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Citation:
Pollak, Rebecca. "Flash in the Pan: A History of Manufacturing Watercolor Pigments in America." In Kathleen A. Foster, *American Watercolor in the Age of Homer and Sargent*, pp. 375-87. Philadelphia: Philadelphia Museum of Art in association with Yale University Press, 2017.

MATERIALS

Flash in the Pan:
A History of Manufacturing Watercolor Paint in America

Rebecca Pollak

The mid-nineteenth to early twentieth century was an exciting time in the development of artists' materials in Europe and the United States. A new generation of colorants, papers, and other materials offered artists, illustrators, and designers innovative ways to express their vision. An understanding of these materials deepens our appreciation of their work, pulling us into the moment of creation and the technology of the time. The developments that took place during this period in the medium of watercolor—typically defined as a dispersion of finely ground pigment in gum arabic—resulted from both artistic mastery and industrial ingenuity.

Materials that had previously been obtained and prepared solely by the formally trained artist were made available to the masses for the first time through specialized manufacturers and sellers, called "colormen." By the mid-eighteenth century in Europe, where landscape painting in watercolor had a long history, these purveyors of artists' paints were already well established.[1] However, a formal system for supplying artists with paint and other art materials did not exist in colonial America. It was not until the Revolutionary War (1775–83) and the Napoleonic Wars (1799–1815) restricted the availability of imported products that the fledgling commercial paint industry began domestic production of fine artist paints.

Americans did not, at first, regard watercolor as a fine-art medium. Early in the history of watercolor practice in America, the primary practitioners were amateurs (frequently women) or military officers, who were trained to use watercolor in topographical documentation.[2] Neither would have known how to prepare their own paints, and so they depended on commercial suppliers, especially while traveling. The establishment of colormen in the United States allowed these amateur artists to proliferate because technical knowledge was no longer needed in order to have a reliable and affordable source of paint. The expanding market in turn drove innovation in how watercolor paint was made, packaged, supplied, and used by both amateur and professional painters. An examination of the materials, manufacture, and supply of these paints in late eighteenth- and nineteenth-century America, within the context of the larger domestic paint industry, reveals the swift evolution of watercolor paints during this period.[3]

From Shipping Docks to Storefronts

In 1767 the painter John Singleton Copley lamented the puritanical American culture that regarded the creation of fine art as "no more than any usefull trade, as they sometimes term it, like that of a Carpenter tailor or shew maker."[4] Just as the professional artist was a rarity in America before 1750, so too was the profession of colorman as a distinct endeavor. Rather, the artist, forced by necessity to import his pigments, resins, and other materials for paint making, typically sold a portion of the goods he received as a source of additional income. Often the artist-seller would simply set up "shop" at or near docks as the materials were unloaded from English ships, thus precluding the need for domestic suppliers of these goods.[5]

The earliest brick-and-mortar color shops, selling only imported artist materials, were located in Boston, New York, and Philadelphia in the mid- to late eighteenth century. Even after the Revolutionary War, these shops continued to import nearly all of their colors and other supplies from England through an agent or manufacturer. A few early shops served

John H. B. Latrobe (1803–1891)
Detail of **Trompe-l'oeil,** c. 1827
Watercolor, graphite, pen and black ink, with scraping, on wove paper
6⅝ x 8⅞ inches (16.8 x 22.5 cm)
Philadelphia Museum of Art. Gift of the McNeil Americana Collection, 2009-218-3

FIG. 318
Paint and Varnish Manufacture as Conducted by F. W. Devoe & Company, New York
Illustration on the cover of *Scientific American*, May 17, 1884

(*Top row*) grinding and mixing of colors, with separate facilities for making artists' tube colors, milled on a circular glass table with a revolving granite block; (*second row*) brushes made in-house and gums broken down into smaller pieces and sorted by hand; (*third row*) pulverizing of dry colors, the main store and showroom at the corner of Fulton and William Streets, and the cooling room; (*bottom row*) manufacture and/or processing of lower-grade and toxic pigments such as white lead and vermilion.

the additional function of art academies, providing a gathering place for learning and discourse.[6] The colonial portraitist John Smibert ran a color shop out of his house in Boston that also gave artists access to his collection of imported prints, plaster casts, and copies he had made of works by the old masters.[7]

In the nineteenth century, the close physical proximity of industrial and artistic activity in increasingly populous American cities allowed colormen to formally establish themselves as middlemen between the artist and the manufacturer of his supplies. Artists in neighboring studios would patronize these firms, which subsequently adapted and refined paints, stretchers, and other tools in response to their needs. As the symbiotic relationship between artists and their suppliers developed, the firms expanded, diversified, and often specialized. Some found success as distributors or dealers—forerunners of the art-supply houses and galleries such as M. Knoedler & Company that formed around midcentury. To support an emerging middle-class art market, these firms commissioned American artists to make copies of popular paintings and sculpture from Europe, or arranged for the reproduction and publication of selected artists' works, which introduced them to an international audience.

Early Domestic Color Makers

Until the twentieth century, all types of paints were made from the same essential materials: dry pigments, oils, resins, and gums. What distinguished artists' paints from industrial or "house" paints was how finely the pigments were ground and the quality and treatment of the vehicles used to disperse them. Before 1867, when ready-mixed paint in cans was patented,[8] the terms *color* and *paint* might refer either to pigment or to paint prepared as needed by painters or druggists according to client specifications. The manufacturer Samuel Wetherill of Philadelphia wrote to his supplier in London in 1789 that in America, "We are Druggists as well as Oil and Colour Men."[9] Because pharmacies already imported colors to use in medicines, and were familiar with grinding and mixing, the combining of the trades was natural.[10]

In the early years of the republic, commercial paint production was driven by the need for large quantities of protective coating for ships and houses, as well as for metal carriages, an early American export.[11] The deterioration of international commerce during the War of 1812 caused such a scarcity of chemicals that there was a desperate need for domestic pigment manufacturing, a task taken up primarily by immigrants who had learned the chemical processes in German, French, or English factories.[12] This industry also encouraged the mining of native red and yellow ochers and ores,[13] and the large-scale domestic production of inexpensive pigments such as lead white, minium (red lead), zinc white,[14] Prussian blue, and lampblack.[15] The discovery of chromium-containing mineral deposits in the United States, Britain, and France in the 1820s bolstered the widespread use of chrome colors.[16] A survey by the American government in 1832 indicates that by this time 75 percent of all industries using paints employed domestic materials.[17] The demand for paint soared again during railroad-building booms in the 1830s through 1860s, as railways replaced canals as the primary means of moving goods and people. The United States continued to import many mineral colors and organic dyestuffs—from regional organic or mineral sources or patented synthesized pigments—to manufacture such domestic goods as playing cards or wallpaper, but on a much smaller scale.[18]

By the 1880s paint factories were springing up in industrial centers across the nation. Since the weight of prepared paint made it expensive to transport, small domestic manufacturers in regional markets dominated until the mid-nineteenth century. These firms usually sold both local and imported pigments, made from natural plant, animal, or mineral sources as well as those synthesized by American chemists. As was the case in other American industries at this time, most of the colormen companies started with one or two employees and slowly grew as family businesses. The New York firm of Raynolds & Devoe (later F. W. Devoe & Company), for example, remained a family concern but expanded rapidly in the mid-nineteenth century, and in 1882–83 constructed large-scale facilities in Greenwich Village, where pigment and paint manufacture was spread across six floors (fig. 318).

As manufacturing sites gradually relocated from homes and small workshops to such factories, pigment production relied less on individual artisans involved in every step of product creation and sale, and more on a division of labor between specialized and unskilled workers. Authors of eighteenth- and nineteenth-century artists' manuals frequently advised their readers on the detection of fraudulent materials,[19] for there was ample evidence of widespread adulteration or substitution of many goods, including pigments, oil, and resins.[20] The apparent decrease in product quality resulted from the fact that the workmen involved at different stages of manufacturing might have little idea about the nature of a material or its end use. Painters now had to trust not only that the overseas agents had reputable suppliers, but also that the American importers, manufacturers, and sellers were trustworthy. One 1869 report describes possible adulterants of powdered madder root, at the time widely used as a dyestuff and pigment, as including brick dust, red ocher, clay, mahogany dust, logwood, japan wood, and bran. French madders apparently contained "half their weight of gum, sugar, salts, and other soluble substances."[21] More alarming was an instance in which vermilion (mercuric sulfide) adulterated by red lead was sold by a druggist for house paint, and subsequently used by a merchant to enhance his annatto food coloring.[22]

Commercial Watercolor Paint

While early references to the sale or use of watercolors in America are sparse, those that exist perfectly describe the progress of the art-supplies trade, first documenting the importing and selling of raw materials to artists, then the sale of premade or made-to-order paints prepared by local artisans, and finally the availability of commercially prepared products

FIG. 319
Raw materials for watercolor

(*Clockwise from left*) Cherry almond gum (sometimes used in eighteenth-century watercolor formulations), gum arabic, a glass muller (used to disperse the pigment), synthetic ultramarine blue pigment, and gum water (gum arabic dissolved in water and strained through a sieve).

FIG. 320
Hand-ground watercolor paint in shells

Vermilion and yellow ocher pigments were dispersed in a solution of gum arabic and water using a muller. The paint paste was poured and pressed into the shells and left to dry.

FIG. 321
(*Top*) Watercolor cake manufactured by Reeves & Sons, c. 1830–1890
28 x 17 x 8 mm
Courtesy of Winterthur Museum, Winterthur, Delaware. Bequest of Henry Francis du Pont, 1967.1828

(*Bottom*) Watercolor cake in foil packaging manufactured by Reeves & Sons Ltd., c. 1891–1976
© ColArt International Holdings Ltd. 2012

FIG. 322
Painting case with eighteen palettes, c. 1800
Made for Edward Green Malborne (1777–1807)
Ivory, pigments
5½ x 12 x 9 inches (14 x 30.5 x 22.9 cm)
Museum of Fine Arts, Boston. The M. and M. Karolik Collection of Eighteenth-Century American Arts, 39.117

Early watercolor cakes were rubbed against ivory or porcelain saucers filled with water to solubilize the paint. For ease of use, the diluted paint would be left to dry out on each saucer and the palettes stored in a cylindrical container for the next painting session.

bought off the shelf. One of the earliest references to watercolor supplies is a 1736 advertisement in which the Bostonian John Merritt announced the sale of "Painter's Colours and Gums of every Kind, for House-painting, Face-painting and Water Colours."[23] At this time the artist himself would grind and then disperse his purchased pigment in prepared gum water (fig. 319), forming the paste into irregular cakes to dry. Because the gum in the dried cake was not readily soluble, the paint could not be lifted with a wet brush. The artist had to chip or grate the cake against an abrasive surface and dissolve the small pieces in water, or wet and rub the cake against a porcelain saucer. In short, these paints were difficult to use. By the 1760s the artist and colorman John Gore had begun to simplify the artist's task,[24] offering "colours prepared for House and Ship Painting" and "Watercolours ready prepared in shells" (fig. 320).[25]

The few artists in the nineteenth century who persisted in preparing their own watercolors found that recipes and guidance were harder to come by. Manuals that once may have given detailed instructions for making paint instead urged artists to buy ready-made supplies to avoid the trouble and risk of failure inherent in producing their own watercolors. The challenge is intrinsic to the medium—watercolor paint is comprised of tiny solid particles suspended in a relatively weak gum binder. The paint typically is diluted and applied to an absorbent and flexible surface such as paper, so the physical properties of the pigments and the gum, as well as any additives, are more consequential than they would be on a less porous, more rigid support. Paint lacking in gum binder can be difficult to apply and result in a powdery paint film. Conversely, too much binder will create a brittle paint film that is prone to cracking, cupping, and flaking, especially on a flexible paper support.

In Britain, the eighteenth-century boom in landscape painting stimulated the development of convenient ready-made watercolor cakes, introduced in 1781 by the London firm of William and Thomas Reeves. Reeves paint was formulated with honey as a humectant to attract and retain moisture, which made the cakes more soluble and less likely to crack in storage. William's prior training as a wire maker, when he learned to pass silver and gold through dies of diminishing diameter to "draw" it into wire, presumably inspired him to extrude paint paste in thick filaments and chop it into rectangular pieces.[26] The dried cakes were wrapped in damp cloths to soften the surface, then stamped with the firm's name and wrapped in paper or foil (fig. 321).[27] The award-winning paints were still hard and needed "rubbing out" in water (fig. 322),[28] the morning chore of many Victorian watercolor painters, but they were a marked improvement in terms of both usability and packaging. The jewel-like cakes were sold in attractive sets packaged in wooden (or paper) boxes that were immediately popular (fig. 323). By 1806 large quantities of these watercolor cakes were being imported to the United States: in December alone, Samuel Tuck imported four hundred boxes for his thriving color shop in Boston.[29] The first commercial manufacturer of watercolor cakes in the United States was Lewis J. B. Wells in New York, beginning in 1811–12.[30] Other early watercolor-paint manufacturers were the chemists Joseph Boston (est. c. 1823), Joseph Brutsche (c. 1830s), and A. P. Homer (c. 1850s), all in Philadelphia.[31] The lack of existing records for these enterprises suggests that they were short-lived.

In 1824 the colorman George C. Osborne partnered with the pharmacist Daniel B. Smith in Philadelphia to manufacture high-quality watercolor-paint cakes (figs. 324–26).[32] Osborne had emigrated from London to New York in 1808, and he started his paint business there before moving a few years later to Philadelphia,[33] where he was listed as "painter & c." in the 1816 city directory, as "colourman" in 1818, and as "watercolourman" by 1821.[34] Osborne was notable as one of the few American makers of artists' paints whose company won "premiums" for its products,[35] and he created a brand name that was maintained even as the actual manufacturer of the product changed several times in subsequent decades.[36] Advertisements and packaging for Osborne

FIG. 323
Watercolor box belonging to Thomas Eakins, c. 1850–80
Box manufactured by Waring & Dimes, London
Pigment cakes manufactured by Waring & Dimes, Winsor & Newton, Ackermann, and Newman
12 x 7 x 3 inches (30.5 x 17.8 x 7.6 cm)
Pennsylvania Academy of the Fine Arts, Philadelphia. Charles Bregler's Thomas Eakins Collection*

FIG. 324
Detail of Osborne label inside the box lid (fig. 326), similar to designs by British and European colormen firms

FIG. 325
Green verditer watercolor cake, front (*top*) and back (*bottom*)
Manufactured by George C. Osborne, Philadelphia, 1836–37
31 x 19 x 5 mm
Courtesy of the Winterthur Museum, Delaware. Museum purchase with funds provided by the Special Fund for Collection Objects, 1993.12

FIG. 326
Watercolor box
Manufactured by George C. Osborne, David B. Smith, and William Hodgson Jr. (the commissioning merchant), Philadelphia, 1836–37
Courtesy of the Winterthur Museum, Delaware. Museum purchase with funds provided by the Special Fund for Collection Objects, 1993.12

FIG. 327
Watercolor box belonging to Winslow Homer, 1900–1910
Manufactured by Winsor & Newton
Watercolor pigments and metal
8⅛ x 8¼ inches (20.6 x 21 cm) open
Bowdoin College Museum of Art, Brunswick, Maine. Gift of the Homer Family, 1964.69.191*

Portable and inexpensive paint boxes such as this Japanned tin case with fold-out palettes were extremely popular: eleven million were sold in the twenty years after their introduction in 1853.

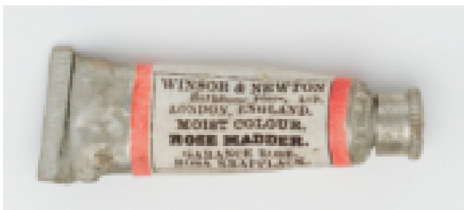


FIG. 328
Moist watercolor pans
Manufactured by Winsor & Newton, c. 1990–2005

The madder lake (*top left*) and cadmium red (*top right*) watercolor cakes were formed by extruding paint paste through a die and chopping the filament into tablets. The paint can also be poured into pans, which were originally porcelain but today are usually made using plastic in either full (31 x 19 x 9 mm) or half-pan (20 x 16 x 9 mm) sizes (*bottom*).

FIG. 329
Rose madder moist tube watercolor from John Singer Sargent's studio, c. 1900–1925 (detail of fig. 338)
Manufactured by Winsor & Newton
Fogg Art Museum, Harvard University Art Museums, Cambridge, Massachusetts. Edward W. Forbes Collection of Artists' Materials, Straus.1083

& Company products included artist testimonials, a mainstay of nineteenth-century American product literature, which frequently included claims that the products were at least as good as any that were imported.[37] That Osborne watercolors were marketed to professional artists, or as professional artist paints, perhaps to appeal to aspiring amateurs, is telling of the changing regard for watercolor painting.

American colormen such as Wells and Osborne, who had likely learned about paint making in England before emigrating to America in the 1800s, began to introduce their own paint formulations to improve upon the ready-made cakes invented by Reeves. Meanwhile, innovation in watercolor manufacture continued apace in Great Britain, where in 1835 the firm Winsor & Newton of London capitalized on the moisture-retaining properties of glycerin, recently discovered by the French chemist and color theorist Michel Eugène Chevreul.[38] Adding glycerin to its watercolor paints, Winsor & Newton introduced "moist watercolor" in pans. For the first time, color could be easily released from the cake with the touch of a wet brush. The paint paste was still extruded and cut, but instead of being stamped, each cake was placed in a small porcelain pan (of various sizes) (fig. 328).[39] By the late 1830s the moist colors were available in portable sets (fig. 327), offering strong competition to the harder, pressed cakes.

In 1841 the American artist John Goffe Rand, looking for a better way to store his oil paints than the messy, unsealable pig bladders or fragile syringes then in use, invented the collapsible metal tube with a screw cap.[40] The design was quickly adopted and modified by Winsor & Newton, which obtained its own patent in 1842 and sold the innovation exclusively for its line of oil paints. Following on the success of the tubed oil paints, in 1846 the firm added even more glycerin to its watercolor formula to produce semi-liquid watercolor paint packaged in tubes. But watercolor in tubes was not introduced to the American market until the 1850s, and was then imported from British and European manufacturers (fig. 329). The semi-liquid watercolor paint is described in trade catalogues of New York firms such as Goupil & Cie and Masury & Whiton[41] as "particularly adapted for large works, as any quantity of colour can be immediately obtained . . . ; they present a range of pigments which, in brilliancy and similarity of manipulation, much resemble Oil Colours."[42]

A review of American trade catalogues from the late nineteenth century suggests that watercolor manufacturers in the United States were slow to produce their own tubed watercolor paints. In its 1888 catalogue, the Philadelphia firm F. Weber & Company touted the "introduction of Moist Water Colors, in half and whole pans and tubes" as its "latest effort in the manufacture of Artists' Materials," about forty years after Britain.[43] By this time most American firms were manufacturing oil paints and other products in tubes, so the delay can be ascribed either to the technical challenge in formulating the liquid watercolor or to a lack of demand. The latter seems unlikely, as nearly every company had continued importing watercolor in tubes and offered special portable cases to hold them.

Paint Formulation and Technology

In this transitional period, paint formulas were experimental, evolving, and transient. In order to appreciate the significance of the nineteenth-century developments and their impact on the works of art produced during this time, it is important to understand how the physical properties of watercolor paint affect painting techniques. The paint does not form a cohesive layer, as do acrylic and oil, but scatters pigment particles across the paper surface. The smaller, sparser particles allow the paper to reflect light between them, creating images that are notably "transparent" and luminous. However, the increased surface area of finely ground pigments, used in thin washes with minimal binder, makes watercolor pigments especially vulnerable to damage from exposure to light and other chemicals.

Fine particle size is essential in watercolor paint and allows the pigment to remain suspended when the paint is mixed with water to create a homogeneous wash of color. But the balance is delicate: if the pigment is ground too fine, particles tend to clump and fall out of suspension; if too large, the paint has a granular quality. Mineral pigments such as natural ultramarine (lazurite) or vermilion tend to have a larger particle size range with greater density than organic pigments such as gamboge or carmine, and thus often only the finest particles were collected to prepare these watercolors. Several mineral pigments have a particle size at which they appear most brilliant, so some granularity had to be accepted.[44] Nevertheless, the particle sizes of many early pigments produced unique optical effects that are difficult to achieve with modern paints (fig. 330). The largest particles in natural yellow ocher, for example, are more than 80 times the size of the average particle in the synthetic version, which by the twentieth century had largely replaced the natural product. The broad size range (~1–80 microns) caused the particles to settle differentially into the valleys of a textured paper sheet, creating subtle effects. Additionally, the larger pigment particles did not sink quickly into the paper and could be lifted easily to reclaim highlights.

The invention of new synthetic pigments with a smaller, more homogenous particle size, and the improvement of grinding and milling technology, made mechanization viable for artist-grade paints and had the greatest impact on watercolor paint in the mid- to late nineteenth century. Before the 1860s, the new colors were mostly synthesized mineral pigments, until techniques were invented for producing organic pigments derived from coal tar, a byproduct of coal gas and the coke manufacture that was fueling the industrial revolution.

In the eighteenth century, the artist's palette was limited. Roughly thirty pigments were available for all types of painting, and only half were suitable for fine artists' paints. Two of these were recent inventions suitable for watercolor: Prussian blue (created in 1704)[45] and cobalt green (1780s). By contrast, more than twenty intensely chromatic pigments were introduced between 1800 and 1870, many of them derived from the newly isolated elements chromium, barium, and cadmium (fig. 331). Previously, most green paint was a mixture of blue and yellow pigments, since

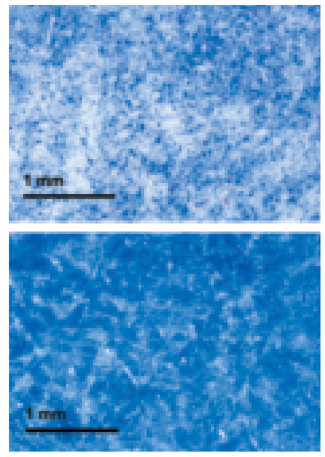
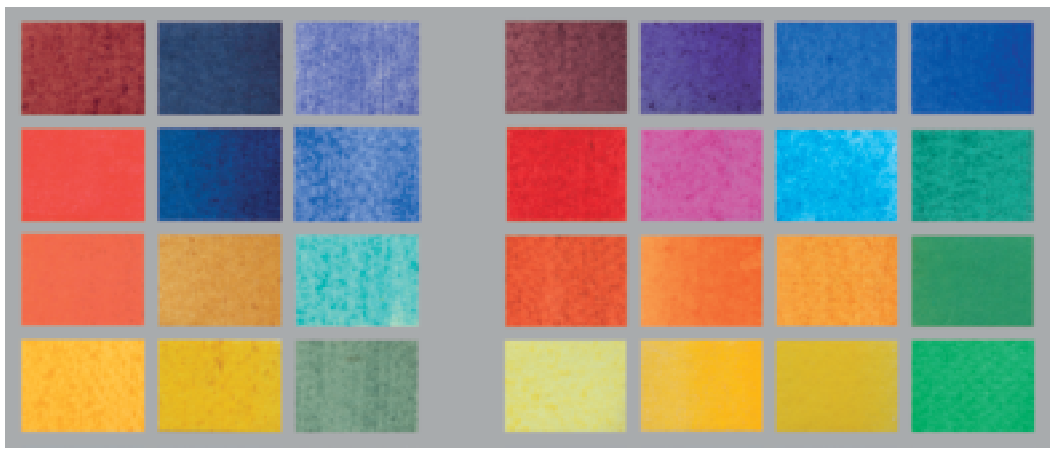
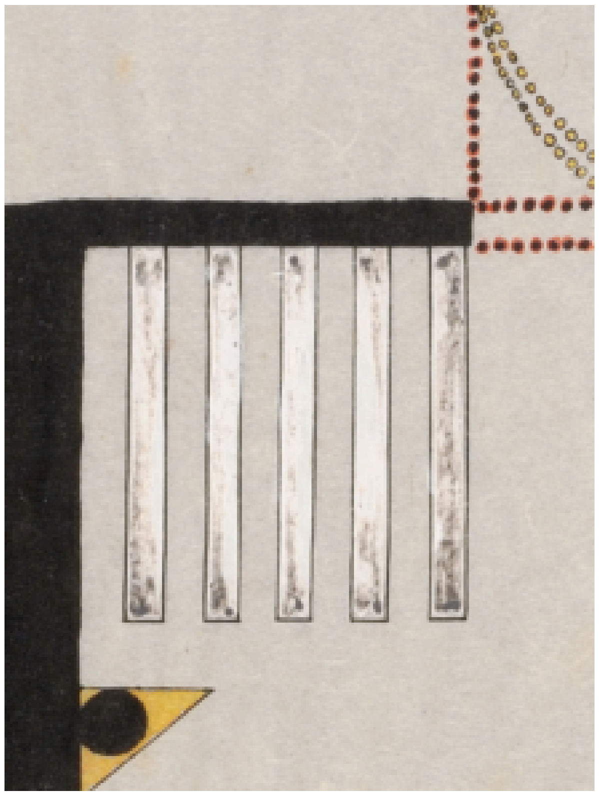


FIG. 330
Finely ground natural ultramarine (*top*) is more granular than the synthesized product (*bottom*). The natural pigment settles into the recesses of the paper surface, creating uneven washes that can be used to good effect on heavily textured watercolor paper. The synthetic pigment is very fine and uniform in size, creating a continuous wash of saturated color that still reflects the brightness of the paper sheet. Field of view approximately 2.5 x 4 mm

FIG. 331
(Left grid) The eighteenth-century watercolor palette was relatively limited and included several opaque and granular colors. *(Right grid)* In the nineteenth century, watercolorists employed new colors and synthetic replacements for traditional pigments, among them brilliant greens, cool yellows, and bright blues that washed beautifully.



Madder lake	Indigo	Smalt		Indian red	Cobalt violet	Cobalt blue	Synthetic ultramarine
Vermilion	Prussian blue	Lapis		Alizarin crimson	Rose madder lake	Cerulean blue	Viridian
Venetian red	Yellow ocher	Cobalt green		Mars red	Cadmium orange	Mars yellow	Chrome oxide green
Gamboge	Indian yellow	Green earth		Cobalt yellow	Cadmium yellow	Chrome yellow	Emerald green



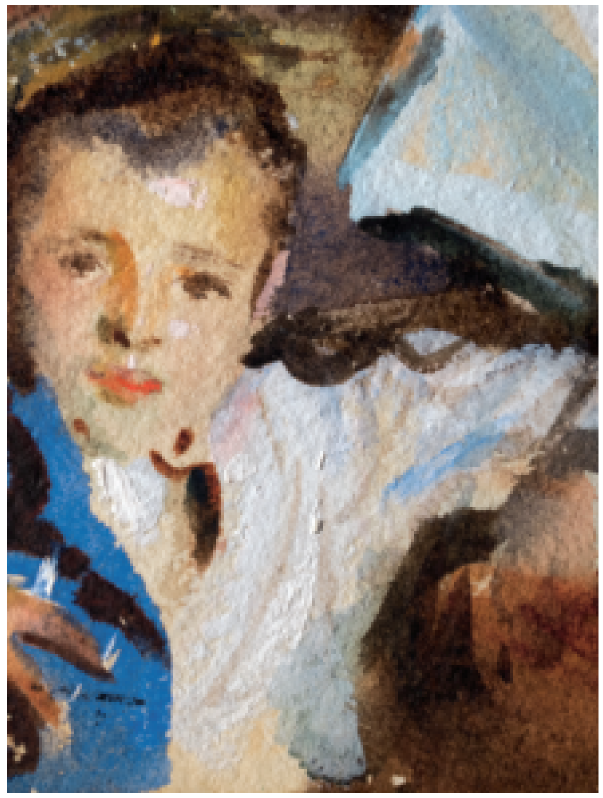


FIG. 332 (*left*)
Lothar Schreyer (German, 1886–1966)
Detail of **Color Form 2 (Night),** 1921
Hand-colored lithograph
11½ x 7 inches (29.2 x 17.8 cm)
Philadelphia Museum of Art. Gift of Curt Valentin, 1950-116-1

The lead white (basic lead carbonate) watercolor paint used in this drawing has reacted with sulfur in the air to form lead sulfide, a brown or silver-black product.

FIG. 333 (*right*)
John Singer Sargent (1856–1925)
Detail of **A Venetian Trattoria,** c. 1902–3 (see fig. 271)
Watercolor and white opaque watercolor over graphite on wove paper

Zinc white was used to heighten areas of this drawing on a cream-colored paper. The pigment was identified by visual examination with long-wave ultraviolet radiation (no instrumental analysis was performed).

FIG. 334
Chinese white in tubes and bottles
Manufactured by Winsor & Newton
Illustration from A. H. Abbott, *Catalogue no. 162A of Artists' Materials* (Chicago: A. H. Abbott, c. 1910), p. 72A

there had never been a strong chemically stable green suitable for watercolor. The syntheses of chrome oxide green (in 1809), emerald green (1814), and viridian (1840) bolstered the palette as artists were moving outdoors to capture the landscape *en plein air.* Mars colors, artificial preparations of natural earth pigments (introduced in the 1820s), largely supplanted natural iron-oxide pigments in artists' paints. Zinc white (introduced in 1834; figs. 332–34)[46] and chrome (1818) and cadmium (1840s) pigments provided the first bright, opaque yellow paints that were not expensive or highly toxic. Cobalt blue (introduced in 1802) and synthetic ultramarine (1830s) were followed by cerulean blue (1860s), alizarin, and manganese violet (both 1868). These pigments also were cheaper and easier to produce in large quantities. The expanded palette allowed watercolorists to use pure colors instead of mixtures, which often have a dulling effect, and imparted unprecedented brilliance and clarity to their compositions (figs. 335, 336).

Until the late nineteenth century, many watercolors continued to be prepared in small batches by hand grinding on a stone or a glass slab, using a muller to evenly disperse paint particles (see fig. 319). If done correctly, this process takes a very long time, but it helps to prevent pigments from clumping or settling out of a wash. Yet some pigments are prone to flocculation (clustering together) and appear granular, similar to larger particles. Prussian blue, for example, could not be dispersed effectively until steam-powered mills, developed in the 1830s, made mechanical pressure possible.[47]

The availability of ready-mixed commercial paints in cans revolutionized industrial paint production, but the pursuit of a shelf-stable, profitable prod-

FIG. 335 (*left*)
Nicolino Calyo (born Italy, 1799–1884)
Detail of **View of the Waterworks at Fairmount,** 1835–36 (see fig. 8)
Opaque watercolor on wove paper, mounted on board

FIG. 336 (*right*)
Winslow Homer (1836–1910)
Detail of **Bermuda,** 1900 (see fig. 267)
Watercolor and graphite on wove paper

(*Left*) Opaque painting techniques popular in the 1860s and 1870s used the traditional oil-painting method of working from dark to light, first applying darker washes and then creating highlights with opaque paints (often admixtures with white pigments). (*Right*) The transparency and brilliance of many new synthetic colors made them well suited for working from light to dark, using the brightness of the paper to create highlights, a practice considered by many artists to be the true watercolor technique.

uct put the priorities of paint makers and sellers at odds with those of the fine artist. Formulation of prepackaged semi-liquid watercolor in tubes required additives to contend with the settling, hardening, and spoiling to which water-borne paints are prone. Wetting agents and dispersants reduced milling time and cut labor costs. Humectants, plasticizers, fillers, and preservatives improved flexibility, controlled tinting strength, added body, and lowered the cost of the paint. However, these advancements occurred through a process of trial and error, sometimes resulting in an inferior product for artists. The new formulations and methods of manufacture affected watercolor painting in unintended ways. For instance, in the nineteenth century the older dry-cake colors were preferable to moist colors for preliminary tints because the extra sugar or glycerin used in the latter to increase solubility also made the moist paints unintentionally "pick up" from the paper sheet during later washes. Moreover, the added viscosity might cause pigment particles to settle unevenly on the paper surface—a desirable effect to some, but a failing to others.[48] Newer pigments with smaller particles, especially the coal-tar (organic) pigments, settled more deeply into the paper fibers than mined pigments, staining the paper and making the colors difficult to "lift" when desired (fig. 337).

A new type of technical literature emerged in the nineteenth century to address artists' questions about the quality, purity, and permanence of the new array of colors on offer. The recommendations drew on research of a "new breed of color technologists: men who were chemically adept, familiar with the latest color theories of scientists such as Chevreul, Helmholtz, and Maxwell, and intimately connected to the world of fine art."[49] The London chemist George Field was an influential color maker who performed early studies on pigment stability (first published in 1835) that stimulated scientific research in the field.[50] Field maintained a close relationship with the colormen William Winsor, a chemist, and Henry Newton, an artist. They exchanged pigments and took an active interest in Field's research. Their firm Winsor & Newton included technical information on its pigments in various publications in the 1870s and 1880s, and by the 1890s would regularly publish technical information on the chemical stability and lightfastness

FIG. 337
Genuine and synthetic madder lake watercolor, Kremer pigments, 2016

Genuine madder lake (*left*) and synthetic alizarin crimson (*right*) watercolors were diluted with water and brushed out on Whatman "Creswick" paper (from 1916). A damp cotton blotter was then gently pressed over the top half of the applied paint. The madder lake lifted from the sheet easily, while the alizarin pigment (a synthetic coal-tar derivative) immediately embedded in the paper fibers.

of its paints. Similar studies were undertaken in the United States, and in 1886 the Philadelphia colormen Charles Janentzky and Frederick Weber (of Janentzky & Weber) published a manual of their pigments based on their own "reliable tests."[51] This transparency earned artists' trust, but as established colors were substituted or enhanced with new pigments, color names persisted for products that were increasingly distant from the original chemical compositions.[52] In their treatise on modern watercolors, Winsor & Newton let it be known that several colors had been improved but not renamed, and so were unjustly saddled with a bad reputation.[53] Indian red, for example, previously was made using a reactive natural iron oxide from the Persian Gulf that was observed to accelerate the decomposition of indigo. This color and other "earth" pigments, including Venetian red and light red, were by the 1880s produced synthetically by calcination and were very stable.[54]

The continuation of color nomenclature served to evoke a familiar hue,[55] and perhaps stirred the romantic sensibilities of Europhilic artists in America. In his entertaining 1920s memoir of the early paint industry, George Heckel, the longtime secretary-treasurer of the Paint Manufacturers' Association, reflected on Americans' conviction of the superiority of European goods in the late nineteenth century:

> Notwithstanding our boasting and our blustering . . . , notwithstanding the exalted sentiment of our national songs, we have all—till the great war gave us our true measure—entertained a secret furtive notion that "they do this better in France," or in England or in Germany. That was the real reason for "Oxford ochre" long after there was none available; . . . for "Old Dutch process white lead" long after the Dutch process had been improved in America out of all recognition, for "Turkish umber" and "Italian sienna" from Pennsylvania, for "French zinc" made also in Pennsylvania, and for a host of "imported" products that never smelt salt water.[56]

FIG. 338
John Singer Sargent's moist watercolors in tubes, c. 1900–1925
Manufactured by Weber & Co.; Newman; Winsor & Newton; Hatfield; and Schmincke-Hordam
Harvard University Art Museums, Cambridge, Massachusetts. Edward W. Forbes Collection of Artists' Materials (Straus.1083)*

In the same spirit, colorman trade catalogues or advertisements continued to bolster American products with testimonials from amateurs and professionals alike. These artist testimonials hint at personal relationships among American manufacturers, suppliers, and artists, but there is scant documentation of such exchanges.[57]

Despite the production of fine artist-grade watercolors in the United States by midcentury at firms such as Osborne, Janentzky & Company (later F. Weber & Company),[58] F. W. Devoe & Company,[59] and, later, Joseph Hatfield (in the 1900s),[60] many professional artists continued to select imported materials. George Field's preference for Winsor & Newton watercolors in his influential publication *Chromatography; or, A Treatise on Colours and Pigments* (1835), and in later works, solidified the firm's reputation for quality products and the highest standards of research. By the 1880s Winslow Homer used solely English materials to create his watercolors. His two extant watercolor boxes contain only Winsor & Newton paints,[61] and after 1878 all his formal watercolors are on Whatman paper, another English product.[62] A watercolor box used by Thomas Eakins between about 1850 and 1880 (see fig. 323) contains cakes from four different English firms, despite his proximity in Philadelphia to the majority of American suppliers.[63] The tube watercolors found in John Singer Sargent's Boston studio in 1925 (fig. 338) are again mostly English and European imports, but a few are American brands, including Hatfield, Weber, and Prang.[64] Childe Hassam, however, is notable for his ardent use of domestic materials. In response to the question "Do you find Winsor & Newton about as good as any?" he defended American-made paints, replying, "Yes, but I like American colors. I thought the Devoes colors as good as any others. It is absolutely foolish to say that any colors made in Europe are better than colors made here."[65]

American artists doubtless were aware of subtle differences in color and character in paints of the same name, but obtained from different manufacturers or suppliers. Natural ochers and umbers might be sourced from different locations, so that a yellow ocher from Osborne might look or behave differently than one from Weber or Reeves. To benefit from these distinctive qualities, an artist might keep in active use several pans of Hooker's green, a commercial color prepared using a mixture of yellow and blue—usually Gamboge and Prussian blue—from different suppliers.[66] But the notion that the quality of European- and American-manufactured watercolors differed in the late nineteenth and early twentieth centuries may have been more pervasive than it was accurate. There has been little analysis of early American watercolor paint, with existing studies limited to basic pigment and binder identification.[67] Evaluating the physical properties of existing samples of American paints, such as the range of particle sizes and changing mixture proportions over time, would provide a valuable comparison to well-documented color preparations of the time, from English color firms in particular.[68]

FIG. 339
Winslow Homer (1836–1910)
Detail of **Bermuda**, 1900 (see fig. 267)
Watercolor and graphite on wove paper

Fading is evident along the left edge of this watercolor, where a prior window mat protected the perimeter of the sheet from exposure to light. The purple of an afternoon sky, which appears to be a mixture of blue and red paints, has cooled from the fading of the red pigment, which was likely organic.
Field of view 51 x 64 mm

After the Golden Age

At the height of watercolor's international popularity and artistic regard in the 1880s, it was almost impossible for the color industry to keep up with demand. By the end of the nineteenth century, however, middle-class collectors who had embraced the art form watched their investments shift color, darken, and fade (fig. 339). George Field's early study on the permanence of colors became more or less obsolete. The

FIG. 340
Watercolor set, c. 1830s
Manufactured by George C. Osborne
5 x 3⅛ x 13/16 inches (12.7 x 3.3 x 2.1 cm)
Private collection

The paper label adhered to the tray reads, "Manufactured and sold at D. B. Smith & W. Hodgson, Jr.'s Drug and Chemical Store, North East Corner of Arch & Sixth Streets, Philadelphia"

number of available pigments had multiplied greatly, and formulations for established colors had changed, so that his recommendations were no longer applicable to existing products. Watercolor came to be regarded as an unreliable and unprofitable medium. Prompted by the implications for the textile industry (in which many of the new colorants were primarily used), the British government got involved for the first time and in 1888 updated Field's work.[69]

By the time American manufacturers established their own testing standards in the early twentieth century, energy was being redirected to paint products for a wider market. While some domestic color firms, such as Devoe, incorporated scientific product research early on, most American manufacturers were slow to follow suit. Guarded formulation secrets and a nonscientific trial-and-error approach to product development also hindered progress. Eventually, the trade associations would move things forward,[70] "with the co-operative spirit they engendered, and the hard-won tolerance of the technical man, with his exact methods and his intolerance for guess-work and unfounded belief."[71]

By the 1920s nearly all American manufacturers of high-quality artists' paints had been enveloped by larger corporations, and the "artist-grade" product lines were discontinued.[72] In 1925 Devoe & Raynolds acquired Wadsworth, Howland & Company, a Boston firm nationally famous for making artists' paints, which was also one of Frederick Devoe's "hobbies," as these required "the pinnacle of exactness in the science of color-making."[73] But the acquisition was driven by Wadsworth's durable line of Bay State exterior paints, since the Devoe firm was expanding into the new market of industrial finishes. In Europe, incorporation initiatives had been less rapid. The conservative postwar paint market in Britain continued to invest in traditional materials and manufacturing methods, and was slower to embrace the new synthetic polymers that were immediately popular with Americans glad to have minimized reliance on scarce raw materials during the war years. Both during and after World War I, the United States excelled in large-scale production, quickly developing a self-sufficient industry for synthetic organic colorants formerly imported from Germany.

Ultimately it was the schoolchild, and not the professional, who would determine American production of watercolor paint. Early commercial sets marketed to children, such as "Toy Colors" made by George C. Osborne (fig. 340), included toxic pigments containing lead, chrome, and mercury. In the 1850s, spurred by the desire to teach his young daughter art, the Boston publisher Louis Prang developed nontoxic watercolors and contracted the American Crayon Company in Ohio to manufacture moist pan sets for students (fig. 341).[74] The child-safe materials he produced supplemented an educational initiative to promote art in public schools that was both sincere and savvy—the eight-color oval-pan set has been an iconic product for over 150 years.[75] Production of scholastic or "student-grade" paints offered several lucrative advantages. With safety and economy the primary concerns, student paints were composed of cheap pigments and dyes in a limited range of colors, using fillers and a sugary binder. Incorporation of watercolors into educational programming guaranteed a market and introduced the medium to budding artists early on and at a low cost relative to artists' paints.

Prang is one of only two mid-nineteenth-century American companies still making watercolor paint today. The other, the Martin F. Weber Company (formerly F. Weber & Company; see p. 380), is a Philadelphia firm that took over the manufacture of Osborne watercolors in the 1870s. Weber succeeded with a different strategy than Prang's—appealing to artists' nostalgia for a time before the "Machine Age" with the slogan "The Colors the Old Masters would have used."[76] In the spirit of the early twentieth-century Arts and Crafts movement, some artists took a greater interest in making their paints by hand. This labored control over their materials was perhaps "an antidote to the modern industrial production of paint by companies that were seen as cynical or corrupt."[77] Frederick Weber, Jr., the company's owner and technical director from 1920 to 1967, purportedly advised many prominent twentieth-century artists—including Thomas Hart Benton, Arthur Dove, N. C. Wyeth, and Andrew Wyeth—on their methods and materials.

Watercolor manufacture underwent great change from the mid-nineteenth through twentieth century, led primarily by innovations in England and Europe. Firms such as Winsor & Newton were consistent pioneers in paint formulation and packaging, and adopted scientific methodology for testing and reporting the stability of their products. Although American companies eventually produced high-quality watercolor paints that rivaled those of Britain and the rest of Europe, their products were not broadly adopted by American artists of the era. Ultimately, American watercolor manufacturers found a steady but less prestigious market in amateur- and student-grade paints. The development of synthetic pigments, milling technology, and paint formulations also paved the way for the production of commercial and industrial paints and coatings, a burgeoning market in the United States in the twentieth century.

Throughout this period, American artists remained sensitive to the unique properties that different pigments and methods of manufacture imparted to watercolor paint, from the appearance and color saturation of the paint to the way it could be manipulated on the support. American watercolorists energized by the forthright medium exploited its immediacy and brilliance to evoke their experiences and artistic vision with luminous clarity.

FIG. 341
Prang watercolor set "No. 8"
(*Top*) Illustration from *"Old Faithful" Products* (Sandusky, OH: American Crayon Company, 1925), p. 23
(*Bottom*) Photograph courtesy of the Dixon Ticonderoga Company

nying brochure, with an introduction by Edward Bruce and Forbes Watson, celebrated the U.S. government as a patron of art in public buildings, explaining that the watercolors were destined for the Marine Hospital in Carville, Louisiana. The jury noted that the watercolors "interpreted the spirit of their own land." See "Two Hundred American Watercolors," National Gallery of Art, accessed October 2016, http://www.nga.gov/content/ngaweb/exhibitions/1941/american_watercolors.html.

159. Alan Burroughs, *A History of American Watercolor Painting*, exh. cat. (New York: Whitney Museum of American Art, 1942); the exhibition ran from January 27 to February 25, 1942. Also from this moment, the first scholarly treatment of the subject appeared in Sherman Lee, "A Critical Survey of American Watercolor" (PhD diss., Case Western Reserve University, Cleveland, 1941).

160. Lloyd Goodrich, *American Watercolor and Winslow Homer,* exh. cat. (Minneapolis: Walker Art Center, 1945). The exhibition also traveled to Detroit, San Francisco, and Brooklyn.

161. Ibid., p. 8.

162. Carol Troyen has considered this sequence of exhibitions and the course of watercolor in the postwar period; Troyen, "War Waged on Paper," pp. lxiv–lxix; Barbara Dayer Gallati reviews the changing tastes in twentieth-century American watercolor in Ferber and Gallati, *Masters of Color and Light*, pp. 174–207.

163. See Ralph Fabri, *History of the American Watercolor Society* (New York: American Watercolor Society, 1969), pp. 32–36.

164. Champney, *John Angelo at the Water Color Exhibition*, [p. 32].

Materials

The author is grateful to Nancy Ash, Rodney Baldwin, Ronald Bodoh, Dr. Spike Bucklow, ColArt Ltd., Karen David, the Dixon Ticonderoga Company, Eva Eis, Laura Fravel, Green & Stone Ltd., Larry Henke, Scott Homolka, Joan Irving, Lyra Kilston, Dr. Georg Kremer, Catherine R. Matsen, Alison Miner, Laura Neufeld, Rebecca Pelly-Fry, Michelle Sullivan, Judith C. Walsh, and Jason Wierzbicki for their expertise, time, and generous contributions to this project. Special thanks are also owed to Kathleen A. Foster for the opportunity to study this compelling subject.

1. In the mid-eighteenth century, the épiciers (spice sellers) of France, who had dealt in imported spices or drugs, with which pigments were often categorized, began to specialize as *marchands de couleurs* (color merchants), selling only art supplies. See Philip Ball, *Bright Earth: Art and the Invention of Color* (New York: Farrar, Straus and Giroux, 2002), p. 179.

2. See Marjorie B. Cohn, "Cause and Effect in the Historical Development of Watercolor," in *The Broad Spectrum: Studies in the Materials, Techniques, and Conservation of Color on Paper*, ed. Harriet K. Stratis and Britt Salvesen (London: Archetype, 2002), p. 63.

3. The discussion here of the terminology and materials of watercolor painting is necessarily brief and focuses on paints to the exclusion of other important new materials and tools, notably new brushes and papers that also facilitated the watercolor movement in the nineteenth century. For comprehensive information on the history of watercolor materials, see Marjorie B. Cohn, *Wash and Gouache: A Study of the Development of the Materials of Watercolor*, exh. cat. (Cambridge, MA: Center for Conservation and Technical Studies, Fogg Art Museum, 1977). See also Marjorie Shelley, "The Craft of American Drawing: Early Eighteenth to Late Nineteenth Century," in Kevin J. Avery et al., *American Drawings and Watercolors in the Metropolitan Museum of Art*, vol. 1, *A Catalogue of Works by Artists Born before 1835,* exh. cat. (New York: Metropolitan Museum of Art, 2002), pp. 29–78, for a thorough historical and technical record of the drawing materials used by Americans from the colonial period until 1900. The many existing studies of the works of individual artists in this volume also thoroughly document watercolor materials and techniques in use during the nineteenth and early twentieth centuries. Significant contributions to this field include exhibition catalogues devoted to salient public collections of American watercolors, such as those in the Art Institute of Chicago, Brooklyn Museum, Metropolitan Museum of Art, Museum of Fine Arts, Boston, and Worcester Art Museum, among others.

4. John Singleton Copley (1738–1815) to Benjamin West or Captain R. G. Bruce, February 1767, in *Collections of the Massachusetts Historical Society*, vol. 71, *Letters and Papers of John Singleton Copley and Henry Pelham, 1739–1776* (Boston: Massachusetts Historical Society, 1914), pp. 65–66.

5. The earliest American advertisement for a shipment of painters' colors appeared in 1710 or 1711. See George Francis Dow, *The Arts and Crafts in New England, 1704–1775: Gleanings from Boston Newspapers . . .* (Topsfield, MA: Wayside, 1927), p. 237.

6. The first art academies were established in New York and Philadelphia. The Columbian Academy of Art (later Columbian Academy of Painting) was founded in New York in 1792, the New York Academy of Fine Arts (later the American Academy of Fine Arts) followed in 1802, and the Pennsylvania Academy of the Fine Arts was formed in Philadelphia in 1805.

7. Smibert's collection was frequented by artists such as Charles Willson Peale, Gilbert Stuart, and John Trumbull. See Richard H. Saunders, *John Smibert: Colonial America's First Portrait Painter* (New Haven: Yale University Press, 1995). Smibert had come to the Americas to teach drawing, painting, and architecture at a college in Bermuda that was never established. He opened his shop on Queen Street in Boston in 1734 to supplement his income, and it was operated and later taken over by his nephew John Moffat (c. 1704–1777). See John Moffat to Arthur Pond, December 28, 1752; quoted in Henry Wilder Foote, *John Smibert, Painter: With a Descriptive Catalogue of Portraits, and Notes of the Work of Nathaniel Smibert* (Cambridge, MA: Harvard University Press, 1950), pp. 103–5.

8. D. R. Averill patented ready-to-use, prepackaged paint in 1867, but early factory-made paints were notorious for their poor quality; Letters Patent 66,773, dated July 16, 1867; reissue 3,051, dated July 28, 1868; reissue 3,597, dated August 17, 1869, accessed October 2016, https://www.google.com/patents/USRE3597. In the 1870s, the Sherwin-Williams paint-manufacturing company perfected a formula to keep fine paint particles suspended in linseed oil, and released their product around 1881; Benjamin Moore followed suit in 1883.

9. Samuel Wetherill & Sons to Brandram, Templeman & Jaques, London, June 3, 1789; quoted in Miriam Hussey, *From Merchants to "Colour Men": Five Generations of Samuel Wetherill's White Lead Business*, Research Studies, no. 39 (Philadelphia: University of Pennsylvania Press, 1956), p. 1.

10. Prominent merchants, such as the Elliott family in Philadelphia, also manufactured small quantities of bright pigments to sell in their shops. The Elliott business survived well into the nineteenth century under the name Carter & Scattergood. See John W. Jordan, ed., *Colonial Families of Philadelphia* (New York: Lewis Publishing, 1911), vol. 2, pp. 1636–42; Theresa Osterman Green, "The Birth of the American Paint Industry" (master's thesis, University of Delaware, Newark, 1965), p. 44. The business address is listed in James Robinson, *The Philadelphia Directory, for 1810: Containing the Names, Trades, & Residence, of the Inhabitants, of the City, Southwark, & Northern Liberties* (Philadelphia: printed for the publisher, 1810), p. 92.

11. Rural homes were generally not painted at this time, but the increasing population in urban areas in the early to mid-nineteenth century necessitated constant building and painting. See Roger W. Moss, ed., *Paint in America: The Colors of Historic Buildings* (Washington, DC: Preservation Press, 1994), p. 23.

12. Immigration to the United States, curtailed during the time of the Napoleonic Wars, began to increase in the 1820s and then rose dramatically in the 1840s and 1850s. Germans were a particularly large immigrant group by midcentury, having come to the New World seeking economic opportunity or refuge from the failed liberal revolution of 1848.

13. Until the early to mid-nineteenth century, American production utilizing the country's natural resources had been discouraged by British taxation policies. See Shelley, "The Craft of American Drawing," pp. 30–31.

14. The manufacturing processes of zinc oxide are designated in commerce as the "indirect" or "French process," which indicates zinc oxide made from the metal, and the "direct" or "American process," which is zinc oxide made from the ore, and hence traditionally somewhat less pure. American production of zinc white was largely for crude applications, such as priming surfaces, or for industrial paints. The high-grade zinc oxide used in artists' paints had to be imported to the United States.

15. By 1820 there were several established factories in Philadelphia that produced red and white lead, and in New York, Prussian blue. By the 1760s lampblack was being produced in Pennsylvania (manufactured from waste oils of New England fisheries). See J. Leander Bishop, Edwin T. Freedley, and Edward Young, *A History of American Manufactures from 1608 to 1860: Exhibiting the Origin and Growth of the Principal Mechanic Art and Manufacture, . . .* (Philadelphia: Edward Young & Co., 1864), vol. 2, pp. 155, 261–62.

16. See ibid., p. 231: "The manufacture of chemicals, paints, medicines, etc., was commenced at Baltimore, by Messrs. Howard Sims and Isaac Tyson, who erected a laboratory . . . and were incorporated in 1822. They became extensive manufacturers . . . of chromate of potash, chrome yellow, and other chromic pigments from the chromate of iron at Bare Hills, Maryland, and in Chester County, Pennsylvania."

17. A census of manufacturers was taken in 1832 in an effort to determine the effects of foreign competition and tariffs on domestic industry. The domestic sources of pigments and paints listed in this survey were located in Vermont, New Hampshire, Massachusetts, and New York. See United States and Louis McLane, "House Document 308, Serial 222, 223," in *Documents Relative to the Manufactures in the United States Collected and Transmitted to the House of Representatives, in Compliance*

with a Resolution of January 19, 1832 (Washington, DC: D. Green, 1833), n.p. See also Green, "The Birth of the American Paint Industry," pp. 48–49.

18. To avoid the prohibitive British import tax, the United States established trade relations with European countries such as Holland and Germany, and with the East Indies. See Ann Siegel Vanderhoof, "Artists' Suppliers and Supplies in Eighteenth-Century America" (master's thesis, University of Delaware, Newark, 1977), p. 4.

19. For an overview of this topic as discussed in artists' manuals of the period, see Leslie Carlyle, *The Artist's Assistant: Oil Painting Instruction Manuals and Handbooks in Britain, 1800–1900; With Reference to Selected Eighteenth-Century Sources* (London: Archetype, 2001). See also Max Doerner, *The Materials of the Artist and Their Use in Painting: With Notes on the Techniques of the Old Masters*, trans. Eugen Neuhaus (New York: Harcourt, Brace, 1934); H. C. Standage, *The Artist's Manual of Pigments, Showing Their Composition, Conditions of Permanency, Non-Permanency, and Adulterations . . .* (Philadelphia: Janentzky & Weber, 1886), p. 44.

20. For a discussion of the extent of adulteration, see Leslie Carlyle, "Authenticity and Adulteration: What Materials Were 19th Century Artists Really Using?," *Conservator*, vol. 17 (1993), pp. 56–60. See also Joyce H. Townsend et al., "Later Nineteenth Century Pigments: Evidence for Additions and Substitutions," *Conservator*, vol. 19 (1995), pp. 65–78.

21. George Field, *Field's Chromatography; or, Treatise on Colours and Pigments as Used by Artists*, rev. ed. by Thomas W. Salter (London: Winsor & Newton, 1869), p. 139.

22. See Friedrich Accum, *A Treatise on Adulterations of Food, and Culinary Poisons . . .* (London: Longman, Hurst, Rees, Orme, and Brown, 1820), p. 281.

23. *Boston News-Letter*, September 16–23, 1736; quoted in Dow, *The Arts and Crafts in New England*, p. 238. "Face-painting" here refers to portrait painting.

24. John Gore (1717–1796) was a painter and merchant in Boston. In 1775 he ordered several expensive paint mills from England to support his business. See Moss, *Paint in America*, p. 22.

25. *Boston News-Letter*, November 25, 1762; quoted in Dow, *The Arts and Crafts in New England*, p. 240. Gore also advertised the sale of "Water Colours" in the *Boston Gazette* on March 9, 1761, but he did not specify that the paints were ready-made; ibid., p. 239.

26. William Reeves (1739–1803) was an apprentice and member of the Worshipful Company of Gold and Silver Wyre Drawers in London in the early 1760s, before setting up business as a colorman in or before 1766. He entered into a partnership with his older brother, Thomas Reeves, around 1768. The brothers dissolved their partnership in 1784 and ran rival businesses for nearly thirty years. See Don Pavey with Peter Staples, *The Artists' Colourmen's Story: A Guide to the History of Artists' Colourmen of London as Illustrated in the Artists' Colourmen's Room at the Winsor & Newton Colour Works at Wealdstone* (Harrow, England: Reckitt & Colman Leisure, 1984), p. 8.

27. See "Reeves' Story," on the Reeves website, accessed June 30, 2016, http://www.reeves-art.com/reeves-story.

28. William and Thomas Reeves were awarded the Silver Palette of the Society for the Encouragement of the Arts, Manufactures and Commerce (now known as the Royal Society of Arts) in April 1781, for their improved watercolors. The cakes continued in use until late in the nineteenth century. Winsor & Newton continued to produce watercolor paint in cakes until the 1970s.

29. For the quantity, see William T. Whitley, *Gilbert Stuart* (Cambridge, MA: Harvard University Press, 1932), pp. 131–32. The market for these cakes likely included women amateur artists who painted paper fans. In 1743 John Smibert had ordered more than 4,200 fan mounts to replenish his already depleted supply at the beginning of "the season," as referenced in a letter from Smibert to Arthur Pond, March 24, 1744; quoted in Foote, *John Smibert, Painter*, pp. 87–88. Samuel Tuck ran a paint dealership called Paint and Color, located on Broad Street in Boston. Tuck merged in 1832 to become Stimson & Valentine, and about 1860 the firm became Valentine & Company, as Henry and Lawson Valentine became sole partners. The Valentines hired the chemist Charles Homer (brother of Winslow Homer, who, along with Frederick Stuart Church, would illustrate several advertisements for the firm), which at the time was unusual for an American paint-manufacturing company. The firm moved to New York City in 1870 and exists today as Valspar in Minneapolis. See the history on their website, accessed October 2016, http://www.valsparglobal.com/corp/about/ourhistory.jsp.

30. Lewis John Bodvil Wells (1768–1823) is listed as a "water colour maker" at 58 Chatham Street in David Longworth, *Longworth's American Almanac, New-York Register & City Directory, for the 36th Year of American Independence* (New York: David Longworth, 1811). His advertisement in the directory gives his address as 68 Chatham Street, and describes him as a "Water color maker for drawing, after the manner of Reeves, Reeves' and water colors in all varieties—all 30 percent cheaper, and 50 percent better than any other store in the United States." Quoted in Alexander W. Katlan, *American Artists' Materials Suppliers Directory: Nineteenth Century; New York 1810–1899, Boston 1823–1887* (Park Ridge, NJ: Noyes Press, 1987), p. 259. Wells moved his business to Philadelphia around 1814, advertising as "patent lint manufacturer 52 S. Front." See *Kite's Philadelphia Directory for 1814* (Philadelphia: B. & T. Kite, 1814), s.v. "Wells, Lewis J. B." In 1817, Wells obtained a patent for making paint cakes (Wells, L. J. Bodvil. Compressing and imprinting colors. United States Patent 2,729X, issued January 24, 1817), but these records were lost in a patent office fire in 1836. An advertisement in the 1818 *Philadelphia Directory* states that "Lewis I. Bodvel Wells, Operative Chemist, Water-Colour and Camel's Hair Pencil Maker, Has removed from Philadelphia to New York, Where he manufactures (*only* for Peter Kerrison & Co. Druggists, &c. Greenwich Street) the following articles, which can be obtained in this city . . . of Daniel B. Smith, druggist"; see John A. Paxton, *The Philadelphia Directory and Register for 1818* (published for the editor by E. & R. Parker, 1818), n.p. (among advertisements at the front), accessed October 2016, https://archive.org/stream/philadelphiadire1818phil. Lewis Wells is, however, again listed in the Philadelphia directories in 1820–22. Advertisements in the 1821 and 1822 directories for H. & A. Wells, patent and family store, describe the firm as "successors to L. I. B. Wells.—No appointed Agent in Philadelphia"; see *The Philadelphia Directory and Register for 1821* (Philadelphia: M'Carty & Davis, 1821), n.p. (among advertisements at the back), accessed October 2016, https://archive.org/stream/philadelphiadire1821phil. No subsequent mentions of Lewis Wells or H. & A. Wells were found.

31. Joseph Boston was a dyer and chemist in Philadelphia, listed in city directories of 1823 and 1825. Two extant watercolor cakes produced by him are in a private collection. The blocks measure 20 by 29 by 5 mm, and are imprinted on one side "J. Boston Chymist Phila." Boston also manufactured pigments. See *The Franklin Journal, and American Mechanics' Magazine . . . July, 1827* (Philadelphia: Franklin Institute, 1827), p. 407. See also F. Bailey, *Bailey's Washington Almanac Philadelphia Directory, 1823* (Philadelphia: Desilver, 1823), p. 75; Joshua Sharp, *Bailey's Washington Almanac, for the Year of Our Lord 1825* (Philadelphia: Lydia R. Bailey, 1824), p. 106. Joseph Brutsche emigrated from Germany in 1827 and was listed as a watercolor manufacturer in Philadelphia in the 1850 census. He is also listed as the same in Philadelphia city directories from 1855 to 1863. See *McElroy's Philadelphia Directory, for 1855* (Philadelphia: Edward C. & John Biddle, 1855), p. 64. A. P. Homer is listed in Philadelphia city directories in the 1850s. See *McElroy's Philadelphia Directory, for 1850* (Philadelphia: Edward C. & John Biddle, 1850), p. 192.

32. Extant watercolor-paint cakes made by George C. Osborne (c. 1784–1837) are similar in formation and appearance to Reeves cakes produced during the same period. For pigment analysis of the watercolor cakes produced by Osborne that are in the collection of the Winterthur Museum, Delaware, see Janice H. Carlson and John Krill, "Pigment Analysis of Early American Watercolors and Fraktur," *Journal of the American Institute for Conservation*, vol. 18, no. 1 (1978), pp. 19–32.

33. No record of Osborne's business was found in New York City directories, but it is described in John F. Watson and Willis Pope Hazard, *Annals of Philadelphia and Pennsylvania in the Olden Time: Being a Collection of Memoirs, Anecdotes, and Incidents of the City and Its Inhabitants, and of the Earliest Settlements of the Inland Part of Pennsylvania* (Philadelphia: J. M. Stoddart, 1854), p. 150.

34. See James Robinson, *The Philadelphia Directory for 1816* (Philadelphia, 1816), s.v. "Osbourne [*sic*], George C.," https://archive.org/details/philadelphiadire1816phil; John A. Paxton, *The Philadelphia Directory and Register for 1818* (Philadelphia: published for the editor by E. & R. Parker, 1818), s.v. "Osborne, George C.," https://archive.org/details/philadelphiadire1818phil; *The Philadelphia Directory and Register for 1821* (Philadelphia: M'Carty & Davis, 1821), s.v. "Osborne, George," https://archive.org/details/philadelphiadire1821phil (all accessed October 2016).

35. Osborne presented his "Superfine American Water Colors" to the public at the first Franklin Institute exhibition in Philadelphia, in 1824. According to text on his early product labels, the paints were "judged to be of superfine quality rivaling the best production of Europe." Quoted in Marian Sadtler Carson, "Early American Water Color Painting," *Antiques*, vol. 59, no. 1 (January 1951), p. 54. The Osborne paint box in the Winterthur collection retains twenty of the original paints, each embossed with his eagle and shield. In 1835 Osborne won a silver medal from the Franklin Institute for his oil cakes, manufactured and packaged similarly to his watercolors. See "Report of the Committee of Premiums and Exhibitions: Ninth Exhibition of Domestic Manufactures, held by the Franklin Institute, of the State of Pennsylvania, for the Promotion of the Mechanic Arts," *Journal of the Franklin Institute of the State of Pennsylvania, and Mechanics' Register*, n.s., vol. 17, no. 5 (May 1836), pp. 322–23.

36. George C. Osborne succeeded his business to his son George W. Osborne around 1831. See John F. Watson and

Willis P. Hazard, *Annals of Philadelphia and Pennsylvania: Being a Collection of Memoirs, Anecdotes, and Incidents of the City and Its Inhabitants, and of the Earliest Settlements of the Inland Part of Pennsylvania, from the Days of the Founders*, vol. 3 (Philadelphia: E. S. Stuart, 1887), p. 150, accessed October 2016, http://www.archive.org/details/annalsofphiladelp03wats. George C. Osborne's name appeared on paint boxes from the 1820s to the 1840s; he continued to work with Daniel Smith until his death in 1837. The paints were carried by the Philadelphia druggists Smith & Hodgson, which later became the Bullock & Crenshaw drug and chemical store, from 1820 to about 1840s. The Geo. W. Osborne & Co. location at 104 North Sixth Street is the same as for Smith & Hodgson (1828–1840s) and Bullock & Crenshaw (1840s–c. 1900).

37. Paints manufactured by Osborne are described in the 1843 catalogue of Bullock & Crenshaw, reprinted in Alexander W. Katlan, *American Artists' Materials*, vol. 2, *A Guide to Stretchers, Panels, Millboards, and Stencil Marks* (Madison, CT: Sound View Press, 1992), pp. 315–17.

38. Although best known to artists for his 1839 publication *The Principles of Harmony and Contrast of Colors* (see Judith Walsh, "Winslow Homer and the Color Theories of Michel-Eugène Chevreul," in Martha Tedeschi with Kristi Dahm et al., *Watercolors by Winslow Homer: The Color of Light* [Chicago: Art Institute of Chicago, 2008], pp. 199–205), Chevreul's fame stems chiefly from his investigations of lipids. In 1811 he proved that an alkali split a fat into a soap and an alcohol, which he named glycerin (glycerol). Glycerol is a viscous liquid that is colorless, odorless, and nontoxic. It is widely used in the food industry as a sweetener and humectant and is also used in pharmaceutical formulations.

39. The porcelain pans varied in size, but became more standardized to fit the portable palette boxes introduced in the 1850s (see fig. 327).

40. The squeezable tube is, in fact, the one product invented for art materials that found its way into everyday life. John Rand (1801–1873) filed patents in Britain and the United States, but sold off his British patent to appease creditors overseas: British Patents 8863 (March 6, 1841) and 9480 (September 29, 1842); United States Patents 2,252 (September 11, 1841) and 3,694 (August 7, 1844). The metal tubes were initially marketed in London by the supplier Thomas Brown. See "Death of John Gough [*sic*] Rand" (obituary), *New York Post*, January 23, 1873, clipping in the John Goffe Rand papers, 1832–1960, Archives of American Art, Smithsonian Institution, Washington, DC; Gerald W. Ward, *The Grove Encyclopedia of Materials and Techniques in Art* (Oxford: Oxford University Press, 2008), p. 434.

41. For Masury & Whiton's location and stock of artists' materials, see "Editor's Table," *Knickerbocker; or, New-York Monthly Magazine,* vol. 52, no. 4 (October 1858), p. 432.

42. Winsor & Newton, *Catalogue of Materials for Water-Colour Painting, and Sketching, Pencil, and Chalk Drawing, . . .* (London, 1849), p. 15. The newer mineral colors were well suited for the opaque painting techniques popular with American and British artists in the 1860s. Cobalt blue and chrome yellow, for example, were bright and appealing but relatively heavy and uneven in washes. Until milling technology was refined a few years later, they performed best when used in a dry, opaque manner.

43. Introduction to *Illustrated Price List of Artists' Materials: Comprising a Complete List of Painting and Drawing Materials, for Artists, Amateurs, . . . ; Materials for Gilders, Sign and Coach-Painters; Etchers' and Engravers' Tools . . .* (Philadelphia: F. Weber & Co., 1888), [p. vi]; watercolor paints in tubes were introduced in this catalogue, p. 82. For further information on the company, see F. Weber & Co., Inc. records, 1865–1973, Getty Research Institute, Los Angeles, Special Collections, acc. no. 950018.

44. Umbers, for example, lose their warmth and turn gray with excess grinding. Blue smalt and green malachite become nearly colorless as they are broken down.

45. Prussian blue was available to artists by 1724, but was not imported to America until 1746. The first domestic manufacture of the pigment was in 1806, in Pennsylvania. See William Haynes, *American Chemical Industry*, vol. 1, *Background and Beginnings, 1609–1911* (New York: Van Nostrand, 1954), p. 202; also Green, "The Birth of the American Paint Industry," p. 82.

46. Winsor & Newton introduced "Chinese white," a zinc oxide pigment, as a watercolor paint in 1834 to replace lead white, which can darken in polluted environments and tends to settle out of a gum solution. Fumes of burnt zinc ore were gathered to make the pigment, producing very fine pigment particles that made a smooth paint. Other white pigments commonly used in watercolor paints, such as barium sulfate and chalk, are relatively stable but appear significantly darker in tone when wet, making it difficult for the artist to accurately predict how a mixture will appear when dry. Zinc-white watercolor, when used alone or in mixtures, does not change in tone when dry.

47. In the 1740s pigments were crushed between mechanized stone rollers that first were horse powered and then, by the nineteenth century, steam powered. These advances had more impact on the larger paint industry than on the manufacturing of fine artists' colors. Initially, the quality of paints made using the mills was poor compared to those created by hand grinding, which benefited from the technician's sensitivity and skill. The mills were not used to make fine artists' colors until a Parisian merchant refined the mechanized preparation in the 1830s. Subsequently, British manufacturers engineered machine grinding that produced fine, homogenous pigments and watercolors that set the international standard. Cobalt blue, a heavy pigment prone to granulation, was vastly improved in the 1870s using steam-powered mills for grinding. See Cohn, *Wash and Gouache*, p. 34.

48. Ibid., p. 55.

49. Ball, *Bright Earth*, p. 160.

50. See George Field, *Chromatography; or, A Treatise on Colours and Pigments, and of Their Powers in Painting, &c.* (London: C. Tilt, 1835). In 1856, Sir Arthur H. Church began experiments on the permanence of watercolor. See A. H. Church, *Chemistry of Paints and Painting*, 2nd ed., rev. (London: Seeley, 1892).

51. Standage, *The Artists' Manual of Pigments*, pp. v–vii; quoted in Alexander W. Katlan, "The American Artists' Tools and Materials for On-Site Oil Sketching," *Journal of the American Institute for Conservation*, vol. 38, no. 1 (1999), p. 22.

52. For a glossary of terms used in colormen's recipes, see Mark Clarke, "A Nineteenth-Century Colourman's Terminology," *Studies in Conservation*, vol. 54 (2009), pp. 160–69.

53. J. Scott Taylor, *A Descriptive Handbook of Modern Water-Colour Pigments . . .* (London: Winsor & Newton, 1887).

54. Ibid., p. 16.

55. Throughout the nineteenth and early twentieth centuries, certain color names were retained while the composition of the paints changed. For example, Naples yellow, a pigment traditionally composed of lead antimonite, was later made using a mixture of cadmium yellow and zinc white. Vermilion (mercuric sulfide) was enhanced or substituted with red lake pigments, green earth with yellow lake and/or artificial ultramarine. Some colors had a different composition in watercolor than in oil, based on the suitability of the pigments with each medium.

56. George B. Heckel, *The Paint Industry: Reminiscences and Comments* (Saint Louis: American Paint Journal Co., 1931), p. 43.

57. For example, the F. W. Devoe catalogues of the 1880s list more than forty artists who provided testimonials about the quality of the paints, including Albert Fitch Bellows, William Merritt Chase, Thomas Eakins, John Falconer, and William Hart. See F. W. Devoe (New York), catalogue of 1883–88, cited in Katlan, *American Artists' Materials*, vol. 2, pp. 322–25. An 1826 advertisement for Osborne's watercolors includes excerpts from letters addressed to the company dated 1824 through 1826. These include testimonials from John Audubon, Titian R. Peale, Joshua Shaw, and Thomas Sully. See William Cullen Bryant and Charles Folsom, *The United States Review and Literary Gazette* (Boston: Bowles and Dearborn, 1826), p. 326.

58. What is today the Martin F. Weber Company began in 1853 as Scholz & Company, a sales agency, and evolved through a series of partnerships (Scholz & Company became Scholz & Janentzky, then Janentzky & Company, and then Janentsky & Weber Manufacturers and Importers) to become F. Weber & Company in 1887. The company was incorporated in 1920 by Frederick Weber's sons (Frederick Jr. and Ernest) following his death in 1919, and soon had three retail stores in Philadelphia, Baltimore, and Saint Louis. See the company's history on their website, accessed September 2016, http://www.weberart.com/about-us.html.

59. The F. W. Devoe and C. T. Raynolds Company originated in 1754, when William Post started his eponymous business selling paint on the East River in New York. Although one of the earliest paint makers in America, the business did not produce artists' paints until the 1870s. The company expanded rapidly during the mid-nineteenth century, constructing large-scale manufacturing facilities in Greenwich Village in 1882–83 (see fig. 318). A number of major organizational changes followed Frederick W. Devoe's death in 1913. In 1918, after becoming a publicly traded company, the firm moved manufacturing facilities to Brooklyn, Chicago, and Newark, New Jersey. The full chronology of the firm is as follows: William Post (1754–98); William Post & Sons (1798–1800); William & Gerardus Post (1800–1834); William Post (1834–35); Butler & Barker (1836–46); Francis Butler (1846–48); Butler & Raynolds (1848–51); C. T. Raynolds (1851); Raynolds & Devoe (1852–55); Raynolds, Devoe & Co. (1855–58); Raynolds, Devoe & Pratt (1858–64); C. T. Raynolds & Co., F. W. Devoe & Co. (two separate companies, 1864–92); F. W. Devoe and C. T. Raynolds Company (1892–present day). Devoe was bought by the Celanese Corporation in 1964, acquired by the Grow Group in 1976, and continues to be a subsidiary of the corporation.

60. The artist and colorman Joseph Henry Hatfield (1863–1928) was born in Ontario but settled in Canton, Massachusetts. He trained in Paris and returned to the United States in 1892 in the company of Childe Hassam, John Singer Sargent, and Mary Cassatt. Around 1903 he

started preparing his own paints (using pigments obtained from France, Germany, and Great Britain) and selling them to fellow artists. See Lance Mayer and Gay Myers, *American Painters on Technique, 1860–1945* (Los Angeles: J. Paul Getty Museum, 2013), p. 194.

61. Two watercolor boxes that belonged to Winslow Homer are now in the collections of the Bowdoin College Museum of Art in Brunswick, Maine (see fig. 327), and the Portland Museum of Art in Portland, Maine. Each is a twenty-pan, Japanned-black, moist-watercolor box made by Winsor & Newton. Each pan in the Bowdoin box has been analyzed at the Center for Technical Studies at the Fogg Museum, Harvard University, Cambridge, MA. See Richard Newman, Craigen Weston, and Eugene Farrell, "Analysis of Watercolor Pigments in a Box Owned by Winslow Homer," *Journal of the American Institute of Conservation*, vol. 19 (1980), pp. 103–4. The Portland box has been analyzed at the National Gallery of Art, Washington, DC. See Barbara Berrie, Yoojoo Strumfels, and Carol Tolocka, "Winslow Homer's Watercolor Pigments," in Stratis and Salvesen, *The Broad Spectrum*, pp. 101–7.

62. Judith C. Walsh, "Observations on Watercolor Techniques of Homer and Sargent," in *American Traditions in Watercolor: The Worcester Art Museum Collection,* ed. Susan E. Strickler (Worcester, MA: Worcester Art Museum, 1987), pp. 45–65.

63. Eakins's extant watercolor box is now in the collection of the Pennsylvania Academy of the Fine Arts, Philadelphia (see fig. 323). The box was manufactured by Waring & Dimes of London, and the watercolor cakes were made by Waring & Dimes as well as the London firms Winsor & Newton, Ackermann & Co., and James Newman. See Mark F. Bockrath, Virginia Norton Naudé, and Debra Hess Norris, "Thomas Eakins: Painter, Sculptor, Photographer; Examination, Technical Analysis, and Treatment of His Works in the Charles Bregler Collection of the Pennsylvania Academy of the Fine Arts," *Journal of the American Institute for Conservation*, vol. 31, no. 1 (1992), pp. 51–64.

64. Technical materials, including thirty-six watercolor and tempera paint tubes, were collected from Sargent's Boston studio after his death by an assistant to Edward W. Forbes, then director of the Fogg Museum. The selected tubes might not be representative of Sargent's full palette. See Annette Manick and Antoinette Owen, "Bringing Back Something Fine," in Erica E. Hirshler and Teresa A. Carbone, *John Singer Sargent Watercolors*, exh. cat. (Boston: Museum of Fine Arts, 2012), p. 208.

65. Ibid., p. 39, quoting from DeWitt McClellan Lockman's interview with Childe Hassam, February 3, 1927, Interviews of artists and architects associated with the National Academy of Design, 1926–27, Archives of American Art, Smithsonian Institution, Washington, DC. Childe Hassam also used paints supplied by Joseph Hatfield, although the type of paint is not specified; ibid., p. 194.

66. Popular colors such as Hooker's green or so-called Neutral Tint were prepared mixtures. Hooker's green was offered in two shades (#1 and #2) by Winsor & Newton and others. Homer's watercolor box in the collection of the Portland Museum of Art (see note 61) contains both green shades, as well as three pans of vermilion (scarlet vermilion). See Walsh, "Observations on Watercolor Techniques of Homer and Sargent," p. 64–65.

67. For pigment analysis of early American watercolor paints in two paint boxes containing watercolor cakes made by Osborne and of the colors found in fraktur in the collection of the Winterthur Museum in Delaware, see Carlson and Krill, "Pigment Analysis of Early American Watercolors and Fraktur," pp. 19–32. See also Jennifer Mass, Catherine Matsen, and Janice Carlson, "Materials of the Pennsylvania German Fraktur Artist," *Antiques,* vol. 168, no. 3 (2005), pp. 128–35; Kesha Talbert, "Technical Analysis of Watercolor Pigments in Early American Fraktur," poster paper presented at the 44th AIC and CAC-ACCR Joint Annual Meeting and Conference, Montreal, May 15–16, 2016.

68. Bronwyn A. Ormsby et al., "British Watercolour Cakes from the Eighteenth to the Early Twentieth Century," *Studies in Conservation*, vol. 50 (2005), pp. 45–66. See also Joyce H. Townsend, "The Materials of J. M. W. Turner: Pigments," *Studies in Conservation*, vol. 38 (1993), pp. 231–54; Joyce H. Townsend, "The Analysis of Watercolor Materials, in Particular Turner's Watercolors at the Tate Gallery (1790s to 1840s)," in Stratis and Salvesen, *The Broad Spectrum*, pp. 83–88; Berrie, Strumfels, and Tolocka, "Winslow Homer's Watercolor Pigments," in ibid., pp. 101–7.

69. Dr. W. J. Russell and Capt. W. de W. Abney, *Report to the Science and Art Department of the Committee of Council on Education on the Action of Light on Water Colours: Presented to Both Houses of Parliament by Command of Her Majesty* (London: printed for H. M. Stationary Office, 1888). See also N. S. Brommelle, "The Russell and Abney Report on the Action of Light on Water Colours," *Studies in Conservation*, vol. 9, no. 4 (1964), pp. 140–52.

70. In the 1880s, local paint societies were formed in New England and Saint Louis, followed by societies in Chicago, New York, Philadelphia, Cincinnati, and Pittsburgh. American paint manufacturers would not organize nationally until 1899, when the Paint Grinders Association (later the Paint Manufacturers' Association, 1917) was formed. The American Society for Testing and Materials (ASTM) would follow in 1902.

71. Heckel, *The Paint Industry*, p. 49.

72. Those who, like Frederick Devoe, enjoyed manufacturing artists' paints (see p. 386) had done so supported by revenue from their larger-scale production of commercial paints. Increased awareness of pigment toxicity toward the end of the nineteenth century led to an effort to replace the lead- and chrome-based colors that had been profitable American products and exports. Loss in the larger generators of revenue caused other companies to sell, merge, or cut smaller product lines.

73. Devoe and Raynolds Company, *The Colorful Years, 1754–1942: The Story of a Colonial Venture That Became an American Institution* (New York: Devoe and Raynolds, 1942), p. 39.

74. Prang's paints were made in Germany until the raw materials could be sourced domestically in the United States.

75. Prang watercolor set "No. 8," recommended for grammar and high-school students, contained eight half-pans of carmine, gamboge, ultramarine, orange, Hooker's green no. 1, violet, warm sepia, and charcoal gray. In the twentieth century, nearly every other artist-materials manufacturer adapted Prang's design and marketed its own version of scholastic watercolors. See *"Old Faithful" Products* (Sandusky, OH: American Crayon Company, 1925), p. 23; for the company history, accessed October 2016, see http://www.dixonusa.com/history/prang.cfm.

76. See F. Weber & Co., Inc. records, 1865–1973, Getty Research Institute, Los Angeles, Special Collections, acc. no. 950018. The phrase seems to have been used from about 1921 to about 1935, according to examples found in the archives and online.

77. Mayer and Myers, *American Painters on Technique*, p. 195. It would be many decades before a new American manufacturer would take on the production of watercolor paint. Firms such as Daniel Smith (est. c. 1970s) and M. Graham & Company (1992) retain a similar focus on traditional methods and materials.