great gourmand”; in front of him, on foot “Thaïs the courtesan”; and “Silenus the drunkard” about to lurch off his donkey and out of the tapestry, into the viewer’s space, in a typical Coecke touch. Young Bacchus rides up ahead and carries Gluttony’s standard. Tiny figures in the background landscape illustrate as a foil the story of virtuous Judith, who was able to dispatch Holofernes after lulling him into drunken torpor. In this same vein, overhead flies “the beautiful virtue of Temperance.”

Although the tapestry’s known history stretches back no further than the collection of Leon de Somzee in Brussels in 1901, with putative provenance to Padua, it might originally
have come from one of two additional sets of Sins, possibly Coecke’s series, traceable in documentary records. The first, a set of “seven pieces of tapestry showing the Seven Deadly Sins” presented to the collegiate church of Saint Michael and Saint Gudula in Brussels in late July 1539 by the nobleman Laurent (or Laureijs) de Blioul, member of Charles V’s Privy Council, is probably too early for the Metropolitan’s tapestry. But the second, another seven-piece set showing “the depiction of the Seven Deadly Sins,” which was confiscated from the estate of the count of Egmont’s ally Jan IV van Glymes (1528–1567), marquis of Bergen op Zoom and count of Walhain in Brabant, could be the edition from which our
REDEEMING PIETER COECKE VAN AELST’S GLUTTONY TAPESTRY

TECHNICAL OBSERVATIONS AND CONSERVATION HISTORY

Despite previous critical judgments of Gluttony, an assessment of the tapestry carried out by the staff of the Department of Textile Conservation in 2012 proved the high quality of its weave and its place in sixteenth-century Flemish tapestry production. Microscopic analysis of the weaving techniques, identification of the fibers used, and an accurate visual examination and record of the obverse and reverse of the piece were employed. Previous treatments were reassessed, and new conservation treatments were undertaken to prepare it for display. The results of that examination and treatment are outlined here.

The tapestry was woven with dyed wool, dyed silk, and silver-gilt-wrapped silk threads on an undyed wool warp; the warp is made of two yarns with a Z-twist, plied in an S-direction. The weave structure is still tight, demonstrating a count of 8 to 10 warp and 29 to 30 weft threads per centimeter. The harmonious combination of precious materials like metal-wrapped threads with the rich nuances of dyed silk and wool wefts is achieved using sophisticated technical methods. For example, the textures of human features, including the curled hair of the taverner on the left side of the scene, and design elements of figures’ dress exhibit hatching in silk, wool, and metallic threads (Figure 5). Fine rows of double interlocking join different gradations of colors (Figure 6), while small details such as the tassels of the drapery on Alexander’s horse on the right side of the scene are woven with silver-gilt-wrapped threads in crapautage (Figure 7). The preservation of much of the tapestry’s original color ensures visual appreciation of the quality of the weaving technique. Distinctive technical effects are achieved by combining two yarns of the same material with no twist and in different colors. Green and red wool threads, for example, are used in the colorful background on the right side of the main scene, while a
combination of light blue and red silk threads model the dark purple dress of Gluttony (Figure 8). The same technique in making weft threads can be observed in details of the border design in Aglauros’s Vision of the Bridal Chamber of Herse, a Flemish tapestry woven in the workshop of Willem de Pannemaker in the third quarter of the sixteenth century (Figure 9).19

The condition of Gluttony is generally good, further reflecting the strength of its weave structure. However, its silk wefts are fragile in several areas, and the silver-gilt-wrapped threads have tarnished because of oxidation. The tapestry underwent several restoration campaigns before entering the Museum’s collection in 1957. There is no extant documentation concerning most of these treatments. Generally (unless noted below) the quality of the material and the synthetic dyes employed suggest the late nineteenth or early twentieth century as the probable time these restoration campaigns took place.20 A 12- to 15-centimeter-wide band, tapestry-woven with dyed wool wefts and silver-wrapped threads on undyed wool warps, was joined to the original structure of the tapestry to replace a missing design along the lower border. Although some of its colors have faded, this area is well integrated aesthetically and technically. The inner frame on the lower and upper edges is also a later addition intended to repair a damaged and missing portion of the tapestry, in this case reproducing the design of the original inner frame of which original segments are preserved along the left and right sides of the tapestry.21

Past restoration of the metallic threads is visible in some areas, including in a group of angels in the upper center; here, copper-wrapped bast fiber threads were used to reproduce the brightness of the original metallic threads.22 Some sections of loss, such as those in the dog’s legs on the left side of the scene, have been rewoven with bright white silk floss that does not compare to the fine quality of the original silk weft threads. Because of this intervention, the figure loses its original fullness and creates a stylistic distortion that is not consistent with the Renaissance character of the other
known *Gluttony* tapestries (see Figures 1, 2). Further small lacunae of the weave structure have been filled using the *soumak* technique; one of these areas is visible on a detail of the sausage that Gluttony holds in her right hand on the left side of the scene (Figure 10).²³

In 1984, the textile conservation laboratory of the Cathedral Church of Saint John the Divine in New York carried out a fully documented conservation treatment of the *Gluttony* tapestry.²⁴ The piece was wet cleaned and then consolidated. An open tabby mend technique was adopted to replace small areas of silk loss, such as those in the legs of Cleopatra’s horse in the center of the scene, and cotton fabric patches were applied on the reverse of the tapestry to support large-dimension lacunae. In 2012, *Gluttony* was reexamined and conserved by the staff of the Department of Textile Conservation in preparation for the exhibition “Grand Design: Pieter Coecke van Aelst and Renaissance Tapestry” at the Metropolitan Museum in 2014–15. None of the previous restoration treatments were removed. However, the lining and backing support attached during the 1984 treatment were replaced with new material.²⁵

Following a low-suction vacuum cleaning, nine supportive cotton sateen fabric straps 20 to 26 centimeters wide were vertically stitched to the reverse of the tapestry to support the most fragile areas of the piece. To provide reinforcement during hanging, a cotton sateen fabric band 25 centimeters wide was stitched along the upper edge, while another band 35 centimeters wide in plain-weave cotton fabric was stitched along the lower edge to better protect the tapestry during display. The piece was finally lined with plain-weave beige cotton fabric and fitted with a hanging system incorporating a band of Velcro sewn onto cotton webbing and attached through the new lining along its upper edge.

**ANALYSIS OF DYES**

Dyes used on the *Gluttony* tapestry were analyzed by means of high-performance liquid chromatography with a photodiode array detector. Small samples of weft of various colors were taken from the tapestry, and dyes were extracted from those samples for analysis.

There is no definitive evidence to indicate the date of the tapestry based on its dyes, yet some findings support the proposition that the tapestry was created in the middle of the sixteenth century. The dyes used on the main panel were madder (likely *Rubia tinctorum*), weld, indigo dye,²⁶ cochineal,²⁷ soluble redwoods (such as sappanwood or brazilwood), dyer’s broom, and archil. A similar range of dyes was used on the right and left sides of the inner frame, supporting the technical observation that both sides of the inner frame were woven at the same time as the main panel.

Table 1 in the Appendix shows a summary of suggested dyes used on the *Gluttony* tapestry and, for comparison, on Aglauros’s *Vision of the Bridal Chamber of Herse*. In general, it shows a similarity in the range of dyes: a combination of the major use of traditional European dyes, such as madder, soluble redwoods, weld, dyer’s broom, indigo dye, and archil, and the minor use of cochineal for the pink or red parts. These dyes, with the exception of cochineal, had already been in use in medieval Europe.²⁸ In the mid-sixteenth century new natural dyes from America began to be imported into Europe. The new dyes included cochineal, old fustic, annatto, or logwood.²⁹ Cochineal was first imported about 1520 and soon became an important article of commerce and the most highly prized of all dyes from America.³⁰ It appears to have caught on immediately, in contrast to the other dyes, which seem to have been adopted more slowly.³¹ Although further analysis is necessary to confirm the tendency to use the American dyes in sixteenth- to nineteenth-century tapestries, *Gluttony* may have been woven in the period when natural dyes from America were just beginning to be used in Europe, in the second half of the sixteenth century.

A useful indicator for dating textiles containing natural dyes is the presence of tin with cochineal, which produced bright scarlet, as opposed to crimson, which was produced with alum.³² Tin mordant was used with cochineal in Europe from about the 1620s onward.³³ In *Gluttony*, the bright pink on the saddle skirt of Silenus’s donkey and the pink and red hues of the flower petals on the side inner frames were
realized with a combination of cochineal as the main dye and madder as the minor dye. The vivid pink used on the saddle skirt, clearly seen on the reverse (Figure 11), was mordanted with aluminum-based material, not tin, according to the analysis by scanning electron microscope coupled with energy-dispersive X-ray spectroscopy (SEM-EDS).34 Again, the result does not conflict with the proposed sixteenth-century date of the tapestry.

By contrast, thread samples from the inner frame on the lower and upper edges reveal both natural dyes and early synthetic dyes. The brown thread sample appears to be dyed with natural dyes: tannin dye and probably old fustic. From the blue and purple thread samples, indigo carmine was detected. Indigo carmine, an early synthetic dye, was available from 1740 and is reported to have been in use mainly until the latter part of the nineteenth-century.35 The yellow thread sample was possibly dyed with an analog of an early synthetic dye, metanil yellow (C.I. Acid Yellow 36), which has been available since 1879. Considering the presence of both natural dyes, which largely lost commercial importance by 1920,36 and the early synthetic dyes, we can confirm the technical observation that the inner frames on the lower and upper edges were added in the late nineteenth or early twentieth century, indicating that the main panel and both sides of the inner frame were woven before that period.

ANALYSIS OF METAL THREADS

Three samples of metal-wrapped threads were collected from selected original areas of the Gluttony tapestry37 in order to characterize their geometry and composition and to compare them with three thread samples from Aglauros’s Vision of the Bridal Chamber of Herse tapestry (see Figure 9).

The sampled metal threads were first examined and imaged using a polarized light microscope (PLM). They were later mounted on a carbon stub and imaged by means of a scanning electron microscope (SEM).38 Characteristic measurements were taken with the aid of both instruments, notably the thread width, the metal strip width, the distance between coils, the twist angles, and the number of coils per unit length (Table 2 in the Appendix).

In addition, small fragments of metal threads were separated from the core yarn and embedded in epoxy resin. The fragments were then sectioned, polished with an ion milling system,39 and carbon coated40 before being studied by SEM coupled with energy and wavelength dispersive X-ray spectroscopy (EDS-WDS).41 SEM-EDS-WDS analysis was used to characterize the alloy of the thin metal strips and to measure their thickness and that of the gilding.

The studied threads share similar technological characteristics, which are consistent with the manufacturing practices in use in sixteenth-century Europe.42 All the metal-wrapped threads are realized by wrapping a silver-gilt strip with an S-type coil around a yellow-dyed silk core (Figure 12). Though the geometric characteristics of the coils are slightly variable, the strip-metal composition and thread-construction techniques of the two tapestries are quite similar (Table 2). Metal threads from Gluttony vary from very regular, evenly spaced coils around a thin silk thread, to more loosely wrapped, larger strips forming a somewhat larger thread. A comparable range of sizes is found in Aglauros’s Vision of the Bridal Chamber of Herse and is consistent with other metal threads from European Renaissance tapestries.43 Both low (Figure 12a) and high (Figure 12d) twist angles were measured. The tightness of the strips varies broadly, as a result of the original thread manufacture, its history, and its present state of preservation. Metal strips from both the Gluttony and the Aglauros’s Vision of the Bridal Chamber of Herse tapestries are realized with a similar silver alloy of average composition: Ag = 91±0.9 wt% and Cu = 8.9±0.9 wt%. Lead (Pb) was detected in trace amounts up to 0.8 wt%. All the silver strips have a similar thickness of 14–24μm and are gilded on one side with a thin layer of gold 150–400 nm thick (Figure 13). The presence of a single gilded surface and of edges with sharp angles and flat surfaces (Figure 13) suggest that the strips were cut from a gilded metal foil. This interpretation is also supported by the highly oriented microstructure seen in
cross section, typical of a heavily worked silver-copper alloy (Figure 13). No traces of mercury or of copper enrichment at and below the gilded surface were found, suggesting that the foils used for these two tapestries were most likely gilded by welding rather than fire gilded with mercury amalgam or copper soldered. The technique of cutting thin strips from a pregilded silver foil was widely used in the manufacturing of metal-wrapped threads up to the sixteenth century, when the practice was gradually replaced by the use of gilded metal rods, drawn and flattened to obtain thin, double-sided gilded strips.

Two additional metal-wrapped thread samples, believed to belong to later additions, were taken from Gluttony’s inner frame and main panel (sample 3, from the bottom border, and sample 4, from the angel on the upper central area of the main panel). These threads consist respectively of a double-sided, silver-coated copper strip wrapped around cotton thread, and of a one-sided, zinc-coated copper strip wrapped around a bast fiber thread. Their composition and construction technique support the hypothesis that they were introduced during later restoration phases.

**CONCLUSION**

This account of Gluttony’s weave structure and restoration techniques, of the results of dye analysis of its colored wefts, and of the materials and construction of its metal-wrapped threads reveals that the tapestry is consistent with production carried out about 1550–60, and thus it could indeed have belonged to the lost documented set owned by Jan IV van Glymes. At some point, the tapestry’s wide outer border and both horizontal sections of the narrow inner border were removed, resulting in the loss of any record of the weavers’ mark and city of production. When the tapestry underwent restoration, probably in the late nineteenth or early twentieth century, the surviving narrow inner borders at the vertical edges were replicated on the horizontal edges, achieving a similar effect but using markedly different dyes and metal-wrapped threads. Previously the subject of conjectural connoisseurship, Gluttony can now, through scientific analysis, be recognized as a mid-sixteenth-century work and returned to its rightful place in discussions of Pieter Coecke’s tapestry series.

The rehabilitation of Gluttony as a work of the mid-sixteenth century confirms the popularity of Coecke’s Seven Deadly Sins series and represents a third tier of production. This class followed the earliest editions for Henry VIII and Mary of Hungary, woven in virtuoso technique under the direction of Paulus van Oppenem and Willem de Pannemaker, and the second range, still splendid but not as ostentatious, like those acquired by the count of Egmont and, probably, owned by the duke of Lorraine. The distinct

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12. Secondary electron images of the studied threads from Figure 3 (a, b, and c, corresponding to samples 1, 5, and 6) and Figure 9 (d, e, and f, corresponding to samples 1, 2, and 3) [see Table 2]. Metal-wrapped threads from Figure 3 show a generally higher degree of corrosion in the form of silver sulfides. Threads were imaged at the same magnification.

13. Left: back scattered electron image of the cross section of sample 1 from Figure 3, in which the gold appears as a bright layer (see black arrows) on top of the silver strip. A corroded surface is visible underneath the gold layer (see white arrow). Right: secondary electron image of sample 2 from Figure 9, showing a flat edge with angular features that are consistent with a cut strip. The core fibers have been masked in this image to remove the visible and disturbing charging effects.
possibility that the Metropolitan’s Gluttony originates from Jan IV van Glymes’s set provides a clear understanding of the appearance and execution of such an edition, when Coecke’s cartoons were being used for at least the fifth time. Though the raw materials include some metal-wrapped threads and the weavers attempted sophisticated techniques of crapautage and hatching, the ultimate effect is less accomplished than the versions made in the more vaunted workshops. Above all, the weavers’ application of a palette markedly different from that of Coecke’s cartoon, perhaps reflecting the increased range of dyes available over the intervening decade and a half, demonstrates just how dramatically his design could be transformed in the weavers’ translation. Though documentary evidence has long shown that Coecke’s series were not woven exclusively for royal patrons but also appeared in re-editions, many of the later versions have been lost or unrecognized. The Metropolitan’s Gluttony provides a bona fide record of one of the middle-of-the-range, mid-sixteenth-century versions of Coecke’s designs, perhaps less splendid but important in their own right by reaching a broader market and perpetuating the master’s inventions.

NOTES

1. For discussion of Coecke’s work, significance, and patrons, see Cleland 2014.
3. “Signifiance de sept tappis/ dés sept pechez pour/guillaume pannemakere desquelz/a fait les patrons et ordonnances/maistre pierre van aelst paaintre/d’anvers.” Biblioteca Nacional de España, Madrid, MSS 6015, fol. 2r; see Cleland 2014, pp. 198, 371, no. 46.
4. Morgan Library and Museum, New York (AZ130); illustrated in Cleland 2014, p. 190, fig. 150.
7. I am grateful to my Metropolitan Museum colleagues Florica Zaharia, Cristina B. Carr, and Giulia Chiostrini, Department of Textile Conservation, and to Giovanna P. Fiorino-Iannace and the staff of the Antonio Ratti Textile Center, for first viewing the tapestry with me in June 2010 and enabling the ensuing project, spearheaded by Giulia Chiostrini.
8. “damme gloutonnie/sans souci tenant le pot toussours preste”; “cuysiniers/taureniers cabarretiers/pastissiers et toutz/maistres et maistresses de friandise”; “La/mort la pourchasse comme veneur.” Biblioteca Nacional de España, Madrid, MSS 6015, fol. 7r.
9. “philoxenus desirant avoir le col aussi grant/que dung cygne pour plus longuement percevoir et/gouster le bon vin”; “Cleopatra royne degipt”; “Alexandre le grand fut fort note de gourmandise”; “Thays la paillarde”; “Silenus lyvroigne”; “la belle vertu de temper-ance.” Ibid., fols. 7v, 8r.
12. Standen 1985, vol. 1, p. 113. The tapestry is mentioned only in a note by Georges Marlier (1966, p. 333). Jan Karel Steppe (in Bauer 1981, p. 87) afforded it less than a sentence, remarking that it is “die später […] und auch nicht von so guter Qualität ist” (later . . . and also of not such good quality).
13. Barbara Caen to Elizabeth Cleland, August 18, 2012, and May 17, 2013. I am grateful to Dr. Caen for sharing her knowledge of nineteenth-century tapestries. For the Baumgarten tapestry, see Candee 1912, fig. facing p. 262.
14. The term “silver-gilt-wrapped thread” is taken to mean a thin layer of gold applied on a silver metal strip wrapped around a silk core.
15. According to Masschelein-Kleiner (1993, p. 71), sixteenth-century tapestries from Brussels “are remarkably fine, 7.25–8.25 and more warp threads per centimeter.” Moreover, Masschelein-Kleiner specifies that “the warps of Belgian-made tapestries were made of undyed wool spun in Z-twist and plied in S-twist.” These technical details correspond with Gluttony’s weave structure. In addition, technical aspects of other Renaissance tapestries show similarities with Gluttony’s weave features, materials, and warp count per centimeter. For example, see the Lust tapestry (before 1544) from the Seven Deadly Sins (series 22, no. 2) at the Palacio Real de Madrid in Campbell 2002, pp. 410–16, no. 47.
16. The hatching effect here translates from one color to another by alternating long and short wert passes.
17. The crapautage effect, also called basket-weave, is achieved by metallic wert threads crossing more than one warp thread.
18. Although some areas woven in pink, yellow, and green have lost their tonal intensity, the original colors remain vivid on the piece’s reverse. See the discussion below of the dyes employed in Gluttony.
19. Observed during a viewing in the Metropolitan’s Antonio Ratti Textile Center on April 18, 2013. Aglauros’s Vision of the Bridal Chamber of Herse was chosen as a comparandum for the technical investigation of Gluttony for two main reasons. First, it is certainly dated to the mid-sixteenth century. Second, it was woven under the direction of Willem de Pannemaker in Brussels, the same weaving director who was responsible for one of the Seven Deadly Sins sets in Madrid and the set in Vienna. For more information regarding the history of Aglauros’s Vision of the Bridal Chamber of Herse, see Campbell 2002, pp. 391–94.
20. See the dyestuff analysis below.
21. Technical analysis of the inner frame along both sides of the tapestry shows that the warp thread is the same as that used in the main panel’s weave. The inner frame on the upper and lower portions of the piece is a later addition, as is the blue galon (the outside border of the tapestry) around its edges. Further evidence is given below.
22. See the discussion and analysis of the metallic threads below.
23. For a description of the soumak technique as used in tapestry weaving, see Harvey 1991, p. 135.
24. In 1984 the Morgan Library and Museum requested the loan of Gluttony for two and a half years. On May 29, 1984, the tapestry
was transferred from the Metropolitan to the textile conservation laboratory at Saint John the Divine, New York, for treatment. Although the Morgan Library ultimately withdrew its request for the loan, the treatment was completed at Saint John’s before the tapestry was transferred back to the Metropolitan Museum in December 1984. For a detailed description of the conservation treatment applied at that time, see Hutchinson 1989, pp. 89–94. An account of the loan request, object transfer, and loan cancellation is in the object file in the Department of Textile Conservation, MMA.

25. Reflecting developing standards in tapestry conservation practice over the last thirty years, cotton upholstery webbing has been superseded at the Metropolitan by light, tightly woven cotton sateen fabric as the tapestry strapping material of choice. See Barnett et al. 2006, pp. 155–62.

26. The term “indigo dye” here refers to any dye plant that produces indigo, such as woad (Isatis tinctoria) or indigo (Indigofera tinctoria), and does not specify the type of plant.

27. Carminic acid, a main colorant of American cochineal and Armenian cochineal, was detected in the samples, indicating that they could have been dyed with either of them. However, the tapestry’s date makes it seem likely that the American variety was used.


REFERENCES


TABLE 1. SUMMARY OF SUGGESTED DYES USED ON FIGURES 3 AND 9

<table>
<thead>
<tr>
<th>Culture</th>
<th>Gluttony (Figure 3)</th>
<th>Aglauros’s Vision of the Bridal Chamber of Herse (Figure 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMA accession number</td>
<td>57.62</td>
<td>41.190.135</td>
</tr>
<tr>
<td>Number of samples analyzed</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Original/Restoration</td>
<td>Original (the main panel, the inner frame on the sides)</td>
<td>Original</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Colors/Materials</th>
<th>Wool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red 1</td>
<td>madder</td>
</tr>
<tr>
<td>Red 2</td>
<td>cochineal + madder (•) madder + weld (•)</td>
</tr>
<tr>
<td>Pink 1</td>
<td>cochineal + madder (•) madder + weld</td>
</tr>
<tr>
<td>Pink 2</td>
<td>madder + soluble redwoods</td>
</tr>
<tr>
<td>Purple 1</td>
<td>madder + indigo dye madder (with no indigo dye)</td>
</tr>
<tr>
<td>Purple 2</td>
<td>archil + indigo dye tannins + cochineal(•) + madder(•) + unknown yellow compounds</td>
</tr>
<tr>
<td>Orange</td>
<td>madder + soluble redwoods weld + madder</td>
</tr>
<tr>
<td>Yellow</td>
<td>weld</td>
</tr>
<tr>
<td>Green 1</td>
<td>dyer’s broom + weld + indigo dye</td>
</tr>
<tr>
<td>Green 2</td>
<td>weld + indigo dye</td>
</tr>
<tr>
<td>Blue</td>
<td>indigo dye</td>
</tr>
<tr>
<td>Brown 1</td>
<td>weld tannins + indigo dye</td>
</tr>
<tr>
<td>Brown 2</td>
<td>madder + weld soluble redwoods + cochineal(•) + unknown yellow compounds(•)</td>
</tr>
<tr>
<td>Brown 3</td>
<td>unidentified (archil?)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Colors/Materials</th>
<th>Silk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>madder + tannins cochineal + tannins</td>
</tr>
<tr>
<td>Pink</td>
<td>cochineal + tannins</td>
</tr>
<tr>
<td>Yellow</td>
<td>weld</td>
</tr>
<tr>
<td>Green</td>
<td>weld + indigo dye</td>
</tr>
<tr>
<td>Brown</td>
<td>soluble redwoods</td>
</tr>
<tr>
<td>Yellow (core yarn of metal thread)</td>
<td>unidentified young fustic + tannins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Original/Restoration</th>
<th>Restoration (the inner frame on the upper and lower edges)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color/Materials</td>
<td>Wool</td>
</tr>
<tr>
<td>Blue</td>
<td>indigo carmine (early synthetic dye, C.I. Acid blue 74, first prepared in 1740)</td>
</tr>
<tr>
<td>Yellow</td>
<td>early synthetic dye? (possibly an analog of metanil yellow [C.I. Acid Yellow 36], available since 1879)</td>
</tr>
<tr>
<td>Dark purple</td>
<td>indigo carmine + unknown dye, possibly synthetic</td>
</tr>
<tr>
<td>Brown</td>
<td>tannins + probably old fustic</td>
</tr>
</tbody>
</table>

The symbol (•) indicates that the dye was found as a minor addition. The brown woolen sample from Figure 9 and the light brown silk sample from Figure 3, which were dyed with soluble redwoods, originally may have been red. Tannins used for the purple wool sample and for the brown wool sample from Figure 9 appear to be from a similar type of plant. Tannins used for the red and pink silk samples were probably used for weighting the silk.
<table>
<thead>
<tr>
<th>Tapestry</th>
<th>Sample</th>
<th>Twist type</th>
<th>Thread width (μm)</th>
<th>Metal strip width (μm)</th>
<th>Metal strip thickness (μm)</th>
<th>Distance between coils (μm)</th>
<th>Twist angle (degrees)</th>
<th>Coils per unit length (n/mm)</th>
<th>Metal strip composition</th>
<th>Gilding</th>
<th>Gold thickness (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Gluttony</em> 57.62 (Figure 3)</td>
<td>1</td>
<td>S</td>
<td>250–300</td>
<td>350–370</td>
<td>20</td>
<td>91</td>
<td>48</td>
<td>1.7</td>
<td>Ag90 Cu10</td>
<td>Gold, one side</td>
<td>200–250</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>S</td>
<td>350–400</td>
<td>350–380</td>
<td>16–18</td>
<td>185</td>
<td>50</td>
<td>1.3</td>
<td>Ag90 Cu10</td>
<td>Gold, one side</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>S</td>
<td>380–500</td>
<td>550–570</td>
<td>20–22</td>
<td>157</td>
<td>59</td>
<td>1.25</td>
<td>Ag91 Cu9</td>
<td>Gold, one side</td>
<td>150–200</td>
</tr>
<tr>
<td><em>Aglauros’s Vision of the Bridal Chamber of Herse</em> 41.190.135 (Figure 9)</td>
<td>1</td>
<td>S</td>
<td>540–600</td>
<td>420–450</td>
<td>18</td>
<td>164</td>
<td>67</td>
<td>1.5</td>
<td>Ag92 Cu8</td>
<td>Gold, one side</td>
<td>200–300</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>S</td>
<td>500–540</td>
<td>500</td>
<td>14–18</td>
<td>248</td>
<td>52</td>
<td>1.25</td>
<td>Ag92 Cu8</td>
<td>Gold, one side</td>
<td>200–250</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>S</td>
<td>300–350</td>
<td>340</td>
<td>22–24</td>
<td>227</td>
<td>41</td>
<td>—</td>
<td>Ag91 Cu9</td>
<td>Gold, one side</td>
<td>300–400</td>
</tr>
</tbody>
</table>