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Article: Whistler's Little Game: Watercolor Materials and Techniques  
Authors: Emily Klayman Jacobson and Blythe McCarthy  
Source: Book and Paper Group Annual 38, 2019.  
Pages: 15-28  
Editors: Justin Johnson, Managing Editor & Kimberly Kwan, Assistant Editor  
Editorial Office: [bpgannual@gmail.com](mailto:bpgannual@gmail.com)  
ISSN: 0887-8978

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The *Book and Paper Group Annual* is published once each year in print format by the Book and Paper Group (BPG), a specialty group of the American Institute for Conservation (AIC).

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## Whistler's Little Game: Watercolor Materials and Techniques

### INTRODUCTION

Although James McNeill Whistler (1834–1903) dabbled in watercolors as a child and in his early years as an artist, he did not turn to watercolor painting in earnest until after his lawsuit against the art critic John Ruskin in 1878 and subsequent bankruptcy in 1879. At that point, in an effort to revive his career, Whistler traveled to Venice with a commission for etchings from the Fine Art Society. After his return from Venice more than a year later, Whistler's painting in watercolor intensified, becoming an integral part of his working oeuvre and complementing the artistic techniques of his oils and etchings.

This technical study included the 52 watercolors in the Freer Gallery of Art, all bought by founder Charles Lang Freer.<sup>1</sup> They were exhibited for a decade after the museum's opening in 1923 and only sporadically on view since then. In all, there are just more than 200 firmly documented watercolors by Whistler. This number is based on existing watercolors identified in the Whistler catalogue raisonné (MacDonald 1995) but does not include drawings with single color washes, design watercolors, butterfly sketches, or colored etchings. In addition to the Freer works, another 81 watercolors from 19 museums around the United States and Europe were examined, resulting in a significant body of information informing this study.<sup>2</sup>

### EXISTING WATERCOLOR MATERIALS

#### *Pennell Collection at the Library of Congress*

The project began with the examination of known Whistler watercolor materials. A paint box and palette purported to have belonged to Whistler was donated to the Library of Congress in Washington, DC, by Whistler's biographers, Joseph and Elizabeth Pennell, in 1917. Analysis of this paint box published in *Studies in Conservation* (Fitzhugh, Leona, and Shibayama 2011) contained the results for several tubes of watercolor, including ones manufactured by James Newman, George Rowney & Co., Dr. Schoenfeld, and Charles Roberson

& Co. At that time, researcher Jacob Simon brought attention to the fact that, based on label information, seven tubes of watercolor from Charles Roberson could not have been sold until after Whistler's death (Simon 2012, 58). Therefore, it is important to note that the paint box is a composite of materials used by Whistler and from the Pennells, both of whom were artists.

The online resource of Simon (2019), "British Artists' Suppliers," helped us conclude that eight tubes of watercolor are from the correct time period and could have belonged to Whistler, including Newman's moist golden ochre and Dr. Schoenfeld's raw sienna (appendix 1). The collection also includes three tubes of Beckmann's Synotonos-colour in zinc white with Roberson resale labels. Beckmann's Synotonos-colour, a German-manufactured paint, became available in England in 1893. Although considered a substitute for oil paint, its use for watercolor was mentioned in *The Art Journal* in 1895: "They dilute readily with water for water-colour painting, and we have been much pleased with the delicacy and transparency of the washes which they make even on rough paper" ("Art Notes" 1895). Sales records in the archives of colorman C. Roberson & Co. (HKI MS.121-1993 489) list Joseph Pennell's purchases of "Synotonos" white starting in 1895 and continuing through 1896, but they do not list any purchases of this material by Whistler.

#### *Studio Materials at the Hunterian Art Gallery*

Materials that remained in the artist's studio after his death were donated by Whistler's sister-in-law, Rosalind Birnie Philip, to Hunterian Art Gallery in Glasgow, Scotland (appendix 2). They include 10 tubes of watercolor, 13 jars of gouache, and two watercolor palettes, as well as a mixing tray and the lid of a wooden box, which all have remnants of mixed watercolors. The jars of gouache, four of the tubes of paint, and the paint on the palettes were analyzed by Joyce Townsend and Erma Hermans during a study of Whistler's oil paintings at the Tate and are summarized in appendix 2 of *Whistler in Watercolor: Lovely Little Games* (Glazer et al. 2019).

Whistler likely had to relinquish his art supplies during his bankruptcy in 1879. He wrote to Walter Greaves that he

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Papers presented at the Book and Paper Group Session, AIC's 47th Annual Meeting, May 13–17, 2019, Uncasville, Connecticut

should take the “best kind” of Japanese papers from his studio and leave only the “commonest kind” of paper for the bank to claim (GUW09125, Whistler to Walter Greaves, 10 September 1879). Therefore, the materials in the Hunterian are generally associated with his works after 1880. It is possible that some of the materials in the studio may have belonged to Beatrice Whistler, the artist’s wife, who also painted in watercolor.

*Sales Records in the C. Roberson & Co. Archives*

New information about Whistler’s purchases of watercolor supplies was uncovered in sales records at the archives of C. Roberson & Co., held at the Hamilton Kerr Institute in Whittlesford, England (HKI MS.110-1993 601). A transcription of the page referencing Whistler from the ledger book (fig. 1) shows that he began making purchases from Roberson in January 1881. Whistler likely turned to Roberson because he had left numerous other colormen with unpaid bills after his bankruptcy, including Winsor & Newton, Lechertier, Barbe & Co., and Hardy-Alan.

The sales records are in ledger books, written in shorthand, that contain a wealth of information summarized in table 1 of *Whistler in Watercolor—Lovely Little Games* (Glazer et al. 2019, 251). Between 1881 and 1883, during Whistler’s

most prolific period of painting in watercolors, he purchased numerous watercolor supplies from Roberson. For example, on October 11, 1881, Whistler purchased camel hair brushes, sable brushes, a block of paper, a waterproof sketching bag, a japanned water bottle, and watercolor paints—equipment essential for working outdoors. This purchase was immediately before he went on a painting trip to the Channel Islands.

Most importantly, further details from the Roberson warehouse records confirmed that Whistler was buying his watercolor paints in tubes. The description of an 18-tube japanned watercolor box with a divided palette from the ledger matches almost exactly one of the palettes at the Hunterian (GLAHA 54148).

PAPER

*Watermarks*

Computed x-ray radiography was undertaken on the 52 works in the Freer collection, with five watermarks identified. For his early watercolors, those painted before the bankruptcy, Whistler used papers not necessarily intended for watercolor, including laid papers, like those he used for his etchings. Three of the five watermarks found appear

1881		J. McN. Whistler		28 Wimpol
Jany	22	Box Etching materials to order <sup>40/</sup> Box <sup>1/-</sup> Apl 9. Coarse Can h patt med size		
Apl	9	Light grey ? Box 1 of 3 <sup>28/6</sup> F White <sup>4/</sup> Ch White <sup>4/</sup> Lin & terps <sup>5/4</sup> Foun white & colors <sup>16/</sup>		
Ju.	17	Mad Lake <sup>6/-</sup> Oil sables <sup>5/9</sup> Box & Pos <sup>6-</sup> 25. F White <sup>2/6</sup> Ind Red <sup>1/</sup> Dk Dry s oil <sup>6</sup> Ex fine		
	25	Hog longhand <sup>3/9</sup> 1 lb F White in oil <sup>5/-</sup> Box <sup>1/-</sup> 29. Oil colors <sup>1/</sup> box & Pos. <sup>4</sup> Aug 22 1 lb Coarse		
Aug	22	Ground F White & Pot <sup>5/-</sup> Sept 17 set Poles & rings for Easel <sup>30/</sup> Old mahog oval Palette <sup>12/</sup>		
		1 lb Rough F White in Pot <sup>5/-</sup> Turps <sup>1/9</sup> Linseed <sup>1/</sup> Oil colors <sup>12/8</sup> Oct 10. Set hooks Poles & Rings <sup>30/</sup> .		
		Turps. <sup>2/6</sup> Lin <sup>1/6</sup> Lt dry oil <sup>5</sup> Rgh grd white <sup>5/-</sup> Oil colors <sup>14/6</sup> 11th 2 ea Cop Plates 7 x 5. <sup>6/-</sup> 8 x 6 <sup>10/</sup> .		
		9 x 7. <sup>12/</sup> Hd Vice <sup>3/6</sup> 22 in stool enc seat <sup>8/-</sup> Hogtool <sup>2/6</sup> CH Brushes <sup>4/6</sup> Sable <sup>1/6</sup> 8° Block x N <sup>3/6</sup> Brown		
		WProof skg Bag <sup>24/</sup> Jap W Bottle <sup>3/3</sup> 18 tube Jap WC Box div Pal <sup>8/6</sup> WColors <sup>16/4</sup> 22in 3x9 Ex fine		
		SPCan <sup>5/10</sup> Nov 3. 1 lb Pot Rgh F White <sup>5/-</sup> 11th Oil colors <sup>9/6</sup> Linoil <sup>1/6</sup>		
	1882			
Jan	27	2 lb Rough F White <sup>6/8</sup> 29 Pot Rgh Grd White <sup>3/4</sup> Oil tubes <sup>26/</sup> Aug 8. 8° Imp Blk		
		& base <sup>5/-</sup> Sables <sup>13/6</sup> Ex fine WC Hog <sup>2/6</sup> 2 Prep Millbds 12 x 8 <sup>1/10</sup> . 13 x 9 <sup>2/</sup> 9th WColors <sup>4/8</sup>		
Sep	16	WColors <sup>11/8</sup> Ex Fine Hog <sup>9/9</sup> 6 Prep Millbds 10 x 8, <sup>4/6</sup> . 1 Block 11-1/2 x 9, <sup>7/</sup> 10 x 7 <sup>3/6</sup> x N		
	23	(Rep WC palette) 2 Copper Plates ea 5-3/8 x 3-3/8 <sup>4/</sup> . 3-3/8 x 1-3/4 <sup>2/</sup> . 5-3/8 x 1-3/4 <sup>1/6</sup> Etg ground <sup>1/-</sup>		
Oct	9	Bn Paper Block 11-1/2 x 9. <sup>3/</sup>		
	1883			
Jan	27	Etchers HandBk <sup>5/-</sup> Feb 2. Etch Ground <sup>2/</sup> Silk Dabber <sup>1/6</sup> Pos. <sup>4</sup> 8th Etg ground <sup>1/-</sup>		
Feb.	8	Silk Dab <sup>1/6</sup> Pos <sup>2</sup> Mar 8. WC Sables <sup>11/4</sup> Dble Elept 8° Blk x N <sup>7/</sup> Imp 8° do <sup>4/6</sup>		
Apl	14	Oil colors <sup>2/</sup> Exf Hog <sup>2/</sup> Flat oil sables <sup>15/5</sup> Box & pos <sup>6</sup> Ju 18 Mar <sup>1/6</sup> Pe <sup>1/8</sup> Imp		
July	12	3 Dbl Elep 8° Blks x HP <sup>21/</sup> 2 Imp 4 <sup>10</sup> Blk x HP <sup>14/</sup> Chi White <sup>8</sup> Red WC Sables <sup>8/4</sup> Au 8. Flat		
		oil sables long han <sup>11/11</sup> Pochade Box <sup>7/</sup> 2 ea 8° Blk x N, x HP <sup>14/</sup> WColors <sup>11/4</sup> oil do <sup>1/6</sup> Bsh Case <sup>2/</sup> .		

Fig. 1. Transcription of the C. Roberson & Co. ledger page of purchases by James McNeil Whistler.

in works painted during a trip with fellow artist Ernest Delannoy in Northern France and the Rhineland in 1858. One watermark, with the initials “LL” in a wreath (fig. 2), has been identified by paper historian Peter Bower (pers. comm., May 16, 2018) as that of a French stationer and was found in both versions of *The Kitchen* (F1898.152 and F1898.153). A partial “BLAUW” watermark (fig. 3) was found on the watercolor *Boutique de Boucher—Saverne* (F1898.156). This is part of the countermark of Dutch papermakers Dirk and Cornelis Blauw. It is unclear whether this is a Dutch paper considering that this watermark is known to have been copied by French papermakers throughout the 18th and 19th centuries. Finally, the blind stamp “FRÈRES” (fig. 4), found on *Street at Saverne* (F1898.147), could be the mark of a number of French papermakers with “Frères” in their names but has not yet been firmly linked to one specific papermaker.

Most of Whistler’s watercolors (about 80%) created during the 1880s were painted on traditional wove watercolor papers. Although he continued to use Japanese and old papers for etchings produced in Venice, one of only three watercolors painted during the trip, *Venice Harbor* (F1905.118),

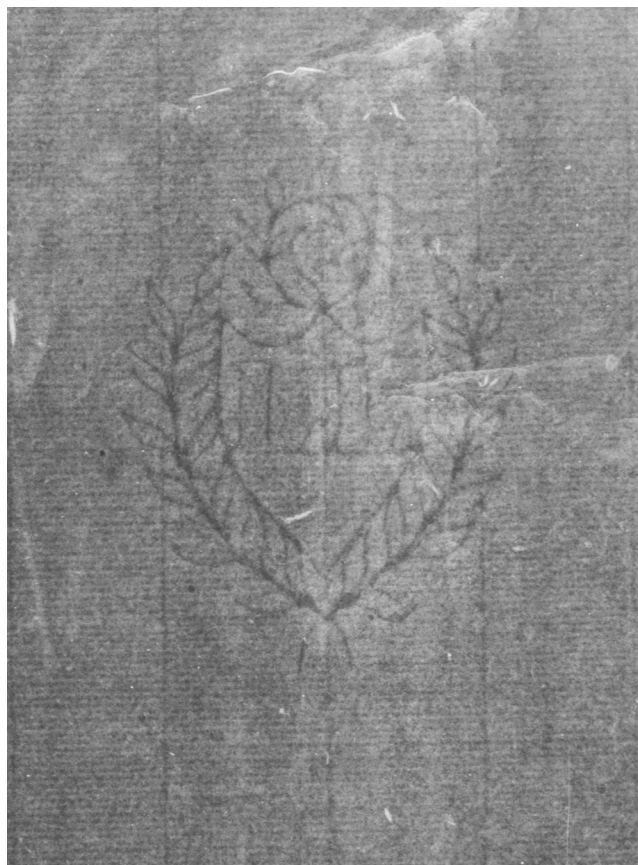


Fig. 2. Computed radiograph of watermark with the initials “LL” in a wreath found in *The Kitchen* (F1898.153).

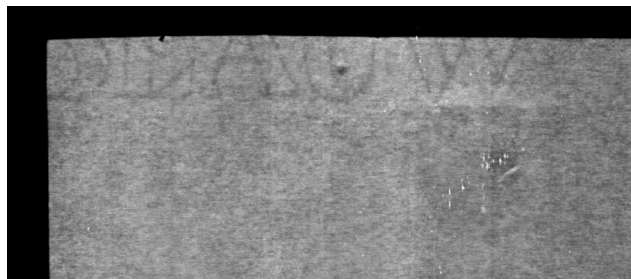


Fig. 3. Computed radiograph of partial watermark reading “BLAUW” found in *Boutique de Boucher—Saverne* (F1898.156).

presages a change in the type of paper Whistler used for watercolors in his mature period. Painted in 1879, the paper of *Venice Harbor* has a “J. Whatman/Turkey Mill/187[?]” watermark (fig. 5). Turkey Mill was the Whatman mill run by the Hollingsworths in Boxley, England. Another Whatman watermark appears on *Nocturne: Grand Canal, Amsterdam* (F1902.161), painted in 1882. It has a partial name and date, “[?]MAN 1881,” followed by the letter “B” (fig. 6) and has been identified by Peter Bower (pers. comm., April 9, 2018) as a partial Whatman watermark. The letter B was added to indicate that it was made by papermaker William Balston at Springfield Mill in Maidstone, England.

#### Paper Blocks

The Roberson archives includes the information that between 1881 and 1883, Whistler purchased 16 blocks. A block was made with sheets of paper compressed and sealed around the edges, except in one section along the top edge. Once the top sheet was painted, it could be separated by inserting a sharp tool into the unsealed section and running it around the edges to cut the adhesive and release the top sheet. Blocks made it much easier for watercolor artists to travel and paint outdoors. Roberson offered blocks made with papers from multiple papermakers, including Whatman, and those named after watercolor artists such as Varley, Cox, and Harding. Unfortunately, no information about the paper or papermaker for the blocks Whistler purchased is included in the Roberson ledgers. Block sizes were extrapolated from information listed in the ledger and ranged from 7 × 10 in. to



Fig. 4. Blind stamp reading “Frères” found along the edge of *A Street at Saverne* (F1898.147).



Fig. 5. Computed radiograph of watermark reading “J. WHATMAN/TURKEY MILL/187[?]” found in *Venice Harbor* (F1905.118).

10 × 14 in. These sizes are approximate, as variations in sheet size were common in hand production. The use of blocks was confirmed by the presence of blue fiber and adhesive residues along the edges of 23 watercolors (fig. 7).

There are also three small blocks, each 3-1/2 × 5 in., in the Hunterian collection (GLAHA 55489-55491), although no watercolors this small were seen during this study. The label on one block identifies it as being purchased in Algiers, which Whistler only traveled to in 1901, a few years before his death (GLAHA 55491). A majority of Whistler’s watercolors, ranging from the smallest at 3-3/4 × 6-1/8 in. to the largest at 8-11/16 × 12-3/16 in., are sizes that could have come from the blocks Whistler purchased through Roberson.

#### Paper Texture

Watercolor papers during the 19th century were manufactured with surfaces sold under the following names: rough, cold press, and hot press. Watercolor paint takes on a difference appearance when brushed across these three surfaces, lying more smoothly on a hot-pressed paper and less evenly on rough surface (figs. 8–10). The Roberson ledger includes details on the particular surface textures that Whistler requested for his blocks—he purchased seven hot-pressed blocks and seven cold-pressed blocks, with another two blocks unidentified.

Each papermaking mill developed its own processes for the finishing of the paper, so the distinctions between the three textures are very subjective; what looks like a cold-pressed paper from one mill may resemble a rough surface from another. For this study, three modern Sennelier watercolor papers were chosen to use as standards for assessing Whistler’s papers (N139911 cold pressed, N139912 hot pressed, and

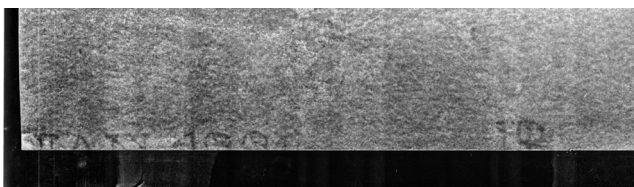


Fig. 6. Computed radiograph of partial watermark reading “MAN 1881 B” found in *Nocturne: Grand Canal, Amsterdam* (F1902.161).

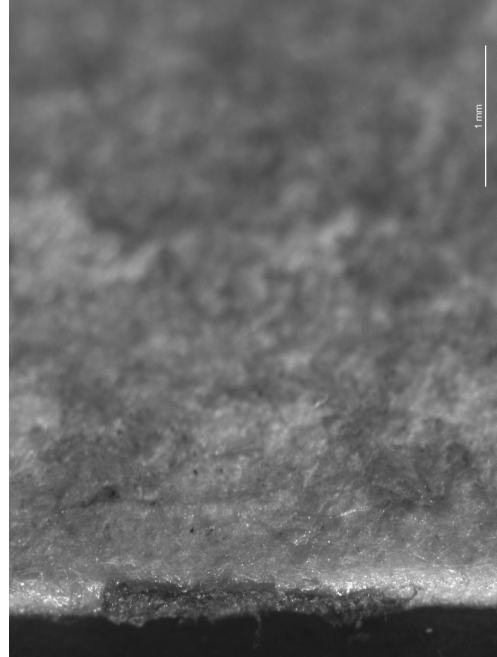


Fig. 7. Blue fabric remnants, like those seen at the edge of *Southend Pier* (F1904.82), confirm that many of the papers that Whistler used were removed from blocks.

N139913 rough). Although Whistler used the hot and cold pressed papers relatively equally, two discernible trends were identified: Whistler used mainly cold pressed papers for his seascapes and preferred the smooth, hot-pressed surface for a majority of his street scenes.

#### Experimentation

Whistler purchased at least five fabric-covered boards that bear the stamp of E. Mary & Fils (fig. 11). Opened in 1882, E. Mary became the Paris agent for Charles Roberson & Co. in 1883. The boards for the five works (including *Green and Silver—Beaulieu, Touraine* (F1899.25) are a similar size and all have the maker’s stamp on the verso. Although the boards were probably manufactured for oil painting with a pre-prepared ground layer of white lead (confirmed by XRF and FTIR of F1899.25), Whistler experimented with them nonetheless.

Eleven watercolors examined were painted on Japanese paper. Whistler used Japanese paper for his etchings and was well aware that the surface of these papers could be soft, unsized, and not conducive to painting in watercolor. Seven of these 11 works are painted on Japanese paper-wrapped boards. These Japanese paper-wrapped boards do not appear in the sales catalogs of artists’ suppliers from this time period. *Two Pettigrew Sisters Asleep with a Baby* (GLAHA 46159) at the Hunterian Art Gallery is on a Japanese paper-wrapped board

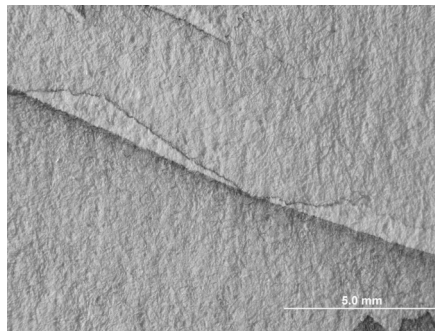


Fig. 8. Detail of *St. Ives: Cornwall* (F1905.117) showing the smooth texture of a hot-pressed paper.

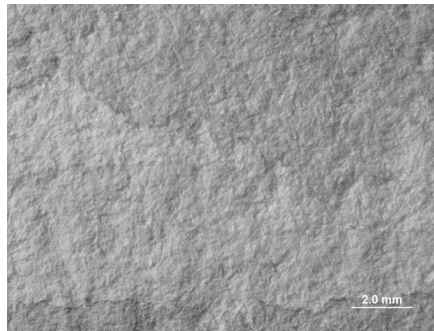


Fig. 9. Detail of *Grey and Silver—Pier, Southend* (F1902.169) showing the slight texture of a cold-pressed paper.

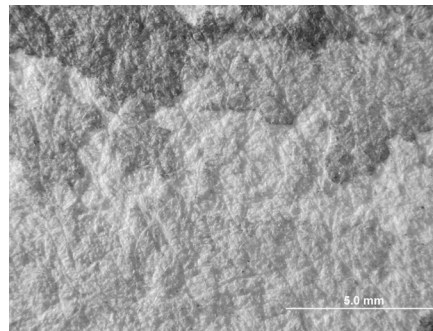


Fig. 10. Detail of *Venice Harbor* (F1905.117) showing the pronounced texture of a rough paper.

that has a maker's stamp on the verso—that of E. Mary & Fils—raising the possibility that Whistler requested that these special boards be made for him.

After 1888, Whistler experimented using brown paper for his watercolors, producing at least nine works on that support, including *Blue and Gold—The Rose Azalea* (F1894.25). This was a paper that Whistler had always favored for his pastels, writing to the artist Auguste Delâtre, “Enclosed I am sending you a sample of the brown paper with which you wrapped the etchings when you sent them to me . . . Now it is just the paper I need for my drawings. I am always looking for some” (GUW 09057, Whistler to Auguste Delâtre, October 1871/1874).

#### PIGMENT ANALYSIS

Pigment analysis on the Freer watercolors began with non-invasive methods of x-ray fluorescence spectroscopy (XRF) and fiber optic reflectance spectroscopy (FORS), attempting to analyze each color by picking about 10 or more spots that appeared to be the most pure and to have only one layer of

watercolor (fig. 12). This was followed by reflectance Fourier transform infrared spectroscopy (FTIR), in situ on the painting, for confirmation of Prussian blue and identification where possible of yellow. These methods provided targets for further analysis: potential organic colorants using high-performance liquid chromatography—mass spectrometry with a UV-VIS diode array detector (LCMS-DAD).

The results were complicated by Whistler's use of pigments, which, similar to his oil painting practice, often utilized a mixture of the same pigments in varying amounts to form almost every color. His apprentice, Inez Bate, wrote that the artist taught his students not to “use too independent colours—Let everywhere the same material run throughout” (GUW 00226, Inez Bate Addams to Whistler, May 1899/1901). Thus, this study was defining the colors of the Whistler watercolors by their major components, recognizing that each color also contained minor amounts of the other pigments that he used in the specific work. Limited XRF or FORS analyses were carried out on watercolors in other collections, although the results shared here are primarily those on the Freer works.

#### Student Palette

The earliest watercolor in the Freer, *A Fire at Pomfret* (F1905.333), contains the pigments lamp black, vermilion, cochineal/carmine, cobalt blue, indigo, iron oxides, and Prussian blue and an organic yellow to make green. Although it is unlikely that Whistler was still using the same paints for *Sam Weller's Landlord in the Fleet* (F1905.332), painted about 5 years later, he likely was still using materials that were readily available, although painting with a limited number of colors and applied sparingly (lamp black, vermilion, cobalt blue, indigo, iron oxides with touches of zinc white). Whistler is known to have torn pages from books to use for his drawings, and this watercolor is the exact same size as a page from one of Whistler's textbooks (Whistler 166) held at the University of Glasgow Library. Whether the page comes from this textbook has not been confirmed.



Fig. 11. Manufacturer's stamp on the verso of *Green and Silver—Beaulieu, Touraine* (F1899.25). This stamp appears on the verso of four other works on the same fabric-wrapped boards.

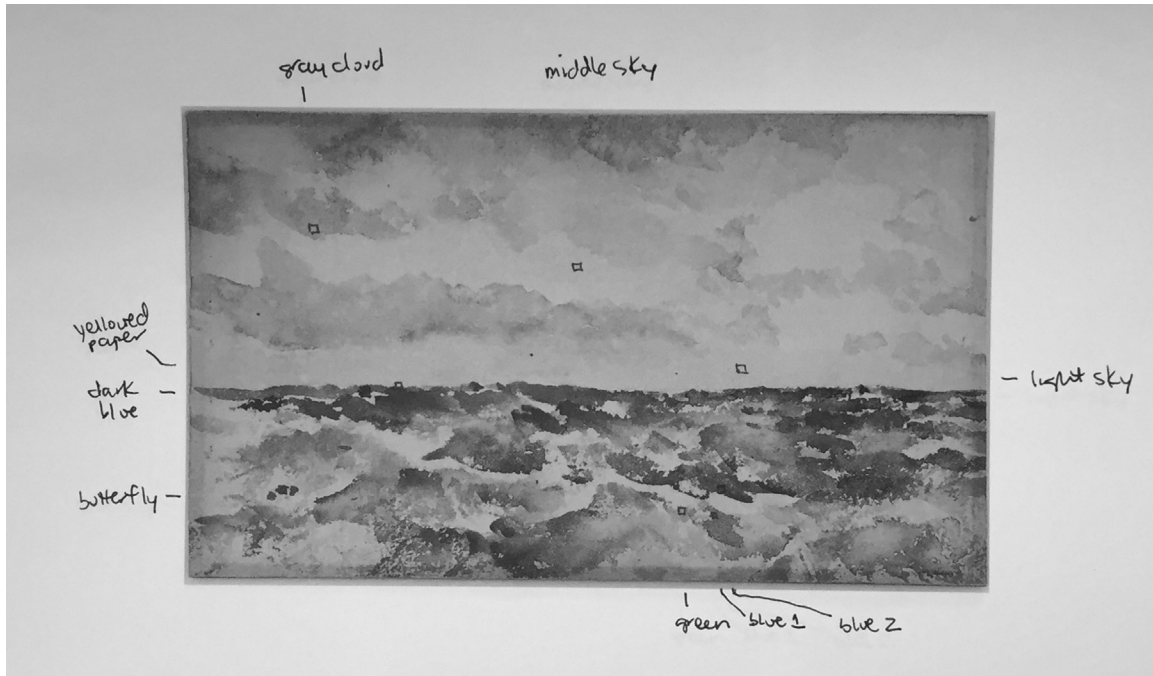


Fig. 12. Photocopy image of *Blue and Silver—Choppy Channel* (F1899.24) marked to identify the spots analyzed by FTIR and FORS. Similar templates were made for all 52 watercolors.

#### Early Palette

Throughout the 19th century, discoveries of new colorants extended the palette available to artists, but with the exception of cobalt blue, Whistler's early watercolors rely primarily on well-established pigments. A variety of iron-based pigments, bone black, vermilion, indigo, cobalt blue, lead white, and an unidentified organic green, are found in the watercolors from his 1858 trip with Delannoy. The early watercolors contain multiple iron oxide pigments within each work. Yellows generally were iron oxides, although chrome yellow was found in *Boutique de Boucher—Saverne* and both examples of *The Kitchen*.

Assuming that his supplies were lost due to his bankruptcy, the pigments used in *Venice Harbor* likely were new purchases or supplies borrowed from the young American artists, such as Otto Bacher, who Whistler met in Venice. The palette seems to continue what he was using earlier. Although the use of zinc white here is a departure from the watercolors he painted during his 1858 trip, it was not new for Whistler. He was using zinc white touches in his juvenilia, and zinc was found in the ca. 1867 watercolor study *In the Studio* (DIA 51.223) in the Detroit Institute of Art.

On his return to England, Whistler had great success with the sale of his small pastels from Venice. He began painting a series of small, portable watercolors that he hoped would be equally as marketable. "I have done delightful things," he confided to a fellow artist, "and have a wonderful game to

play" (GUW 09420, Whistler to Waldo Story, January 1884). Whistler used the word *game* in a double sense: to refer to both his latest work and his plans for selling it.

At Whistler's probable instigation, his friend, architect Edward W. Godwin, described *London Bridge* (F1905.115) in the journal *British Architect* in September 1881 as Whistler's first watercolor. Although put forward as something new, this work is well aligned with Whistler's previous work in watercolor in terms of materials and technique. *London Bridge* was also one of the last of Whistler's watercolors to feature underdrawing—a striking element of Whistler's technique after September 1881 is that he stopped utilizing any underdrawing.

#### Mature Palette

It was after an October 1881 purchase from Roberson that Whistler appears to have made a definitive switch from painting with cobalt blue to the cheaper cerulean blue. The latest identification of cobalt blue by FORS in the Freer watercolors is in *London Bridge*, painted before September 1881, whereas the earliest watercolor with cerulean blue in the Freer, *Note in Blue and Opal—Jersey* (F1904.83), dates to a November 1881 trip to the Channel Islands. This trip was taken after the purchases from Roberson in October 1881. FORS was used to differentiate these two cobalt pigments based on their different absorptions. After 1881, only cerulean blue was found with FORS. In some cases, cobalt without tin was found on the watercolor by XRF, often with cerulean blue

seen in FORS in other areas of the watercolor. This non-cerulean blue cobalt was seen in some watercolors together with Prussian blue and was perhaps the mixture referred to as Leitch's blue, Antwerp blue, or cyanine blue ("Leitch's Blue" 2013). In a few works with cobalt, neither cobalt blue nor cerulean blue pigments were found by FORS, and no Prussian blue was present. In these cases, there was always a hydrated iron oxide present. Metals were added to alter the tint of iron oxide pigments (Helwig 2007), and the cobalt may be present in the iron pigment.

Both zinc white and bone black were found in all of the watercolors in the Freer collection dated after 1880. Various scholars have attributed either blue or brown tints to bone black. In Whistler's watercolors, small blue particles were present, and the blacks have a blue cast. Tubes of ivory black are found among the Whistler materials at both the Library of Congress and the Hunterian. Prussian blue or cobalt are often found in the black areas, and it is likely that Whistler used them to form a mixed black (Field 1835, 179).

In the 1880s, the palette expanded to include more of the modern, manufactured pigments. Cadmium and lemon yellow, emerald green, and madder are found in addition to the pigments that Whistler used previously. Some of the iron-based pigments in use after 1881 were quite pure and lacked the chemical elements, such as silicon, aluminum, magnesium, and rubidium, normally associated with the quartz and clay components found in natural ochres. This suggests that some of these pigments may be artificial Mars colors.

A critic's review of Whistler's 1884 exhibition "Notes"—"Harmonies"—"Nocturnes" in the *Standard* described *A Note in Green* (F1902.165) as a girl standing "in front of a blazing greenish-yellow background" ("Mr. Whistler's Exhibition" 1884). Only traces of this bright yellow can be seen along the left edge, where the frame protected the watercolor from light, whereas the yellows in the rest of the painting have dulled. Energy-dispersive x-ray spectroscopy (EDS) confirmed the presence of a strontium chromate yellow, which is known to display a color shift toward green due to degradation from light exposure, as well as cadmium sulfide (Otero et al. 2017). Both strontium chromate (lemon yellow) and lead chromate (chrome yellow) were identified in works from this period, although they are not found among Whistler's studio materials. Cadmium sulfide yellow is among the materials at the Hunterian.

Madder, a red anthraquinone plant dye with two major colorants (alizarin and purpurin), fluoresces in UV light due to purpurin. Only purpurin was found in the pink gown in *Southend Pier* (F1904.82) using LCMS-DAD. Although madder is present in *Southend Pier*, iron oxide reds, mixed or layered with vermilion, are more common in Whistler's watercolors.

Multiple pigments were mixed together to form the varied green shades used in Whistler's seascapes and landscapes. Copper arsenic-containing pigments with similar appearance

were found in the *Reach in the Upper Thames* (F1905.121) and *Blue and Silver—Choppy Channel* (F1899.24). A sample from *Blue and Silver—Choppy Channel* was identified as emerald green using Raman spectroscopy. However, the majority of Whistler's greens are optical greens made from the mixing or layering of pigments. The dominant pigment is often tinted with a secondary blue, yellow, or green. The optical greens generally contain yellow iron oxides, cadmium sulfide or chromates, or more than one of these, mixed with Prussian blue. Indigo or cerulean blue, either in addition to the Prussian blue, or occasionally without it, were also identified. Some or all of the Prussian blues may be Antwerp blue, a mixture of Prussian blue and aluminum sulfate; however, the analytical methods used in this study do not permit differentiation.

During FTIR analysis of pigments in the three watercolors associated with St. Ives on the Cornwall coast, kaolin clay was discovered in the paper. Kaolin clay is a natural resource in the Cornish hills and may have been used as a filler or coating in the paper. The St. Ives papers are the only ones among Whistler's watercolors found to contain kaolin. Another factor that differentiates the St. Ives watercolors from other seascapes is a lack of cerulean blue (or cobalt for that matter), which is unusual for Whistler's seascapes.

#### Late Palette

The palettes and the paint box lid at the Hunterian Art Gallery contain both lead and zinc whites mixed together, although they were not found together in any Freer works. Using XRF, the elements lead and zinc were found together in white areas in two watercolors at the Art Institute of Chicago, dating to the 1890s: *The Little Blue Cap* (AIC 2012.96) and *Green and Blue: The Dancer* (AIC 1988.219). The presence of both zinc and lead in the Hunterian palettes supports an association of these materials with the later years of Whistler's career.

#### WORKING TECHNIQUES

Little has been written about Whistler's working techniques in watercolor painting. Indeed, Whistler himself rarely wrote about his watercolors; a trove of his correspondence survives but answers few questions about his watercolor practice (GUW—The Correspondence of James McNeill Whistler). The only information comes from Whistler's follower Mortimer Menpes, who wrote "In water colours Whistler always used Chinese white [zinc white] with every tone, to give body to the pigment—just as in his oil colours he used ivory black" (Menpes 1904, 73).

Whistler added zinc white to his paints in almost all of his watercolors after 1880; however, he sometimes used it in discrete areas, and other times over the entire painting, as indicated by the fluorescence of zinc white in the watercolors (and confirmed by XRF and FORS analysis). For example, *Southend—Sunset* (F1905.119) only fluoresces in some of the





Fig. 13. Black and white image of *Milly Finch* (F1907.170) in normal light.

clouds, whereas *Pink Note: The Novelette* (F1902.158) fluoresces almost all over. It is important to keep in mind that the fluorescence of zinc white can be quenched over time due to exposure to light and moisture (Artesani et al. 2016). This is clearly visible in the UV image of *Grey and Silver—Pufflet* (F1902.117), where the frame rabbet covered the edges of the painting, preserving the fluorescence. Therefore, a lack of fluorescence does not necessarily indicate an absence of zinc white.

Terminology of watercolor and gouache paints became an interesting issue based on Whistler's watercolors. Although zinc white is mixed into most of his mature watercolors, many of them remain quite transparent, so the terms *gouache* or *opaque watercolor* have implications that do not seem to fit with these works. However, calling them watercolors does not convey the fact that they incorporate zinc white. It would be interesting to hear how other conservators deal with this question and what terminology would be suggested.

Although the watercolors appear quite simple and dashed off, many have been reworked. One example is a change made in the skirt of the reclining figure in *Milly Finch* (F1907.170) that was revealed during examination with reflected infrared light (figs. 13, 14). The infrared image shows that the skirt of the figure was originally spread wider and was subsequently painted over.

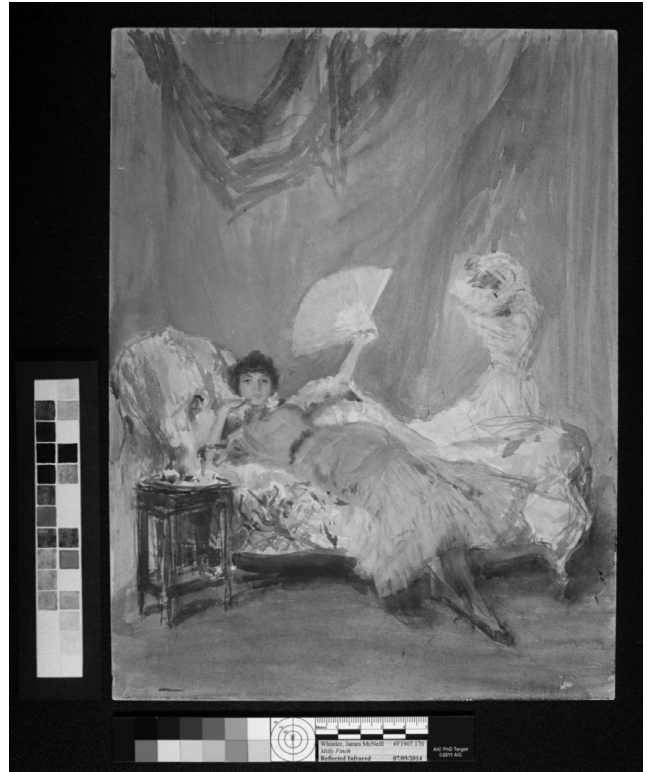


Fig. 14. Reflected infrared image of *Milly Finch* (F1907.170), which reveals changes made to the skirt of the reclining figure.

Examination with the microscope revealed many areas that had been reworked using various watercolor techniques, including sanding, rewetting, and blotting. Areas of disturbed fibers in the paper indicating rewetting and reworking can be seen in the detail of the face in *Harmony in Violet and Amber* (F1902.164) (fig. 15).

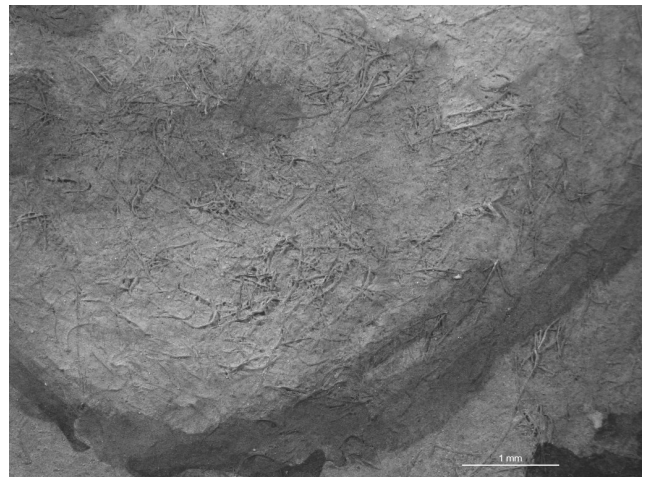


Fig. 15. Detail of *Harmony in Violet and Amber* (F1902.164). The disturbed fibers in the face indicate that Whistler reworked this area of the watercolor.

## MOUNTING AND PRESENTATION

Throughout his career, Whistler dictated all elements of his artworks—from choosing frame colors and decorating the frames himself to selecting wall colors and writing exhibition text. Whistler placed his watercolors into the frames with no mats or spacers, giving his watercolors the same status as his oil paintings (fig. 16).

Small graphite “sight” marks were found in at least 29 watercolors, either in the corners (fig. 17) or as marks along the edges. It is quite possible that these are marks made by Whistler to show his framer how he wanted his watercolors to appear in the frame. Whistler once wrote, “[T]ell Grau to measure them for the usual frames he always makes for all my little pictures—Oil or watercolour or Pastel—and tell him to be most particular . . . to get the exact measurement of the ‘sight’” (GUW 08001, Whistler to Charles James Whistler Hanson, September 14/21, 1888?).

Whistler also preferred that his works be adhered over-all to a backboard for display, writing “I should really like them to be ‘laid down’” because “they would look all the more solid, and fit their frames better and appear smarter if they were ‘laid down’” (GUW 08610, Whistler to Charles Dowdeswell, February 25/28, 1886). *Green and White: Dieppe* (B2011.26), at the Yale Center for British Art, has an L.



Fig. 16. *Note in Pink and Purple—The Studio* (F1902.163) in its original Whistler-designed frame



Fig. 17. Detail of *Pink Note—Shelling Peas* (F1902.166) with one of the sight marks that may have been left by Whistler.

Cornellisen stamp on the verso. Based on a visible adhesive layer between the watercolor paper and board, the watercolor was probably mounted by Cornellisen after Whistler had painted it. A label on the verso of *A Little Red Note—Dordrecht* (F1908.15) (fig. 18), of Lechertier Barbe & Co., suppliers in London, could indicate the work was a premade watercolor board or mounted by them. Four of the watercolors examined during this study had been removed from their mounts at some point in their past. Because Whistler dictated that his watercolors be mounted, many boards are likely historic and should be considered an integral part of the work.

Paper discoloration is visible in about half of the watercolors observed in all collections. Small areas of unpainted paper have now yellowed, in many cases with a halo of unchanged paper around the discolored area. It is possible that this deterioration occurred while the watercolors were stored in their original wood frames; however, this has not yet been confirmed. Although it is imperative to maintain the connection between original Whistler frames and their watercolors, it would be best to house them separately to avoid potential damage.

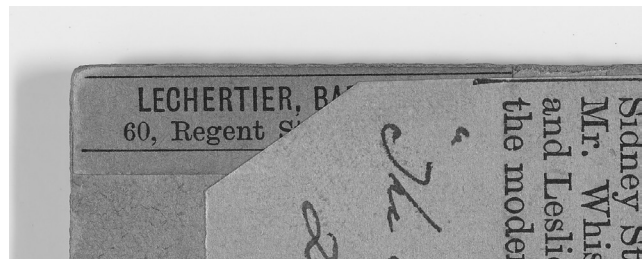


Fig. 18. Partially visible Lechertier, Barbe & Co. label on the verso of *A Little Red Note—Dordrecht* (F1908.15).

## CONCLUSION

In keeping with his paper choices for his etchings, Whistler used older and unusual papers in his watercolors painted before the 1880s. These watercolors were sketched first in graphite and subsequently painted, adhering to the British tradition for watercolor painting. In some early works, he used mixtures of cobalt blue, Prussian blue, bone black, iron earth pigments, and lead white, which has oxidized in many instances (e.g., in *The Kitchen*, F1898.153).

Once Whistler began painting in watercolor in the 1880s, he moved to using traditional wove watercolor papers, including Whatman paper. He used zinc white predominantly, alternating between mixing it with almost every color he used and adding it in specific areas only. His preferred palette shifted to painting with cerulean blue rather than cobalt and saw the addition of touches of cadmium, lemon, chrome, and strontium yellows, as well as cadmium orange and emerald green. Similar to his works in oil, Whistler used varying amounts of the same set of pigments that were used throughout the watercolor to obtain subtle variations in shade.

Most importantly, in his watercolors, as well as his pastels and oils, Whistler chose to create small, intimate works. Although the portable aspect of these works was certainly part of Whistler's "game" to create sellable artworks, the

watercolors also continued the same painting principles that he applied to his works in all media.

## ACKNOWLEDGMENTS

A project of this scope could not have occurred without the assistance of many colleagues. The authors would like to thank everyone who hosted them at their institutions, undertook analyses, patiently answered queries, and assisted in this project: Christina Bisulca, Katherine Blood, Stacy Bowe, Peter Bower, Bruker AXS Inc., Victoria Button, Francesca Casadio, Soyeon Choi, Matthew Clarke, Kristie Couser, Kristi Dahm, Patricia de Montfort, Alan Derbyshire, Ann Driesse, Anne Evenhaugen, Theresa Fairbanks-Harris, Beth Finch, Elisabeth West Fitzhugh, Chris Foster, Lee Glazer, Alexandra Greathead, Erma Hermens, Roy Hewson, Erica Hirshler, Rena Hoisington, Amy Hughes, Bruce Kaiser, Penley Knipe, Natalie Lawler, Marco Leona, Alison Luxner, Margaret MacDonald, Annette Manick, Amy Marquis, Justin McCann, Niamh McGuinne, Chika Mori, Lauren Murtagh, Barbara Natanson, Mark Norman, Lizzie O'Neill, Antoinette Owen, Régine Page, Tom Primeau, Pamela Robertson, Kerry Roeder, Kim Schenck, Bhavesh Shah, Nobuko Shibayama, Jacob Simon, Martha Smith, Harriet Stratis, Joyce Townsend, Sidney Williams, Jo Kirby, Kate Helwig, and Sally Woodcock.

## APPENDIX

## Appendix 1. Watercolors in the Library of Congress Whistler paint box

This list of paints includes analytical results from Fitzhugh et al. (2011); paint availability information taken from the National Portrait Gallery, "British Artists' Suppliers" (Simon 2019); and additional label information discovered through enhancement of digital images.

Label Information	When Available	Fitzhugh et al. Number	Pigments Identified
<i>The following watercolors could have been used by Whistler:</i>			
[Elfen]beinschwartz Dr. Fr. Schoenfeld (label not fully legible)	1862; sold in England from 1882 on	26	Ivory or bone black
Newman's Moist Cadmium Orange 24 Soho Square, London	1801–1937	19	Cadmium orange
Geo. Rowney & Co. CR. LAKE. (Crimson Lake) 52 Rathbone Place & 29 Oxford St., London	1862–1881	10	Carmine and calcium carbonate
Fine Watercolor Paints Cobalt Blue Dr. Fr. Schoenfeld & Co., Düsseldorf	After 1862; sold in England from 1882 on	14	Cobalt aluminate

(Continues)

Appendix 1. Watercolors in the Library of Congress Whistler paint box (*Continued*)

Label Information	When Available	Fitzhugh et al. Number	Pigments Identified
French Ultramarine C. Roberson & Co. (label fragmentary)	1840–1908	23	Synthetic ultramarine (sulfur-containing aluminosilicate)
Newman's Moist Golden Ochre 24 Soho Square, London	1801–1938	21	Yellow iron oxide (goethite) and quartz
Rowney & Co. Moist Color Neutral Tint (label not fully visible)	1848–1923	17	Graphite with red and blue particles
Fine Watercolor Paints Raw Siena Dr. Fr. Schoenfeld	1862; sold in England from 1882 on	15	Yellow iron oxide (goethite)
<i>The following watercolors could not have been used by Whistler:</i>			
Tempera Colours for Decorative Design Antwerp Blue Roberson & Co. 99 Long Acre, London	Not seen in catalogs before 1903	9	Prussian blue
Burnt Sienna C. Roberson & Co. 99 Long Acre, London (label not fully visible but likely to be Ltd.)	No earlier than July 1908	7	Red iron oxide (hematite)
Emerald Green C. Roberson & Co. Ltd. 99 Long Acre, London	No earlier than July 1908	4	Emerald green (copper aceto-arsenate)
Indian Red C. Roberson & Co. Ltd. 99 Long Acre, London	No earlier than July 1908	5	Red iron oxide (hematite)
Light Red C. Roberson & Co. Ltd. 99 Long Acre, London	No earlier than July 1908	6	Red iron oxide (hematite) and quartz
Vermilion C. Roberson & Co. Ltd. 99 Long Acre, London	No earlier than July 1908	12	Artificial vermilion and unidentified organic red
Vermilion Roberson & Co. Ltd. Long Acre, London	No earlier than July 1908	20	Artificial vermilion
Beckmann's Syntonos [Colours] Zinc White L. Auerbach & Co. Partially covered by resale label: Roberson & Co. 99, Long Acre, and 154, Piccadilly, London	1893 or later	3	Zinc white

## Appendix 2. Watercolor Supplies from Whistler's Studio at the Hunterian Art Gallery, University of Glasgow

Hunterian Number	Watercolor Supply	Size	Notes
GLAHA 54139	Dr. Fr. Schoenfeld & Co. finest wet watercolor tube, raw sienna		
GLAHA 54140	Glass bottle of Newman's luminous body colour, Antwerp blue	10 mL	
GLAHA 54147	Wooden paint box with watercolors mixed on lid		
GLAHA 54148	18-tube japanned watercolor box with divided palette		
GLAHA 55460	Japanned palette; lid with 3 wells		Newman label
GLAHA 55461	Tube of Winsor & Newton moist colour, raw umber		
GLAHA 55462	Tube of Winsor & Newton moist colour, light red		
GLAHA 55463	Tube of Winsor & Newton moist colour, ivory black		
GLAHA 55464	Tube of Newman's moist colour, French blue		
GLAHA 55465	Glass bottle of Newman's luminous body colour, Newman's white	10 mL	
GLAHA 55466	Glass bottle of Newman's luminous body colour, unknown black	10 mL	
GLAHA 55489	Block of cold pressed paper with incorporated wood base	5-1/6 x 3-9/16 in.	
GLAHA 55490	Imperial 32 mo (32°) block of Whatman cold pressed paper with incorporated wood base	5 x 3-5/8 in.	Made by Rowney; sold by Sennelier and/or Prevost
GLAHA 55491	Block of cold pressed paper with incorporated wood base (purchased in Algiers while there in 1901)	5-1/8 x 3-5/8 in.	Sold by Grande Droguerie/Produits chimiques/L. Ferriol/Rue de Constantine, 19/Alger
GLAHA 55492	Ceramic mixing tray (purchased in Algiers while there in 1901)		Sold by Grand Droguerie/Produits chimiques/L. Ferriol/Rue de Constantine, 19/Alger
GLAHA 57765	Glass bottle of Newman's luminous body colour, cobalt blue	10 mL	
GLAHA 57766	Glass bottle of Newman's luminous body colour, vermilion	10 mL	
GLAHA 57768	Glass bottle of Newman's luminous body colour, venetian red	10 mL	
GLAHA 57769	Glass bottle of Newman's luminous body colour, cadmium yellow	10 mL	
GLAHA 57770	Glass bottle of Newman's luminous body colour, yellow ochre	10 mL	
GLAHA 57771	Glass bottle of Newman's luminous body colour, lemon yellow	10 mL	
GLAHA 57772	Glass bottle of Newman's luminous body colour, raw umber	10 mL	
GLAHA 57773	Glass bottle of Newman's luminous body colour, raw sienna	10 mL	
GLAHA 57774	Glass bottle of Newman's luminous body colour, burnt sienna	10 mL	
GLAHA 57792	Tube of Newman's moist colour, cadmium orange		
GLAHA 57793	Tube of watercolor? Cobalt blue		
No number	Dr. Fr. Schoenfeld & Co. finest wet watercolor tube, Antwerp blue		
No number	Dr. Fr. Schoenfeld & Co. finest wet watercolor tube, raw umber		
No number	Dr. Fr. Schoenfeld & Co. finest wet watercolor tube, viridian		
No number	Dr. Fr. Schoenfeld & co. finest wet watercolor tube, Indian red		

## NOTES

1. Technical examination of the watercolors employed multiple techniques. A binocular microscope was used to study paints, application techniques, and paper structure. Reflected infrared images were taken under tungsten light using a Nikon D100 camera with a Kodak Wratten 87C filter. UV-induced visible fluorescence images were taken under a Blak-ray, Model XX15 UV-A lamp using a Nikon D100 camera with Kodak Wratten 2E and

X-Nite CC1 filters. The imaging of the watermarks was carried out with a GE Rhythm system using a Picker hotshot x-ray tube with a .3-mm focal spot. Low-energy (Grenz) radiation was used at 13 to 18 kV, 3 mA at 5 minutes, and 20- to 23-in. tube distance. Five to 15 locations on each watercolor were analyzed noninvasively with a Bruker Artax 800 x-ray fluorescence spectrometer (XRF) with a polycapillary lens and an excitation spot size of approximately 100  $\mu\text{m}$ . Conditions were 45 kV, 10  $\mu\text{A}$ , in air, with 30-

32-second acquisition. The same locations were analyzed using a Cary 50 UV-VIS spectrometer with fiber optic probe over the range of 300 to 800 nm (FORS) with a scan rate of 30 nm/min at a resolution of 1 nm. Measurements were made in situ in reflection mode or on small samples removed from the watercolors using a Nicolet Nexus 670 Fourier Transform Infrared spectrometer with a Continuum microscope (FTIR). We collected 32 to 256 scans with a resolution of 4 nm, dependent on the signal to noise. A background was collected on gold. After FTIR measurement, samples were examined with polarized light microscopy.

2. Watercolors were examined at the following museums: Ashmolean Museum, Oxford, England; Baltimore Museum of Art, Baltimore, Maryland; Chicago Art Institute, Chicago, Illinois; Colby College Art Museum, Waterville, Vermont; Detroit Institute of Art, Detroit, Michigan; Fitzwilliam Museum, Cambridge, England; Harvard Art Museums, Cambridge, Massachusetts; Hunterian Art Gallery, Glasgow, Scotland; Metropolitan Museum of Art, New York, New York; Museum of Fine Arts, Boston, Massachusetts; National Gallery of Art, Washington, DC; National Gallery of Ireland, Dublin, Ireland; Terra Foundation for American Art, Chicago, Illinois; University of Michigan Art Museum, Ann Arbor, Michigan; Victoria & Albert Museum, London, England; Yale Center for British Art, New Haven, Connecticut.

#### REFERENCES

- Artesani, A., S. Bellei, V. Capogrosso, A. Cesaratto, S. Mosca, A. Nevin, G. Valenti, and D. Comelli. 2016. "Photoluminescence Properties of Zinc White: An Insight into Its Emission Mechanisms Through the Study of Historical Artist Materials." *Applied Physics: A Materials Science and Processing* 122: 1053.
- "Art Notes." 1895. *The Art Journal* 57: 29.
- "Leitch's Blue." 2013. CAMEO (Conservation and Art Materials Encyclopedia Online). Museum of Fine Arts, Boston. Accessed July 3, 2019. [http://cameo.mfa.org/wiki/Leitch%27s\\_blue/](http://cameo.mfa.org/wiki/Leitch%27s_blue/).
- Field, George. 1835. *Chromatography; or, A Treatise on Colours and Pigments, and of Their Powers in Painting*. 1st ed. London, UK: Charles Tilt.
- Fitzhugh, Elisabeth West, Marco Leona, and Nobuko Shibayama. 2011. "Pigments in a Paint Box Belonging to Whistler in the Library of Congress." *Studies in Conservation* 56, (2): 115–124.
- Glazer, Lee, Emily Jacobson, Blythe McCarthy, and Katherine Roeder. 2019. *Whistler in Watercolor—Lovely Little Games*. New Haven, CT: Yale University Press.
- GUW. n.d. *The Correspondence of James McNeill Whistler, 1855–1903*, edited by Margaret F. MacDonald, Patricia de Montfort, and Nigel Thorp. Includes *The Correspondence of Anna McNeill Whistler, 1855–1880*, edited by Georgia Toutziari. University of Glasgow website. Accessed September 2, 2019. <http://www.whistler.arts.gla.ac.uk/correspondence/>.
- Helwig, Kate. 2007. "Iron Oxide Pigments: Natural and Synthetic." In *Artists Pigments: A Handbook of Their History and Characteristics*, vol. 4, edited by Barbara H. Berrie. Washington, DC: National Gallery of Art. 39–109.
- MacDonald, Margaret F. 1995. *James McNeill Whistler: Drawings, Pastels and Watercolours. A Catalogue Raisonné*. New Haven, CT: Yale University Press.
- Menpes, Mortimer. 1904. *Whistler As I Knew Him*. London, UK: Adam and Charles Black.
- "Mr. Whistler's Exhibition." *Standard* (London), May 19, 1884.
- Otero, Vanessa, Marta F. Campos, Joana V. Pinto, Márcia Vilarigues, Leslie Carlyle, and Maria João Melo. 2017. "Barium, Zinc and Strontium Yellows in Late 19th–Early 20th Century Oil Paintings." *Heritage Science* 5 (46):2.
- Simon, Jacob. 2012. "Notes." *Studies in Conservation* 57 (1): 58.
- Simon, Jacob. 2019. "British Artists' Suppliers, 1650–1950." National Portrait Gallery website. Accessed September 2, 2019. <https://www.npg.org.uk/research/programmes/directory-of-suppliers.php/>.

#### FURTHER READING

- Bacher, Otto H. 1908. *With Whistler in Venice*. New York, NY: Century.
- Bower, Peter. 1990. *Turner's Paper: A Study of the Manufacture, Selection and Use of His Drawing Papers, 1787–1820*. London, UK: Tate Gallery Publications.
- Callen, Anthea. 2000. *The Art of Impressionism: Painting and the Making of Modernity*. New Haven, CT: Yale University Press.
- Carlyle, Leslie. 2001. *The Artist's Assistant: Oil Painting Instruction Manuals and Handbooks in Britain 1800–1900*. London, UK: Archetype.
- Hackney, Stephen, Rica Jones, and Joyce Townsend, eds. 1990. *Paint and Purpose: A Study of Technique in British Art*. London, UK: Tate Gallery Publishing.
- Hermens, Erma, and Arie Wallert. 2011. "James McNeill Whistler: Fluidity, Finish and Experiment." In *Studying Old Master Paintings: Technology and Practice*, edited by Marika Spring. London, UK: Archetype. 229–236.
- Mayer, Lance, and Gay Myers. 2013. *American Painters on Technique 1860–1945*. Los Angeles, CA: J. Paul Getty Museum.
- Smith, Martha. 1997. "Hunting for Old Paper with James McNeill Whistler." *Book and Paper Group Annual* 16: 89–90.
- Sutherland, Daniel E. 2014. *Whistler: A Life for Art's Sake*. New Haven, CT: Yale University Press.

- Townsend, Joyce. 1994. "Whistler's Oil Painting Materials." *Burlington Magazine* 136 (1099): 690–695.
- Wallert, Arie, Erma Hermens, and Marja Peek, eds. 1995. *Historical Painting Techniques, Materials and Studio Practice: Preprints of a Symposium, University of Leiden, the Netherlands, 26–29 June 1995*. Los Angeles, CA: J. Paul Getty Trust.
- Way, T. R. 1912. *Memories of James McNeill Whistler*. London, UK: John Lane.
- Wilner, Eli, ed. 2000. *The Gilded Edge: The Art of the Frame*. San Francisco, CA: Chronicle Books.

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