



MATERIA

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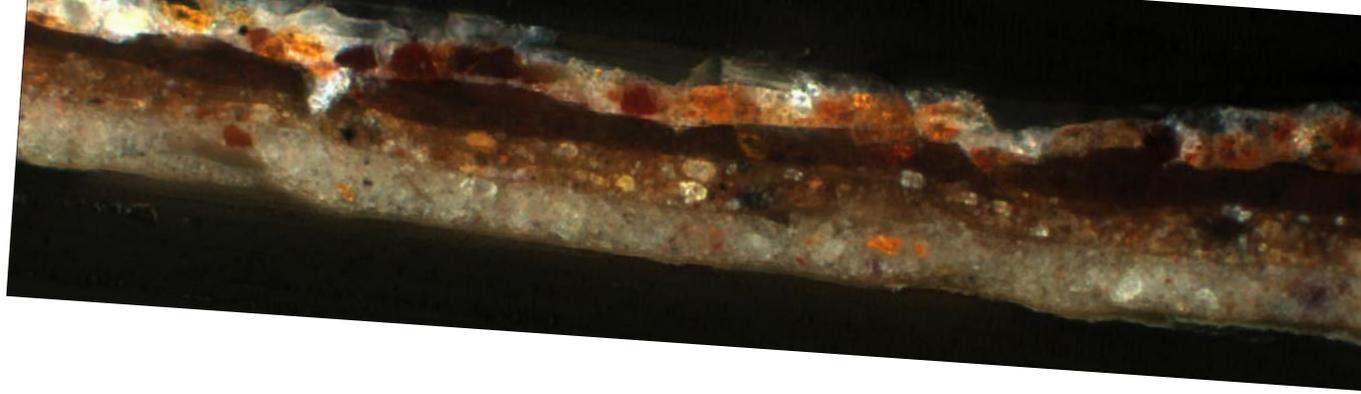
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Cover Overall images of Sir Peter Lely, *Lady Frances Savile, later Lady Brudenell*, ca. 1668, oil on canvas, 30 1/4 × 25 1/8 inches (76.8 × 63.8 cm); and Sir Godfrey Kneller, *Lady Mary Wortley Montagu*, ca. 1715-20, oil on canvas, 35 1/8 × 27 1/4 inches (89.2 × 69.2 cm) with with MA-XRF maps of calcium, iron, and lead for each portrait. Photo courtesy of Yale Center for British Art, Paul Mellon Collection.

Contents Giovanni Santi, *Tobias and the Archangel Raphael (Tobiolo e l'arcangelo Raffaele)*, 1490-1494. Egg tempera and oil on canvas, 96.4 x 62.2 inches (245 x 158 cm), Galleria Nazionale delle Marche, Urbino, long term loan to Museo di Casa Raffaello. Photo courtesy of Galleria Nazionale delle Marche, Palazzo Ducale, Urbino.

Editorial Team page Photomicrographs of paint cross-sections taken from Juan Francisco de Aguilera (act. Mexico, first third of eighteenth century), *The Virgin of Carmen and the Souls of Purgatory with Saint Joseph and the Prophet Elijah*, ca. 1720. Oil on copper, 32.2 x 24.5 cm. The Metropolitan Museum of Art: purchase, Nancy Dunn Revocable Trust Gift, 2017 (2017.234).

Hello & Welcome

to the first issue of *Materia: Journal of Technical Art History*. This project began in March 2020 during an online chat among a group of friends and colleagues who were frustrated by the unprecedented lack of access to research materials during the Covid-19 pandemic. Over the course of the last fifteen months, we have worked to refine our original idea and bring it to life. *Materia* has been a collaborative effort to establish a uniquely accessible space that will help bridge the divide between what are often treated as separate disciplines, such as art history, conservation, conservation science, and other contributing fields. We founded this journal to encourage dialogue and partnerships among scholars from different backgrounds and circumvent traditional academic and institutional hierarchies.

From the beginning, our team identified the need for a publication dedicated to technical art history, an expanding field of research. As the project evolved, we recognized the potential for an open-access platform to reach a more inclusive and diverse audience. For the pilot issue, we solicited a handful of articles from colleagues who kindly agreed to participate. Technical studies form the inherent backbone of this discipline and are represented by three articles in this issue of *Materia*. Among them is an article by Jessica David, Richard Hark, and Edward Town, from the Yale Center for British Art, exploring what macro X-ray fluorescence scanning (MA-XRF) can reveal about a group of portraits by prominent seventeenth- and eighteenth-century English painters.

Gianluca Poldi, Maria Letizia Amadori, and Valeria Mengacci present a technical study of Giovanni Santi (ca. 1439–1494), the esteemed but less-extensively studied father of Raphael. Building upon previous research into Santi's materials and techniques, this article explores the details of two paintings on canvas in the collection of Galleria Nazionale delle Marche.

The third technical study, by José Lazarte, Silvia Centeno, and Federico Carò, considers the eighteenth-century painter Juan Francisco de Aguilera, active in New Spain. Building on the technical examination of a painting on copper support by Aguilera, their research presents one of the first studies dedicated to understanding the artist's materials and painting techniques.

This issue also includes a set of articles of a more theoretical nature stemming from the question “What does it mean to situate meaning in an artwork’s materiality?”. Conceived in relationship to one another, “Technical Art History and the Art Historical Thing” by Michael Yonan and “Toward a ‘Theory’ for Technical Art History” by Emma Jansson address many of the benefits, but also some of the remaining challenges, involved with integrating material perspectives into a broader art historical inquiry.

We are delighted that these articles launch *Materia* into cyber-being. Although this first issue concentrates on the technical examination of easel paintings, largely due to our own professional backgrounds and networks, we are actively seeking submissions on a diversity of art media and cultural heritage for future issues. Scholars are also encouraged to submit a copy of their work in a second language when relevant, so that we may expand access to non-English speakers.

We are grateful to the various organizations and people that have offered us encouragement, advice, and valuable insights along the way. It has been our honor to have such an excellent roster of international authors entrust us with their research. We would also like to thank Getty Publications for the opportunity to use their new publishing software Quire as the platform for our digital publication. We could not have created our first issue without the troubleshooting support from Erin Cecele, Greg Albers, and Daniel Keller. A big thanks to Anton Balitskyi for creating our website. We are also grateful to the editorial team at *J18: A Journal of Eighteenth-Century Art and Culture*, in particular Hannah Williams and Meredith Martin, for sharing their experience launching a new open-access digital publication. The content of this first issue was greatly enriched by the efforts and feedback of our peer reviewers, whom we thank for offering their contributions. We are deeply indebted to the work of our manuscript editor Mary Cason, who has been a valuable member of our team throughout this adventure.

Materia is designed to be an inclusive platform, thus we welcome submissions on all forms of cultural heritage. Submissions for the next issue of *Materia* are now open, with an initial deadline for abstracts of July 15, 2021. We encourage anyone interested to consult our Submission Guidelines, which can be found on the *Materia* website along with the current issue. Without further ado, we wish you happy reading!

The *Materia* team

“A Real Master Among Hundreds”: The Secrets and Techniques of Seventeenth- Century Portraiture in Britain¹

Jessica David, Richard Hark, and Edward Town

ABSTRACT

Over the course of the past five years, the Yale Center for British Art has been engaged in an in-depth technical cataloging endeavor called “Reformation to Restoration,” which, in its first phase, focused on Tudor and Stuart portraiture. With the support of Yale’s Institute for the Preservation of Cultural Heritage, the project has entered a new stage, utilizing macro X-ray fluorescence spectroscopy (MA-XRF) to analyze fifty portraits, yielding a spectrum of new data on the identity and spatial distribution of specific painting materials; the evolution of the painter’s palette over this period; approaches to mark making and blending; as well as compositional changes that are not evident using traditional forms of spot analysis or conservation imaging. Focusing on leading painters of the day, such as Cornelius Johnson, Anthony Van Dyck, Peter Lely, Mary Beale, and Godfrey Kneller, this paper aims to present a new method of dissecting the physical layers of British portraits and their relationship to contemporary written accounts about portrait making. In the absence of an efficacious guild system that offered training in figurative painting or a formalized academy, it was these London-based studios that were the dominant influences of portrait production in Britain during the period in question.

INTRODUCTION

The research presented here derives from the “Reformation to Restoration” project, which at the time of writing, is entering its sixth year at the Yale Center for British Art (YCBA). At its heart, it is an in-depth cataloging endeavor developed to address and where possible answer numerous questions about the Center’s early portraits through the process of technical examination, archival investigation and collaboration with other institutions engaged in the study of Tudor and Stuart portrait painting.² The focus of this paper is portrait making in seventeenth-century Britain, and in particular the investigation of flesh painting in oils using macro X-ray fluorescence (MA-XRF) scanning alongside conventional methods of study (conservation imaging, sampling, microscopy), which in turn is interrogated using historical

texts about painting practice. It does not aim to “unpack” each portrait from the ground layer up, nor does it offer an exhaustive review of previous technical studies.³ Rather, its goal is to identify specific aspects of the portraits’ construction that are not visible to the eye or readily observed using traditional methods of technical analysis. Whereas these traditional methods have been, and will remain, essential in identifying the presence of certain pigments in a painting, aggregated MA-XRF data provides unique insights into how those individual pigments were actually deployed in paint. By comparing this data, we seek to reveal broad trends and patterns in portrait production, identify signature qualities of five influential painters and their studios, and contextualize firsthand accounts about these artists’ working

methods using examples of their work from the YCBA's collections.

X-ray fluorescence spectroscopy is a nondestructive technique that has been used for many years in the field of cultural heritage for the analysis of a variety of materials, including the identification of pigments on paintings. Point XRF measurements, often using a handheld instrument, are commonly utilized to gain valuable information about elemental composition, which often allows one to infer the identity of the colorants.⁴ Micro-XRF (μ -XRF) instruments offer higher spatial resolution, and some can be used in scanning mode to map the distribution of elements over a small portion of a painting (a few square centimeters). The more recent development of large area μ -XRF, usually referred to as macro-XRF (MA-XRF) offers the high definition of μ -XRF but allows for examination of a much larger area (hundreds of square centimeters) in a single scan.⁵ MA-XRF instruments are commercially available and allow paintings to be scanned in a horizontal position on a table or vertically with the painting secured in an easel or on a wall. By digitally stitching together individual scans, even very large paintings, such as Rembrandt van Rijn's *Night Watch* (17 sq. m), have been analyzed using MA-XRF.⁶

The procedure consists of first obtaining a mosaic image of the area to be scanned and then selecting the data-collection parameters, all of which influence the duration of the analysis. Scans with higher spatial resolution and better spectral characteristics require more time. For the "Reformation to Restoration" project, the analysis of an entire painting was usually accomplished with a lower-resolution (the equivalent of ~ 72 dpi) overnight scan requiring 12–18 hours, while smaller features such as an eye or cheek could be scanned at a higher resolution (~ 500 dpi) in 4–6 hours.⁷ Processing of the raw spectral data is required to resolve the overlap between certain elements (e.g., lead and sulfur, iron and cobalt, barium and titanium). False-color element maps were generated using either the instrument

software or the freely available MA-XRF data processing and visualization programs. A specific color was assigned to each element by the authors for consistency and increased visibility when the maps are overlaid.

Illustrated in Figure 1 is a compilation of MA-XRF element maps, all acquired with the same collection parameters, showing the distribution of iron and copper in the eyes of nine portraits discussed and illustrated below. The portraits span approximately one hundred years, from 1619 to ca. 1720. This selection, though concise, illustrates several broader trends identified among the paintings analyzed using scanning XRF. For example, application of iron- and copper-containing paint on the sitters' features shift from crisp, deliberate lines and careful blending (in examples a and b) toward looser, less discreet strokes of paint, with the layering and blending of brushwork less observant of contour. Under magnification, the sitter's eyes in examples a and b are blue, supporting the conclusion that the copper located on their scleras relates to azurite blue pigment. The subsequent examples shown in Figure 1 also contain copper, but it is evident from visual examination of the paintings that the copper there does not relate to a local color, like blue or green, and its distribution makes less sense in terms of the sitter's features. In those cases, the presence of copper more likely relates to the use of copper-containing materials (not necessarily as a colorant) in ground and paint layers, potentially added as a siccativ to speed the paint layer's drying, a practice discussed further below.⁸

Prior to this study, important technical research has been conducted on this period of portraiture, and the authors gratefully acknowledge the "Making Art in Tudor Britain" project of the National Portrait Gallery, London; Rica Jones and Joyce H. Townsend's

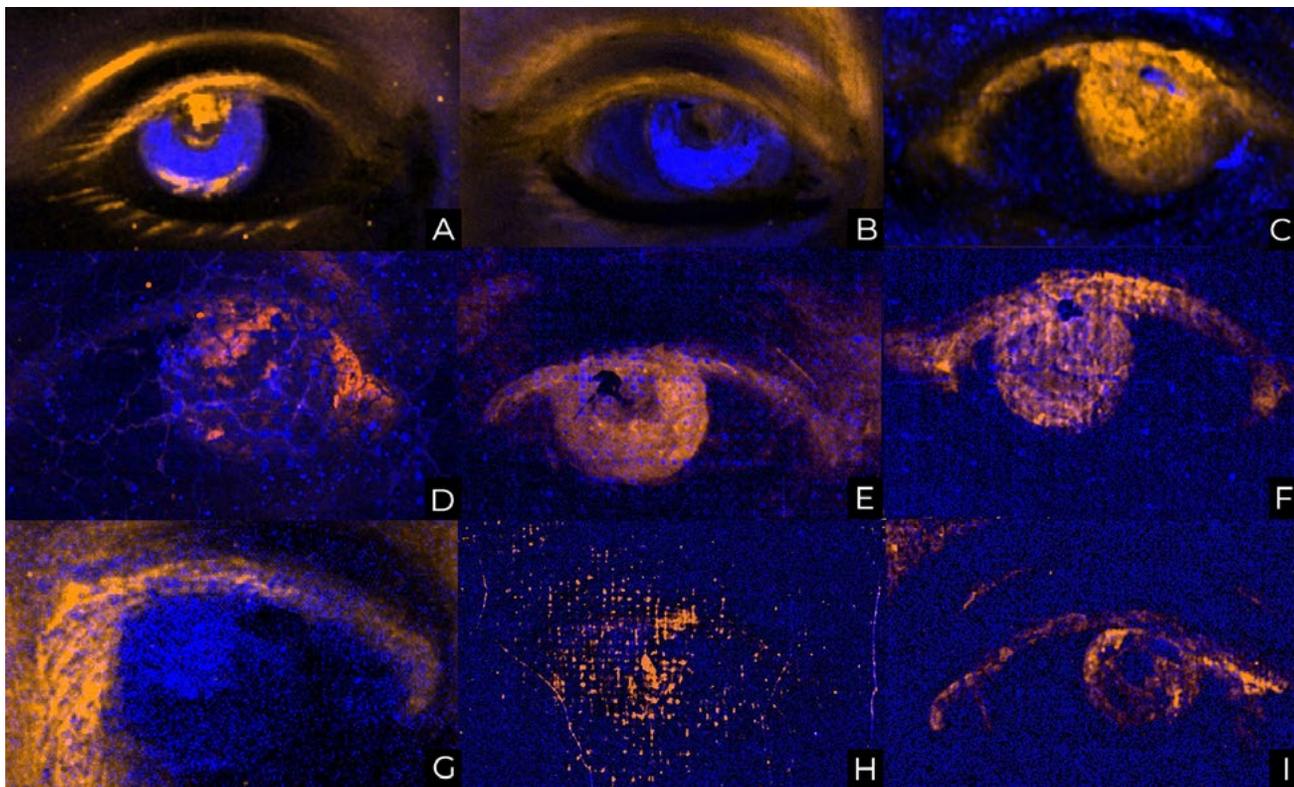


Fig. 1 MA-XRF element maps for iron (in orange) and copper (in blue) of nine eyes from the following portraits: (a) Cornelius Johnson, *Martha Temple, Lady Penyston*, 1619, oil on panel; (b) Cornelius Johnson, *Sir Alexander Temple*, 1620, oil on panel; (c) Sir Anthony van Dyck, *Queen Henrietta Maria*, ca. 1636, oil on canvas; (d) Sir Anthony van Dyck, *Mountjoy Blount, Earl of Newport*, 1637-38, oil on canvas; (e) Cornelius Johnson, *Portrait of a Man*, early 1650s, oil on canvas; (f) Sir Peter Lely, *Diana Kirke, later Countess of Oxford*, ca. 1665, oil on canvas; (g) Mary Beale, *Bartholomew Beale*, ca. 1660, oil on paper laid to canvas; (h) Sir Godfrey Kneller, *Lady Mary Wortley Montagu*, ca. 1715-20, oil on canvas; (i) Sir Godfrey Kneller, *Self-portrait*, oil on canvas. There is a small amount of copper in each scan, but only in the (a) and (b) images does the copper relate to the hue of the upper paint layer, a blue identified as azurite that was used on the sitters' irises. The application of iron-based (earth) pigments also varies among portraits from softly blended gradations that define form to looser, linear paint strokes that describe contour.

technical catalogue of the Tate's sixteenth- and seventeenth-century paintings; and Mansfield Kirby Talley's *Portrait Painting in England: Studies in the Technical Literature Before 1700* (1981), among other publications. Talley combined close reading of early technical treatises with analysis of contemporary portraits and in some cases mapped, by drawing over photographic reproductions, the placement of specific paint mixtures and their sequence of application. A sort of precursor to XRF scanning, his method was akin to the process of elemental mapping and interpretation presented here.⁹

THE SETTING

In around 1678, at the height of his reputation and influence, Peter Lely (1618-1680) participated in a performative competition against a rising star of the Stuart court, Godfrey Kneller (1646-1723). Their challenge: to paint the likeness of Charles II from life, in front of an audience, and within a set time. When, some years later, the gossipy George Vertue (1684-1756) described this event, he captured the sense of intense rivalry between the two painters. Although both were born and trained outside England and described as equally "gentlemanly" in their demeanor, Kneller was

twenty-eight years Lely's junior and full of "fire and ambition." When time was called, Lely had "only laid in his picture in a broad manner" while Kneller, "to the pleasing Surprize to the King & the whole Court," had brought his portrait to completion.¹⁰ These two portraits of the king—one finished, one not—are not known to have survived, but the focus of that demonstration was not so much the product as the process. While the episode is known through Vertue's anecdote, it demonstrates how differently these painters approached their practice. It also attests to a contemporary interest among those both within and beyond the profession with the personae of these artists, their methods, and most importantly their secrets.

Then, like today, the curious and the covetous wanted to know one thing: how was it done. Like Sir Anthony van Dyck (1599–1641) before them, Lely and Kneller redefined the style and craft of painting in Britain by creating an aesthetic at court that had a pervasive influence.¹¹ Generations of native-born painters trained in their workshops, contributed to their output, emulated their signature techniques and, if and when it was possible, documented their processes for personal reference or profit. The second half of the seventeenth century saw a boom in the publication of painters' manuals, or "how to" guides, often largely plagiarized.¹² These manuals cover a range of topics from the philosophical and moral role of art to the specifics of studio design, composition setting, and the nitty-gritty of studio work such as pigment and support preparation, brush selection, and the stages of painting. Most of these manuals were authored by artists who are little known today, and certainly never achieved the celebrity status of Lely or Kneller. Their knowledge of contemporary painting practices may have come either through their own training, or through a position in society that gave them time and access to observe these processes.¹³ Like Vertue's notebooks, these were personal memoranda and likely never intended to be published, but the "de Mayerne" manuscript, the so-called "Gandy" manuscript, and the "pocket-books" of Charles Beale, offer unparalleled insight into

the working methods of the period's greatest painters. What was seen and said is one thing; what was committed to paper is quite another, so a healthy skepticism is required when dealing with these texts, which in any case often use esoteric and archaic terminology.

ANALYSIS AND INTERPRETATION

Among the YCBA's early portraits are those that represent one of many versions of the same likeness, which may or may not be products of the same workshop. Others belonged to larger portrait sets but are now orphaned. Advancements in the methods used to examine paintings—developments in non-destructive analytical techniques, wider availability of equipment and its greater mobility, and improved visualization of the results—have revealed information about artistic and studio practices that have not been seen before, and help explain the relationship of these paintings to pictures outside the YCBA's collection (Fig. 2). Few painters of the period habitually signed their work, a problem that is exacerbated by the complexity and scale of the studios where they were produced. First-hand accounts describe workshops in which various levels of apprentices and specialist painters (drapery, landscape) may have contributed to any given commission.¹⁴ The practice of copy making by apprentices for the purpose of learning or simply to accommodate requests for multiple portrait versions was widespread.

Upon Lely's death, the executors of his estate authorized former pupils and associates to complete the unfinished portraits that remained in Lely's studio and to also restore a number of works in order to make them fit for sale.¹⁵ Thus, the very notion of a definitive date or an attribution to one artist was far from straightforward then and is therefore difficult to describe today. This paper does not delve deeply into authorship but, when possible, focuses on objects with solid attributions



Fig. 2 Overall images of Lely, *Lady Frances Savile, later Lady Brudenell*, ca. 1668, oil on canvas, 30 1/4 × 25 1/8 inches (76.8 × 63.8 cm); and Kneller, *Lady Mary Wortley Montagu*, ca. 1715–20, oil on canvas, 35 1/8 × 27 1/4 inches (89.2 × 69.2 cm); both Yale Center for British Art, Paul Mellon Collection; with MA-XRF maps of calcium (yellow = a), iron (orange = b), and lead (white = c) for each portrait. It is evident from just these scans that the two painters approached flesh painting differently. Kneller’s brushwork is more energetic, his paint thinner and less blended than Lely’s, whose flesh and textile paint are more worked up, the paint blended to form soft tonal transitions and volumes.

(through rare signatures, payments, or other records) as the starting point upon which to build a technical profile of that painter. That said, it is equally important to identify evidence of multiple hands at work, characteristic quirks, and generic practices, as they help differentiate the contributions of studio assistants from the primary painter.¹⁶

CORNELIUS JOHNSON (B. 1593 LONDON-D. 1661 UTRECHT)

Johnson was unusual among his contemporaries in routinely signing and dating his portraits. The five portraits in the

YCBA’s collection that are inscribed span thirty years of a long career, from a somewhat stylized Jacobean period to the more gestural, swaggering Dutch subjects made after his move to the Netherlands in 1643.¹⁷ Today, there are only two firsthand accounts of Johnson’s painting practice: the first, a brief note by Théodore de Mayerne (1573–1655) on Johnson’s use of, and warnings about, orpiment; the second, recorded by Daniel King, on Johnson’s advice for painting drapery and, notably, his use of ultramarine blue as a final glaze.¹⁸

Little is known of the size of Johnson’s studio at its height, but extant portraits such as that of



Fig. 3 Cornelius Johnson, *Martha Temple, Lady Penynston*, 1619, oil on panel, 29 × 26 inches (73.7 × 66 cm); and *Sir Alexander Temple*, 1620, oil on panel, 26 × 20 inches (66 × 50.8 cm); Yale Center for British Art, Paul Mellon Collection.

Martha Temple, Lady Penynston and her uncle *Sir Alexander Temple* (Fig. 3) help reconstruct the painter's process and circle of patronage. It does not require spectroscopic analysis to see that Sir Alexander's face is redder and rougher than Martha's. In keeping with historical practices and contemporary texts on flesh painting, Johnson varied his palette according to gender, making the male complexion hotter than the female, and yet MA-XRF scans for iron and mercury show more than just an increased volume of certain pigments. Johnson pushed hue and texture to differentiate gender, lifestyle, and age. For example, the ruddy tones on Sir Alexander's face were applied in discreet, almost hatched brushstrokes, whereas Martha's soft blush was created with thorough blending, or "sweetening," with a sable brush that thinned and smoothed the pink hue to a transparent veil of color (Fig. 4).¹⁹ Only on her

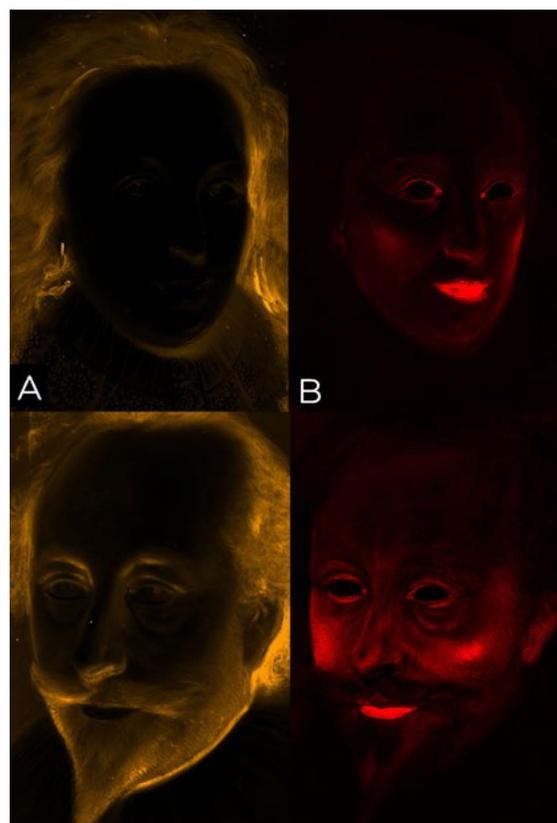


Fig. 4 MA-XRF element maps of iron (relating to earth pigments, represented with orange = a and mercury (relating to vermilion) in red = b from the faces of the portraits illustrated in Fig. 3

eyebrows, eyelashes, and the azurite blue veins on her temple did Johnson permit the shape of the brush to leave a visible footprint.

The portraits once formed part of a set commissioned by Sir William Lenthall (1591–1662) at Bessels Leigh, Oxfordshire, completed by Johnson between 1619 and 1622. Johnson also made pictures for other members of this family, including the 1620 portrait of *Susanna Temple, later Lady Lister* (Tate Britain, London), where, again, Johnson emphasized the sitter's youth and gender with a cooler flesh palette and careful wet-in-wet blending that visually "closed" the brushwork on her flesh without quenching the luminosity of the lighter paint below.²⁰

The individuality of the sitters' expressions and complexions, and the skillful juxtaposition of soft flesh, crisp lace, and patterned silks comprise a product that is technically sound, visually luminous, and shrewdly formulaic. It is unlikely that Johnson painted every part of these portraits himself. The sequential, wet-over-dry paint layering of the costumes and the fictive ovals created an opportunity for studio hands, as did the demand for additional versions. The portraits of *Sir Alexander Temple* and *Martha, Lady Penyston* (and quite possibly others not yet identified) were produced more than once (Fig. 5).²¹ Comparison of the two *Lady Penystons* shows how exactly alike



Fig. 5 Cornelius Johnson, *Martha Temple, Lady Penyston*, 1619, oil on panel, 26¾ × 20 inches (68 × 51 cm). Private collection.

Fig. 6 Cornelius Johnson, *Portrait of a Man*, early 1650s, oil on canvas, 41 × 33 inches (104.1 × 83.8 cm), Yale Center for British Art, Paul Mellon Collection. Detail of the face; MA-XRF map of mercury (red) from the same face.



those versions were produced, suggesting they were completed in very close succession and possibly with both in the studio simultaneously.

Comparison of Johnson's *Sir Alexander Temple* (Fig. 4) to the *Portrait of a Man*, a painting he made over thirty years later, illustrates an evolution in his technique (Fig. 6). The tidy brushstrokes and careful articulation of eyelids and lip shape evident in MA-XRF maps of Sir Alexander's face were abandoned in favor of soft, gestural strokes, some sure, others almost searching, without an obvious formula. Both likenesses are individual yet bear the anatomical "stamp" of Johnson; the sitters' crisply delineated irises impart a watchful, soulful expression, their foreheads high and luminous but the crown of their heads slightly squashed, and their low shoulders sloped to make a wide pyramidal shape of their busts.²² But the articulation of every detail—metallic embroidery, spangles, loose hair tendrils—seen in earlier portraits gave way to a softer, atmospheric quality in the later paintings, where only a few, subtle clues were provided about texture: the hazy bluish highlights on black velvet and the flash of a sparkly ring in the shadow.

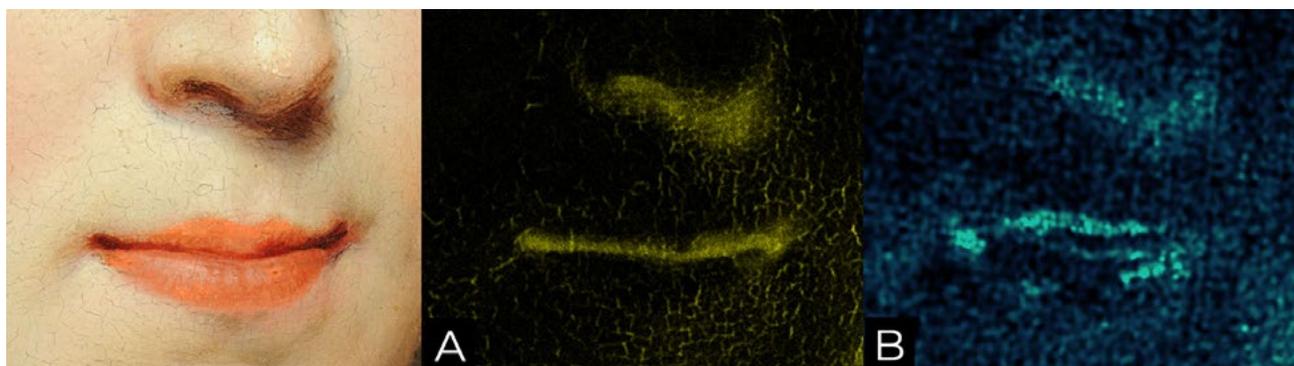
The presence of specific pigments in the above paintings that can be inferred from MA-XRF analysis (lead white, ochers, earths, brown umber, azurite, and bone black) comprise a small portion of the palette outlined in contemporary manuals and manuscripts, which include the following: lead white, ochers (yellow, brown, and red), massicot, orpiment, yellow lake or "pinke," vermilion, red lead, various organic red lakes (cochineal, brasil

wood, and carmine), Indian red, azurite or bice, smalt, indigo, ultramarine, ultramarine ashes, verdigris, green verditer, spa green terre verte, umber, asphaltum, Cologne earth, Spanish brown, burnt ivory, lamp black, charcoal, sea coal, and lamp black.²³ The limitations of XRF analysis result in significant omissions from the flesh palette, namely organic materials like red lakes and "pinkes" (meaning organic yellow lakes). However, XRF can provide clues to the locations of organic lakes based on identification of inorganic "ingredients" used in their production (i.e., aluminum hydroxide, potassium carbonate, and calcium sulphate).²⁴ The deep berry hue on Martha's lips and nostrils, for example, corresponds to a density of calcium and potassium, which, when compared to the painting, neatly follows brushstrokes of red lake-like paint (Fig. 7).

SIR ANTHONY VAN DYCK (B. 1599 ANTWERP-D. 1641 LONDON)

The shift in Johnson's style and his method of paint application can be seen as indicative of shifting tastes in portraiture and in particular the influence of Anthony van Dyck, which is apparent in Johnson's work from the 1630s.²⁵ The range of pigments available to painters

Fig. 7 Detail of nose and mouth of *Martha Temple, Lady Penyston*; beside it, MA-XRF maps for calcium (yellow = a) and potassium (turquoise = b) relating to organic red lake pigment.



changed little over this period, but the various ways that they were used was of great interest to contemporaries, particularly as related to Van Dyck. King, for example, described Van Dyck's three mixtures for "carnation tints" (warm/ rosy hues) and "bluish scumbles" for cool tones.²⁶ The pigments are not always named specifically; for instance, King described the carnations as varying mixtures of white, burnt ocher, red ocher, plus unspecified "red" and "yellow" pigment. Composition of half-shadow tints applied "between the deep shadow and flesh colour" are specifically named as "sea cole" black, white, and ocher, which "he scumbles over with bise white red xc."²⁷

The portrait of *Queen Henrietta Maria*, one

of many high-quality versions of this likeness, and that of *Mountjoy Blount, Earl of Newport* support King's account to an extent (Figs. 8, 9). Visual examination, supported by MA-XRF analysis, reveals soft gradations of iron-based earths mixed with lead white blended across their flesh and then, mixed with umber, daubed to reinforce shadows. In neither portrait does vermilion pigment seem to be mixed into those modeling layers, but rather was added later in the painting process—sparingly to Henrietta Maria's cheeks, tear ducts, and lips, and enthusiastically to Mountjoy's visage (Fig. 10). The flesh paint is thin and permits the peach-color imprimatura to peek out along the sitter's eyelids, cheekbones, and the bridge of the nose. The underlying brown umber "sketch" that delineates the features along the



Fig. 8 Sir Anthony van Dyck, *Queen Henrietta Maria*, ca. 1636, oil on canvas, 41 5/8 × 33 inches (105.7 × 84.5 cm). Private collection.



Fig. 9 (right) Sir Anthony van Dyck, *Mountjoy Blount, Earl of Newport*, 1637-38, oil on canvas, 85 × 51 inches (215.9 × 129.5 cm). Yale Center for British Art, Paul Mellon Collection.



Fig. 10 Details of the sitters' faces in Figs. 8 and 9 and MA-XRF elemental maps of iron (orange = a), mercury (red = b), and manganese, which relates to a brown umber pigment (purple = c).

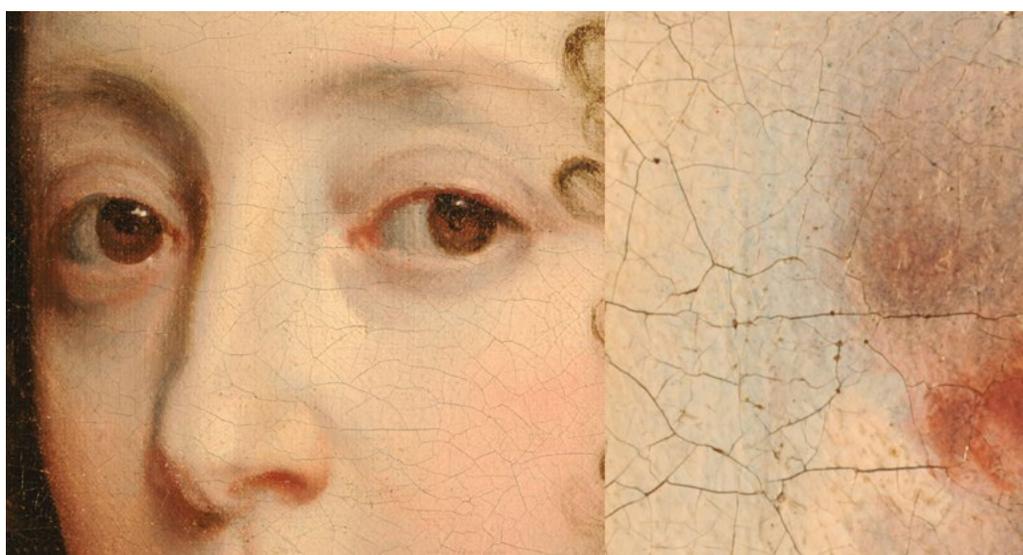


Fig. 11 Details of the face of *Henrietta Maria* showing (left) cool brown paint in the shadows of her face, demarcating her brow and the left side of her nose, over which a greenish-blue hue was scumbled, followed by (right) a final scattering of azurite that bridges the shadows and highlights on the flesh.

shadowed sides of the face (the left side on *Henrietta Maria*; the right on *Mountjoy*) was also left partially visible.

The flesh paint on *Henrietta Maria* is in better condition than on *Mountjoy Blount*, and it is, therefore, clearer to see that the transitions between the deep shadows and flesh tones on her face were “bridged” by a greenish blue paint, a mixture of lead white, black, and ocher particles followed by scumbles of high-grade azurite (Fig. 11). MA-XRF affirms that most shadows on her face contain azurite; sometimes applied in dense daubs, such as under her eyes and on her neck, and in other places as a thin bluish tint that skims over highlights to impart a luminous glow. Some azurite was detected on

Mountjoy’s face and hand, but rather than crisp strokes and scumbles over flesh mid-tones, it seems to be concentrated in areas of shadow and therefore likely relates to a drying accelerant like a copper-infused oil or sparse amounts of verdigris rather than blue pigment (Fig. 12).²⁸

The “Gandy Diary,” an anonymous journal attributed to the minor portraitist William Gandy (d. 1729) is a compilation of firsthand accounts, technical critiques, and gossip pertaining to the paintings and practices of portraitists such as Van Dyck, Lely, and Kneller.²⁹ Between 1691 and 1692, the author visited several Van Dycks and made visual analysis of their palettes and layer structures. Like King, Gandy also noted the painter’s use of blue scumbles, writing, “I observed that the flesh was broken with blue where the light was, & all over as in this Nature he took a middling Hogstoole [hog’s-hair brush] or a large [brush] or according as the place did require and & laid it all on, broad, with some flesh broken with blue, then . . . breaking it with more blue.”³⁰ In short, Gandy (similar to King) recognized Van Dyck’s generous use of blue scumbles on his sitters’ faces to bridge highlights and mid-tones and to delineate cool shadows.

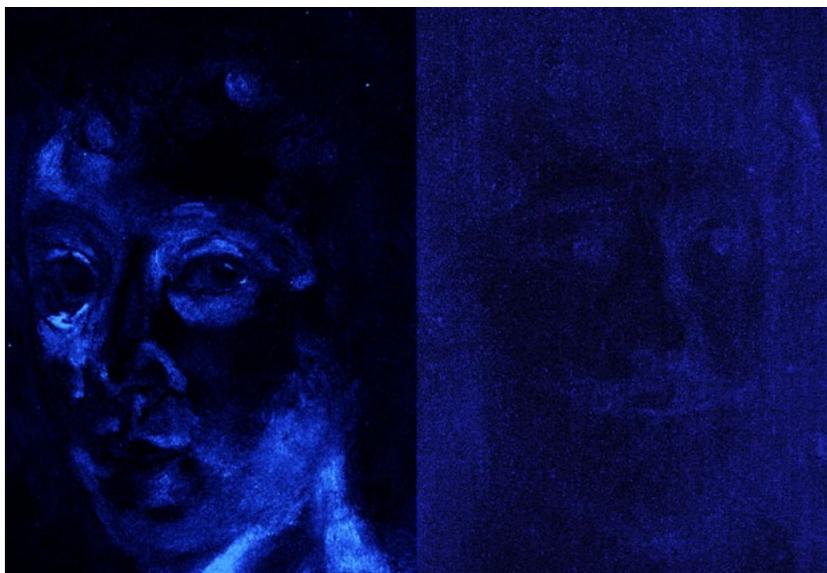


Fig. 12 MA-XRF maps of copper (blue) from the faces of *Henrietta Maria* and *Mountjoy Blount*, illustrating the disparate use and placement of copper-containing materials. On *Henrietta Maria* azurite was used for its hue and sparkling luminosity; on *Mountjoy* the copper seems to be an additive to aid drying and not an intentional colorant.

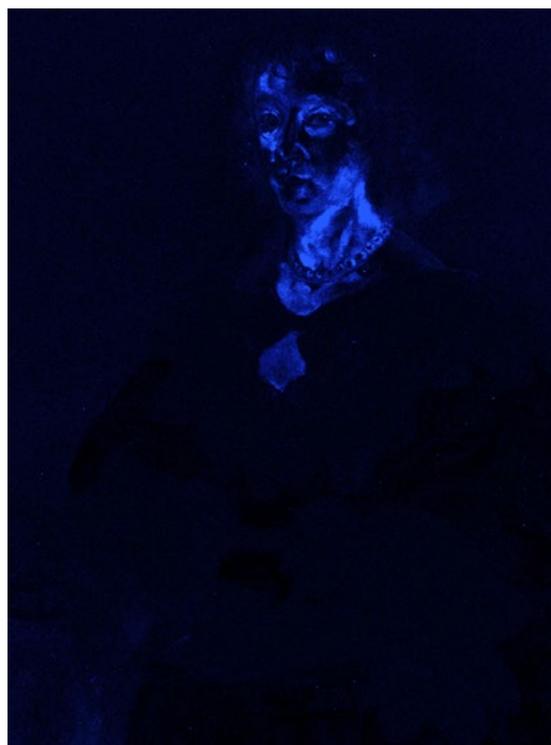


Fig. 13 MA-XRF map of copper (blue) from *Henrietta Maria*, supporting the conclusion that quantities of the copper-based pigment, azurite, were used on her face and bust but apparently none on her arms and hands.

At another point, Gandy saw Van Dyck's portrait of the three eldest children of Charles I and Henrietta Maria, and commented, "Vandike about his hands used yellow ochre & red ocre only."³¹ Perhaps not coincidentally, Gandy's observation corresponds to the portraits discussed here. MA-XRF analysis combined with microscopic examination of the paint layer shows that the quantities of azurite used to almost sculpt the flesh tones of Henrietta Maria's face and bust were substituted on her hands with a modest mixture of lead white, earth pigments, and a little black (Fig. 13). And, neither sitter's hands contain considerable amounts of vermilion. On neither portrait is a discrepancy between the

flesh passages evident by simply looking, and it is curious that Gandy had the confidence to make these judgments on Van Dyck's pigment mixtures, unless of course he was party to a firsthand account of the artist's technique—in other words, if a member of Van Dyck's studio informed him that costly pigments were limited to specific commissions and/or to privileged passages of the canvas, such as the face and textiles of the primary figure. The difference in paint mixtures may also be purely practical, illustrating that the hands were painted at a different stage than the sitters' faces, likely by assistants using generic flesh-paint mixtures that were never intended to precisely match or compete with the sitters' visages.

SIR PETER LELY (B. 1618 SOEST-D. 1680 LONDON)

Some of Gandy's notes on specific painters take the form of conversations with his "informants." For example, he says "to Mr. [William] Fever that Vandike, did not paint with so much variety of Colouring as Lilly did." To this Fever replies, "Vandike had as great variety of Colouring

as any other, but Vandike did obscure his Colouring with—Sweeting over the surfaces, . . . he obscured his Art."³² This is not a critique commonly associated with Van Dyck today, but Gandy and Fever, who at that moment seem to be high-level (studio?) assistants, regularly engaged in the comparison and critique of painters from the previous generation. Their comments indicate a shift in taste away from the soft-edged, atmospheric haze created with wet-in-wet layering and soft blending toward a more direct, painterly approach. Lely, Gilbert Soest (ca. 1605–81), and Kneller advocated (through explicit advice or practice) extensive



Fig. 14 Sir Peter Lely, *Diana Kirke, later Countess of Oxford*, ca. 1665, oil on canvas, 52 × 41 inches (132.1 × 104.1 cm), Yale Center for British Art, Paul Mellon Collection. Detail of her face; MA-XRF scans of iron (orange = a), mercury (red = b), and manganese (purple = c) from the face.



Fig. 15 Sir Peter Lely, *Sir Ralph Bankes*, ca. 1660, oil on canvas, 46 7/8 × 38 3/4 inches (119.1 × 98.4 cm), Yale Center for British Art. Overall and detail of the face, which showcases Lely's discreet placement of color "patches" and minimal blending.

pre-blending of hues on the palette and limited blending on the canvas.³³ Lely advised Fever to "lay your patches of Colouring one by another & not Colour upon Colour, and only hack them together & keep them beautiful and Clear."³⁴

Anecdote paints Lely as secretive. His long-time apprentice John Greenhill reported that he never saw his master paint a face from life, which, given the evidence of Greenhill's aptitude as a portraitist, may be something of an exaggeration.³⁵ Lely was certainly observed in the act of painting by Gandy's mysterious William Fever, as well as Mary and Charles Beale, although the Beales did have to pay for the portraits and by extension the privilege of watching the master at work.³⁶ The tremendous demand for his portraits, as well as copies and versions, compelled Lely to "commercialize."³⁷ His studio was filled with unfinished canvases of what he called "poses"; pre-prepared canvases left half finished (no doubt by assistants) from the bust down, onto which sitters could have their heads placed by Lely.³⁸

According to Gandy's source, Lely started

every likeness with many gradations of just lead white and earths, similar to Van Dyck. These were laid and adjusted over numerous sessions on top of a flat dead color, "a mediam that he might put in lights & darkness in the finishing, so that the dead color stands for something," meaning the dead color played a role in the finished painting.³⁹ It is impossible to dissect the number of sittings over which *Diana Kirke's* head was painted, but microscopic examination of the paint's surface helps inform a basic stratigraphy. Comparison of the paint layer with MA-XRF maps for iron, manganese, and mercury illuminate specific pigment mixtures used, including many discreet strokes of pure earth pigment, followed by brown umber to reinforce features, and then vermilion for Diana's blush and the hot shadows on her mouth, nose, and eyes (fig. 14). In many places the paint "patches," or the footprint of the paintbrush, is un-smudged, suggesting that each application was allowed to dry before the next went down, both to build up deep shadows and retain a range of local hues that layering and soft blending could obliterate. The result is a patchwork of subtle hue shifts, which is even more evident on the faces of Lely's male sitters, such as *Sir Ralph Bankes* (Fig. 15).⁴⁰

Many years after it was painted, Gandy copied



Fig. 16 Mary Beale, *Bartholomew Beale*, ca. 1660, oil on paper laid to canvas, 14 × 11 inches (35.6 × 27.9 cm), Yale Center for British Art, Paul Mellon Collection. Macro photograph showing loose, wet-in-wet brushwork on Bart's face.

a portrait of Isabella Dormer, observing that “it did Shine like a thousand Glowormes” and in places the brushwork was “very rude & Edgy.” These were compliments, for as he goes on to say, “if you sweeten [the paint] together you take away the Spirit & it is quite spoiled.”⁴¹ The words “rude” and “edgy” in this context seem to mean rough or unresolved, but deliberate. This idea of belabored nonchalance was clearly on Gandy’s mind, as in the same year he made the copy of *Dormer*, he recorded a comment from Fever that “[Lely] put in the touches & dashed over here & there, with Judgement, this made it seems careless or done with a Sight, but the great labour & pains was done before.”⁴²

MARY BEALE (B. 1633 BARROW-D. 1699 LONDON)

Mary Beale is recognized as the most commercially successful woman artist of the seventeenth century. Her husband, Charles, worked for the Patent Office and was also a colorman who made and supplied painters’ materials, including a special red lake used by Mary and several prominent painters in their circle.⁴³ Charles kept notebooks from at least 1660–81 documenting his trade, family accounts, and details of his wife’s studio

activity.⁴⁴ Mary Beale was clearly on good terms with Lely. They dined together, Lely gave her advice, and he lent her paintings from his personal collection, works by Van Dyck and various Italian masters, which she only returned upon his death. Attributions to Beale can be difficult because of her great talent for making copies and emulating Lely’s style specifically.⁴⁵

Beale was interested in fast painting—the single sitting—and talked with Lely on this subject. On one visit to her home, Lely took notice of a Van Dyck there. Clearly an object of significance to her, she posited how Van Dyck, “could possibly divide to finish in one day a face that was so exceeding full of work and wrought up to so extraordinary a perfection.”⁴⁶ Lely replied that it looked to have been “painted over” fourteen times. He then recounted an anecdote told to him by the painter and musician Nicolas Lanier, who claimed that when he sat for Van Dyck it took the master seven days to capture his face and he was still not satisfied with it. Lely, it should be remembered, was not himself a fast painter, although he endeavored to hide the laborious stages of painting.⁴⁷

Beale’s portrait of Bartholomew is one of many depicting her sons, most left unfinished from the neck down (Fig. 16). The technique is so brusque, the brush digging and smearing

the paint, that it almost looks as if it could have been completed in one sitting.⁴⁸ In fact, Mary mastered what Gandy envied of Lely, the appearance of very fast painting, accomplished here in about three steps. The basic placement of Bartholomew's features was sketched with a dark brown umber, which was also spread across the background (and is still visible there).⁴⁹ Beale then worked up Bartholomew's flesh very swiftly, perhaps in one go, with a mixture of earths and lead white. These hues are evident under magnification, but MA-XRF provides a clearer image of the paint's application by showing the distribution of pigment particles within each brushstroke, beginning with a mixture of lead white and earth pigment, slightly gradated, dragged straight down the left side of the cheek (Fig. 17). Next, a scattering of vermilion pigment was laid on top. This application does not smear the underlying stroke, indicating that it was already dry. Beale then cleaned up Bart's silhouette by adding more umber around his head.⁵⁰ The pigment mixtures and sequence of paint application are not vastly different from those on Lely's *Diana Kirke* or *Lady Frances Savile*, but the result shows genuine immediacy rather than affected facility.

SIR GODFREY KNELLER (B. 1646 LÜBECK-D. 1723 LONDON)

Unlike Lely, Kneller let anyone watch him paint. He reportedly worked on multiple likenesses in a single day, always in his studio, the faces

Painted from life in sittings as short as one hour. In 1693 he described to Gandy how to paint a face in under an hour, which explains why the paint-off with Lely turned out in his favor. His work was noted for its unfinished or sketchy look; the costumes and backgrounds left unresolved, and this became a vogue among contemporaries who sought to emulate his effortless fluidity. But even those who observed him in action were little enlightened, as his process was so swift and intuitive that his methodology remained beyond them. Miniature portraitist and author Jean André Roquet observed that "Kneller was in every respect a difficult pattern to follow and yet all the English painters would fain imitate him... Several were so affected, as not to cover the whole canvas."⁵¹

Kneller rarely traveled to take a likeness and clearly preferred to work in his studio where light, sitting distances, and the arrangement of mirrors—for the benefit of sitters and onlookers—could be controlled.⁵² Alexander Pope urged him to make one exception for his friend and patroness, Lady Mary Wortley (see Fig. 2). Pope explained to Lady Mary that Kneller "thinks it absolutely necessary to draw the Face first, which he says can never be set right on the figure if the Drapery & Posture be finished before." Having apparently negotiated the arrangement with Kneller, he further explained that "he proposes to draw your face with Crayons, finish it up, at your own house, in a morning; from whence he will transfer it to the Canvas."⁵³

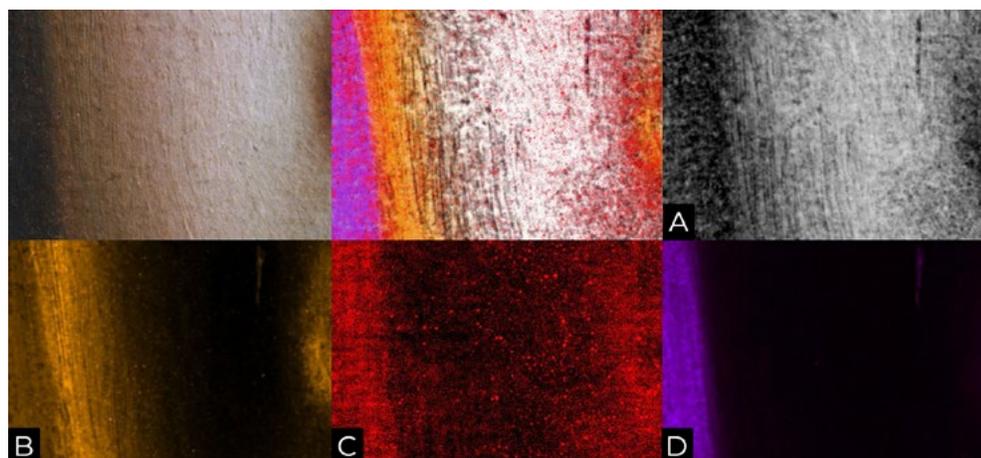


Fig. 17 Detail of the cheek of *Bartholomew Beale* compared with overlaid MA-XRF scans of lead (white), iron (orange), mercury (red), and manganese (purple) from the same region of the portrait plus individual maps of each element where Pb = a, Fe = b, Hg = c, Mn = d.

It seems almost certain the YCBA's portrait of *Lady Mary Wortley* is a product of that commission. The portrait is typical of Kneller's loose, searching method of paint application; stray contour lines buzz around her silhouette and the mark of the brush is visible throughout, flicked to draw a linear shadow on fabric, dragged to make a bluish scumble on flesh, and daubed for impasto highlights off the tip of a hog's-hair brush. The paint of the flesh is thicker than any other passage and although there is some soft, wet-in-wet blending (of cool highlights into her rosy cheeks, for example), the premixed paint "patches" were not merged. As a result, the thicker flesh tones seem to hang on the armature of her features, with the ground color peeking out along most facial contours. Her textiles and hands were described with lean, fluid paint that sketches their proportions without defining their shape or articulating texture.⁵⁴

This concentration of thick, mostly unblended paint on *Lady Mary's* face, as well as several other Knellers at the YCBA, resonates with advice he gave to Gandy when he had to capture a likeness quickly, emphasizing, "Mind only to get the likeness . . . when you have got the likeness & it is Scumbled all over, then Imboss your face and fill it with Colour, This Method makes nothing of Painting."⁵⁵ Gandy observed Kneller working and noted that after applying premixed tints to his sitters' faces with a bristle bush, he "heaps it with Colours in the middle of the face so leaves it When he finish the 2nd or 3rd Setting . . . he only minds the likeness put in the Spirit, to get in the likeness takes up all his Time."⁵⁶ The lack of punctuation



Fig. 18 Sir Godfrey Kneller, *Sir Theodore Colladon*, ca. 1705, oil on canvas, 30 × 25 inches (76.2 × 63.5 cm), Yale Center for British Art, Paul Mellon Collection. Detail of the sitter's face.

clouds Gandy's meaning, but the emphasis in both accounts on capturing and preserving likeness stands out. The likeness, it seems, was captured early in the process and guarded as painting progressed, presumably so the portrait would not lose its resemblance to the sitter, especially if they only sat for Kneller once as in the case of *Lady Mary*.

Like Johnson, Kneller varied both his palette and his brushwork according to the sitter's gender and age. Compared to his *Lady Mary*, the flesh paint on *Sir Theodore Colladon* of ca. 1705 and *Henry Portman Seymour* of c. 1714 (both at the YCBA) resembles islands of unblended, subtle hues laid down with directional brushstrokes that help model the topographies of those male faces (Fig. 18). But in all the portraits examined, Kneller's paint never completely covers the contours of his sitters' features; male or female, the light (sometimes greenish) gray underlayer remains visible, like guidelines along their features.⁵⁷

The "footprints" or gaps in the upper paint layers that allow one to see down to the ground color tend to be narrow, as if Kneller's

brush skirted a line that is no longer visible. His practice of applying loose guidelines of brown oil paint to his figures is evident on the portrait of *Lady Mary* (and other less “finished” canvases), but those dark lines are not consistently visible within the vacui that follow her features.⁵⁸ MA-XRF affirms the strong presence of calcium in those channels, significantly more than any other portion of the painting. Although not visible to the eye today, could those calcium-rich lines have defined the likeness that, according to Pope, Kneller transferred to canvas after visiting Lady Mary?

Ostensible evidence of under-drawing material is less frequently observed in seventeenth-century portraits than in those from the previous century. However, this does not indicate its absence, but rather the limitations of traditional analytical techniques, like infrared imaging and microscopy in identifying the under-drawing material. Both *Lady Mary* and Kneller’s *Self-portrait* contain distinct lines of calcium corresponding to the contours of the face and (Mary’s) hands (Figs. 19, 20).⁵⁹ Those broken, skittering lines give the impression of a dry drawing material dragged over the canvas weave, which only survived imbibement into the oil paint layer because the paint did not cover it. Linear strokes containing the same density of calcium are present on Kneller’s *Lucretia* of 1672–75 and *Portrait of a Woman as St. Agnes*, Traditionally Identified as *Catherine Voss* of 1705–10 (both YCBA), but those lines are a bit softer, as

if smudged or applied as a wet medium. The apparent variety (and sometimes combination) of Kneller’s preparatory marks—a chalk used to draw or transfer facial features, a fluid brown paint to approximate the sitter’s postures and place shadow lines on the face and hands, and occasionally a light flesh hue (in paint) to sketch the contours of hair or wig with a squiggle—



Fig. 19 Detail of *Lady Mary Wortley Montagu* with MA-XRF maps of calcium (yellow). Sinuous lines of a chalk-containing material delineate the contours of her facial features.



Fig. 20 Sir Godfrey Kneller, *Self-portrait*, oil on canvas, 25 5/8 × 21 inches (65.1 × 53.3 cm), Yale Center for British Art, Paul Mellon Collection. MA-XRF maps for calcium showing a detail of the sitter’s head.

supports his reputation as a deft, instinctive maker.

Kneller's statement to Pope that he could not place Lady Mary's head on a prefabricated pose, his words to Gandy on capturing likeness and spirit, and the unfinished portraits left in his studio with only the faces articulated (as opposed to their figures), demonstrate fundamental ways in which his practice differed from Lely's. And yet, much like his predecessor as Principal Painter to the King, the scale of Kneller's studio and hundreds of unfinished portraits potentially completed by others upon his death, pose a challenge to the concept of a clear and concisely defined "oeuvre, or what makes a signature example when one name can be associated with such variety."⁶⁰ These circumstances also present an opportunity for technical investigation to fill in (if not resolve) aspects of studio life that are only sketched by historical accounts.

NEXT STEPS AND CONCLUSION

A recent MA-XRF analysis campaign of paintings at the Yale Center for British Art has offered new insight into the painting practices of leading artists from the Tudor and Stuart periods; evidence that, when compared with historical accounts on painting and existing technical studies on comparable works, forms a clearer picture of each painter's distinctive approach, the extent of the involvement of studio assistants, and the ways in which craft knowledge was shared and reiterated among them. Thus far, MA-XRF scanning has been conducted on fifty portraits from the Tudor and Stuart periods at the YCBA, and our conclusions are supplemented by studies made on key works in other collections, typically using other forms of analysis.⁶¹ Included are portraits by Marcus Gheeraerts the Younger, George Gower, John de Critz, Robert Peake the Elder, Peter Paul Rubens, Paul van Somer, William Larkin, Cornelius Johnson, Anthony van Dyck, Gerard Soest, Isaac Fuller, William Dobson, John Michael Wright, Peter Lely, Mary Beale, John Greenhill, Simon Verelst, Godfrey Kneller, John Riley, and

William Wissing. This approximately eighty-year range of portraits encompasses broad stylistic shifts that do not necessarily require technical analysis to appreciate. Our objective in including several generations of painters in this study is to extend beyond individual object or artist-based case studies toward a technical survey that supports both focused queries and broader appraisal of developments in portraiture over a hundred years of British painting.

The continued progress of this project is dependent on partnerships with other collections and research teams willing to collate their technical data with ours. Thus far, only a portion of the YCBA's Tudor and Stuart portraits have undergone a full suite of analysis including MA-XRF scanning. As the investigation continues and more is revealed of those objects and their makers, the need for additional comparative material becomes more pressing—for example, where a specific artist or an exemplary artwork is unrepresented or underrepresented in the YCBA's collection. Other considerations that were touched lightly upon here, including authorship, quality, condition, and accessibility, levy additional challenges in interpreting a data set like this, which is why, at least at this stage, we favor the largest possible net to gather a breadth of evidence that can be interpreted from various perspectives. With these new insights comes the possibility of a renewed phase of art historical interest and inquiry into the materials and techniques of these and other painters of the period, centering their practice as the principal means by which to interpret their work. For so long, there has been an overreliance upon contemporary anecdote and what else might survive in the paper archive. This new approach not only fills some substantial gaps in our knowledge, but also helps distinguish the difference between what was said and what was actually done.

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ENDNOTES

¹ The titular quotation derives from the "Commonplace Book" of Dr. Thomas Marshall, MS Marshall 80 (dated 1640s), Bodleian Library, Oxford, quoted in Mansfield Kirby Talley, *Portrait Painting in England: Studies in the Technical Literature before 1700* (Paul Mellon Centre, 1981), 150—a foundational text that has hugely influenced the research presented here. The full quote is as follows: "Most art lovers are so little aware of what the work of art they see really consists of, that they find it difficult to point out a real master among hundreds, who can explain understandably in which way and in what manner the artist has accomplished what he set out to do." This is possibly the only English translation from a portion of Dutch script in Marshall's writing that deals with the painting practice of Sir Anthony van Dyck. The text is also referenced in Adam Samuel Eaker, "Lore of the Studio: Van Dyck, Rubens, and the Status of Portraiture" (PhD diss., Columbia University, 2016), <https://doi.org/10.7916/D8SJ1KKQ>.

² A number of portrait miniatures by painters like David des Granges, Nicholas Hilliard, John Hoskins, Edward Norgate, and Isaac Oliver were included in the study and are certainly relevant in terms of the comparison of historical accounts on "limning" to extant works but are omitted from this focused discussion on oil-painting practice.

³ The interpretation of XRF data and its relationship to historical accounts of painting are underpinned by close looking, microscopy, infrared imaging, X-radiography, and paint cross-section analysis. The following instrumentation was utilized, although not all techniques are illustrated here: Olympus SZX16 stereo microscope for examination of paint layers, used with an Olympus DP73 microscope digital camera; Olympus BX51 stereo microscope for study of cross-sections and paint dispersions used with an Olympus DP72 microscope digital camera; Nikon D700 with a Micro-Nikkor 105-mm lens for macro photography; retrofitted Nikon D810 camera with a Coastal Optical 60-mm, macro 1:4, apochromatic lens that captures in the near IR range; Goodrich InGaAs SWIR (GA1280J) with a 0.9-1.7 μm range, used with an Edmund Optics 50mm SWIR Series Fixed Focal Length Lens; X-radiography with a Comet CXR-105 100 kV Unipolar-Open beam tube with a GE CRx Vision Scanner and GE Rhythm RT/Review Software.

⁴ Anikó Bezur et al., *Handheld XRF in Cultural Heritage: A Practical Workbook for Conservators* (Los Angeles: Getty Conservation Institute, 2020): 152-54.

⁵ Matthias Alfeld et al., "Optimization of Mobile Scanning Macro-XRF Systems for the in situ Investigation of Historical Paintings," *Journal of Analytical Atomic Spectrometry* 26, no. 5 (2011): 899-909.

⁶ More on the MA-XRF scanning of the *Night Watch* (1642), Rijksmuseum, Amsterdam, can be found at "Operation Night Watch," accessed 14 May 2021, <https://www.rijksmuseum.nl/en/whats-on/exhibitions/operation-night-watch>.

⁷ MA-XRF maps were collected using a Bruker M6 Jetstream. The instrument was equipped with a Rh target and operated at 50 kV and 300 μA . The entire painting was imaged using a 400- μm X-ray spot size, pixel size of 350 μm and a dwell time of 10 ms per pixel. Close-up scans of eye and cheek passages were obtained using a 100- μm spot size, pixel size of 50 μm and a dwell time of 75 ms/pixel. Each face was also scanned using a

200-µm spot size, 150-µm pixel size and 20-ms/pixel dwell time. Except for scans of entire paintings, a He purge of 0.6 L/min was utilized to enhance detection of lighter elements. Element maps were generated after the data was processed using either the Bruker M6 software or Pymca and Datamuncher. A specific color was assigned to each element by the authors for consistency and increased visibility when the maps are overlaid.

⁸ To provide directly comparable images, consistent gamma levels were maintained across the MA-XRF eye scans illustrated in fig. 1. It should be noted that examples a and b also contain lower levels of copper across the entire flesh area; however, because there is so much more on the surface of the paint layer, the surrounding, weaker signals for copper are suppressed in the images. In other words, the very high levels of copper in certain areas obscure the low levels of copper in all other areas. On the other examples (c-i), copper levels are consistently lower.

⁹ In addition to the projects described above, numerous significant contributions have been made to the understanding of seventeenth- and eighteenth-century painting practice, and specifically the accuracy of historical written accounts in consideration of new technical analysis of contemporary artworks, among them, Mansfield Kirby Talley and Karin Groen, "Thomas Bardwell and His Practice of Painting: A Comparative Investigation between Described and Actual Painting Technique," *Studies in Conservation* 20, no. 2 (1975): 44-108; Ella Hendriks and Karin Groen, "Lely's Studio Practice," *Hamilton Kerr Institute Bulletin* 2 (1994): 21-37; Sylvana Barrett and Dusan C. Stulik, "An Integrated Approach for the Study of Painting Techniques," *Historical Painting Techniques, Materials, and Studio Practice: Preprints of a Symposium, University of Leiden, the Netherlands, 26-29 June 1995*, ed. Arie Wallert, Erma Hermens, and Marja F. J. Peck (Marina del Rey, CA: Getty Conservation Institute, 1996), 6-11; M. J. N. Stols-Witlox, *Historical Recipes for Preparatory Layers for Oil Paintings in Manuals, Manuscripts, and Handbooks in North West Europe, 1550-1900: Analysis and Reconstructions* (PhD diss., University of Amsterdam), accessed February 15, 2021, <https://hdl.handle.net/11245/1.430263>; Alison Stock, "Does the de Mayerne Manuscript Reflect Contemporary Studio Practice?," in *In Artists' Footsteps: The Reconstruction of Pigments and Paintings; Studies in Honour of Renate Woudhuysen-Keller* (n.p.: Antique Collectors' Club, 2013), 109-115.

¹⁰ "Vertue's Note Book A.c. (British Museum Add. MS 23,075)," *Volume of the Walpole Society* 20 (1931-32): 120.

¹¹ Both Lely and Kneller received a knighthood, Lely in the year before his death (1679) and Kneller in 1691.

¹² See Talley, *Portrait Painting in England*, 171-90.

¹³ Nicholas Hilliard's *Treatise Concerning the Art of Limning* ((1598-1602/3) is a notable exception, published by the painter about his craft at the height of his career. Authors such as Richard Blome, Daniel King, William Sanderson, and Marshall Smith fall into the other, larger category of artists of modest reputation, gentleman of low rank, or unknowns: Richard Blome, *The Gentleman's Recreation in Two Parts: the first being an encyclopaedia of the arts and sciences . . .* (London, 1686), accessed February 12, 2021, Early English Books Online Text Creation Partnership, <https://quod.lib.umich.edu/e/eebo/A28396.0001.001>; Daniel King, *Miniature, or the Art of Limning, the Manner and use of the Colours Both for Picture by the Life, Landskip, History; Dedicated to Mary, Daughter of Thomas Lord Fairfax* (British Library, Add MS 12461); William Sanderson,

Graphice. The use of the pen and pencil. Or, the most excellent art of painting (London: Robert Crofts, 1658); Marshall Smith, *The Art of Painting According to the Theory and Practise of the Best Italian, French, and German Masters . . .* (London, 1692).

¹⁴ There are numerous historical accounts of drapery and landscape painters either working in the studios of portrait painters or being sent their canvases to complete specific passages. Jean André Roquet provides a glimpse of drapery painter Joseph van Aken's enterprise: "he used to have canvases sent him from different parts of London, and by the stage coaches from the most remote towns in England, on which one or more masks [faces] were painted, and at the bottom of which the painter who sent them took care to add the description of the figures, whether large or small." Roquet, *The Present State of the Arts in England*, trans. J. Nourse (1755; London: Cornmarket Press, 1970), 45.

¹⁵ The task of completing and restoring these paintings fell both to assistants working in Lely's studio at the end of his life, like Henrik Sonnius, as well as to more established painters including William Wissing, Gaspar or Caspar "Magdalen" Smith, Peter Nason, and Pieter Gerritsz van Roestraten. See Mansfield Kirby Talley, "Executors Account-Book of Sir Peter Lely, 1679-1691," in *Portrait Painting in England*, 360; Talley, "Extracts from the Executors Account-Book of Sir Peter Lely, 1679-1691: An Account of the Contents of Sir Peter's Studio," *Burlington Magazine* 120, no. 908 (1978): 745-49; and the anonymous, unpublished *Book of Accompts of the Hon. Roger North, Dr. William Stokeham, and Hugh May, executors of Sir Peter Lely, during the years 1679-1692*, British Library, Add MS 16174, 12v-16r.

¹⁶ For more on the pricing of portraiture, the role of studio assistants, and copy making during this period, see also "Van Dyck's London Studio," in *Van Dyck and Britain*, ed. Karen Hearn (London: Tate Britain, 2009), 152-69; Linda Bauer, "Van Dyck, Replicas and Tracing," *Burlington Magazine* 149, no. 1427 (2007): 99-101; J. D. Stewart, "Records of Payment to Sir Godfrey Kneller and His Contemporaries," *Burlington Magazine* 113, no. 814 (1971): 30-33.

¹⁷ See Karen Hearn, *Cornelius Johnson* (London: Paul Holberton, 2015); and Edward Town and Jessica David, "The Early Career of Cornelius Johnson, 1593-1627," in *Cornelius Johnson: Painter to King and Country* (London: Weiss Gallery, 2016), 18-35.

¹⁸ Regarding orpiment, see Donald Fels, *Lost Secrets of Flemish Painting: Including the First Complete English Translation of the De Mayerne Manuscript, B. M. Sloane 2052* (Hillside, VA: Alchemist), 118; and J. A. van de Graaf, "Het De Mayerne Manuscript als Bron voor de Schildertechniek van de Barok" (PhD diss., University of Utrecht, 1958, 174). See also Hearn, *Cornelius Johnson*, 63. Various scholars have noted that this section of the manuscript appears to be written in a different hand; Hearn suggests it could be Johnson's. See also King, *Miniature, or the Art of Limning*, f. 46v. For more on the compilation and content of King's manuscript, see Talley, *Portrait Painting in England*, 207-27.

¹⁹ The anonymous author of *The Excellency of the Pen and Pencil* (London, 1668) wrote that "sweetening" will "drive and intermix the Colours one into another, that they will appear as if they were all laid on once, and not at several times" (102). King, among other authors, uses the term "sweetener" to describe soft blending (*Miniature, or the Art of Limning*, 47r). On sweetening brushes see also R. D. Harley, "Artists' Brushes: Historical Evidence from the Sixteenth to the Nineteenth Century," *Studies in Conservation* 17, supp. 1 (1972): 123-29.

²⁰ Rica Jones and Joyce H. Townsend, "Portrait of Susanna Temple, later Lady Lister, 1620 by Cornelius Johnson," Tudor and Stuart Technical Entries, accessed February 2021, <https://www.tate.org.uk/about-us/projects/tudor-stuart-technical-research/entries/portrait-susanna-temple-later-lady-lister>.

²¹ Another version of Johnson's *Sir Alexander Temple* is at Hagley Hall, Stourbridge. On Johnson's copy making and pricing,

see Hearn, *Cornelius Johnson*, 18-19.

²² Hearn notes these and additional characteristics of Johnson's portraiture in *Cornelius Johnson*, 8-9.

²³ The term *bice* here refers to a blue pigment, often a low-grade, fine copper blue related to azurite, but elsewhere it may also refer to a synthetic basic copper carbonate (synthetic azurite). Talley compiled a list of pigments mentioned in notable historical texts on portraiture in *Portrait Painting in England*, 400-405. See also R. D. Harley, *Artists' Pigments c. 1600-1835: A Study in English Documentary Sources*, 2nd ed. (London: Butterworth Scientific, 1982), and for *bice* see p. 47.

²⁴ For more on the historical production of lake pigments and their recipes, see Jo Kirby, Marika Spring, and Catherine Higgitt, "The Technology of Red Lake Pigment Manufacture: Study of the Dyestuff Substrate," *National Gallery Technical Bulletin* 26 (2005): 71-87; and Jo Kirby, Maarten van Bommel, and André Verheeken, *Natural Colorants for Dyeing and Lake Pigments: Practical Recipes and their Historical Sources* (London: Archetype), 2014.

²⁵ Johnson produced several (known), small-scale versions or adaptations of Van Dyck portraits, including an oil on copper of *Charles II as Prince of Wales with a Spaniel* now in the collection of Crab Tree Farm, Lake Bluff, Illinois. For more on Van Dyck's influence in Britain and his London studio, see Hearn, *Van Dyck and Britain*, 10-13; and Hearn, *Cornelius Johnson*, 24-26, 30-33.

²⁶ King, *Miniature, or the Art of Limning*, f. 42r.

²⁷ Talley (*Portrait Painting in England*, 208) notes that when pigments are listed in manuscripts without punctuation this generally implies a mixture of those named colors.

²⁸ The identification of copper using XRF is fairly straightforward, but interpreting it as azurite blue, rather than a green or a paint additive (such as a drying agent) requires additional consideration and/or analysis. Henry Peacham, for example, urged painters to include verdigris (the copper-based green pigment) when modeling black textiles and hair: "For blacke-velvet, take Lampe-black and Verdigeace for your first ground; but then when its dry, lay it over with Ivory blacke and Verdigreace, (to helpe it to dry)." Peacham, *The Compleat Gentleman* (London, 1622; repr. Oxford: Clarendon: 1906), 132. De Mayerne notes the use of siccatives, specifically for slow-drying lake and (an unidentified) black, referencing copper-containing "verdet" [verdigris], white copperas, and umber. See Graaf, *De Mayerne Manuscript*, 187. See also Marika Spring, "New Insights into the Materials of Fifteenth- and Sixteenth-Century Netherlandish Paintings in the National Gallery, London," *Heritage Science* 5, no. 40 (2017), <https://doi.org/10.1186/s40494-017-0152-3>; and on other siccatives, Marika Spring, "Colourless Powdered Glass as an Additive in Fifteenth- and Sixteenth-Century European Paintings," *National Gallery Technical Bulletin* 33 (2012), 4-26. For more on Van Dyck's palette, flesh painting, and use of azurite, see Ashok Roy, "The National Gallery Van Dycks: Technique and Development," *National Gallery Technical Bulletin* 20 (1999): 50-83.

²⁹ A copy of the "Gandy manuscript" was transcribed into what is now called the "Memorandum Book, 1777-1795," compiled with the *Memorandum Books of Ozias Humphry, R.A., containing notes of travel, observations on paintings, diaries of his own occupations, and miscellaneous entries . . .*, British Library, Add MS 22950.

³⁰ Gandy, Add MS 22950, f. 39v (pp. numbered 23). The pages related to "Gandy's" notes are numbered differently from the rest

of the book. Each set of facing pages in this section was given a single number. For clarity, both the folio numbers and the written page numbers are recorded here. On the use of the term "to break" (paint hues and values) in historical English-language texts, see Ulrike Kern, "The Origins of Broken Colours," *Journal of the Warburg and Courtauld Institutes* 79 (2016): 187-89.

³¹ Gandy, Add MS 22950, f. 38r (pp. 21). Gandy does not identify Van Dyck's blue as azurite.

³² Gandy, Add MS 22950, f. 32v (pp. 16). On the possible identity of Mr. Fever, see Talley, *Portrait Painting in England*, 315-20.

³³ Fever told Gandy that Lely mixed up to forty flesh tints on his palette, "tempered" to match the subjects' flesh as observed from life. This may explain why Lely took such a great deal of time to complete just his sitters' heads. Gandy, Add MS 22950, f. 20v (pp. 4).

³⁴ Gandy, Add MS 22950, f. 24v (pp. 8). "Hack" seems to refer to merging adjacent paint passages discreetly rather than blending them together or "sweetening" them.

³⁵ "Vertue's Note Book A.q. [British Museum, Add. MS. 23,071]," *Volume of the Walpole Society* 24 (1935-36): 28. For more on Lely's mentoring, see Diana Dethloff, "Lely, Drawing, and the Training of Artists," in *Court, Country, City: British Art and Architecture, 1660-1735*, ed. Mark Hallett, Nigel Llewellyn, and Martin Myrone (New Haven: Yale Center for British Art; London: Paul Mellon Centre for Studies in British Art, 2016), 291-312.

³⁶ The Beales commissioned portraits from Lely of several friends so that they could observe him at work. Lely accepted a portion of his fee in the form of pigment, including ultramarine and lake. According to Charles, Mary took copious notes during these sessions, but after several visits both husband and wife noted that Lely became guarded and worked in a "more concealed mysterious scanty way of painting then the way he used formerly, wch wee both thought was a farr more open & free & much more was to be observed and gained from." "Vertue's Note Book A.q.," 170.

³⁷ An unfinished portrait of James II by Lely (National Portrait Gallery, London, inv. 5211), including just the sitter's head, showcases his subtly laid patches of unblended flesh tints. Such a study could be the source of multiple versions, incorporated onto "poses" by studio assistants.

³⁸ See Talley, *Portrait Painting in England*, 335.

³⁹ Gandy, Add MS 22950, f. 21r (pp. 4).

⁴⁰ Consistent with examples discussed above, Lely adjusted his palette according to the gender of his sitter. Gandy's friend Fever reported watching Lely work up a portrait of the 2nd Earl of Sandwich and questioned Lely as to why the Earl's complexion was so bright and red in places. Lely assured Fever and the Earl that the colors would lose their strength in the drying process. Fever noted of Lely's palette for female sitters that "Mr. Lilly uses Ultramarine very seldom about a very fair Lady's face, for his Men removes it." Gandy, Add MS 22950, f. 25v (pp. 9); f. 21r (pp. 4).

⁴¹ Gandy, Add MS 22950, f. 35v-36v (pp. 19-20).

⁴² Gandy, Add MS 22950, f. 32r, 32v (pp. 15-16).

⁴³ See note 36. For more on Charles Beale's pigments and their exchange, see Talley, *Portrait Painting in England*, 276-77.

⁴⁴ Out of thirty documented notebooks kept by Charles Beale, only two survive (1676/7) and (1680/1) at the Bodleian Library, Oxford University, and the National Portrait Gallery Archive,

respectively. Much of what exists was reiterated, in some form, by Vertue in his notebooks. See also Talley, *Portrait Painting in England*, 270-305.

⁴⁵ Charles lists numerous copies made by Mary, some after privately owned paintings that were borrowed for the express purpose of reproduction; her son, Charles Jr., was sometimes sent to fetch and return them. For example, in July 1681 Charles recorded that “my D. heart finisht the first Coppy of ye HL. [the honorable lady] of Lady Ogles picture after Sr. P [Sir Peter] Lely at Newcastle House. “Vertue’s Note Book A.x. [British Museum, Add. MS. 23,072],” *Volume of the Walpole Society* 24 (1935-36): 175.

⁴⁶ “Vertue’s Note Book A.x.,” 168-69.

⁴⁷ For commissioned portraits and copies, Mary could take up to four sittings for the likeness and flesh painting, plus several additional days to finish the sitter’s clothing and the background. See Talley, *Portrait Painting in England*, 294-97.

⁴⁸ For discussion on a comparable Beale at the Tate, see Rica Jones and Joyce H. Townsend, “Portrait of a Young Girl, c. 1681 by Mary Beale,” Tudor and Stuart Technical Research Entries, accessed February 2021, <https://www.tate.org.uk/about-us/projects/tudor-stuart-technical-research/entries/portrait-young-girl-c1681>.

⁴⁹ The presence of a brown oil “sketch” between the ground and upper paint layers is ubiquitous among the portraits discussed here. The hue is typically a warm brown, composed of brown umber, earths, and/or a red lake, applied with a fine brush to delineate facial features (possibly over a charcoal or chalk sketch). A broader brush was sometimes used to block in the background and add approximate values to the sitters’ heads and costumes.

⁵⁰ As noted above regarding the portrait of *Martha Temple, Lady Penyston*, XRF analysis is incapable of identifying organic materials such as the colorant of lake pigments, but the presence of substrate materials (calcium carbonate, potassium carbonate) can offer clues to the locations of now-faded lakes. For instance, MA-XRF shows crisp strokes of a calcium-containing material on Bart’s upper lip, nostrils, irises, and upper lash lines. Those calcium-rich marks do not correspond to other materials identified with XRF (like earth, umber, vermilion, or bone black pigment), implying it was added discreetly. Its pattern is consistent with a method of underpainting described by the anonymous author of *The Excellency of the Pen and Pencil*: “tracing out these parts with Lake is to be done before you lay on any Colour” (101). The author then suggests wiping the color away lightly so it doesn’t “overcome” the other colors.

⁵¹ Roquet, *Present State of the Arts in England*, 34.

⁵² On Kneller’s studio and his placement of mirrors, see Gandy, Add MS 22950, f. 32r. When Alexander Pope wrote to Lady Wortley of Kneller’s consent to visit her, he impressed upon her that it was “a manner in which they seldom draw any but Crown’d Heads” (i.e., members of the royal household). Pope, *The Correspondence of Alexander Pope*, vol. 2, 1720, ed. George Sherburn (Oxford: Clarendon, 1956), 22.

⁵³ Pope, *Correspondence*, 22.

⁵⁴ Except for impasto passages, the body of Kneller’s paint appears lean and quite liquid. This may have been intentional, to encourage the paint’s fluidity in support of his fast brushwork. Fever noted that Kneller had a habit of cleaning his brushes in linseed oil and proceeding to use them without wiping the residue, making the oil “swim” on the color and, according to Fever, to “starve them” (perhaps as the paint became diluted

and sullied by pigment residue from the oil pot). Gandy, Add MS 22950, f. 33v. William T. Whitley references a number of passages (like the above) from the Gandy manuscript, which he encountered via Ozias Humphry’s “notebooks” before Gandy was identified as their source. Whitley, *Artists and Their Friends in England, 1700-1799* (London: Medici Society, 1928), 237.

⁵⁵ Gandy, Add MS 22950, f. 45v-46r (pp. 29).

⁵⁶ Gandy, Add MS 22950, f. 45v.

⁵⁷ For comparison to technical studies on comparable Kneller portraits, specifically his application and use of under- and preparatory layers, see Rica Jones and Joyce H. Townsend, “John Smith the Engraver 1696, by Godfrey Kneller,” Tudor and Stuart Technical Entries, accessed February 2021, <https://www.tate.org.uk/about-us/projects/tudor-stuart-technical-research/entries/john-smith-engraver-1696>; and Jones and Townsend, “The Harvey Family 1721, by Godfrey Kneller,” Tudor and Stuart Technical Entries, accessed February 2021, <https://www.tate.org.uk/about-us/projects/tudor-stuart-technical-research/entries/harvey-family-1721>.

⁵⁸ For more on Kneller’s technique and analysis of his “Kit-Cat” or “Kit-Kat” portraits (depicting members of the Kit-Cat dining club), see Talley, *Portrait Painting in England*, 344-56; see also the unfinished portrait of *Richard Boyle, 2nd Viscount of Shannon* at the National Portrait Gallery, London (inv. 3235).

⁵⁹ There is no visible colorant within the passages that contain the calcium mentioned here.

⁶⁰ Like Lely, Kneller left hundreds of unfinished portraits in his studio, and his will stipulated that “no finished portraits shall be delivered under the usual price (15 guineas for a head, 20 with one hand, 30 for a half, and 60 for a whole length . . .), but that those left unfinished shall be finished by [Edward] Byng [his assistant],” quoted in C. H. Collins Baker, *Lely and Stuart Portrait Painters: A Study of English Portraiture Before and after Van Dyck* (London: P. L. Warner, publisher to the Medici Society, 1912), 93. See also Roquet, *Present State of the Arts in England*, 33.

⁶¹ In situ analysis was conducted using a Bruker Tracer III-SD handheld X-ray fluorescence spectrometer in the collections of the Denver Art Museum by Roxanne Sperber (then at Yale’s Institute for the Preservation of Cultural Heritage), and at the National Portrait Gallery, London, and at National Trust UK properties by Richard Hark (author). The authors are grateful to the following for sharing their expertise and access to their collections: Matthew Hargraves, Chief Curator of Art Collections at the YCBA, Kathleen Stuart, then at the Denver Art Museum; Charlotte Bolland, Alexandra Gent, and Polly Saltmarsh, National Portrait Gallery, London; Gerry Alabone, Daniel Cull, Christine Sitwell, and David Taylor, National Trust, UK; David Solkin, Professor Emeritus, Dept. of History of Art, The Courtauld Institute of Art; Lawrence Hendra and Philip Mould, Philip Mould Gallery, London; and Florence Evans, Charles Mackay, and Mark Weiss, Weiss Gallery, London.

Technical Peculiarities in Giovanni Santi's Paintings on Canvas

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ABSTRACT

Giovanni Santi (Colbordolo ca. 1439-Urbino 1494) was one of the most important painters active in Urbino (Marche region, Italy) during the last decades of the fifteenth century, where he was employed at the court of the celebrated Federico da Montefeltro. He is known mainly as the father of Raphael, but he had a remarkable production of paintings, especially on wood but also on canvas and on wall. This paper focuses on technical peculiarities related to Santi's paintings on canvas, including some practices that have not yet been noted in relation to his panel paintings. In particular, two works painted on herringbone-weave linen canvases were investigated: *Tobias and the Archangel Raphael* and *Saint Roch* (both dated ca. 1490-94), in the collection of the Galleria Nazionale delle Marche. The results presented are a part of a large research project based on noninvasive and micro-invasive investigations carried out on twenty-eight works attributed to Giovanni Santi, only partially published in a recent exhibition catalog dedicated to the artist (Palazzo Ducale, Urbino, 2018). Black underdrawing, characterized by a thinly applied network of close hatching for some of the shadows, was observed and, regarding the different hues, a complex use of pigments. The binder detected is siccative oil, with the addition of a large amount of transparent glass particles, which would have been added both to give body to the pigment without using white fillers and to improve drying, a technique that Santi presumably learned from the Flemish painter Justus van Ghent (act. Urbino ca. 1473-1475) and something that he possibly transmitted to his son Raphael as a workshop practice. In fact, Giovanni Santi's workshop survived his death.

INTRODUCTION

Giovanni Santi (Colbordolo ca. 1439-Urbino 1494), known as the father of Raphael, is one of the most important painters active in Urbino during the last decades of the fifteenth century. He enjoyed great prestige at the court of Montefeltro, where he was admired for both his painting skills and his work as a scenographer. Santi is recorded as joining the workshop of his father, Sante di Peruzzolo, in 1484 (the year of Peruzzolo's death), where he specialized in fine arts and crafts.¹ Among Santi's known paintings, we can cite the cycle of the Muses for the so-called Tempietto of the Ducal Palace in Urbino (commissioned by Federico da Montefeltro), the mural paintings in the Tiranni Chapel in Cagli (Marche region), as well as some altarpieces and smaller devotional works. By 1493 his fame as a portrait painter had brought him to the court of Isabella d'Este in Mantua. He was

also known to be a humanist, as testified by his poem "La vita e le gesta di Federico di Montefeltro duca di Urbino" (The life and deeds of Federico di Montefeltro, Duke of Urbino),² which was written at the beginning of the 1480s.

The catalog of the exhibition that took place at the Palazzo Ducale in Urbino in 2018 added new information on Santi's biography and artistic activity.³ In addition, a great deal of data concerning the drawing, pictorial technique, and painting materials related to twenty-eight artworks by Santi dated to different periods were presented.⁴ The diagnostic campaign combined multispectral imaging techniques in the visible such as infrared (IR) and ultraviolet ranges (UV), reflectance spectroscopy (performed in an extended visible range), X-ray fluorescence

spectroscopy (ED-XRF), with micro-invasive investigations such as polarizing light microscopy (PLM); and environmental scanning electron microscopy with energy dispersive X-Ray (ESEM-EDX).⁵

This paper presents the results achieved with respect to Santi's canvas paintings: *Tobias and the Archangel Raphael* and *Saint Roch* (Figs. 1, 2), made on herringbone fabric, by comparing them with other early Italian canvas

paintings. Two questions arise: did Santi choose these supports for technical reasons (size or mechanical necessities), or did visual factors also play a role, whereby the artist also aimed to exploit the vibrant surface effect of this painting fabric.⁶ Certainly, the use of herringbone-weave canvases during the last decades of the fifteenth century presents a rarity within the context of Urbino, and indeed the entire Italian peninsula at this date, as we will discuss.



Fig. 1 Giovanni Santi, *Tobias and the Archangel Raphael* (*Tobiolo e l'arcangelo Raffaele*), 1490-94, egg tempera and oil on canvas, 96 7/16 x 62 3/16 in. (245 x 158 cm). Galleria Nazionale delle Marche, Urbino, long-term loan to Museo di Casa Raffaello. (Photo: courtesy Galleria Nazionale delle Marche, Palazzo Ducale, Urbino).



Fig. 2 Giovanni Santi, *Saint Roch* (*San Rocco*), 1490-94, egg tempera and oil on canvas, 95 11/16 x 57 7/8 in. (243 x 147 cm). Galleria Nazionale delle Marche, Urbino, long-term loan to Museo di Casa Raffaello. (Photo: courtesy Galleria Nazionale delle Marche, Palazzo Ducale, Urbino).

SANTI'S PAINTINGS ON CANVAS

Santi was above all a painter of panels, with only three surviving canvases almost unanimously attributed to him by critics: *Saint Jerome* (Fig. 3) of the Vatican Museums (82 11/16 x 66 15/16 in. [210 x 170 cm]), which was painted on a plain-weave canvas and still shows influence of the technical methods of some Northern European paintings; *Tobias and the Archangel Raphael* (96 7/16 x 62 3/16 in. [245 x 158 cm]) and *Saint Roch* (95 11/16 x 57 7/8 in. [243 x 147 cm]), both painted on herringbone-weave canvas, and both in the collection of the Galleria Nazionale delle Marche and housed in the Museo di Casa Raffaello (Raphael House) in Urbino. *Saint Jerome* is generally dated to the mid-1470s,⁷ and the two canvases of Urbino are dated to the early 1490s (1490-94).⁸

Due to the absence of provenance records relating to the two canvas paintings in Urbino, there remains disagreement among art historians as to their original location, patronage, and decorative function,⁹ leaving several questions open. Later sources document that both paintings were in the Church of San Francesco in Urbino, where they are recorded by the writer Marcello Oretti in 1777 as being present at the sides ("ai lati") of the chapel of Saint Sebastian. The same paintings were also recorded as being seen by David J. Passavant in 1839, at which time they were present in the same chapel, but now placed on the sides of the larger painting *Sacred Conversation with the Baptist, the Saints Francis of Assisi, Jerome and Sebastian, and the Buffi family* (the so-called Buffi Altarpiece, oil on arched panel, 129 x 87 in. [330 x 221 cm]). This large-scale altarpiece can be dated to ca. 1489 through a document recording the commission of the Saint Sebastian altar for this church. The present authors agree with the art historian Ranieri Varese¹⁰ that these documents do not necessarily indicate that the two canvases were part of the original arrangement of the Buffi Altarpiece. Indeed, their reconstruction as a triptych in the 2018 exhibition dedicated to the painter revealed significant discrepancies between the various parts. First, the notable differences in the sizes of the three paintings

and in the choice of support dissuaded us from considering them as forming an original single complex. In addition, the absolute lack of compositional unity as evidenced by the relationship among the background elements, including the clouds, the hills, and the lower foreground, are also inconceivable for a work of this particular date and cultural context.

PAINTING ON CANVAS IN ITALY

Discussion of the Italian context regarding canvas supports can be of help to better identify the rarity of Santi's choice of herringbone, not only within the Marche region but also of the larger central Italian area.

Herringbone-weave canvas very seldom appears in the fifteenth century as a painting support, although its use did become more frequent during the course of the following century. This kind of fabric was more robust and rough, but also more elastic than plain weave, and it was preferred in the sixteenth century, particularly in Venice,¹¹ perhaps because it was perceived to be particularly suitable for a type of painting with dense and irregular brushstrokes, and for large formats.

In the fifteenth century, linen canvases with a basic square-weave pattern (i.e., plain weave) and a 1:1 weft-warp correlation are prevalent. This type of support is characteristic of processional banners, such as the one now in the Ducal Palace of Urbino depicting the *Baptism of Christ* on the front and the *Preaching of the Baptist* on the back (ca. 1472-74, 63 x 44½ in. [160 x 113 cm]), a work attributed by some scholars to the young Santi,¹² despite some clear differences in technique, including its underdrawing. The plain-weave pattern is characteristic of canvases painted with egg or glue tempera (distemper), a medium preferred by Andrea Mantegna. Such paint mixtures were sometimes applied directly onto the linen, without the use of a ground preparation, as seen in northern European *Tüchlein* paintings, and less frequently in Italy.¹³ In Italy the first examples of oil painting on canvas (plain weave) date to around the

middle of the fifteenth century, and include Donato de' Bardi's *Crucifixion* (ca. 1448, 65 x 93 1/16 in. [165 x 238 cm], Pinacoteca Civica, Savona) and Paolo Uccello's *St. George and the Dragon* (1460–70, 21 7/8 x 29 1/4 in. [55.6 x 74.2 cm], National Gallery, London).¹⁴ In addition, there are a few early examples of Italian oil paintings on canvas where the less common twill and herringbone patterns were used, as in some of the enormous canvases by Carpaccio belonging to the cycle of the *Stories of Saint Ursula* (1490–98, Gallerie dell'Accademia, Venice), where different types of canvas are sometimes sewn together¹⁵. For example, a part of the *Arrival of the English Ambassadors* (108 1/4 x 231 7/8 in.) [275 x 589 cm] is painted on twill canvas, as well as a section of the *Dream of St. Ursula* (107 7/8 x 105 1/8 in. [274 x 267 cm]), while the *Return of the Ambassadors to the English Court* (117 x 207 7/16 in. [297 x 527 cm]) has a herringbone support,¹⁶ and the others have a plain-weave support. A herringbone fabric was also used in Vicenza by Bartolomeo Montagna for an oil (and tempera?) painting, the *Madonna Adoring the Child between the Saints Monica and Magdalene* (ca. 1485, 72 7/16 x 66 9/16 in. [184 x 169 cm], Pinacoteca Civica di Palazzo Chiericati, Vicenza).¹⁷ In the same area, about twenty years earlier, it was employed in the *Madonna with Child and the Saints John the Baptist and Paul* (66 1/8 x 85 13/16 in. [168 x 218 cm], Church of St. Francis, Schio), attributed to the master of the polyptych of Arzignano, where the binder appears to be a proteinaceous medium.¹⁸ A herringbone-weave canvas was also used by Michele da Verona to paint the *Crucifixion* (1501, oil on canvas, 131 7/8 x 283 7/16 in. [335 x 720 cm]), now in the Pinacoteca di Brera, Milan.¹⁹

With regard to twill-weave canvases, early examples include the *Crucified Christ* (ca. 1436, 123 5/8 x 75 in. [314 x 190.5 cm], egg and glue tempera on canvas, Castelvecchio Museum, Verona) by Jacopo Bellini,²⁰ and the smaller *Virgin and Child with the Magdalen and Saint John the Baptist*, an altarpiece by Mantegna in the National Gallery of London (ca. 1500, 54 3/4 x 46 in. [139.1 x 116.8 cm]).²¹

SANTI'S TEXTILE SUPPORTS

The original support used for *Tobias and the Archangel Raphael* consists of two pieces of canvas sewn vertically: the left strip measures 35 7/16 inches (90 cm) in width, whereas the right measures only 20 1/8 inches (51 cm) in width; both are 97 7/16 inches (245 cm) in length. The canvas used for *Saint Roch* similarly consists of two pieces of canvas sewn vertically, 95 11/16 inches (243 cm) in length, with the left strip measuring 18 1/8 inches (46 cm) in width and the right strip 35 7/16 inches (90 cm).²² According to investigations made using ESEM-EDX, the canvas supports used for *Tobias and the Archangel Raphael* and *Saint Roch* are made of linen.

As part of a previous conservation intervention, which took place in the 1970s, the two canvases of both paintings were lined and mounted onto new auxiliary stretchers. About twenty years earlier, in *Saint Jerome* (Fig. 3)—previously mentioned but not yet examined



Fig. 3 Giovanni Santi, *Saint Jerome (San Girolamo)*, 1475–78, canvas, 82 11/16 x 66 15/16 (210 x 170 cm). Vatican Museums, Vatican City. (Photo: public domain).

through diagnostics—close observation of the painting’s surface showed the artist’s use of a plain-weave canvas support, a choice that Santi could have made based on his knowledge of contemporary Flemish works on canvas. Significant examples include the paintings of Justus van Ghent (c. 1410–c. 1480, act. Urbino ca. 1473–1475), who is documented as having painted on canvas for the Confraternity of Corpus Domini in Urbino.²³ The canvas of Santi’s *Saint Jerome* is made of three vertically sewn stripes (66 15/16 in. [170 cm] total width), the central one being about 35 7/16 inches (90 cm) wide, and the narrower one on the left probably elongated with an addition at the bottom.

In the three canvas paintings, the paint layers have been executed on a white ground preparation, which was applied so thinly that the texture of the canvas is clearly visible on the surface (Fig. 4).



Fig. 4 Giovanni Santi, *Saint Jerome*. Detail. (Photo: G. Poldi).

UNDERDRAWING

Infrared reflectography of Santi’s panel paintings revealed the presence of an underdrawing made with a carbon-based ink.²⁴ The style of the underdrawing is quite characteristic of Santi’s technique, with its typically fluid, modulated, and continuous use of line. For some paintings, this contour drawing was used alongside a dense hatching, with an inclination that is mainly top right to bottom left, but it is not fixed; the direction of the hatching easily varies to follow the volume and the shape of the different parts of the object, sometimes passing from diagonal to vertical to the opposite diagonal, suggesting that the author was a versatile draftsman. This variety, even within the same figure, prevents us from clearly establishing whether Santi was right-handed or left-handed. The hatching is sometimes more elaborate and accurate, sometimes quicker and less frequently seen, and elsewhere found only under some figures where he wanted to clearly express the shades and shadows to be followed by paint.

Hatched underdrawing was also specifically found in the two canvases of *Tobias and the Archangel Raphael* and *Saint Roch*, particularly in the draperies, although in these paintings the underdrawing technique was less discernible using IR imaging than in other works by Santi. This is due to the diagonal pattern of the herringbone weave interfering with the slanted direction of the drawing. In addition, certain aspects of the paintings’ conditions also make it difficult to read the underdrawing: the reflectographic images show the presence of numerous abrasions throughout the composition—more widespread in the darker areas of the rocks and figures. The hatching, which is not always regular, was developed by Santi for various shadows, most likely to facilitate the final shading. In fact, it is

more frequent where the painter made use of semi-transparent glazes, as seen in the areas containing red lakes (Figs. 5, 6).

These two paintings, which can be regarded as among Santi's best works in terms of pictorial quality and rendering of the figures, are drawn and painted with great accuracy. Few changes are visible: in *Tobias and the Archangel Raphael*, the position of Tobias's left leg was shifted slightly, seemingly in order to prevent his foot from touching that of the angel (Fig. 7). In addition, the horizontal folds in the sleeve of the archangel's red robe were altered to start closer to the shoulder. In *Saint Roch*, minor corrections were made to some of the outlines, as seen in the rocks and in the tip of the figure's hat, which was reduced slightly, as well as the placement of his left hand, initially drawn a little further to the left (Fig. 5).

As seen in other paintings by Santi, the relative absence of large-scale compositional changes, as well as the confident, fluid handling of the underdrawing, both point toward the artist's use of cartoons, transferred perhaps using carbon paper or through pouncing, then accurately brushed out to avoid dirtying the subsequent layers of paint. In comparison to Santi's panel paintings examined, here the underdrawing, where it can be seen, tries to build volume as well as shadows, as seen in Saint Roch's mantle.

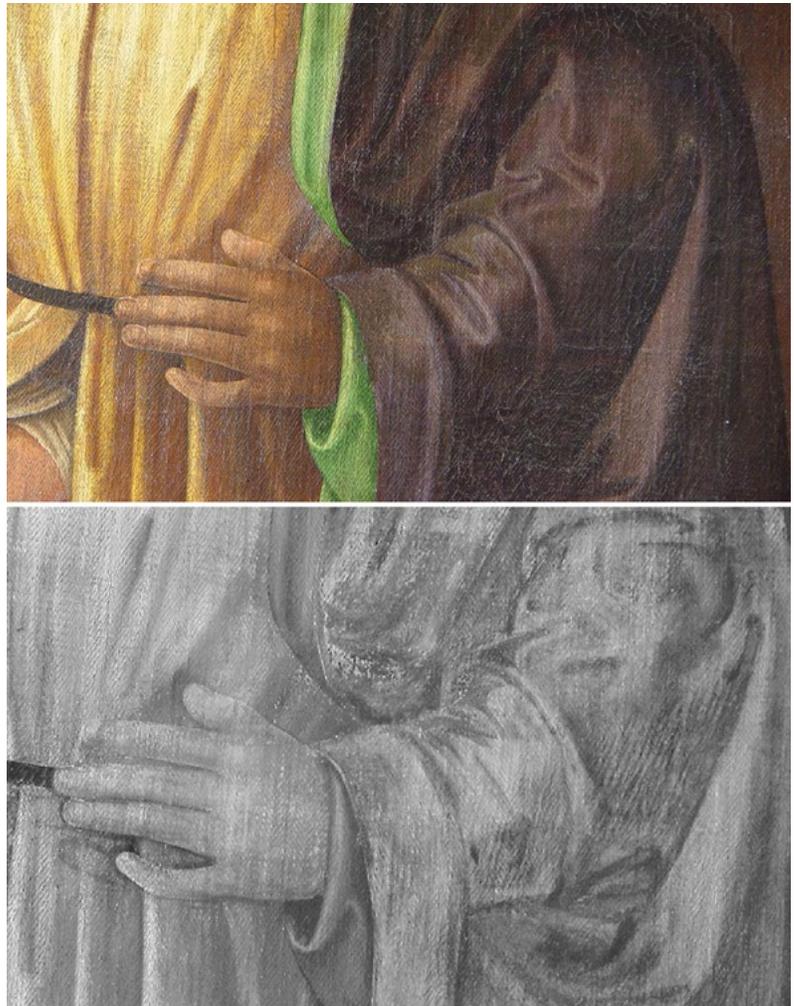


Fig. 5a-b Giovanni Santi, *Saint Roch*. Visible and IR detail. (Image: G. Poldi).



Fig. 6a-b Giovanni Santi, *Tobias and the Archangel Raphael*. Visible and IR detail of the archangel's violet surcoat. (Image: G. Poldi).



Fig. 7a-b Giovanni Santi, *Tobias and the Archangel Raphael*. Visible and IR detail with the change of position in Tobias's leg. (Image: G. Poldi).

PAINTING MATERIALS, POWDERED GLASS, AND LAYER STRUCTURE

The technical examination of Santi's panel paintings has revealed a palette consisting of: lead white, lead-tin yellow, orpiment, ochres, hematite and earth pigments, vermilion, two different red lakes (cochineal and madder), natural ultramarine, azurite, indigo, copper-based pigments (verdigris), carbon black, and bone black.²⁵ With the exception of indigo and madder—each one found only in one of the examined paintings—this palette range was also employed by Santi for the two canvases at Casa Raffaello.

Santi used these pigments in traditional mixtures and, for paintings on mobile supports, employing different binders, combining both drying oils and proteinaceous binders within the same painting, choosing different media for different colors or mixing them, as in the *Martyrdom of St. Sebastian* (c. 1477–1478, panel, 82 11/16 x 65 3/8 in. [210 x 166 cm], Galleria Nazionale delle Marche, Urbino, long-term loan to Museo di Casa Raffaello), the

Visitation (86 1/4 x 69 11/16 in. [219 x 177 cm], panel, Chiesa di Santa Maria Nuova, Fano),²⁶ and the *Virgin and Child* (c. 1480, oil and egg tempera on panel, 26 11/16 x 19 1/4 in. [67.8 x 48.8 cm], National Gallery, London).²⁷

Using ESEM-EDX, colorless powdered glass was detected in red and green glaze layers of *Tobias and the Archangel Raphael*, which we can interpret as being related to the artist's experimentation with the oil binder. The same use of colorless powdered glass was also found in the other paintings by Santi examined as part of this research. In this instance, it is probable that Santi was once again influenced by Justus of Ghent. The latter painted the *Communion of the Apostles* (c. 1473–1474, oil on panel, 113 3/8 x 126 3/8 in. [288 x 321 cm], Galleria Nazionale delle Marche, Urbino) for the Confraternity of Corpus Domini,²⁸ as well as the series of the twenty-eight *Uomini illustri* (Illustrious men) for the *studiolo* of Federico da Montefeltro in the Ducal Palace of Urbino, today divided between Urbino (Galleria Nazionale delle Marche) and Paris (Musée du Louvre), both of which have been shown to contain colorless powdered glass.²⁹

Fig. 8a-c Giovanni Santi, *Tobias and the Archangel Raphael*. Clockwise: (a) texture of the painted canvas; (b) digital micrograph of the canvas with its white ground; (c) ESEM micrograph, detail of the linen fibres. (Image: M.L. Amadori).



For Santi's two Urbino canvases, the linen supports were prepared with a thin layer of gypsum and glue, each with a maximum thickness less than 100 μm , which allowed the herringbone weave of the canvas to remain visible on the surface (Fig. 8a-c).

Technical analysis has shown that Santi made extensive use of lead white in the underlayers and flesh tones of the paintings. The blue of the sky was painted with an abundant amount of lead white mixed with azurite (vis-RS absorbance band around 630–640 nm). The same mineral blue pigment was also used to paint the distant mountains in the background. During this research it was not possible to confirm whether natural ultramarine was used in the sky, as the presence of surface dirt on both paintings complicated the non-invasive diffused reflectance (vis-RS) spectra readings gained from this area. The rocks present behind the figure of *Saint Roch* were painted with a thick layer of lead white, ochre, and various earth pigments, as well as the occasional use of vermilion, which was glazed in some areas with thin strokes of verdigris (copper acetate). The presence of verdigris was also confirmed in the brighter areas of the composition using vis-RS, where the results presented the pigment's

typical absorbance bands in the range 700–720 nm. In other cases, verdigris was also found mixed with lead-tin yellow, for example in the skillfully painted crowns of the light green trees in the mid-ground. In contrast, the darker trees visible in the distant background were found to contain verdigris alone. Similar painting materials and paint mixtures were also identified for *Tobias and the Archangel Raphael*.

The red and pink hues of the paintings were obtained using various red pigments, depending on the desired shade, with vermilion, red lake, hematite, and red ochre being identified. In both works, the flesh tones were made using abundant amounts of lead white mixed with small amounts of vermilion, ochre, and earth pigments (these latter were found to be particularly abundant in the darker flesh tones of *Saint Roch*). In *Saint Roch*, the bright red hue of the saint's trousers was obtained with lead white and vermilion, and the addition of a red carmine type-based lake used as a glaze in the shadows. The presence of this type of red lake, derived from coccid insects (such as kermes or cochineal) was identified by its characteristic absorbance bands in the vis-RS spectra, at 530 and 570 nm.³⁰

The presence of manganese was detected in both paintings using ED-XRF, notably in the purple stockings of Tobias, as well as in the red robe of the *Archangel Raphael*. This in turn confirms Santi's use of glass for the paint mixtures of the two works, associated in these cases with the layers of red lake and other thin oil glazes. The presence of precious natural ultramarine, mixed together with a cochineal-based lake (a mixture often used by Santi for his panel painting) was also detected in the deep

purple of the mantle of *Saint Roch*, as well as in the purplish pink of the *Archangel Raphael's* sleeves. Ultramarine was further identified in the angel's blue-grey shoes, where it was found mixed only with lead white.

The technique used in the build-up of the painting layers was clarified and deepened by stratigraphic investigations as below. The yellow colour of *Saint Roch's* robe was found to have been made using various mixtures of lead-tin yellow, mixed with lead white in

the highlights, or with yellow ochre and earth pigments in the midtones and the shadows. For the *Archangel Raphael's* mantle (Fig. 9a-c), Santi used a similar layer structure, applying at first a thick yellow brushstroke (83- μm thick), consisting of lead-tin yellow (probably type I due to the absence of silicon,³¹ but further analyses such as Raman would be needed for confirmation) with small amounts of hematite and earth pigments, followed by a glaze layer using the same earth pigments mixed with bone black.

The green color of *Tobias's* robe (Fig. 10a-d) consists of two paint layers. The first is light green in colour (50- μm thick) and composed of a green copper-based pigment (60- μm thick) mixed together with lead white, lead-tin yellow, and a few scattered particles of orpiment. The second, darker paint layer consists of the same copper-based pigment (identified as

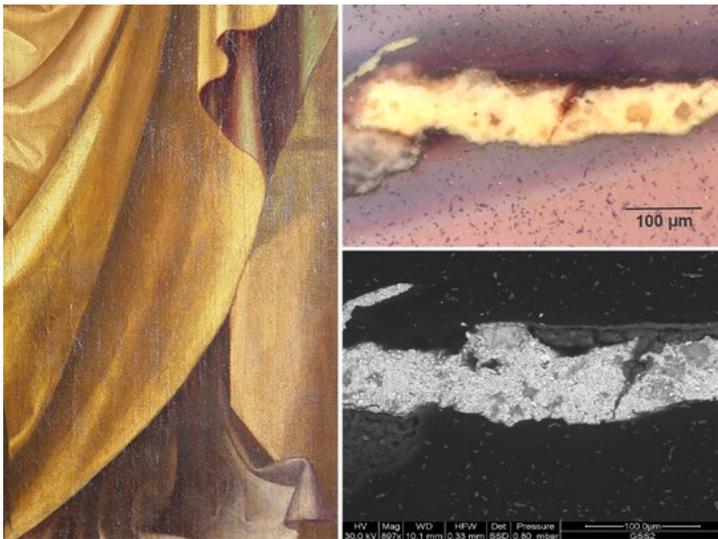


Fig. 9a-c Giovanni Santi, *Tobias and the Archangel Raphael*. Yellow cloak of the archangel: clockwise, (a) detail of the sampled area; (b) visible light micrograph of the cross-section, sample GSS2; (c) ESEM micrograph. (Image: M.L. Amadori).

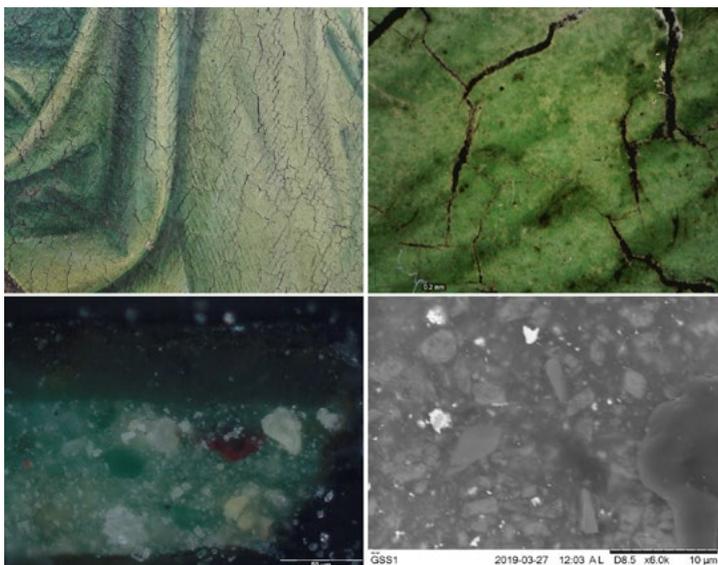


Fig. 10a-d Giovanni Santi, *Tobias and the Archangel Raphael*. Tobias's green dress: clockwise, (a) detail of the sampled area with the diagonal finishing hatching; (b) digital micrograph; (c) ESEM micrograph of the cross-section, with glass particle; (d) visible light micrograph of the cross-section, sample GSS1, with verdigris, lead white, a few particles of lead-tin yellow type I, a grain of red lake. (Image: M.L. Amadori).

verdigris using vis-RS analysis) mixed with lead-tin yellow and finely ground glass particles, the latter of which are probably related to Italian-produced lime-sodium glass.³² The shadows above consist mainly of a copper-based pigment, as well as small amounts of orpiment.

A detail photograph taken of *Tobias's* green robe (Fig. 10a) shows another peculiar feature of Santi's technique; namely his use of diagonal hatched lines—painted from top left to bottom right, as more typical of someone left-handed—like a finishing touch on the paint layers, seemingly as a means of emphasizing the midtones. This particular type of handling was observed solely in some of the red (Fig. 11) and green fabrics within the two works, and further appears to be related to the underdrawing, albeit applied in a more regular manner. The same kind of hatched handling was also observed for the midtone layers in the red lake cloak of *Saint Jerome* (Fig. 12).

The use of detailed hatched handling in the uppermost paint layers is something that can be regarded as characteristic of Santi's personal technique and should therefore be viewed as a feature that was most likely not carried out by apprentices or workshop pupils. Based on this, the presence of such hatched marks in *Saint Roch* and *Tobias and the Archangel Raphael* serves to strengthen the claim that they were painted by Santi himself, and not by a collaborator, thereby rejecting the hypothesis made by Vastano.³³



Fig. 11 Giovanni Santi, *Tobias and the Archangel Raphael*. Detail of the archangel's right sleeve. (Photo: G. Poldi).

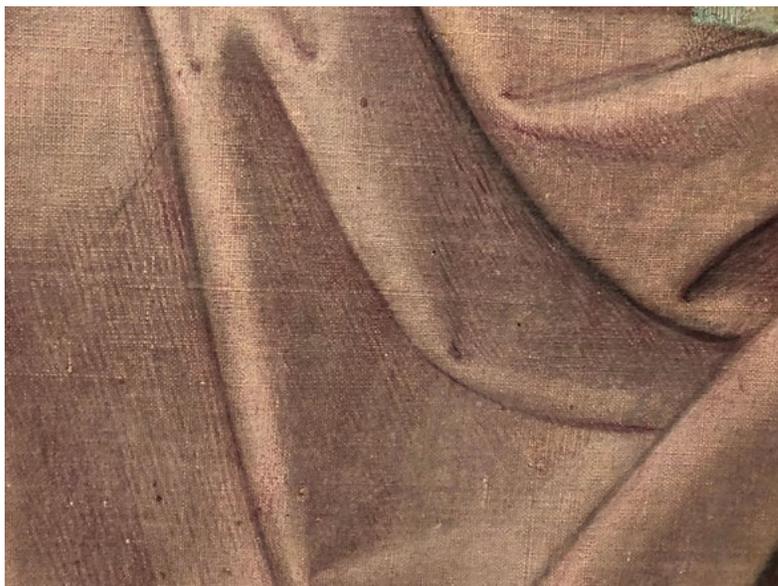


Fig. 12 Giovanni Santi, *Saint Jerome*. Detail of the cloak. (Photo: G. Poldi).

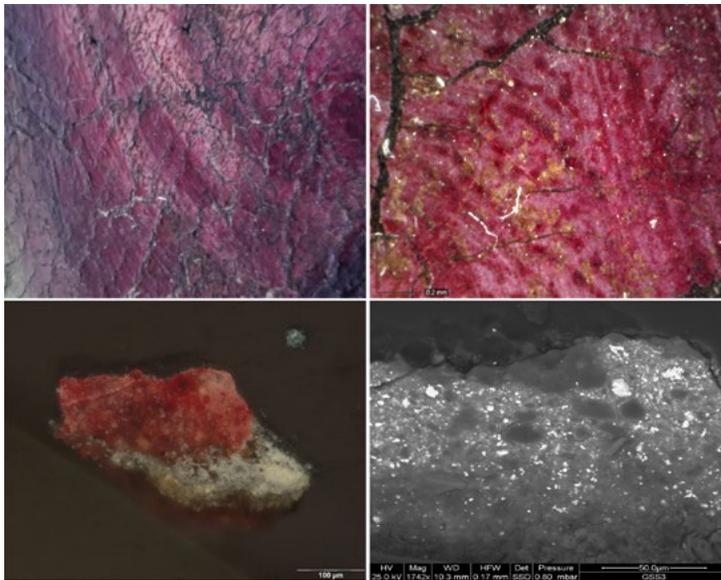


Fig. 13a-d Giovanni Santi, *Tobias and the Archangel Raphael*. Red sleeve, archangel's wrist: clockwise, (a) detail of the sampled area; (b) digital micrograph of the brushstroke; (c) ESEM micrograph of the cross-section, with red lake, lead white, and glass particles; (d) visible light micrograph of the cross-section, sample GSS3. (Image: M.L. Amadori).

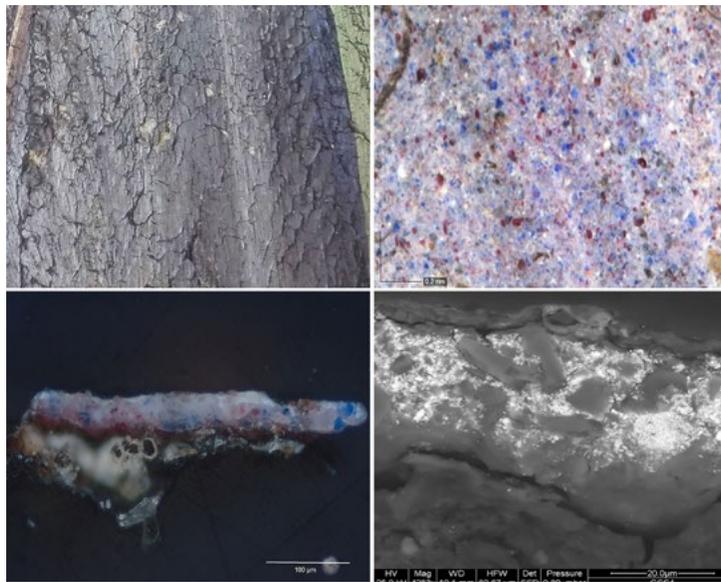


Fig. 14a-d Giovanni Santi, *Tobias and the Archangel Raphael*. Violet surcoat of the archangel: clockwise, (a) detail of the sampled area; (b) digital micrograph; (c) ESEM micrograph of the cross-section, with lead white and glass particles (d) visible light micrograph of the cross-section, sample GSS4, with red lake, lead white, natural ultramarine blue in the upper layer. (Image: M. L. Amadori).

For the red sleeve of the archangel's dress (Fig. 13a-d), Santi applied a thick layer of paint (130- μm thick) containing red lake, lead white, and glass particles. This layer was then covered with a red lake glaze, which was further modified using glass particles in order to make the paint more transparent.

The violet-colored surcoat of the archangel was constructed using a thin layer (10- μm thick) of red lake, followed by highlights (40- μm thick) composed of lead white and red lake particles, with additions of natural ultramarine, as seen in the photomicrograph image (Fig. 14a-d).

Santi's use of colors is generally bright, most notably in the areas containing light and midtoned greens, which are remarkable for their brilliance obtained through the artist's particular approach to paint mixtures and layer structures. The distribution of various pigments can also be mapped out using false-color IR images (Fig. 15a-b), where ultramarine is depicted in the pink and red areas, verdigris in blue zones, and azurite in pale blue-gray.

CONCLUSION

The examination of the two canvases by Santi has not only enriched current knowledge of this artist, whose production has been the subject of recent diagnostic attention, but also permitted a reflection on the early use of herringbone-linen canvases for oil painting.

It is difficult to believe that the use of such canvas supports was accidental, when the painter could have used wood, which was more

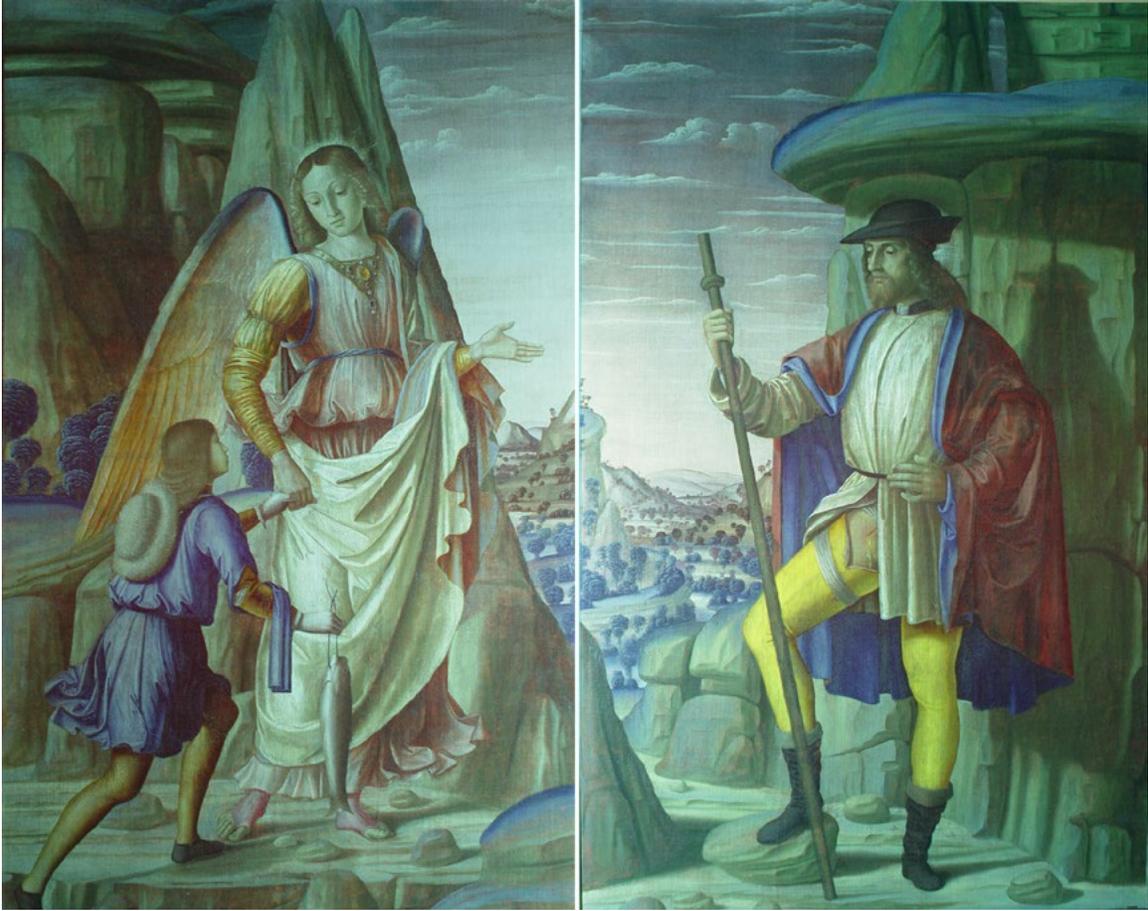


Fig. 15a-b False-color IR images of the paintings illustrated in Figs. 1 and 2. (Image: G. Poldi).

common in Santi's practice. As this is evidently not a question of processional banners, it is possible that the painter decided to experiment with a canvas support not typically used by other artists in his area, but that he may have heard about because it was sometimes used, although rarely, in the Veneto area for large paintings. Or he could have seen some finished works on this fabric, and thought it could be more stable than plain-weave linen canvas, and more intriguing in relation to the optical effects that could be obtained.

Santi used a thin gesso ground without reducing significantly the canvas texture. On the contrary, it seems he tried to exploit the three-dimensional effect of the fabric to give a greater materiality to the work, as can also be seen in the thin layers containing red lakes.

We can only imagine how Santi's painting could have evolved in the following years if he had not died prematurely, perhaps opting for more frequent use of the canvas support—a more practical and modern practice—and perhaps eventually modifying his pictorial technique as a result. After all, a predisposition to experimentation clearly emerges from the technical study of his works.

In addition, the identification of transparent glass particles, sometimes abundant, in Santi's panel and canvas oil paintings, indicates this use too was not fortuitous, and suggests he encountered this practice after having seen Justus van Ghent working in Urbino. Moreover, Santi may have procured those painting materials through the workshop he inherited from his father, Sante. The observation of the

cross-sections seems to indicate that the glass had not only the role of a dryer, at least in some mixtures such as verdigris and lead-tin yellow—two pigments that do not normally have drying problems—and in the thinner, faster-drying layers: it was most likely used as a filler (or extender), both for its optical and its chemical properties, to maintain the transparency of the glaze and avoid particular craquelure. We cannot exclude the possibility that glass was also used to increase the volume of a layer and avoid the use of too much colored pigment.³⁴

The relations and exchanges of technical knowledge between Santi and Perugino are still waiting to be deepened, as well as the possibility that Raphael's practice of using glass derives from the roots of this practice in the paternal workshop that he inherited.

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ENDNOTES

¹ The patronymic Santi, meaning “of Sante,” was also given to Raphael: Raffaello Sanzio.

² Consisting of almost twenty-three-thousand verses, the poem takes the form of a long historical epic tale, which in turn provides an important source for the reconstruction of Italian court society during this period, as well as a document of the most important Italian and Flemish artists known to have been operating on the peninsula at this date. Among the twenty-seven prominent painters cited by Santi, he remarks particularly on the skills of Andrea Mantegna, Verrocchio, Leonardo da Vinci, Piero della Francesca, Melozzo da Forlì, and Perugino. Franco Tomasi, “L’opera letteraria di Giovanni Santi,” in *Giovanni Santi: “da poi . . . me dette alla mirabil arte de pictura,”* ed. Maria Rosaria Valazzi (Cinisello Balsamo: Silvana, 2018), 164–65.

³ For the catalog, see Maria Rosaria Valazzi, “Giovanni Santi pittore poeta scenografo imprenditore,” in Valazzi, *Giovanni Santi*, 15. The exhibition *Giovanni Santi: “da poi . . . me dette alla mirabil arte de pictura,”* was held in the National Gallery of the Marche, Palazzo Ducale di Urbino, November 30, 2018– March 17, 2019. Archival sources reveal that Santi’s workshop hosted the painter Piero della Francesca and also that he was acquainted with Pietro Perugino, the artist who famously trained the young Raphael. Anna Falcioni, “I documenti degli archivi urbinati su Giovanni Santi,” in Valazzi, *Giovanni Santi*, 243. During the late fifteenth century, Santi probably held a monopoly over artistic production in Urbino. Valazzi, “Giovanni Santi pittore poeta scenografo imprenditore,” in Valazzi, *Giovanni Santi*, 15.

⁴ Maria Letizia Amadori and Gianluca Poldi, “La tecnica pittorica di Giovanni Santi,” in Valazzi, *Giovanni Santi*, 259–76. We refer to this essay for a general understanding of Santi’s technique, as well as an indication of the instruments and methodologies used, which include IR reflectography (IRR) performed in two IR bands (850–1000 nm and 1000–1700 nm), false-color IR (IRFC or IRC), diffuse and raking light, UV-induced fluorescence (UVF), surface microscopy (50x and 230x), reflectance spectroscopy (360–740 nm, i.e., vis-RS), EDXRF, cross-sections examined by optical microscopy (OM) including UV light, ESEM-EDX; some samples have been subjected to FTIR, micro-Raman, and GC-MS analysis. The complete version of that contribution, which was printed incompletely due to a pagination error, can be found here (accessed March 12, 2021):

https://www.academia.edu/38204086/M_L_Amadori_G_Poldi_La_tecnica_pittorica_di_Giovanni_Santi_VERSIONE_CORRETTA_.

⁵ The integrated analytical methods have been employed in different case studies, including Maria Letizia Amadori et al., “Lorenzo Lotto’s Painting Materials: An Integrated Diagnostic Approach,” *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* 164 (2016): 110–22.

⁶ Jill Dunkerton et al., *Giotto to Dürer: Early Renaissance Painting in the National Gallery* (New Haven: Yale University Press, 1991), 161–62.

⁷ Valazzi, *Giovanni Santi*, 104–6 (cat. entry by Maria Rosaria Valazzi).

⁸ Valazzi, *Giovanni Santi*, 121–22 (cat. entry by Agnese Vastano). The art historian Agnese Vastano dates the Urbino canvases to 1494–95, while also hypothesizing the participation of a “new” collaborator (as Santi died in 1495), to justify their considerably

higher quality. Taking into account Santi’s best works, we do not think any collaborator is needed to explain their quality, style, and technique.

⁹ Ranieri Varese, *Giovanni Santi* (Firenze: Nardini, 1994), 253–55.

¹⁰ Varese, *Giovanni Santi*, 253.

¹¹ Simona Rinaldi, *Storia tecnica dell’arte, materiali e metodi della pittura e della scultura (secc. V-XIX)* (Rome: Carrocci, 2011), 171.

¹² Valazzi, *Giovanni Santi*, 100–102 (cat. entry by Alessandro Marchi).

¹³ For painting on canvas, see Claudio Seccaroni, “La tempera su tela nelle fonti quattrocentesche e cinquecentesche,” in *Lorenzo Lotto: Il compianto sul Cristo morto; studi, indagini e problemi conservativi; Atti della giornata di studio (Bergamo, 14 dicembre 2001)* (Cinisello Balsamo: Silvana Editoriale, 2002), 99–112.

¹⁴ Nicoletta Torrioli, “Le tele per la pittura,” in *I supporti nelle arti pittoriche: storia, tecnica e restauro*, ed. Corrado Maltese (Milano: Mursia, 1990), 58.

¹⁵ Torrioli, “Le tele per la pittura,” 50.

¹⁶ For good images, see Stefania Mason, *Carpaccio: The Major Pictorial Cycles* (Milan: Skira, 2000), figs. at pages 41–64, 77–79. Carpaccio seemed to prefer the twill and herringbone supports for his larger works.

¹⁷ Gianluca Poldi and Giovanni C. F. Villa, “Schede scientifiche,” in *Catalogo scientifico delle collezioni: I. Pinacoteca di Civica di Vicenza; dipinti dal XIV al XVI secolo*, ed. Maria Elisa Avagnina, Margaret Binotto, and Giovanni C. F. Villa (Cinisello Balsamo: Silvana, 2003), 529–31, no. 8.

¹⁸ Chiara Rigoni, “Il politico di Arzignano: presenze squarcionesche nel territorio vicentino,” in *Francesco Squarcione: “pictorum gymnasiarcha singularis” atti delle giornate di studio (Padova, 1998)*, ed. Alberta De Nicolò Salmazo (Padua: Il Poligrafo, 1999), 89–99; Bensi, “Gli esordi,” n. 40, p. 28.

¹⁹ Mariolina Olivari, “Michele da Verona: la Crocifissione di Brera. Note in occasione del restauro (2003–2005),” *Arte Lombarda* 153, no. 2 (2008): 92.

²⁰ Paolo Bensi, “Gli esordi della pittura su tela in Italia attraverso le fonti medievali e rinascimentali,” *Arte Lombarda* 153, no. 2 (2008): 26.

²¹ Dunkerton et al., *Giotto to Dürer*, 161–62.

²² One meter is the average recurring width of the pieces used in the canvases, a standard measure due to the width of contemporary looms. Torrioli, “Le tele per la pittura,” 76.

²³ Francesca Bottacin, “Il Redentore benedicente della Ca’ d’Oro: restauro e ricerche per nuove ipotesi attributive,” *Quaderni della Direzione Regionale Musei Veneto 6 (Venezia: Polo museale del Veneto, in press)*; Sophie Scully and Christine Seidel, “A *Tüchlein* by Justus van Ghent: The Adoration of the Magi in the Metropolitan Museum of Art Re-Examined,” *Journal of Historians of Netherlandish Art* 8, no. 1 (Winter 2016): 1–29, DOI: 10.5092/jhna.2016.8.1.3. <

²⁴ Carried out using both a Si-detector camera (ab. 850–1000-nm spectral range) and an OSIRIS IR camera, with InGaAs detector (ab. 1000–1700 nm range). For a broader discussion and some images, see Amadori and Poldi, “La tecnica pittorica di Giovanni Santi,” 263–70.

²⁵ Amadori and Poldi, “La tecnica pittorica,” 271–76.

²⁶ Maria Letizia Amadori et al., *Spectroscopic and Imaging Analysis on Panel Paintings by Giovanni Santi, Raphael’s Father:*

Materials and Technique (forthcoming).

²⁷ Jill Dunkerton, "Osservazioni sulla tecnica della Madonna londinese di Giovanni Santi," in *Giovanni Santi: Proceedings of the International Symposium (Urbino, 17-19 marzo 1995)*, ed. Ranieri Varese (Milano: Electa, 1999), 58; Marika Spring, "Colourless Powdered Glass as an Additive in Fifteenth-and Sixteenth-Century European Paintings," *National Gallery Technical Bulletin* no. 33 (2012): 18.

²⁸ Francesca Bottacin, *Ancora sul fiamminghismo di Giovanni Santi: novità e precisazioni*, in Valazzi, *Giovanni Santi*, 36.

²⁹ Maria Letizia Amadori and Gianluca Poldi, "I materiali e la tecnica pittorica della Comunione," in *La Comunione degli Apostoli di Giusto di Gand*, ed. Francesca Bottacin (Padua: CLEUP, in press).

³⁰ See Amadori et al., "Lorenzo Lotto's Painting Materials," 118.

³¹ David Hradil et al., "Microanalytical Identification of Pb-Sb-Sn Yellow Pigment in Historical European Paintings and Its Differentiation from Lead Tin and Naples Yellows," *Journal of Cultural Heritage*, no. 8 (July 2007): 384.

³² Marika Spring, "Raphael's Materials: Some New Discoveries on their Context within Early Sixteenth-Century Painting," in *Raphael's Painting Technique: Working Practices Before Rome*, Proceedings of the Eu-ARTECH workshop, ed. Ashok Roy and Marika Spring (Firenze: Nardini, 2007), 79; Elisabeth Martin and Jean Paul Rioux. "Comments on the Technique and the Materials Used by Perugino, through the Study of a Few Paintings in French Collections," in *The Painting Technique of Pietro Vannucci Called 'Il Perugino'*, Proceedings of the Eu-ARTECH workshop, ed. Giovanni Brunetti, Claudio Seccaroni, and Antonio Sgamellotti (Firenze: Nardini, 2004), 51-52.

³³ Valazzi, *Giovanni Santi*, 121-22 (cat. entry by Vastano).

³⁴ The use of ground transparent glass mixed to different pigments in various color layers, was also noted in Lotto's works, since his early works in the Marche region (Recanati) in 1508: Amadori et al., "Lorenzo Lotto's Painting Materials," 115, 117.

Bold Gestures in a Devotional New Spanish Painting on Copper by Juan Francisco de Aguilera

José L. Lazarte, Silvia A. Centeno, and Federico Carò

ABSTRACT

In recent years, scholars have wondered how Juan Francisco de Aguilera (act. Mexico, first third of eighteenth century), an artist whose presence in Mexico City is shrouded in mystery, positioned himself among the most influential painters of New Spain during the second decade of the eighteenth century. This study, one of the first dedicated to a work by Aguilera, focuses on *The Virgin of Carmen* (ca. 1720), a small devotional painting on copper signed by his hand. The technical examination was prompted by the notion that Aguilera had a profound influence on the fluid and painterly style that characterized New Spanish painting throughout the eighteenth century. Complementary analytical methods and close visual observation were valuable in determining the composition of the support, ground, and paint layers as well as the materials used in the construction of the architrave frame accompanying the painting. The results present Aguilera as an audacious and mature artist who was particularly adept at creating complex multi-figure arrangements. The localized underdrawings, important changes to the composition, and varied paint application found in this work reveal a confident artist whose fame in New Spain can only be explained by the merits of his own skills.

INTRODUCTION

In 2017 The Metropolitan Museum of Art acquired *The Virgin of Carmen and the Souls of Purgatory with Saint Joseph and the Prophet Elijah* (ca. 1720; inv. 2017.234) by Juan Francisco de Aguilera (act. New Spain, Mexico, first third of eighteenth century). The conservation treatment of this painting (Fig. 1) presented the opportunity for a technical examination, allowing insight into the materials and techniques employed by the artist. This study, one of the first dedicated to a work by Aguilera, involved surface examination under the microscope, infrared reflectography (IRR), point X-ray fluorescence (XRF), Raman spectroscopy, macro X-ray fluorescence (MA-XRF) mapping, and the examination and analysis of selected cross-section samples by optical microscopy and Raman

spectroscopy. The accompanying period frame was also analyzed as it is thought to be original to the painting and could provide information about the initial owner and framing tastes for New Spanish paintings destined for private devotion.

The Virgin of Carmen is an important addition to The Metropolitan's growing collection of New Spanish paintings on copper, which includes a work by the influential painter Juan Rodríguez Juárez (1675–1728). Rodríguez Juárez, along with his older brother Nicolás (1666–1734), organized an exclusive art academy in Mexico City, of which Aguilera was a member.¹ In 1722 eleven New Spanish artists signed a document granting the painter José de Ibarra (1688–1756) the authority



Fig. 1. Juan Francisco de Aguilera (act. Mexico, first third of eighteenth century), *The Virgin of Carmen and the Souls of Purgatory with Saint Joseph and the Prophet Elijah*, ca. 1720. Oil on copper, 32.2 x 24.5 cm. The Metropolitan Museum of Art: purchase, Nancy Dunn Revocable Trust Gift, 2017 (2017.234). Before (left) and after (right) treatment.

to represent their academy in the creation of an ephemeral triumphal arch for the entry of viceroy Juan de Acuña y Bejarano, who ruled New Spain from 1722 to 1734.² Research into the function of this academy and its influence on painting styles in eighteenth-century Mexico remains the subject of speculation. However, it is clear that painters were seeking social, professional, and political recognition.³ This academy may have been formed partly in response to the relative absence of artists' organizations after the decline of the Guild of Painters of Mexico City between 1707 and 1717.⁴

No secure biographical records are known for Aguilera, other than the confirmation of his presence in Mexico City during the second decade of the eighteenth century as an accomplished artist. Because of his sudden appearance in Mexico at the Juárez brothers' academy and his stylistic resemblance to

Murillo, it has been suggested that he was a foreigner, probably from Spain.⁵ This has made his possible birth in Mexico a subject of debate.⁶ Recently, however, two baptismal certificates from Mexico City, issued in 1671 and 1680 respectively, have surfaced for individuals with the same name.⁷ In any case, Aguilera's close connection with the most renowned New Spanish painters of his time, through the Juárez academy, would have had an influence on his technique and that of his colleagues.

An exceptional text positions Aguilera as an important figure among his peers, demonstrating his recognition in New Spain. The Spanish translation of the treatise, *Prodromo, overo saggi di alcune invenzioni nuove premesso all'Arte Maestra*, published in 1670 in Brescia, Lombardy, by the Jesuit priest Francesco Lana Terzi (1631-1687), is one of the few translations about artistic practice known

from eighteenth-century New Spain. Possibly dating to the 1740s,⁸ the translation includes an unprecedented statement in which Aguilera's direct method of paint application is said to have been novel in Mexico:

Some make on their palettes various paint mixtures arranged by the use that they will assign to them: in our Kingdom of the Indies, this unpleasant ineptitude lasted many years; until Juan Rodríguez Juárez, el Villalpando, and Aguilera, very famous for their paintings, rejected with truly heroic spirits this tiresome diffidence, introducing the mixture of colors with brushes onto the canvas.⁹

In this statement, Aguilera's association with influential, prolific artists such as Cristóbal de Villalpando (1649–1714) and Juan Rodríguez Juárez (1675–1728) is somewhat unexpected,

given the dearth of information on Aguilera and the few known paintings ascribed to him.¹⁰ The comment reveals that his painterly technique was considered innovative by his contemporaries, a statement that holds true today. Scholars have proposed that Aguilera's soft and vaporous painting effects anticipated those that were common to New Spanish painting throughout the eighteenth century.¹¹ The statement alluding to Aguilera's paint manipulation on the canvas has been interpreted to describe not only a direct application, but also the optical effects that could be achieved by the layering of semi-translucent paint over colored grounds.¹² His few extant works reveal that he was a versatile artist, capable of rendering complex compositions, both small and large, on a variety of supports, including canvas and copper. Aguilera's choice of different supports and formats did not affect his painterly style; he was able to re-create bold brushstrokes not only on a large scale but also in miniature. The artist's



Fig. 2. Juan Francisco de Aguilera, *Virgin of the Immaculate Conception with Jesuit Priests*, 1720. Oil on canvas, 252.7 x 420.5 cm. Museo Nacional de Arte, Instituto Nacional de Bellas Artes, Mexico City.



Fig. 3 Juan Francisco de Aguilera, *Nun Badge of the Virgin of the Immaculate Conception with Crowned by the Holy Trinity*, 1720. Oil on copper, diam. 17.5 cm. Museo Soumaya, Mexico City.

adaptability is underscored in two paintings depicting the Immaculate Conception, the first being a large canvas signed in 1720, measuring 420.5 cm in width, and the second a wearable nun's badge on copper, dated to 1720–30 and only measuring 17.5 cm in diameter (Figs. 2, 3). Aguilera's characteristic paint handling is most evident in the figures of both compositions, demonstrating his consistency as a technician.

Very little is known about *The Virgin of Carmen*, which was held in a private collection in Jerez de la Frontera, near Cadiz, Spain, since the mid-nineteenth century. In this work, Aguilera painted the Virgin, flanked by Saint Joseph and the Prophet Elijah, levitating over souls in purgatory. In Roman Catholicism, purgatory is the realm after death in which souls, materialized with their former nude

bodies in this composition, are purified through punishment before reaching eternal life.¹³ As the souls in Aguilera's painting pray for forgiveness, the Virgin lowers her Carmelite scapular, which provides a passage to heaven. Possibly considering his own mortality, Aguilera placed his signature above, almost encircled by the iron shackles restraining one of the souls (Fig. 10). The iconography suggests that the painting was commissioned by a member of one of the several Carmelite confraternities in Mexico. The Virgin of Carmen gained many followers in New Spain due to her role interceding in spiritual salvation, appeasing the anxiety provoked by death.¹⁴ Indeed, the reduced format of the copper support and the intricacy of its execution suggest that the image was used for spiritual atonement through private prayer.

THE COPPER SUPPORT

Aguilera likely acquired the metal support readymade from a coppersmith, having negotiated the dimensions of the commission with his patron. The support¹⁵ is largely composed of copper with small amounts of lead, which is consistent with the elemental makeup of an unalloyed copper sheet.¹⁶ The dark reddish color of the reverse is due to the presence of red cuprous oxide (Cu₂O), which may form when the metal interacts with humidity in the environment.¹⁷

While little is known about the supply of copper supports for painting in Mexico during this period, the large number of paintings on copper in the region suggests that business was profitable and steady. In fact, more paintings on copper were created in New Spain than in any other Spanish territory, even the Iberian Peninsula itself.¹⁸ The predilection for this metal support in Mexico has been

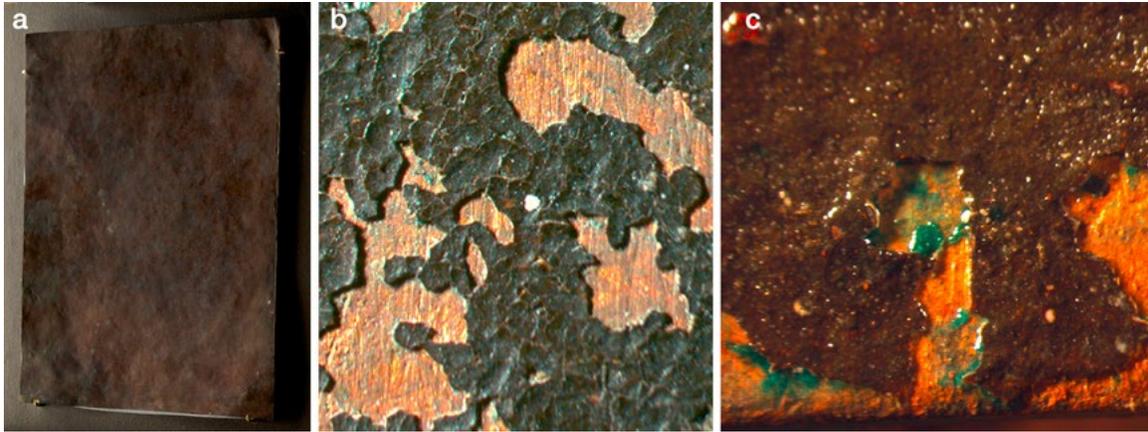


Fig. 4 (a) *The Virgin of Carmen*, verso photographed in raking light showing the planishing indentations left by the hammer; (b) detail of areas of loss in the shadow of the Virgin's brown robe, showing the fine scratch marks and thin copper oleate on the support, viewed at 250× magnification; (c) detail of areas of loss in the lower edge, showing thick layers of copper oleate, viewed at 100× magnification.

explained by the presence of prosperous pre-Hispanic copper mines active in the region of Michoacán during the viceregal period (1521–1821).¹⁹ Moreover, New Spanish artists were taken by the lustrous effects they could achieve on the metallic surface, embodied particularly in Flemish, but also Italian, paintings on copper imported to New Spain throughout the seventeenth century.²⁰

On the copper support used for *The Virgin of Carmen*, several shallow round dents, visible when examined in reflected light on the reverse, correspond to the marks left by the hammer used to planish the sheet over a hard, flat surface (Fig. 4a). Being malleable and ductile, a copper ingot could easily be worked into a sheet with a planishing hammer.²¹ After annealing in an open fire, hammering not only imparted the desired even surface but also rendered the sheet less flexible, while assuring a thin profile.²² These characteristics were ideal for the creation of lightweight portable images such as this devotional painting.

PREPARATION

To date there are no known New Spanish art treatises or documents that discuss the preparation of copper supports. European art

treatises, especially Spanish ones available to New Spanish artists,²³ are nonetheless useful sources for elucidating the priming methods seen in Aguilera's painting. This being said, European art treatises alone cannot be regarded as primary sources for New Spanish techniques. Indeed, it has been shown that canvas preparation methods used by artists in New Spain throughout the seventeenth and eighteenth centuries differed from those described in Spanish treatises.²⁴ In addition, the transmission of knowledge mostly occurred in tacit form and thus varied across workshops in Mexico. These nuances deserve more technical investigation.

One of the most important steps in the preparation of a copper support was the application of an oil priming or ground layer. Prior to this, the support was commonly degreased,²⁵ possibly with an alkaline agent, such as lye leached from ashes. On the surface of the copper support used for *The Virgin of Carmen*, fine scratches corresponding to the practice of sanding—thus creating a toothed surface between the metal and the ground—were evident through minute paint losses (Fig. 4b). A bright green compound, possibly a copper oleate, was observed between the copper and the ground layer overall, with more significant amounts present along the edges

(Fig. 4c). Copper oleate typically forms when copper cations interact with free fatty acids present in the oil binder of the ground, which may in turn be further affected by oxidation and hydrolysis.²⁶ Previous studies have not been able to determine whether the presence of a copper oleate layer is beneficial or detrimental to the adhesion of grounds on copper supports.²⁷

The oil-bound ground is approximately 12 microns thick and is composed of lead white with small amounts of red lake and ocher, which together create a grayish mauve mid-tone.²⁸ The cool gray tonality of the ground, as seen in normal light, could also be the result of an optical effect imparted by the green oleate layer that has formed over time. MA-XRF showed the distribution of lead in the ground, revealing sweeping round patterns that do not extend completely over the edges (Fig. 8c). These circular marks may correspond to the

act of spreading the ground using the palm of one's hand, as recommended in the treatise by Antonio Palomino (1655–1726).²⁹ The ground was applied in a single layer, and as revealed by the broad brushwork noted in the lead distribution map, the artist leveled it with a wide brush to create a polished surface.

UNDERDRAWING AND COMPOSITIONAL CHANGES

The initial stages of the composition were laid in using a dilute layer of brownish paint. This painted underdrawing is particularly noticeable through the superficial abrasions present within the group of cherubs in the upper left corner (Fig. 5). IRR further revealed a loose sketch that appears to have been made using a split-nib quill pen, concentrated in the lower right quadrant, which was applied after the painted underdrawing. Aguilera used a pen with a

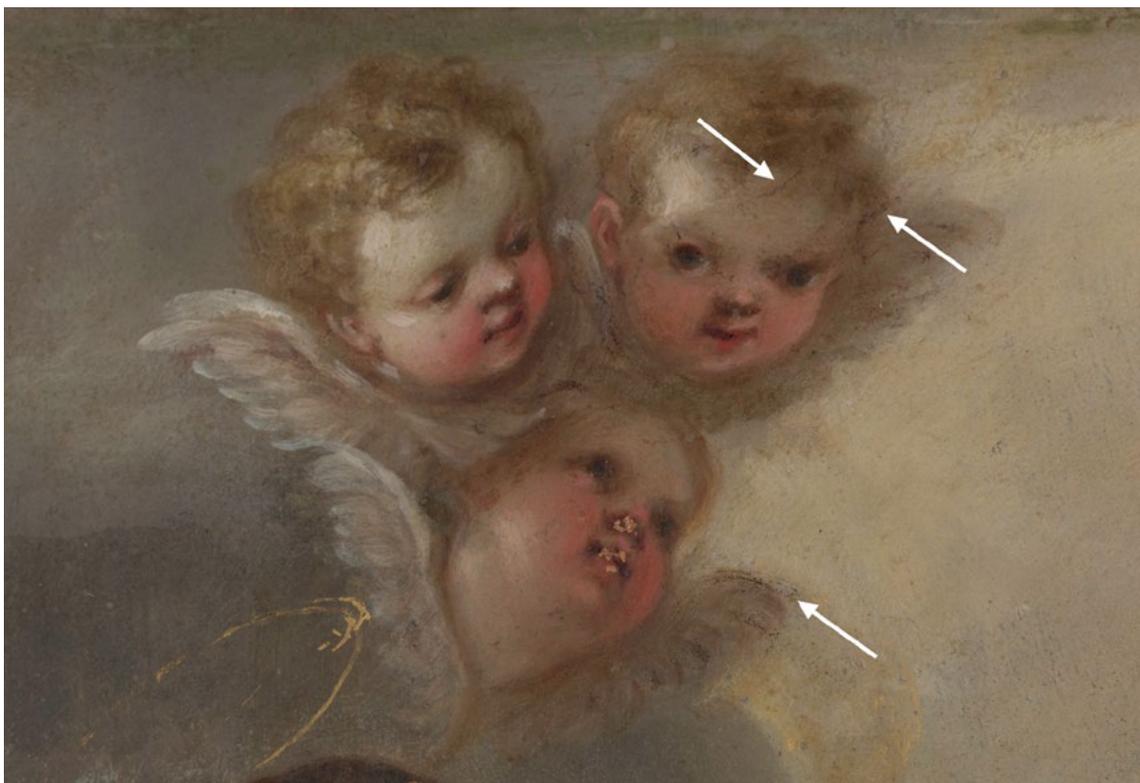


Fig. 5 *The Virgin of Carmen*, detail of the cherubs in the upper left. The initial descriptive outlines in brown paint are intermittently exposed through superficial abrasions (indicated by white arrows).



Fig. 6 *The Virgin of Carmen*, lower right quadrant photographed in normal light (left) and infrared reflectogram (right) showing the spilt-nib pen marks (indicated by white arrows) and the dry carbon-based black medium (indicated by a red arrow), and same detail in normal light.

fluid, carbon-based black medium, most likely a form of ink, to outline the prominent jawline of a male figure along the right-hand edge, suggesting a full beard.³⁰ Ultimately, the painter decided to cover the jaw of the man with his arms stretched toward the Virgin and added a tonsure on his head to represent a monk (Fig. 6). This revision, which effectively morphed the figure from a layman to a clergyman, no doubt also presented significant iconographic changes, in the sense that it offered a broader moral commentary relating to the collection of souls, as even the clergy was not spared from damnation. In addition to the outline of the chin in pen, a diagonal line below the head was made using the same drawing utensil and medium to act as a placeholder for the figure's left shoulder. Aguilera also used a dry, carbon-based black medium to delineate the right bent leg of another male soul praying in the lower right corner. In the final stages of painting, this leg was completely covered by the flaming lake. Aguilera's

effective use of both fluid and dry media for a localized underdrawing demonstrates his creative process in constructing this complex arrangement of figures. It is noteworthy that, to date, there is little evidence indicating that New Spanish painters used carbon-based black media for their underdrawings.³¹ It is possible that the painting's metallic support and light-colored ground may have made it more feasible to use a split nib and ink for the quickly sketched underdrawing. In any case, until more underdrawings are revealed through the technical study of New Spanish paintings, this example remains an anomaly among paintings from this region.

PAINTING TECHNIQUE

The Virgin of Carmen has a luminous quality, imparted by the smoothness of the support and the brightness of the ground, which serve to unify the composition. The thinness



Fig. 7 Details of the Virgin and Child (left) and the Prophet Elijah (right).

and relatively simple structure of the paint buildup demonstrate Aguilera's sophisticated and economical technique, utilizing the color of the ground when necessary. Aguilera created atmospheric effects in the sky and the clouds bolstering the saints with crisscrossed brushstrokes that blend light blue, pink, yellow, and gray passages of oil paint. These pastel transitions served to split the composition into two horizontal sections, dividing heaven and purgatory. The figures, especially the saints, were held in reserve. The grayish ground can be seen through the contours around the shoulders and head of the Virgin and the Prophet Elijah. Aguilera's skill in describing texture is evident in the Virgin's hair, where he applied an under-bound earth pigment with a stiff brush to create airy curls. In contrast, to paint the pelt on the prophet's shoulder, he stippled bodied lead white, which he then agitated with a flick of the wrist to give the impression of fur (Fig. 7).

Due to the generally good condition of the paint layers, physical sampling was limited and MA-XRF was used to determine the distribution of pigments, which included vermilion, lead white, a copper-based pigment (possibly verdigris), and iron-based earths, including ocher and umber—all commonly available at the beginning of the eighteenth century (Fig. 8). For the flesh tones, Aguilera used a direct method, expressive yet systematic in approach, with virtually no blending. For example, in the detail of the only woman in purgatory, over

the initial brown underpaint the artist applied a brown glaze in her brow and temple (fig. 9). He then built up the structure of the face with pink paint on the ear, under the nose, and on the cheeks followed by pale highlights of a thicker consistency. The corner of the mouth was painted with tiny strokes using a deep red, most likely a red lake, while the lips were simply suggested with two parallel strokes of vermilion. The profile of the praying man visible in Figure 9 was modeled in a similar manner. However, here the artist applied a dab of white paint over the ground for the highlight of the nose, which he then guided along the length of the nose with a brush loaded with pink paint. The same technique was used in the highlight of the black shackles, where dabs of blue and white paint were dragged with a dry brush or stick, resulting in fine, unmixed skeins of paint (Fig. 10). To redefine the figures and distinguish details such as the fingers and eyes, the artist applied fluid brown paint with a fine brush to outline shadows over the finished painting.

The blue lining of the Virgin's mantle and Saint Joseph's green robe feature distinct areas of color. The blue pigment, which is remarkably well preserved, was identified as indigo.³² This organic pigment has also been reported in other New Spanish paintings.³³ American indigo from the Audiencia of Guatemala, *indigofera suffruticosa*, was considered among the finest indigo during the eighteenth century, and it is possibly the one Aguilera used to paint the lining.³⁴ In this area, the shadows

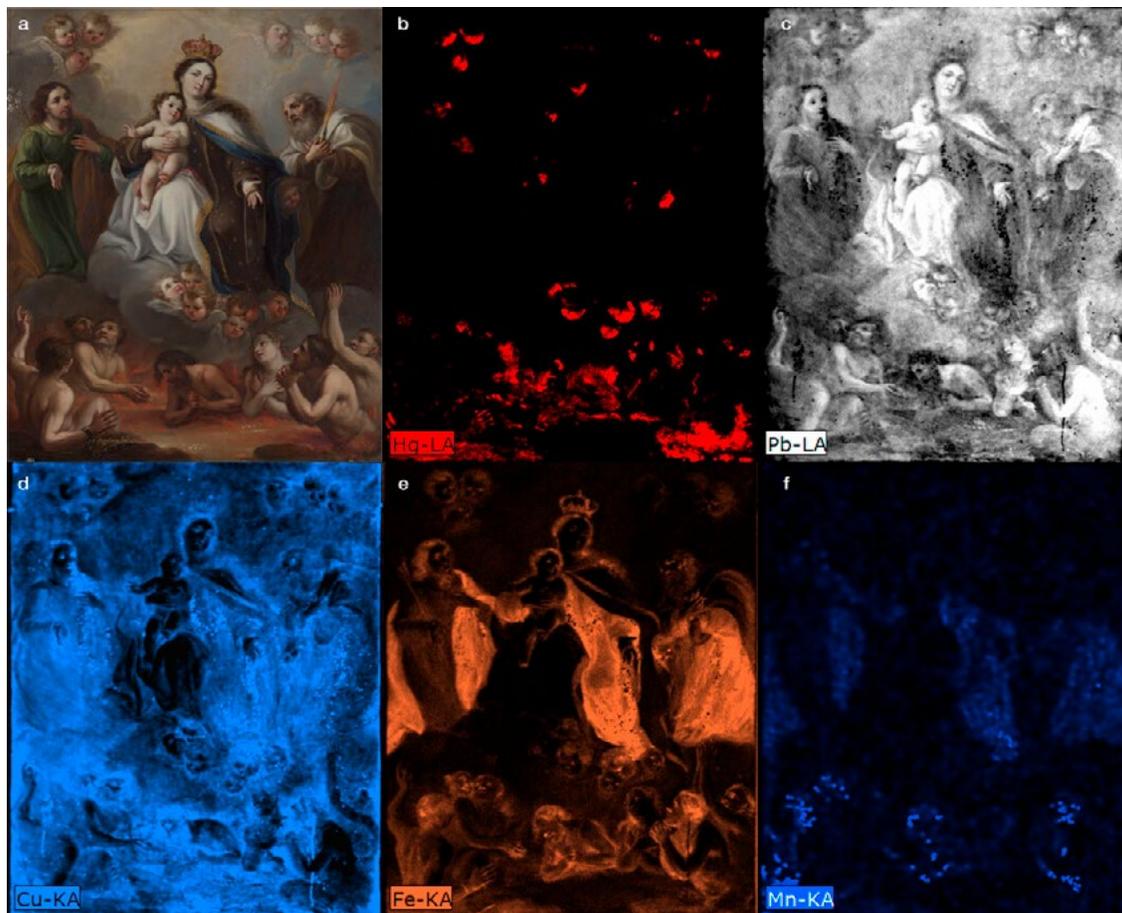


Fig. 8 *The Virgin of Carmen* photographed in (a) normal light: MA-XRF elemental maps, showing the distribution of mercury (b); lead (c); copper (d); iron (e); and manganese (f).



Fig. 9 Details of the face of the woman and profile of a praying man in purgatory.



Fig. 10 Blue and white highlights in the shackles, photographed before treatment.

were made primarily with thick layers of indigo while lead white was added in the highlights. Joseph's robe received a similar treatment. It was painted with a copper-containing pigment, possibly verdigris, with highlights composed of lead white mixed in with an unidentified yellow pigment.

The Virgin of Carmen has minute paint and ground losses localized in areas of dark brown paint. Flaking of dark colored areas is the most common form of degradation observed in paintings on copper supports, likely due to the mechanical behavior of oil-bound earth layers.³⁵ To investigate this condition, two samples (S1 and S2; Figs. 8a, 11) were taken from the brown robe of the Virgin and the shadow on Saint Joseph's yellow cloak. Sample S1 revealed two paint layers over the ground preparation [1], the lower one containing a carbon-based black pigment and an ocher (layer [2]; Fig. 11b), while the upper one was composed of a mixture of a carbon-based black and red lead (layer [3]; Fig. 11b). Sample S2 showed four paint layers over the ground [1]. The first two are similar in composition, containing orpiment and a carbon-based black; the lower layer (layer [2]; Fig. 11d) is lighter than the subsequent one (layer [3]; Fig. 11d),

showing Aguilera's additive modeling of the fabric. Over these two layers, the artist painted a dark brown shadow containing red ocher and a carbon-based black (layer [4]; Fig. 11d). Finally, this area was topped with a scumble containing coarsely ground ocher (layer [5]; Fig. 11d), which appears to be imbedded in a natural resin varnish [6] that seeped under this layer when it was applied in a previous restoration. In addition to the pigments identified in the cross-sections, MA-XRF gave signals for iron and manganese for all brown colors, suggesting the presence of an umber (Figs. 8e, 8f). The localized flaking suggests that failure of adhesion is due to the pigments used, likely earth-based and carbon-based black. However, more complex chemical interactions may also account for this.

Reflective elements, such as the halos, trim of the mantle, and crown of the Virgin, were executed with subtle brushstrokes in shell gold. Aguilera used a smaller brush for this last stage, controlling the thickness of the line to generate particular effects.³⁶ For example, the flaming sword of the Prophet Elijah was painted with a few thick tapering brushstrokes over a vermilion paint layer to depict fire, while the halo of the Virgin was made with a

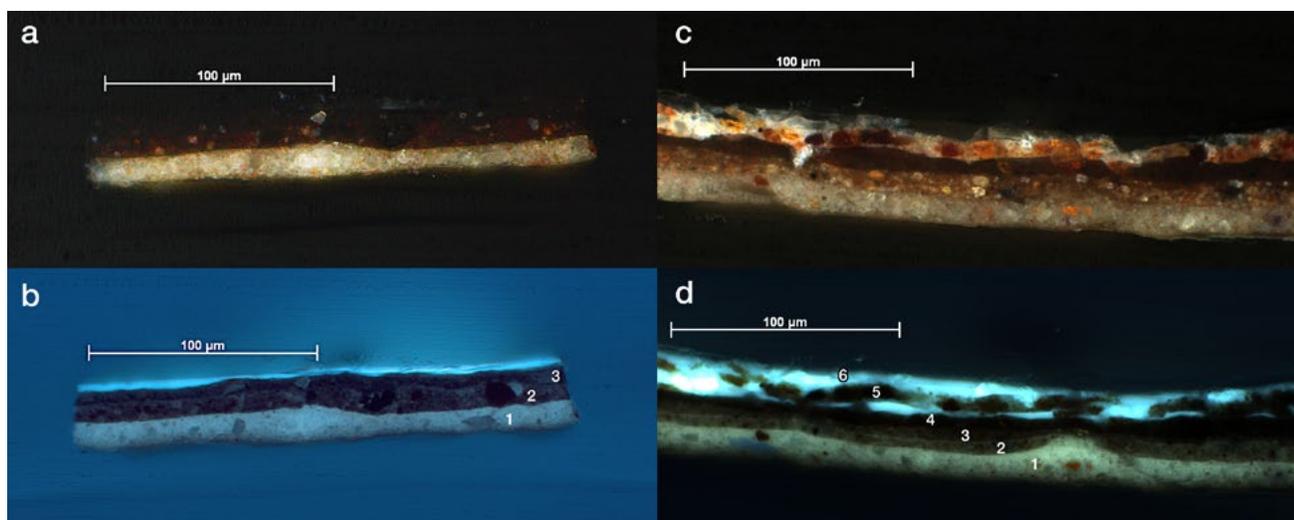


Fig. 11 Photomicrographs of paint cross-sections taken from the brown robe of the Virgin and Saint Joseph's yellow robe, respectively, from the locations indicated in fig. 8a. Sample S1 viewed at 500× magnification in (a) visible light and (b) UV illumination shows sample S2, viewed at 500× magnification in (c) visible and (d) UV illumination.

series of fine undulating marks that trail off, creating an ethereal effect toward the outer rim (Fig. 7). Aguilera's self-confidence as an artist may be surmised from his use of gold to sign his own name. These gold highlights are not merely decorative. In *The Virgin of Carmen*, the reflective vibrations of the gold would have been animated by candlelight, no doubt enhancing the function of the painting as an object of devotion by lending it an aura of the sublime. An affinity for the religious symbolism of reflective surfaces is noted in two unique art forms that emerged in New Spain: *enconchados*, paintings on wooden panels inlaid with mother-of-pearl; and *arte plumario*, featherwork paintings in which iridescent feathers were often adhered to paper with *tzhautli*, the mucilage of orchid bulbs, and laid on copper.³⁷ The inspiration for these artworks came from Japanese and indigenous knowledge, respectively, and their appropriation was likely induced by their dynamic light effects, which were linked with the divine in widely circulated devotional images in the Catholic world.

THE FRAME

The painting arrived at The Metropolitan in a cabinetmaker's frame with ebonized fruitwood molding, tortoiseshell veneer, and cast-silver ornaments. The precious materials used in the construction of the frame point to a wealthy patron. Inventories show that devotional paintings on copper were not costly per se. Rather, it is the value of their accompanying frames that is reflected through their documented high prices.³⁸ The presence of *The Virgin of Carmen* in Spain by the 1850s suggests it could have been brought from Mexico in the *tornaviaje*, the trip back home that Spaniards took after serving as merchants or colonial officials in New Spain.³⁹

The painting fits almost perfectly within the thin rebate of the frame, which in turn suggests that the frame was made to accommodate the dimensions of the copper support. Structurally, the architrave frame is similar to those made in Antwerp for export to Spanish and Spanish American markets from the second quarter of the seventeenth century onward.⁴⁰ Nevertheless, a New Spanish



Fig. 12 Framed painting (left) and image showing the digital simulation of the gilded silver ornaments (right).

manufacture cannot be ruled out. Although the construction of the frame follows a European tradition, the raw materials used to create it may be American in origin. Tortoiseshell-inlay techniques had been a long-standing tradition in the Bay of Campeche, Mexico, where craftsmen exploited the translucent colors of this protein-rich material.⁴¹ To create an opulent scheme and to prevent the wood and glue from being seen through the veneer, woodworkers would often line the back with red paper.⁴² Point XRF analysis detected mercury in an area where the red rag paper was exposed, indicating the presence of vermilion. The same analytical technique showed the presence of gold on the silver seraphs nailed to the frame, with larger amounts found in the crevices. No mercury was detected in combination with gold, possibly ruling out a fire-gilding technique. The gold may have been applied using other gilding methods, perhaps a displacement-plating process, although this can only be confirmed with further analysis. Evidently, the gold was removed intentionally at some point, possibly because the thin layer of metal suffered damage or abrasion with use. To picture the ensemble's appearance when the seraphs were gilded, a digital simulation was created (Fig. 12). In the simulation, the overall warm scheme of the frame balances the fine shell-gold elements of the composition.

CONCLUSION

Despite the apparent recognition that Aguilera received in his lifetime, and the recent acquisition of his works by North American museums, very little is known about him or his technique. Lacking period documentation, only physical evidence locked within Aguilera's works can provide insight into his materials, his methods, and aspects of his artistic process. This study has elucidated Aguilera's creative process in *The Virgin of Carmen*, in which the careful preparation of the ground, important changes to the composition, and sophisticated paint handling points to a mature artist confident in his skills. His approach, established in three schematic zones of space,

is economically effective and serves as proof of a trained hand. The gestural and shorthand quality of his painted underdrawing reveals an artist comfortable with complex anatomical subjects, in which precise guidelines were not necessary to execute a highly detailed image. The local split-nib pen-and-ink sketch indicates that Aguilera developed *The Virgin of Carmen* as he painted it. This is supported by his choice not to follow his sketch of the figure, which in turn changed the iconography and consequent moral message of the painting. Only the study of additional infrared reflectograms of Aguilera's paintings will determine if quick notations or sketches in pen and ink, like the one shown here, were common practice for the artist and others in his circle.

The unprecedented comment in the Spanish translation of Francesco Lana's treatise noting Aguilera's direct paint application suggests that the painter shared his technical knowledge with his peers. This apparent collegiality may have earned him the citation along with two of the foremost painters in the early eighteenth century. To paint *The Virgin of Carmen*, Aguilera began with a subtle and controlled approach in the background, blending the surface to the point where brushstrokes became imperceptible, while in the figures, details were created with abstracted strokes of paint that were not overworked. In addition to mixing pigments on his palette and the support with a brush, Aguilera manipulated dabs of oil paint to create skeins of unmixed paint in the iron shackles above the signature, possibly using a stick or the end of a brush. The dichotomy between a controlled and an energetic paint handling exemplifies the bold gestures seen throughout this masterfully accomplished painting and brings us closer to understanding Aguilera's celebrated technique.

METHODS

Infrared reflectography (IRR)

IRR was done using an OSIRIS InGaAs near-infrared camera with a 6-element, 150 mm focal length, f/5.6-f/45 lens, and 900-1700 nm spectral response. A single capture was made at 33.8 and 15 in. and 4096 × 4096 pixels.

Macro-X-ray fluorescence (MA-XRF) mapping

MA-XRF mapping was carried out using a Bruker M6 Jetstream instrument equipped with a 30 mm² XFlash[®] silicon drift detector (SDD) and an air-cooled micro-focus Rh-target X-ray tube operated at 50 kV and 0.5 mA. The full painting was mapped with a 700 μm spot size, a 700 μm step size, and a dwell time of 80 ms/pixel. The spectra were processed using the Bruker M6 Jetstream software.

Point XRF

Point XRF was carried out with a Bruker Artax 400[®], equipped with a 10 mm² XFlash[®] silicon drift detector (SDD), and a rhodium X-ray tube operating at 50 kV and 700 μA. Spectra were acquired for 60 seconds using a 1 mm pinhole collimator and no primary beam filters.

Samples and Optical Microscopy

Samples were taken using a scalpel under magnification, mounted as cross-sections in Technovit[®] resin, and polished using Micromesh[®] cloth. For the microscopic examination, a Zeiss Axio Imager M2m microscope, with 50×, 100×, 200×, 400×, and 500× magnifications, an AxioCam HRC digital camera, and AxioVision 4.X.X software were used.

Raman spectroscopy

Raman spectroscopy measurements were done in situ in the painting and in the sample cross-sections using a Renishaw System 1000 coupled to a Leica DM LM microscope. All the spectra were acquired using a 785 nm laser excitation, a 1200 lines/mm grating, and

integration times between 10 and 120 s. The power at the sample was set between 0.5 and 5 mW using neutral density filters. When working in situ, a log working distance 20× objective lens was used while a 50× lens was employed to analyze the paint cross-sections.

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⁶ Myrna Soto, *El arte maestra: Un tratado de pintura novohispano* (Mexico City: Universidad Nacional Autónoma de México, 2005), 58-59; Mues Orts, *La libertad del pincel*, 262.

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¹¹ Rogelio Ruiz Gomar, "Juan Francisco de Aguilera: La Purísima Concepción con Jesuitas," in *Catálogo comentado del acervo del Museo Nacional de Arte*, ed. Gomar, Nelly Sigaut, and Jaime Cuadriello (Mexico City: Universidad Nacional Autónoma de México, Instituto de Investigaciones Estéticas, 2004), 2:60; Ilona Katzew, "Valiant Styles," 159.

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¹⁶ Elemental composition of the copper support was identified by point X-ray fluorescence spectroscopy.

¹⁷ Isabel Horovitz, "Paintings on Copper: A Brief Overview of Their Conception, Creation and Conservation," in *Paintings on Copper and Other Metal Plates: Production, Degradation, and*

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¹⁸ Clara Bargellini, "Painting on Copper in Spanish America," in *Copper as Canvas: Two Centuries of Masterpiece Paintings on Copper, 1575-1775* (New York: Oxford University Press, 1999) 31-44.

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²⁰ Sandra van Gihoven, "Flemish Dealers and a Thriving Transatlantic Art Trade During the 17th Century," in *Trading Painters and Painters' Materials, 1550-1800*, ed. Anne Haack Christensen and Angela Jager (London: Archetype; Copenhagen: CATS, 2019) 15-25, 21; Bargellini, "Painting on Copper," 35; Neil de Marchi and Hans J. van Miegroet, "Exploring Markets for Netherlandish Paintings in Spain and Nueva España," in *Nederlands Kunsthistorisch Jaarboek (NKJ)/Netherlands Yearbook for History of Art* 50 (Leiden: Brill, 1999): 80-111.

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²⁶ Lydia-Chara Pavlopoulou and David Watkinson, "The Degradation of Oil Painted Copper Surfaces," *Reviews in Conservation* 7 (2006) 55-65.

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³⁰ The use of a split-nib pen is indicated by the parallel ridges of fluid black medium left when the tip of the pen was pressed and dragged on the surface of the priming.

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³² This pigment was identified non-invasively by *in situ* Raman spectroscopy.

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Technical Art History and the Art Historical Thing

Michael Yonan

Art history is the scholarly study of objects and their histories. This was the definition of the discipline presented to me as a student some thirty years ago, and it remains generally true today. One online source offers a nicely succinct summation: “Art History is the study of objects of art considered within their time period. Art historians analyze visual arts’ meaning (painting, sculpture, architecture) at the time they were created.”¹

A seemingly benign statement. Yet ponder it for a moment, and its underlying assumptions gradually become more unstable. Art history is the study of objects. Yet a visit to any museum will soon dispel the idea that “objects” define the terrain of art history. The objects selected for presentation in any art museum are but a highly selective subset of human goods, and, it should be added, are usually selected inconsistently. What is the reason for displaying an ancient Greek lekythos and not a mass-produced cruet set from IKEA? The simple answer is that one is art and the other is not, which of course invites the question of how and when something becomes art. The definition above provides its own answer by singling out the classical triumvirate of high arts for special indication. Painting, sculpture, and architecture are the most valued kinds of art, which may seem again incontrovertible until one begins to think about artistry more broadly. Cannot textiles, woodwork, ceramics, and other kinds of objects also be understood as art? Museums house them, too, but these objects seem to operate in a different interpretive space, one broadly characterized as “design.” We might turn to universities for clarification. Peeking around the halls of academia quickly alerts one to the existence of other disciplines also interested in objects and their histories.

Archaeology, anthropology, and history are among the more established ones, while museum studies, material culture studies, landscape architecture, design studies, and cultural studies are newer interdisciplinary pursuits that claim some sort of investment in objects. Is art history part of this team, does it overlap with a few, or is it distinct from them?

We can interrogate our definition further by zeroing in on the historical component of the cited definition. Art history considers works of art “within their time period” and therefore isolates visual arts’ meaning “at the time they were created.” These phrases are telling. They reveal that art history is concerned with a primary kind of meaning for its objects, one associated with a specific moment—its making—that is valued above other potential meanings an object can bear. This has the effect of elevating a single moment in an object’s life over others, and moreover implies that works of art have a dominant meaning that takes precedence. Our definition also implies that the art historian’s job is to recover that meaning and make it intelligible. Such a definition is artist centered in that it privileges the artwork’s maker. This framework reasserts the image of a lone genius creator, a central figure in art history, and further characterizes the work of art as a kind of puzzle awaiting deciphering.

Perhaps it is too obvious that this definition is a straw man. The range of art historical practice today is much wider than what it describes, and more sophisticated definitions of art historical practice certainly exist.² But its general contours still seem true, insofar as much art history remains tethered to its terms. Art history

continues to be a highly selective form of object analysis, choosing to analyze objects that possess value historically, aesthetically, or both. It also remains, *pace* Roland Barthes, very much a discipline structured around known and named artists, who function authorially to communicate through their art. These qualities give art history, for all its current diversity, something like a shared set of concerns and priorities.

The problems involved in describing what art history is, versus what it might become, lie at the heart of this essay, which attempts to sketch out the potential place of the object in our discipline: the thing of art history. This seemingly simple task—defining what it is we study—is actually one of the most inconclusive and destabilizing acts for the scholar. We study many different things and do so from many different perspectives. What definition could possibly encompass everything from ancient pottery to contemporary video art? The answer, I have suggested elsewhere, is materiality, and through the explorations of materiality pursued in interdisciplinary material culture studies we might find tools for fine-tuning that definition.³ What I will argue in this essay is that the art historical object needs to be understood in quite literal terms as a thing, as matter, and that technical art history can play the role of bringing that thingness into greater prominence. To give away my conclusion, without the kinds of knowledge gained from technical art history, art historians will never really understand their objects and will forever divorce them from material culture. The object of art history will remain a spectral entity and not a finite thing with specific material characteristics upon which meaning can be built. Yet achieving this, paradoxically, means letting go of the received ideas about what constitutes an object's historical context.

If art history warrants a basic definition, so does technical art history. We can understand it as the process of using technical means to study works of art. These can include laboratory-based procedures that permit better understanding of an artwork's physical qualities, or more roughly the application of scientific procedures to art. Technical knowledge has traditionally been the purview of museum conservation departments—technical knowledge pursued for purposes of preservation. That is certainly an application of

it to good ends, but technical knowledge has many additional benefits.

As Emma Jansson proposes in her part of this article, technical art history can help refine the imprecise language of art historical and art theoretical description, something sorely needed as art historical terminology is often surprisingly inexact. "Oil on canvas" is a designation for thousands of paintings hanging in the world's museums today. The uninitiated might think that this indicates consistency across time and cultures, yet the range of materials that might actually fall under this description is wide, since the precise composition of canvas, for example, is not the same across time. Scholars invested in technical art history have long known this, but the broader art historical community has not yet fully incorporated knowledge of this kind into the formation of historical interpretations.

Technical investigations can also shed light on historical matters that would seem more the purview of the researcher than the scientist. A recently published example illustrates how technical knowledge can open up new historical knowledge. The furniture collection of the Swedish Royal Court (Kungliga Hovstaterna) in Stockholm houses two eighteenth-century pieces attributed to the Swedish cabinetmaker Nils Dahlin (c. 1737–1787), a writing desk and an *étagère* or display cabinet, both dating from 1771 (fig. 1). Incorporated into their design are panels made of lacquered wood originating in East Asia. Based on traditional methods of visual and stylistic analysis, scholars formerly surmised that Dahlin's pieces were constructed from a Japanese screen imported to Sweden and then cut up to create the panels used in the furniture. It was further thought that some of these pieces were left over from wall decorations in the Chinese Pavilion (Kina Slott) at Drottningholm Palace. A series of technical investigations recently confirmed that the mixture of saps used in the lacquered panels of the desk show affinity with lacquers deriving from the Ryukyu Islands



Figs 1 & 2 Nils Dahlin (1731-1787) and others, *Writing Desk* and *Étagère*, 18th century, © Kungl. Hovstaterna, Photo by: Alexis Daflos.

of southern Japan, suggesting that they originated there.⁴ The étagère panels likewise indicate an Asian origin, but one less precise than that for the desk: the lacquer used on them contains elements from trees that grow in Vietnam, which were combined with others from northeast Asia, either China, Japan, or Korea. This also supports the possibility that the panels are Ryukyuan in origin, since political control of the islands had shifted in their early modern history from Ming China to Shimazu Japan. Workshops from across this region combined techniques and materials. This same technical investigation disproved the supposition that the panels are leftovers from the Chinese Pavilion, since the chemical composition is different from the lacquer used in that project.

Pinpointing a Ryukyuan origin for the panels in Dahlin's furniture tells us something important: of what they are actually made. The knowledge gained replaces a generic designation of "Asian" or "Japanese" lacquer with something considerably more precise. This is information that the naked eye, even that of a highly knowledgeable connoisseur, could probably not determine on its own. But more excitingly than that, the technical analysis gives a glimpse into a cultural situation that otherwise is

virtually inaccessible. We get a sense, however remote, of workshop practices in a part of the world (the Ryukyu Islands) not central to commonplace art historical narratives, practices for which the written record is spotty at best. Moreover, beyond recognizing that examples of Dahlin's furniture are hybrids of Asian and European design, we learn that the Asian components are themselves products of cultural exchange across the East China Sea, in other words, that they were hybrid objects even before Europe entered their history. These are layers of historical meaning and possibility that open up an understanding of these objects not accessible via other means. Recognizing this further disturbs the simple idea that the furniture was made by Dahlin; he is a maker, but just one of several whose labor contributed to the final objects.

When scholars now subject this desk and étagère to more elaborate processes of interpretation, asking about their semantic potentialities, they can do so with a firmer understanding of what they actually are. This is an important point because art historical practice has evolved into a highly theoretical undertaking, particularly since the cultural turn of the 1970s, which introduced what

were then called “new perspectives” to art historical study. These are the well-known pantheon of approaches that includes feminist art history, the social history of art, Marxism, psychoanalysis, and more recently queer, postcolonial, and poststructuralist perspectives. In tandem, these theoretically oriented approaches have greatly multiplied perspectives that scholars can bring to what they study. The advantages to this diversity are beyond question. It has resulted in an exponential multiplication of art historical meanings, as many diverse readings of works of art take place simultaneously and many conflicting interpretations coexist.

I do not wish to suggest that there is anything wrong with this interpretive richness. But it requires grounding in the objects themselves lest the interpretation take on a life of its own. All art interpretation emerges from a dialogue, a back-and-forth between the interpreter and the artwork. However, it is an elusive dialogue in that distinguishing input from interpreter and from object is never easy to characterize.⁵ For example, we can look at the social history of art and its reliance on the concept of ideology as a structuring concept for describing how works of art convey meaning in society. Thinking about ideology can take the interpreter down several related paths. The work of art can be defined as promoting a specific ideology associated with the class structure of its historical moment, for example. The notion of art itself is also ideological: how we understand what art is, its process of becoming art, is deeply embedded in ideological concerns. One could continue in this way for a long time. The ideas themselves have a seductive power, and that power generates its own momentum. They can be so directive and urgent that, gradually, they loosen the interpreter’s attention away from the object, which is supposed to be art history’s focus and which rarely fits an interpretive paradigm totally. Objects push back against easy transformation into ideas.⁶ There is also a narrative dimension to art historical interpretation. Art historical methods are not just ways of deriving meaning: they are literary forms, really subgenres of art historical writing. An essay that interprets a work of art according to feminist art historical principles will follow certain interpretive paths, and those paths are to some degree predictable. The most extreme version of

this idea would be to say that all art history is really a kind of fiction, a literary form based in narrative structures about people and objects. While I do not necessarily think this true, it does seem true that some art interpretation slips into a kind of storytelling.

My point is that creating historical narratives about art can actually distract from the object itself as a *thing*, which exists not in historical space at the moment of interpretive encounter, but in the interpreter’s contemporary, temporally experienced space. *Mona Lisa* may be a painting made by Leonardo da Vinci in Italy around 1505, and art historians may wish to understand it through that time, place, and person. Yet we know it today as a contemporary object in Paris. What we see is not only the object Leonardo made, but also an object that he began that has since been modified and recontextualized endlessly, both in the actual physical materials that constitute it and via its image, reproduced constantly, altered shamelessly, and distributed around the globe. Making sure we know what we are interpreting, and being honest about it, is one of the great challenges to undertaking art history today. At issue here is the question of where to draw the line between creating knowledge about an artwork’s originary moment and recognizing the interpreter’s experience of it today. Both are part of the art historical encounter. The object/context divide demands constant repositioning, as a tension between the two is inherent to the study of all art. It can never be fixed unilaterally in a way that applies everywhere, even as much as art theory may wish to describe it in universal terms.

To illustrate this point, let me tell a story of my own. The last conference I attended before the COVID-19 pandemic accelerated in spring 2020 happened to take place in my hometown—Chicago—and one afternoon I escaped the conference in order to visit the Art Institute, a museum that has been part of my life for over forty years. One picture I particularly love looking at is Henri Matisse’s wonderful *Bathers by a River*, begun in 1909 and worked on intermittently by the artist until 1917 (fig. 2). As a student, this painting

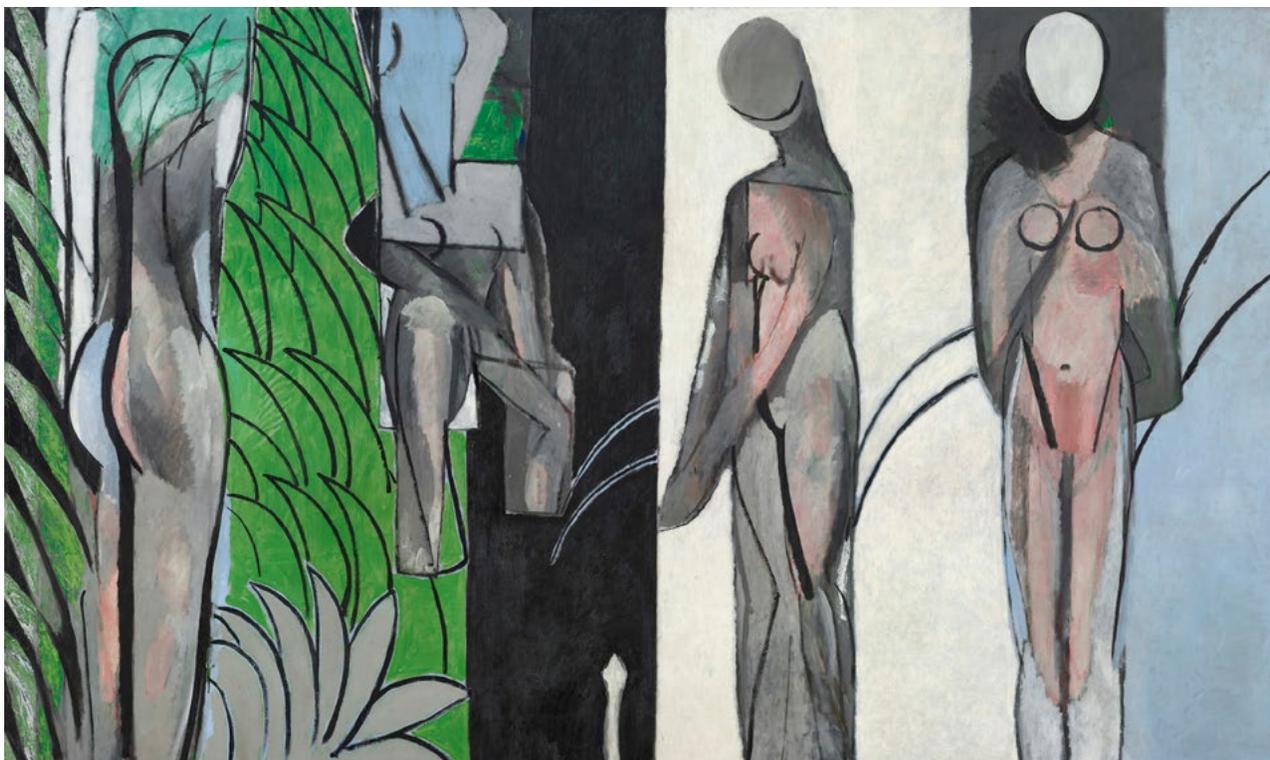


Fig. 3 Henri Matisse, *Bathers by a River*, 1909-1917, © 2021. Image copyright The Art Institute of Chicago/Art Resource/Scala, Florence.

fascinated me. Why, I wondered, did Matisse keep returning to this canvas over such a long time, and why did he change his mind so frequently about what he wanted it to be? Returning to it again after many years, I saw some things in Matisse's painting I had never noticed before, like how thinly the paint is applied on many parts of its surface, how rushed it seemed despite its long gestation time, and, for lack of better descriptors, its audacious crudeness. My looking reaffirmed how wonderful this painting is as an object, how it delights in creating patterns of shape and color that it simultaneously subverts, and how much creative brio is visualized on the canvas through the brushy traces of that process.

The Art Institute recently included *Bathers by a River* in a series of Instagram videos highlighting prominent works from its collection.⁷ In the post, they proposed an interpretation of the picture based on it being made immediately before and during World War I. Matisse's efforts recorded

the artist's foreboding and indecision due to war. They even interpreted its color palette—a combination of gray, black, and a vivid shamrock green—as creating a tense, uncomfortable mood. And the headless, mannequin-like figures they likewise interpreted as stony sculptures devoid of humanity. The painting comes to illustrate a tense emotion that fits an understanding of the historical moment in which it was produced.

This interpretation annoyed me, frankly. Not because it does not fit Matisse's picture, since as a way of understanding it, it was perfectly viable. But it seemed to me a historically determinative way to read the picture, one that minimized what could be said about its materiality, and that was done in the service of making the story behind this painting fit a simplistic understanding of historical context. It also negated my personal joy in looking at it. The post raised a gnawing question for me: why must works of art always be explained through evocation of historical setting? Could there be another way of understanding what

Matisse tried to do in this picture that did not make it a reflection of the conditions in which he made it? My own viewing of the picture suggested that this was possible, but somehow the urge to contextualize had taken the museum down a different track. By insisting on historical context as the primary framework for interpreting Matisse's picture, the preparers of that post missed many of the things about it that have made it so compelling to me. And many of those things are, in fact, embedded in its materiality. That materiality may seem too complex for the average museum visitor to comprehend and therefore not be prioritized in social media posts like this. Yet my sense is that some visitors want to know the science behind the image, so to speak, and would find that kind of information illuminating and aid in comprehending the art.

The Art Institute has produced an exemplary technical report on the painting that demonstrates vividly what technical analysis can reveal about an object's history.⁸ But if we expect the results of technical studies to correlate with established historical trajectories, the impact of such technical knowledge will be lessened. What the many changes to this picture confirm is that Matisse was searching for something, that he was trying to reconcile his work with influential developments in art making, Cubism especially, and also to work through some of his own concerns about what his art would be. That he left so many of the brush marks of this search visible on his canvas says not that he was interested in a loose painting style, but that he wanted his efforts to be seen, to become part of the experience of the picture. That this happened during the ramping up to war is certainly part of the painting's history, but it is not in fact inherent to the object itself. Rather than find traces of a darkening Europe here, maybe we can see instead Matisse's investment in his own artistic growth and change. There is beauty in his efforts that a simple art-in-context interpretation misses.⁹ Recognizing that beauty requires engaging with Matisse's painting as *an object*, while avoiding over-investing in what it represents as *an image*.

By way of a conclusion, I want to suggest that art history consider replacing some of its better-known interpretations of art with new ones rooted in the materiality of art itself. This would be more than object biographies, stories

of how an object passes through different hands over time and takes on new meanings. Rather, it would be a history of an object as a changing set of material conditions that explain how an object's materiality operated at different moments in time, or, to use Emma Jansson's terminology, how objects are "composite structures" with internal as well as external histories. The advantage to this would be to make the artwork an active agent in the construction of its history, not a reflection of that history or of the interpreter's priorities. It seems to me that art historical methodology sometimes asks too much of historical context, forcing it to take some of the work out of understanding an object by reducing it to a vessel defined by historical conditions. By grounding interpretation in the materiality of an object, by seeing it as the literal matter that it is, we might avoid the pitfall of making context into an object's meaning. Doing so would propel us to trust more in what is actually there, rather than transforming the art object psychologically into what we wish it to be. And I would suggest that this would be impossible without the kind of deep material understanding that technical art history can offer. What the work of art actually is needs to be built into the process of interpreting what it might mean.

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ENDNOTES

- ¹ <https://www.iesa.edu/paris/news-events/art-history>, the website of International Studies in History and Business of Art and Culture, a Paris-based school offering instruction in cultural events management and the art market.
- ² For example, that provided by the Khan Academy's Art History course: <https://www.khanacademy.org/humanities/approaches-to-art-history/approaches-art-history#introduction-art-history>.
- ³ Michael Yonan, "The Suppression of Materiality in Anglo-American Art-Historical Writing," in *The Challenge of the Object/Die Herausforderung des Objekts: Proceedings of the 33rd Congress of the International Committee of the History of Art (CIHA), Nürnberg, 15th-20th July 2012*, ed. Georg Ulrich Grossmann and Petra Krutisch (Nuremberg: Verlag des Germanischen Nationalmuseums, 2014), 1:63-66.
- ⁴ Maria Brunskog and Tetsuo Miyakoshi, "A Colourful Past: A Re-Examination of a Swedish Rococo Set of Furniture with a Focus on the *Urushi* Components," *Studies in Conservation*, December 11, 2020, <https://www.tandfonline.com/doi/full/10.1080/00393630.2020.1846359>.
- ⁵ Something suggested in T. J. Clark, *The Sight of Death: An Experiment in Art Writing* (New Haven: Yale University Press, 2008).
- ⁶ Carol Armstrong, response to the "Visual Culture Questionnaire," *October* 77 (Summer 1996): 27-28.
- ⁷ Art Institute of Chicago (@artinstitutechi), "Henri Matisse's *Bathers by a River*," Instagram, August 31, 2020, accessed February 22, 2021, <https://www.instagram.com/p/CEj4YolpXe3/>.
- ⁸ *Bathers by a River*, in *Matisse Paintings, Works on Paper, Sculpture, and Textiles at the Art Institute of Chicago*, ed. Stephanie D'Alessandro (Chicago: Art Institute of Chicago, 2019), cat. 25, https://publications.artic.edu/matisse/reader/works/section/61/61_anchor.
- ⁹ This is closer to the analysis of the picture provided in the catalogue accompanying a major exhibition on this period of Matisse's career organized by the Art Institute of Chicago and the Museum of Modern Art: Stephanie D'Alessandro and John Elderfield: *Matisse: Radical Invention, 1911-1917* (New Haven: Yale University Press, 2010).

Toward a “Theory” for Technical Art History

Emma Jansson

For several decades now, art historians, conservators, and conservation scientists have increasingly come to find their meeting point in the field of technical art history. This relatively new yet steadily growing discipline—broadly defined as the technical examination of artworks—grew out of research undertaken at museum laboratories and conservation studios during the latter half of the twentieth century. Using a variety of inorganic and organic analytical methods, as well as a range of imaging techniques, technical art historians aim to reveal information about an art object’s physical and chemical structures. These data in turn offer evidence relating to an artwork’s visual appearance and also any material changes that might have taken place within the object during the course of its history. Often crucial within the context of conservation treatments, such information can also play a significant role in art historical study, as has been demonstrated by a number of interdisciplinary collaborations in recent years.¹

The purpose of this essay, however, is not to emphasize the interdisciplinary nature of technical art history. Indeed, this has been dealt with at length elsewhere.² Instead, it aims to address a less widely discussed yet important aspect of collaborative research, namely, the necessity of common terminology or, more specifically, a shared methodological and theoretical language.³ It is no bold claim to state that, until recently at least, “the theoretical and epistemological frame of reference has rarely been considered” within technical art history.⁴ David Bomford even goes so far as to liken the discipline to only one side of a

substance dualism, stating that: “Technical art history, like human physiology, maps one half—the physical half—of this Cartesian duality, but the aesthetic or philosophical ghost in the machine remains untouched. We can only trace its presence when reason or irrationality, wit or subversion manifest themselves in the material reality of the outward form.”⁵ The emphasis here can be taken to refer to the empirical nature of technical examination or, perhaps more explicitly, the desire for objectivity that is seemingly offered by this type of deductive research approach—the object is one thing, the subject something else entirely.

This long-standing philosophical dichotomy has also been addressed through the writing of Daniel Miller, whose seminal work *Materiality* presents the divide as a kind of “Durkheimian trauma,” within which the (nonhuman) object inhabits one half of a binary whose other half is represented by the (human) subject.⁶ However, to adopt this polarizing stance, described by anthropologist and art historian Christopher Pinney as a process of “purification,” is inherently problematic, as it encourages us to view this binarism in terms of opposing forces.⁷ Such a view in turn carries with it its own epistemological baggage, which since the work of nineteenth-century sociologist Émile Durkheim has entailed a relatively unchallenged hierarchy; one that favors the subject over the object.⁸ Commenting on Durkheim’s legacy, Bruno Latour notes that “to become a social scientist is to realise that the inner properties of objects do not count, that they are mere receptacles for human categories.”⁹

Needless to say, this subject-oriented focus remains deeply entrenched within the human sciences, art history included, which has arguably led to a rather peripheral treatment of the object within theoretical discourse, something that has been noted previously by my co-author for this dual-essay article, Michael Yonan.¹⁰ Taken in this light, one might speculate as to whether Bomford's rejection of the subject is meant to elicit a kind of challenge to this hierarchy. The reasons for this are understandable, as in doing so he not only circumvents the difficulties presented by this traditional dichotomy, but also lends the discipline an added status—by aligning it with the same kind of empirical positivism that underpins much of the natural sciences.

Reasons aside, to isolate the object in this way nevertheless serves to perpetuate the binarism that we would perhaps rather avoid. In other words, if we limit our reading of the artwork simply to its objecthood, we consequently exclude other avenues of intellectual enquiry, be they sociohistorical, philosophical, aesthetic, or otherwise. What we end up with is a kind of taxonomy, which although a necessary stage in technical study, does not necessarily explore the full potential of what the discipline has to offer. Pinney says as much in stating that “any discussion of materiality that starts and ends with the object is doomed to fail. In configuring materiality as object-ness, it accidentally champions one half (objects) of a binary whose other half (subjects) it wishes to attack. Hence it intensifies the work of purification and does not advance the argument.”¹¹ Taking this into account, it thus appears that a more nonbinary theoretical approach could be of interest when it comes to encouraging further interdisciplinary collaboration—a leveling of the playing field, if you will.

In recent years, there has been increased interest in theorization of the object within philosophical discourse. Examples include the writing of philosophers and theorists such as Latour, Alfred Gell, and Graham Harman.¹² Within the fields of archaeology, social anthropology, and material culture studies, the influence of this “material turn” has also been demonstrated through the work of scholars such as Christopher Tilley, Tim Ingold, and Carl Knappett, as well as the aforementioned work by Miller.¹³ While representing different

disciplines, these authors are nevertheless united through their shared use of the term *materiality*, which is meant to facilitate an object-oriented point of entry into their various areas of research.

Materiality as a theoretical term or concept has also found increased currency among art historians, most notably through the scholarship of Michael Yonan, James Elkins, and Ann-Sophie Lehmann, to name but a few.¹⁴ With regards to technical art history specifically, a comprehensive overview of art theory as it applies to technical study can be found through the doctoral research of Elisabeth Reissner, who uses the paintings of Paul Cézanne in order to demonstrate the applicability of theory within the discipline.¹⁵ While far from exhaustive, this expanding body of literature goes to show that there is growing interest within art history to make space for the artwork as object, as opposed to viewing it as a mere “receptacle” for human meaning in the form of subject matter or represented motifs.

That is not to say that this theoretical undertaking is without its own inherent difficulties, one being the lack of consensus when it comes to defining what is meant by the materiality of an artwork or artefact. While authors such as Ingold and Tilley take materiality to mean the material constituents of objects, its use within art history has sometimes been associated with “material culture” and by extension the “decorative” or “minor” arts.¹⁶ Similarly, there is notable confusion associated with the term “material” through its relationship with historical materialism or a “Marxist-inspired” history of art, which concerns itself with the “economic and therefore material conditions from which art is produced.”¹⁷ Yonan notes how the term “material” evokes for some, if not many, art historians this scholarly perspective and “not necessarily the physical nature of things, for which they would employ the term “medium.”¹⁸ This unclear association between the “material” and “materialism” in art history is problematic, as the latter “may seem to characterise the art object as a commodity,” when in fact the study of an object's materiality can also be used to answer questions that extend outside the spheres of commerce and economy, such as the aesthetic or ideological significance of specific materials or techniques.¹⁹

Another notable difficulty related to this discussion on terminology is the association of the term “material” with “material agency,” or the notion that materials as materials can affect the viewer, and also that they do so irrespective of the author of the work.²⁰ It is this understanding of material agency that lies at the center of Elkins’s book *What Painting Is*.²¹ As noted by Reissner, for Elkins the “significance of paint lies in its effect as a material phenomenon,” and through directing his focus on material agency, he resists “any notion that materials are chosen and manipulated by an artist with a sense of how they will contribute to a work’s final aesthetic or pictorial meaning.”²² In other words, Elkins’s understanding of the material within the context of material agency effectively removes art objects from the sociohistorical conditions within which they were produced.

While these discrepancies in language highlight the need for transparency and concise definitions on the part of scholars—particularly when it comes to their chosen methodologies or theoretical language—it also raises the question as to whether it should be the role of theory to define precisely what is “material” about an art object. After all, conservators, conservation scientists, and technical art historians have for several decades now been utilizing detailed vocabulary that is ideally suited for the task of describing the material structures of artworks, even down to the nanoscale level—what Ingold and Tilley would in turn refer to as the “brute materiality” of objects.²³ In this sense, the contribution of technical art history can in many ways be seen as an answer to the problems put forward by Elkins in his discussion on some of the limits of materiality in art history, namely, the “fear of materiality,” the “slowness of the studio,” and the “limits of phenomenological detail.”²⁴ The same observation was also made by Yonan in the preceding essay, through the suggestion that the material-based perspectives offered by technical art history can act as a buffer of sorts, encouraging researchers to engage with the art object on more than a purely ideological or theoretical basis—hence bringing the interpreter back to the object of study.

If we were to disregard the more descriptive function of theoretical terms such as materiality, one might find that its most useful feature in fact lies partly in its own vagueness. I say

this because if we wish to adopt theoretical terms and concepts with the specific aim of facilitating object-based research, surely it would fall within our interests to use language that allows for the complexity of objects as tangible entities. In other words, theoretical frameworks that in effect encourage a *standardized way of seeing*—similar to semiotics or Panofskian iconology—can arguably be viewed as somewhat reductionist when it comes to examining the actual material stuff of artworks, as in many ways this kind of approach presupposes a set narrative of what an object *is* and, through extension, *why* it should be of interest to scholars.²⁵

The fact that artworks and artefacts are materially complex will come as no revelation to conservators and researchers interested in the artwork as object. Not only do objects consist of a vast array of materials with their own intrinsic chemical and physical properties, but they are also the result of complex interactions between these various components—both during the process of making and afterward as the object and its materials continue to respond to their changing environment and physical conditions. Therefore, rather than viewing objects or artworks as a set of distinct components that can in turn be isolated for the purpose of neat semantic analyses, would it not be better and more conducive to technical research to consider objects as composite structures?

Of course, if for the sake of historical argument or discussion one wishes to focus on a particular element of facture or certain pigment choices, there will inevitably be reasons for doing so. However, the point here is that such focused discussions should always be considered as part of a greater whole, as opposed to an isolated phenomenon; otherwise one might run the risk of decontextualizing materials not only from the artworks to which they belong and form a composite part, but also their broader sociocultural, historical, and production contexts.

Returning to the role of theory, or rather *possible* role—since I have no desire to put forward either an absolute or conclusive

argument in this instance—could a theoretical concept or framework such as materiality act as a kind of bridge or equalizer when it comes to the relationship between scholar and object, a challenge to the hierarchical binarism or substance dualism described above? In other words, if we allow the terminology and methodologies of conservation science and technical art history to take on the role of material *description*, then the function of theory becomes more to do with the ways in which these data can be *mediated* for the purpose of art historical discussion or analysis.

In many ways the term materiality is not necessarily important in and of itself. Rather, it is made relevant by virtue of its function, specifically through what it facilitates, a more central or non-peripheral role for the object within the context of research. This in turn encourages us to re-evaluate the role or position of the subject or human scholar relative to the nonhuman object. Thus, theory becomes a point of entry, a viewpoint of sorts that has a leveling effect. The object is allowed to speak for itself, as opposed to conforming to a subject-oriented narrative. Equally, to adopt such a viewpoint could provide a means of liberating artworks from the limiting state of objecthood or the “physical half” of Cartesianism by opening up their interpretation to more semantic, abstract, or philosophically informed discussions.

In some ways, one might argue that in its most ideal form technical art history already fulfils much of the role and function seemingly espoused by materiality, with the main distinction perhaps being the different academic circles in which these terms and methodological frameworks are most frequently evoked. However, as will no doubt be familiar to both conservators and researchers who use technical analysis as a method of inquiry, too often are our contributions limited to either an appendix or technical entry at the back of a publication, or otherwise remain inaccessible in the form of an unpublished conservation report. I myself have frequently experienced this during my years of study and research.

That is not to say that all technical research falls victim to this kind of hierarchy, far from it, as demonstrated by a number of praiseworthy

examples noted by Maryan Ainsworth in her discussion on the history and development of interdisciplinary collaboration.²⁶ Speaking more broadly, however, and specifically in relation to the position of technical art history versus more traditional art historical theories and methodologies, the material perspectives offered by conservators and conservation scientists remain peripheral, to say the very least. The reasons for such entrenched hierarchies are much too complex and institutionally oriented for me to list here, although it serves to say that both museum organizations and academic curricula would arguably benefit from a more integrated and materially informed approach to the study and display of art objects.²⁷

Bringing this discussion back to the current topic, the issue of language, albeit seemingly banal, can and should be viewed as a natural starting point when it comes to implementing interdisciplinary methodologies and theoretical frameworks. Consider how ambiguous terms such as *materiality* appear when evoked by art historians, often assuming both a descriptive and mediating function at the same time, while in some instances even failing to reference what a conservator or technical art historian might typically associate as “material qualities.” It seems to me counterproductive for scholars from different disciplines to be using the same terminology to refer to different things, or in this case the reverse: using different terminologies and descriptive language to discuss and analyze the same thing (that is, the significance of an artwork’s material composition).

I sometimes wonder whether the preference among art historians for conceptual terms like materiality, together with all of its added theoretical ambiguity, is simply a means or tool for justification, just another way of overcoming the traditional subject-object dichotomy by approaching the topic using more abstract or pseudo-philosophical language. One could argue that such a stance would not seem out of place in a field that is already apparently overrun with decontextualized inductive reasoning and poststructuralist ideas.

The issue, I think, comes down to the ways in which art history is taught at universities, and also how research projects are structured and

realized. Rather than viewing technical study as a kind of addendum to an established art historical inquiry, it is important to integrate these material perspectives at the very beginning of a research collaboration. This will include organization around time frames and schedules (conservators are notoriously pressed for time when it comes to their already-busy treatment schedules), as well as questions relating to funding and resources (technical examinations are often costly and time-consuming ventures). More specific to the present discussion, an ideal interdisciplinary collaboration requires a shared set of terms and a common methodological framework, one that acknowledges material study as a valid and worthy perspective within a broader art historical setting.

Ultimately, my own opinion is that both disciplines in their pursuit of further collaboration would benefit not only from merging their various empirical methodologies—something that is already taking place (see, for example, Yonan’s description of the technical study of an eighteenth-century desk and *étagère*)—but also the epistemological frameworks that they use when approaching a particular research question. What can the methods and theories of each individual discipline tell us about the empirical knowledge gained from the other side? Can these two viewpoints be merged to form a more integrated mode of inquiry, for example, in the form of shared descriptive or mediating terminology? These questions in turn echo some of the discussions put forward by the archaeologist Rosemary Joyce in her book on the Uluu pottery of eastern Honduras.²⁸ Commenting on the role of narrative in archaeological research and writing, Joyce states:

My own view of what narrative does for us is that it requires the writer to be responsible for his or her interpretations by putting those words in her or his own mouth. A narrative doesn’t allow for the kind of passive-voice proclamations in which archaeology routinely indulges, in which archaeologically created data “indicate”, “suggest”, or otherwise appear to do the talking for us. So, in a narrative, my voice is clearly present and my conclusions have to be acknowledged to be mine.²⁹

This statement, I feel, is relevant to both sides of the discussion presented here. On the one hand, technical art history and the empirical sciences need to be aware of the “passive-voice proclamations” that can come about through an excessively object-centric research approach; one in which “objective” data are translated into broader human or contextual meaning. Similarly, art historians and other humanities scholars would undoubtedly benefit from the practice of checking their own presence within the texts and conclusions they write in relation to their research objects, particularly in those instances where the boundary between subjective interpretation and recorded fact begins to wear thin. In both cases, the issue is one of balance and cross-disciplinary dialogue, the constant shifting or renegotiation of the relationship between the art object and its temporally distant past. What can be said about the time, place, and maker behind a remnant artwork or artefact? What is the position or role of the researcher in relation to the interpretations that are being made through their scholarly engagement with the material object?

These are questions and challenges that continue to face our field in its pursuit of interdisciplinary collaboration. While there have been notable gains in this direction—for example, in the form of more international graduate programs focusing specifically on technical art history—there remain certain challenges and frictions between our various specialisms when it comes to fostering further collaboration. Although the growing body of research within the field of technical art history serves to demonstrate the value of consulting differing scholarly perspectives, there is still a lack of consensus when it comes to the theoretical and methodological language we use to bridge these different viewpoints. For example, what terms or concepts could prove themselves useful in the task of describing the process of translating material data into the more interpretive paradigms of art historical meta-discussion? The broader question, of course, being whether we even wish to adopt a

standardized terminology for this undertaking, or if it would perhaps be more beneficial to allow the object itself to establish those parameters through molding our inquiries based on the revelations of technical findings.

I pose these questions very much with the intent of inviting open discussion and debate on this topic. Clearly there is much work left to be done before we can expect a full integration or shared interdisciplinary framework between these vastly different and sometimes contradictory research fields. However, if recent years have taught us anything, it is that there continues to be an enthusiastic interest toward collaborative scientific research within the arts and humanities. Therefore, I am confident that if we continue to fine-tune our methods and language through these collaborations and shared research interests, these questions will, in effect, answer themselves. As one of my old tutors once said, it is simply a matter of “getting your eye” in there.

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ENDNOTES

¹ For an overview see Maryan Ainsworth, "From Connoisseurship to Technical Art History: The Evolution of the Interdisciplinary Study of Art," *Conservation Perspectives: The Getty Conservation Institute Newsletter* 20 (2005): 4-10; and Joyce Hill Stoner, "Turning Points in Technical Art History in American Art," *American Art* 26, no. 1 (Spring 2012): 2-9.

² See, for example, Erma Hermens, "Technical Art History: The Synergy of Art, Conservation and Science," *Art History and Visual Studies in Europe: Transnational Discourses and National Frameworks*, ed. Matthew Rampley (Leiden: Brill, 2012): 151-65.

³ The importance of shared terminology within an interdisciplinary research context has also been addressed by Anna Bentkowska-Kafel in relation to the field of digital humanities. See Anna Bentkowska-Kafel and Lindsay MacDonald, eds., *Digital Techniques for Documenting and Preserving Cultural Heritage* (Bradford, UK: Arc Humanities, 2017).

⁴ Marco Cardinali, "Technical Art History and the First Conference on the Scientific Analysis of Works of Art (Rome, 1930)," *History of Humanities* 2 (March 2017): 222.

⁵ David Bomford, "Forbes Prize Lecture," *Studies in Conservation* 53 (2008): 203 <This appears to be a reference to a lecture by Edward Waldo Forbes>. Note that the author's reference to Cartesianism here relates to the philosophical and scientific system known as mind-body dualism, developed primarily by the French philosopher and mathematician René Descartes (1596-1650). In this instance, the reference to the "ghost in the machine" is taken from Gilbert Ryle's *The Concept of Mind*, which offers a description and a critique of Descartes's philosophical system. See Descartes, "Meditations on First Philosophy (1641)," *The Philosophical Writings of René Descartes*, vol. 2, trans. John Cottingham, Robert Stoothoff, and Dugald Murdoch (Cambridge: Cambridge University Press, 1984); and Gilbert Ryle, *The Concept of Mind* (London: Hutchinson's University Library, 1949).

⁶ This discussion on Durkheim is presented in Christopher Pinney's essay in Miller's anthology: "Things Happen: Or, From Which Moment Does That Object Come?," *Materiality*, ed. Daniel Miller (Durham, NC: Duke University Press, 2005): 256-72.

⁷ Pinney, "Things Happen," 257.

⁸ This observation was first made by Bruno Latour in *We Have Never Been Modern*, trans. C. Porter (London: Prentice Hall, 1993), 52.

⁹ Latour, *We Have Never Been Modern*, 52.

¹⁰ Michael Yonan, "Materiality as Periphery," *Visual Resources* 35, nos. 3-4 (2019): 200-216. <https://www.tandfonline.com/doi/abs/10.1080/01973762.2018.1475887?journalCode=gvir20>

¹¹ Pinney, "Things Happen," 257.

¹² See Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005); Alfred Gell, *Art and Agency: An Anthropological Theory* (Oxford: Clarendon, 1998); and Graham Harman, *Object-Oriented Ontology: A New Theory of Everything* (London: Pelican, 2018). While Latour's actor-network theory can be taken as dealing more explicitly with the relationships between human actors and non-human actants, Harman's work focuses on the agency of objects beyond the realm of human perception.

¹³ See, for example, Christopher Tilley, "Materiality in Materials," *Archaeological Dialogues* 14, no. 1 (June 2007): 16-20; Tim Ingold, *Making: Anthropology, Archaeology, Art and Architecture*

(London: Routledge, 2013); Ingold, "Materials against Materiality," *Archaeological Dialogues* 14, no. 1 (June 2007): 1-16; Carl Knappett, "Materials with Materiality," *Archaeological Dialogues* 14, no. 1 (June 2007): 20-23; Knappett, "Materiality in Archaeological Theory," *Encyclopedia of Global Archaeology*, ed. Claire Smith (New York: Springer, 2014), 4700-4708.

¹⁴ See, for example, Michael Yonan, "Towards a Fusion of Art History and Material Culture Studies," *West 86th: A Journal of Decorative Arts, Design History, and Material Culture* 18, no. 2 (2011): 232-48; James Elkins, "On Some Limits of Materiality in Art History," *Das Magazin des Instituts für theorie* (Zürich) 12 (2008): 25-30; and Ann-Sophie Lehmann, "The Matter of the Medium: Some Tools for an Art Theoretical Interpretation of Materials," *The Matter of Art: Materials, Technologies, Meanings, 1200-1700*, ed. Christy Anderson, Anne Dunlop, and Pamela H. Smith (Manchester: Manchester University Press, 2015), 21-41.

¹⁵ Elisabeth Reissner, "Technical Study within Art Historical Scholarship: 'Meaning in Making' with Particular Reference to the Works of Paul Cézanne" (PhD thesis, Courtauld Institute of Art, 2015).

¹⁶ Yonan, "Towards a Fusion," 234. For references to Ingold and Tilley see note 13 above.

¹⁷ Yonan, "Towards a Fusion," 234.

¹⁸ Yonan, "Towards a Fusion," 234.

¹⁹ Yonan, "Towards a Fusion," 236.

²⁰ For a discussion of material agency in relation to technical study, see section 2.4.3, "Sensory-aesthetic Experience: Georges Didi-Huberman and James Elkins," in Reissner, "Technical Study within Art Historical Scholarship," 94-99.

²¹ James Elkins, *What Painting Is: How to Think About Oil Painting Using the Language of Alchemy* (London: Routledge, 1999).

²² Reissner, "Technical Study within Art Historical Scholarship," 96.

²³ Ingold, *Making*, 27-28. Here the term "brute materiality" is cited from Tilley, "Materiality in Materials," 17.

²⁴ Elkins, "On Some Limits of Materiality," 2. In his article, Elkins notes how the vocabulary of phenomenology (as described by Maurice Merleau-Ponty) is insufficient when it comes to describing individual artworks. Similarly, the "fear of materiality" on the part of art historians relates to the difficulties involved with marrying together material data and broader historical interpretation or critical thinking. This in turn feeds into the final problem—"the slowness of the studio"—which relates to the challenge of translating detailed painterly processes into more broadly based or fast-paced conclusions that offer art historical insight or relevance.

²⁵ For references on Erwin Panofsky's iconology, see his *Studies in Iconology: Humanistic Themes in the Art of the Renaissance* (New York: Oxford University Press, 1939).

²⁶ Ainsworth, "From Connoisseurship to Technical Art History," 4-10.

²⁷ These issues have been raised in part by Heather Lechtman, Richard Stone, and Katharina Walch-von Miller in dialogue with Jeffrey Levin and Brian Considine. See Lechtman, Stone, and Walch-von Miller, "A Matter of Teamwork: A Discussion about Technical Studies and Art History," *Conservation Perspectives: The Getty Conservation Institute Newsletter* 20, no. 1 (2005): 11-16.

²⁸ Rosemary Joyce, *Painted Pottery of Honduras: Object Lives and Itineraries* (Leiden: Brill, 2017).

²⁹ Joyce, *Painted Pottery of Honduras*, 6.