

Fig. 1. As this labeled container of gum sandrac (or sandarac) indicates, a supplier of imported resins and gums for varnish and paint making existed as early as 1797 near the Mount Lebanon, Watervliet, and Hancock Shaker communities. Courtesy New York State Museum, Albany, New York.

“Bedsteads Should Be Painted Green”

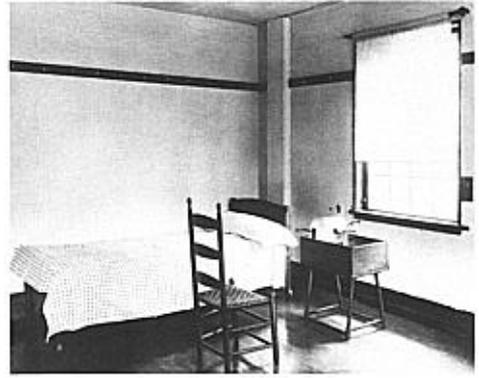
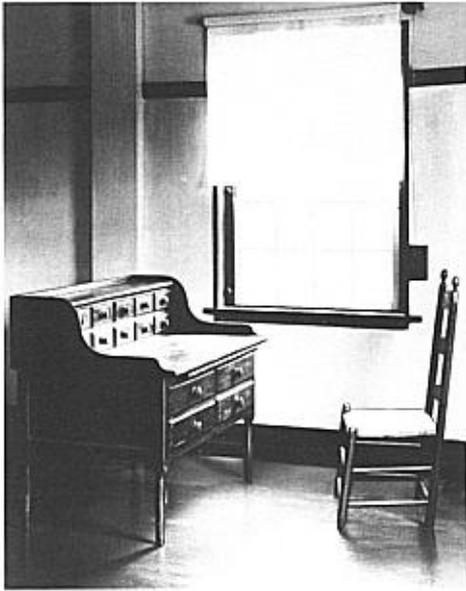
Shaker Paints and Varnishes

For years, village interpreters and visitors alike have tended to believe that the Shakers, like other rural furniture and folk art makers of their time, used natural materials readily at hand in an agrarian society to make the paints they used on buildings and furniture. The deep blue paint in several Shaker meetinghouses, for example, is alleged to have been composed of blueberries and buttermilk.¹

However, a two-year study of existing paint and varnish layers on more than sixty pieces of Shaker furniture and of manuscripts containing paint and varnish recipes indicates that the Shakers were making their own paints and varnishes from proven recipes of *The World*, were purchasing raw materials readily available in New England and New York State, and were using many of the same ingredients in medicinal recipes. Moreover, efforts to replicate specific paints from the

Shaker recipes have shown that these paints were often quite brilliant, unlike the darkened surfaces surviving on many Shaker objects today.

The misconceptions about Shaker paints were part of a more general interpretation of Shaker life that began to emerge in the 1930s. Noted Shaker scholars and dealers Edward Deming Andrews and Faith Andrews actively promoted the market for Shaker materials, and in their 1937 book *Shaker Furniture* presented Shaker-made furnishings as being far more than utilitarian forms; they were symbols, the Andrewses claimed, “of one of the purest of cultures.”² They also identified the pigments used in some of the paints, presumably by color. For example, they identified a large built-in series of cupboards and drawers from the Enfield, New Hampshire, Shaker community (now in the Winterthur Museum) as having an original stain of yellow ochre, an



Figs. 2 and 3. *William F. Winter's photographs for the landmark volume Shaker Furniture skewed perceptions of Shaker furnishings and interiors: as these two images show, the furnishings were depicted not in the context in which they were used but instead were carefully arranged to be photographed in only three or four rooms. Analysis of the original prints shows that they had been retouched for publication. Courtesy the Winterthur Library, Winterthur, Delaware; the Edward Deming Andrews Memorial Shaker Collection, Nos. SA577c and SA584d.*

iron oxide pigment derived from clay. Similarly, they described the deep red colors of other pieces as ochre red and the pegboards, casings, and built-in drawers as having been painted in a range of colors from a greenish to a Prussian blue.

Shaker Furniture is still a touchstone of Shaker scholarship, and *Religion in Wood*, which the couple published in 1966, amplified many of their earlier findings.³ However, the use of pigment names to describe colors in these volumes is misleading. No evidence exists that the Andrewses actually analyzed pigments, and the black-and-white photographs prepared for these two books by William F. Winter present Shaker interiors as quite austere and monochromatic. Yet close examination of the images reveals that the furniture was very carefully arranged for the photographs in, at most, only three room interiors (figs. 2 and 3). The original Winter prints, now in the Edward Deming Andrews Collection at the Winterthur Museum and Library, were extensively retouched to make

the outlines of the furniture sharper, to define shadows more precisely, and to even out irregularities in the painted surfaces.

Thus, many early impressions of Shaker furniture were based on black-and-white views that showed none of the expected evidence of age and use. In fact, Shaker furniture such as tailoring counters, chairs, tables, and sewing desks was intended to withstand heavy and frequent use and was often quite brilliantly colored. And what the Andrewses described as red ochre may in fact have contained no red ochre at all but instead pigments such as red lead, burnt sienna, and

lampblack. Cross-section analysis and pigment identification of samples from the built-in Enfield cupboard, for example, indicate that what has long been understood to be a yellow ochre stain is in fact a thinly applied oilbound paint composed primarily of chrome yellow, white lead, and some inert fillers.⁴ This same combination of pigments was found on the pristine built-in cupboards and drawers from the top floor of the Canterbury, New Hampshire, Shaker Village dwelling house and on the bright yellow interior of a red hanging Mount Lebanon, New York, wall cupboard dating from about 1830-80, now in the collections of the Winterthur Museum.

My research on traditional Shaker paints and painting techniques has involved not only a search for Shaker paint and varnish recipes but actual identification of the paint and varnish layers surviving on furniture, wooden objects, and architectural elements dating from approximately 1792 to 1865. To identify the organic and inorganic components contained in the surviving coatings, I have analyzed pinhead-sized samples through the use of cross-section microscopy techniques and analytical equipment such as Fourier Transform Infrared Spectroscopy (FTIR) and x-ray fluorescence (XRF).⁵ Through this analysis the pigments and binding mediums found in the paints on the objects can be directly compared to recipes found in Shaker books and manuscripts. It is also possible to distinguish between coatings made of shellac or of plant resin varnishes, though it is not possible to discriminate with confidence between specific plant resin components such as amber, mastic, colophony, sandarac, and copal.

Analysis to date of paint samples from more than sixty Shaker objects has revealed only two pieces whose painted surfaces include binders typically associated with agrarian communities. Both bright yellow, the two pieces have a tempera (or egg) binding medium: one is a washstand dating from about 1840 and used in the Enfield community; the other is a carpenter's cupboard believed to have been made between about 1820 and 1840 and now in privately owned Mount Lebanon Shaker collection. One other piece, a green bed from Mount Lebanon, may have been painted with a milk-based paint,⁶ and several architectural paint recipes in Shaker receipt books contain milk. Yet the physical evidence makes plain that the Shakers generally used traditional oil-based paints to paint wooden objects and architectural elements, and recipes containing milk are primarily lime-based whitewashes or exterior paints, not furniture or interior paints.⁷

In addition, this analysis has revealed evidence of numerous layers of overpaint, the use of a wide range of pigments, many generations of varnish over intact paint layers, and distinct changes in color over time. The Shaker penchant for cleanliness and orderliness also extended to regular cleaning and repainting of objects in use, and, on occasion, to complete stripping and repainting or revarnishing. There are numerous entries in Shaker recipe books from the mid-1800s for caustic paint strippers with explicit titles such as "To get Paint off from Wood."⁸ Thus, even as original finishes and untouched surfaces are highly prized and much sought after in the current market for Shaker furniture and wooden objects, this study suggests that comparatively few objects have remained



Fig. 4. Cross-section analysis of the striking 1821 blue-green chest made by Ziba Winchester from the Harvard, Massachusetts, community, revealed that its unusual underhung drawer had a different paint history and thus was probably a later addition. Courtesy Hancock Shaker Village, Pittsfield, Massachusetts.

truly untouched.

An intriguing example of a repainted object is a distinctive blue-green chest with an underhung drawer from the Harvard, Massachusetts, community, now in the collections of Hancock Shaker Village (fig. 4). While Shaker cabinetmakers generally did not sign or date their work, this chest is dated twice and signed. The date "1821" was painted in red on the back, where "[illegible] Winchester Aged 24 1824" was also written in pencil. The underhung drawer construction is also unusual, and there has been some question whether the drawer is

original to the chest. Cross-section samples indicate that the case side was originally painted deep orange and then repainted blue-green; the underhung drawer front was first painted blue and then repainted blue-green. Perhaps the chest was originally made and painted orange in 1821, and then a cabinetmaker, most likely Ziba Winchester, added a blue drawer from another object and repainted the entire form three years later.

The study began with a focus on wooden objects made between 1790 and 1860 from the Mount Lebanon Community, the spiritual center of the Shakers. Selected objects from the Shaker communities in Canterbury and Enfield, New Hampshire, Watervliet, New York, and Harvard, Massachusetts, were also examined and compared. This work is still in progress, but the study to this point reveals some

intriguing information about painting methods, raw materials, and outside influences on Shaker craft practices.

THE MAKING OF PAINTS AND VARNISHES

In its most simple form, paint can be defined as dry pigments (colorants in the form of powders) in a liquid that serves as the carrier or vehicle for the paint. This carrier may also be called the binder, for as the liquid dries down certain nonvolatile components of the carrier remain to hold, or bind, the pigment particles in place to form a paint film. De-

pending on the types and proportions of pigments and binders contained in a paint film, the final product can vary from somewhat translucent to very opaque. On occasion organic or synthetic dyes might be added to achieve a specific color.

A stain can also contain dry pigments and dyes, but a stain typically has a considerably greater proportion of the liquid carrier to the pigmenting material. Stains are designed to penetrate porous surfaces such as wood and to leave a translucent color on the surface that allows the figure of the wood to show through. A varnish coating is often applied over stained or painted surfaces to protect them, to add a measure of gloss, and to produce a rich, saturated color on the surface.

Today we buy paints and stains premixed at the paint store in virtually any color imaginable. Modern paints contain a myriad of additives to extend their shelf life, to make them flow better off the brush, to control their drying time, and to make them less toxic. Alternative binding materials such as acrylic resins, latex, and polyurethanes substitute for traditional oil-based binding mediums. Because paints are commercially mixed, the knowledge of how paints are made, and how they differ from stains, has generally been lost among the general public.

Before the commercial paint industry became truly active in the United States af-

ter the Civil War,⁹ sources of paint were few. Prepared artist's colors in oils could be purchased from colormen (often decorative painters or sign painters who also sold painting supplies) in the eighteenth century or later



Fig. 5. The heading at the top of the bill of sale for New England Paint Works lists a wide range of pigments already ground in oil, as well as such raw materials for paint making as dry pigments, linseed oil, turpentine, copal, and rosin. The invoice is for five hundred pounds of "Boston Lead," presumably white lead, a staple for easel, decorative, and architectural paints. Courtesy the Winterthur Library, Winterthur, Delaware; Joseph Downs Collection of Manuscripts and Printed Ephemera, No. Col. 90.

from distributors such as The New England Paint Works in Bridgeport, Connecticut (fig. 5). But given the number of Shaker receipt books surviving, references to paintmaking procedures in Shaker journals, and a survival of a paint mill (with paint drips still attached) in the collection of Canterbury Shaker Village, it is more likely that the Shakers were producing large quantities of paint for their own uses.

Paint could be ground in volume in a hand-turned paint mill, and smaller amounts could be made with a mortar and pestle, or with a muller and a flat marble slab. The choice of raw materials was somewhat limited, but primarily by expense, not by availability. Paint shops in urban areas sold

pigments imported from Europe, and a wide variety of iron- and lead-based pigments were mined and processed in the United States in the eighteenth century. On March 16, 1761, John Gore, a colorman in Boston, advertised a broad range of pigments, oils, and varnishes “LATELY Imported from London” in *The Boston Gazette*.¹⁰ Gore’s list included more expensive imported pigments such as vermilion (red mercuric sulphide), ultramarine (ground lapis lazuli, a semiprecious stone), Prussian blue “of various Sorts,” carmine (a natural organic red dyestuff made from the dried bodies of the female insect *coccus cacti*), and “Kings Yellow” (orpiment, a naturally occurring, and quite poisonous, yellow sulphide of arsenic), as well as red lead, white lead, “Indian Red” (iron oxide red), “Verdigreafe” (a blue-green copper acetate which is a corrosion product of copper, brass, or bronze), and “Calcin’d Smalts” (cobalt-colored ground glass). Domestic sources for pigments and paints included producers in Vermont, New Hampshire, Massachusetts, and New York.¹¹ The binding materials were limited to oils (typically linseed oil, nut oils, or fish oil), water-soluble gums (such as gum arabic or cherry gum), hide glue, egg, and milk. Sugar, honey, molasses, and rice starch paste were often added as humectants to make the paint dry evenly or to make the paint flow more easily off the brush.

The Shakers were using the same pigments and binding materials for their furnishings and architecture as decorative painters and house painters in the World. What appears to distinguish Shaker painted objects is the use of quite pure, intense paint colors over solid surfaces, unrelieved by decorative geometric or floral patterns. They also

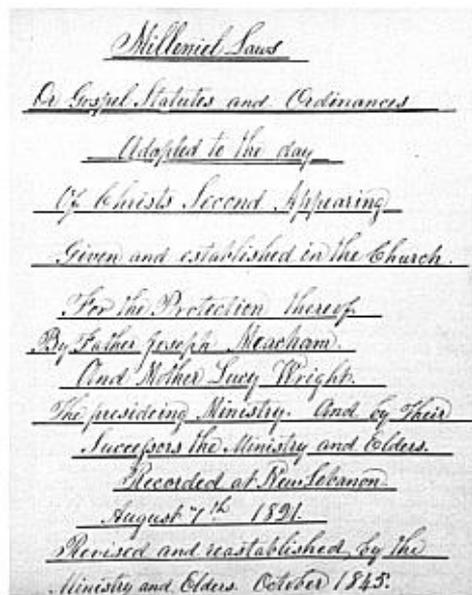


Fig. 6. The 1845 Millennial Laws provided explicit instructions covering all aspects of Shaker life, including exterior and interior paint colors, though it is not yet clear why certain colors were specified for specific uses. Courtesy Western Reserve Library, Cleveland, Ohio.

frequently painted the interiors of large case pieces in contrasting colors. It is not uncommon, for example, to find that the interior of a deep red cupboard with drawers is brilliant yellow or salmon pink. As there is no functional reason for painting the interiors of cupboards and closets contrasting colors, these brilliant colors may have been chosen simply because they were pleasing to the Shakers.

The choice of paint colors and techniques among the Shakers appears to have been guided by recipes and the sect’s Millennial Laws, written and first published in 1821 (fig. 6). The laws were substantially revised and republished in 1845 and again in 1860 and were an attempt to induce some conformity among the widespread villages

during a period of great spiritual upheaval. Section 9 of the 1845 Millennial Laws, “Concerning Building, Painting, Varnishing and the Manufacture of Articles for Sale, &c. &c.” lists specific objects that may be varnished:

Varnish, if used in dwelling houses, may be applied only to the moveables therein, as the following, viz., Tables, stands, bureaus, cases of drawers, writing desks, or boxes, drawer faces, chests, chairs, etc., etc. Carriages kept for riding or nice use may be varnished. No ceilings, casings, or mouldings may be varnished. Oval or nice boxes may be stained reddish or yellow, but not varnished. Bannisters or hand rails in dwelling houses may be varnished.¹²

The Millennial Laws also state that meetinghouse exteriors were to be painted white while their interiors were to be a “bluish shade.” Further, the 1845 laws deemed it “unadvisable for wooden buildings, fronting the street, to be painted red, brown, or black, but they should be of a lightish hue. . . Houses and shops, should be as near uniform in color, as consistent; but it is advisable to have shops of a little darker shade than dwelling houses.” Dwelling house floors, “if stained at all, should be of a reddish yellow, and shop floors should be of a yellowish red,” according to the laws, and “bedsteads should be painted green—comforters should be of a modest color.” The 1845 Millennial Laws even contained a specific injunction about varnishmaking. Rule 8 of Section II stated that “it is not allowable to boil oil, or varnish, in our buildings anywhere” in order “to prevent loss by fire.” This rule was especially pertinent, as many of the Shaker recipes for plant resin-based varnishes and drying oils required cooking them over an open fire.

The evidence in the cross-section

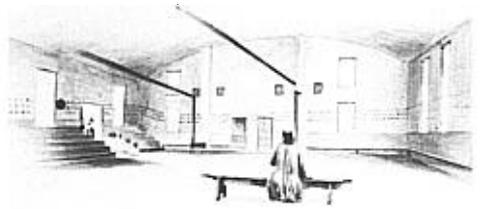


Fig. 7. This 1856 watercolor by Benjamin Lossing showed the interior of the 1824 Mount Lebanon Shaker meetinghouse to have been light blue, and thus painted in a manner consistent with the 1845 Millennial Laws.

Courtesy the Winterthur Library, Winterthur, Delaware; the Edward Deming Andrews Memorial Shaker Collection, No. SA1438.

samples, coupled with surviving Shaker correspondence, suggests that during the mid-1800s Shakers generally adhered to the rules on the use of varnish, although an original plant resin varnish coating and several later coatings were found on moldings in the Canterbury meetinghouse (ca. 1792) that predate the Millennial Laws. Shakers used clear varnish coatings primarily to protect surfaces that could get dirty or damaged from handling, not for decorative purposes. In addition, limited sampling and analysis of interior and exterior paints from four buildings at the Canterbury Shaker Village indicate that early generations of paint adhered to the dictates regarding architectural paint colors.¹³ Protected areas of flooring in the village’s dwelling house, dating from 1793, show evidence of at least twelve generations of thickly applied, opaque paint ranging in color from deep red to bright orange to intense yellow.

The woodwork in the first-floor meeting room of the Canterbury meetinghouse was also varying shades of blue from the first

generation of paint in 1792 until today. An 1856 watercolor painting by Shaker supporter Benjamin Lossing (fig. 7) shows the interior of the Mount Lebanon meetinghouse as a pale blue. And it is very likely that opaque green layers of paint on two beds in the Hancock Shaker Village collection were painted over the original, partially removed orange paint layers in response to the dictates of the 1845 Millennial Laws that bedsteads should be painted green. The opaque green paint of one bed dating from about 1815 is the second generation and was applied over remnants of orange paint that analysis of cross-section samples found still trapped in the wood fibers. The blue glaze layer on the second bed is the third generation of paint applied over an opaque green layer below, and wood fibers contain evidence that the first generation of paint was also orange.

THE EVIDENCE FROM RECEIPT BOOKS

Shaker receipt books also make clear that paints and varnishes used many of the same materials used to make medicines, including venice turpentine, red lead, linseed oil, and gum mastic. In fact, few of the receipt books discovered during this research were devoted primarily to paint and varnish recipes; many also included recipes for a multiplicity of other goods Shakers made for their own use and for sale to the outside world. Abigail Crosman's August 1854 receipt book included explicit dyeing instructions for indigo as well as several paint and varnish recipes; her handwritten note on the front cover advised that "Wisdom gained by Adversity is Reliable as A Guide for the Inexperienced."¹⁴ Another book of "Receipts Directions for Vegetable

Medecine, Memo of Sermons, Etc. 1840" contains shoe black and shoe varnish recipes, several detailed exterior paint recipes, and this recipe for Ague Plaster, to cure aches and pains:

Take Venice Turpentine 8 oz, Gum Olibanum 1 oz, Gum mastic 1 oz, Armenium bole 1 oz, all in fine powder the finer the better, make a plaster of the same, spread it on leather and apply it to the wrists and wear it for a number of days.¹⁵

Before the refinement of petroleum in the late 1800s, only a limited number of solvents and binders for paints and varnishes, as well as for medicines such as salves, balms, and extracts, were available to Americans. Given that the Shakers had a very active medicinal and herbal industry in the Mount Lebanon community from the 1830s until the 1870s (when the rise in the commercial patent medicine industry offered significant competition), it is likely that raw materials such as gums, linseed oil, alcohol, shellac, red lead, verdigris, white lead, and rosin—frequently used for making both medicine and paint—were bought and stored in bulk.¹⁶

A receipt book of about 1849, inscribed "Rosetta Hendrickson A Present from Eld. Austin" (fig. 8) also contains numerous recipes that would make paints as well as medicines.¹⁷ Hendrickson (1844-1912) lived in the Mount Lebanon community near Albany until 1865, when she moved to nearby Watervliet. Elder David Austin Buckingham (1803-85) moved to Watervliet from Mount Lebanon in 1818. This handwritten *Receipt Book, Concerning Paints, Stains, Cements, Dyes, Inks, & c.*, now in the collections of the Western Reserve Historical Society Library in Cleveland, contains a recipe



Fig. 8. This comprehensive receipt book, written in one hand, may have been compiled by Elder David Austin Buckingham and given to Sister Rosetta Hendrickson of the Mount Lebanon and Watervliet communities. Courtesy Western Reserve Library, Cleveland, Ohio.

“For White Swellings and Kindred Diseases” that could have poisoned a patient but would have made a durable bright orange paint:

Linseed oil one pint Red lead 4 ounces Spirits of Turpentine 4 ounces Shugar of lead 2 ounces. Boil the oil in an earthen vessel which has never been used untill it will coat the hard part of a writing quill while hot stir in the red lead & Shugar of lead Slow to very gradual or it will boil over add the Turpentine when it becomes cooler but not cold Spread this ointment thin on white paper and layover the pain.

Hendrickson’s “Receipt for Boiling Oil” (a drying oil) is curiously similar to this last recipe:

Take 4 gals. of oil, stir in 1 1/2 tb. red lead, 1 tb. of Umber & 1 tb. of Litherage, boil it till it will scorch a

feather then take it from the fire and stir in 4 galls. of raw oil while it is yet hot.

Oil prepared in this manner put in with paint ground in raw oil will soon dry.

None of the recipes in Hendrickson’s book include citations indicating their sources, but it is clear that they are not all original recipes. Her recipe for “Fat Copal Varnish” was discovered in *Mackenzie’s Five Thousand Receipts*, published in Philadelphia in 1829. The wording in Hendrickson’s recipe is so peculiar that it must have been copied verbatim from this source, which in turn reprinted at least some of its recipes from earlier sources. For example, Mackenzie’s recipe for a drying oil is identical to that found in P. F. Tingry’s *The Painter and Varnishers Guide*, published in London in 1804.¹⁸ Thus it is likely that proven recipes were copied and circulated from a variety of sources, as the several other Shaker receipt books that do list sources at the bottom of recipes indicate. Undated receipt books apparently compiled between 1840 and 1881 include citations to *New York Agriculter, Farmers Cabinet, The Dictionary of Mechanical Engines and Engineering* (1851), *Scientific American, Popular Science News*, and *Boston Journal of Chemistry* (1881).

These receipt books provide intriguing information about paintmaking methods, raw materials, and modes of application. In several instances the evidence of surviving painted objects corresponds directly to published recipes. One tailoring counter made in about 1860 by Benjamin Lyon and Charles Weed, now in the Mount Lebanon Shaker Collection, was colored with a low-viscosity paint layer composed solely of the iron earth pigment burnt sienna in an oil medium. This physical evidence directly relates to the recipe

for "Tere-de-Sena stain" in the Hendrickson receipt book.¹⁹ A green bed also in Mount Lebanon Shaker Collection is painted with three applications of chrome green pigmented paint (containing oil, protein, and carbohydrate components in the binding media), and its uppermost paint layer contains a plant resin varnish component. There are no distinct boundaries between these layers (an indication that the second and third layers were applied before the previous coating had completely dried); thus they are all the same generation of paint. This type of paint application is very similar to a recipe "For Painting Green" with verdigris in a "Church Family" receipt book from an unidentified Shaker community, now in the Library of Congress.²⁰ The recipe instructs the painter, "Slack your Verdigris in Alcohol or steam then pulverise and sift it mix and Grind it in prepared Oil Adding White lead until it is quite pail Green some thicker than common paint." The painter was then to make a varnish from "Spirit of turpentine and rosin about as thick as common Molasses in warm weather mix the varnish with the paint one third in quantity over the first coat one half for the last coat."

INTERPRETING AGED PAINTS AND VARNISH COATINGS

The interpretation of surviving painted objects is complicated by the Shaker practice of repainting their furnishings and interiors, by their thorough cleaning efforts, and by the use of certain pigments that are comparatively unstable. In addition, any varnish coating applied over a painted surface would darken and yellow over time, changing the original tonalities of the paint. Finally, surfaces that

received regular use and handling, such as counter and table tops, were probably cleaned and recoated more frequently than case sides, drawer fronts, or bases.

Before repainting, the Shakers generally prepared surfaces very thoroughly—in both architectural and furniture paints, there is no evidence of dirt or grime trapped between different generations of paint or varnish. Physical evidence and anecdotal references have established that Shaker sisters in this century often removed the intensely colored paints on wooden furnishings before selling the objects to the World, presumably to make them more appealing and salable.²¹ Thus Shakers may have applied all of the paint generations on a given object or may conscientiously have removed original paint layers before applying a clear varnish to an object. In this sense they were not painting and varnishing their objects any differently from cabinetmakers and rural painters in these areas during the same period.

By making the examination of substances trapped in wood fibers possible, modern analytical techniques can shed light on the composition of original pigments and stains. They have also revealed that the wooden objects and architectural elements Shakers produced before the Civil War consistently relied upon a gum size to seal the wood before it was painted, used plant resin-based varnishes exclusively instead of shellac, and on occasion mixed these varnishes into the last coat of paint on woodwork, furniture, boxes, and buckets.

The most significant and recurring element in the samples taken from painted wooden objects and woodwork was the use of a gum size, or a gum dissolved in water,



Fig. 9. This photograph of the sister's sewing room in the Church family of the Mount Lebanon community, taken in about 1890, reveals that the 1840 cupboard and case of drawers in the background was quite glossy and reflective. Analysis of the pigments and coatings revealed what appears to be its original finish—an oilbound paint composed of chrome yellow, barium yellow, red lead, and iron earth pigments, and only one coat of plant resin-based varnish. The Shaker sisters in the view are, from left, Anna Maria Graves, Mary Hazard, Corinne Bishop, and Dorothy Wright. Courtesy Shaker Museum and Library, Old Chatham, New York.

an option chosen over leaving the wood unsized or applying a priming layer of paint composed of cheap, translucent pigments such as whiting. Though it is not possible to identify the specific type of gum, gum arabic (a exudate from the *Acacia arabica* and *Acacia Senegal* trees in Africa, India, and Australia) appears frequently in the Shaker receipt books. Virtually every sample, except those from several of the green beds, showed gum size trapped in the fibers of the wood below the paint.²² The use of a gum size means that the more expensive pigmented materials would penetrate less deeply into the wood fibers, thus conserving the more costly pigmented material, and would produce a more

even, consistent, and attractive painted surface.

When varnish coatings were applied to Shaker furniture, natural plant resins such as copal, damar, amber, mastic, sandarac, and colophony (rosin) dissolved in fixed oil (or cooked) varnishes or in turpentine were most frequently used. Although most of these materials were imported from Malaysia, Indonesia, and the East Indies, Americans could purchase them readily in the nineteenth century. The Shaker collection of the New York State Museum in Albany includes a cardboard container of gum sandarac carrying the label of John L. Thompson, Sons and Company of Troy, New York, a company established in 1797. The label establishes that a distributor

for imported resins, and presumably related raw materials, existed before 1800 near the cluster of Shaker communities in Watervliet, Mount Lebanon, and Hancock.

A more common and probably cheaper resin was colophony, or rosin, a byproduct of the manufacture of turpentine from pine timber. Colophony varnishes were yellow in color and quite bright and glossy, but not very durable. The book of recipes from the Church Family included a recipe for "Common Varnish": "melt the Rosin first then Add the spirits of turpentine till is thin like water then strain it as you do the other," meaning through a flannel cloth. A varnish recipe from the Hancock Community is somewhat more detailed:

Receipt for making Varnish

1 lb Gum Damar

1 Quart Spirits Turpentine

Put in a tin or earthen vessel sit it in a kettle of water & boil two or three hours or more will do it no harm it will dry the sooner—When we use it we put one part varnish and two parts spirits turpentine—it makes a gloss & dries soon—but when put on heavy it is hard to dry.²³

Cross-section samples from a number of comparatively untouched Mount Lebanon case pieces built between about 1840 and 1860 indicate the use of a plant resin varnish coating above the earliest paint layers, which appear to be part of the original surface construction (fig. 9).²⁴ Examination of two Watervliet clock cases built by Benjamin Youngs in about 1806 and 1809 revealed original plant resin varnish coatings above an organic red stain. A rocker made by Freegift Wells in about 1830, also from the Watervliet community and now in the collection of

Hancock Shaker Village, also shows an original plant resin coating above a thin, deep red paint layer. This particular rocker was repainted dark red and revarnished one more time, probably to freshen and brighten the surface. Numerous painted buckets also had original plant resin varnish coatings, perhaps to give them a measure of waterproofing. Most of these buckets were repainted at least once over the earliest varnish coating.

Shellac, derived from a resin secreted by the lac insect of the *Coccidae* family, was also readily available; it was imported to the United States primarily from India and was offered for sale in this country as early as 1738.²⁵ Shellac does not require cooking, as it readily dissolves in alcohol; it forms a very glossy, hard coating, and it is available in a variety of grades and colors from deep red-brown button lac (one of the least refined grades of shellac) to pale yellow, highly refined blonde. Several mid-nineteenth-century Shaker recipes for making shellac exist, and shellac appears in expense records and paint recipes. Yet of the painted and varnished surfaces examined to date, there is no evidence of an original shellac coating. Perhaps shellac's high gloss was considered inappropriate for Shaker interiors. A container of orange shellac flakes is among the collections of the Hancock Shaker Village, but it may well be that shellac did not come into use as a clear coating until late in the nineteenth century, when the population of Shaker communities began to dwindle; at that time, too, journals indicate that some communities had begun to purchase paints and painting services from the World.²⁶

Recipes also frequently advised the use of a plant resin varnish in the last coating of

paint, and physical evidence suggests that Shakers followed these recipes. Two green beds (one from the Mount Lebanon Shaker Collection and one from the Winterthur Museum) and the original deep-red painted woodwork on the third floor of the 1792 Canterbury meetinghouse document that the technique was used. The mixture would have produced a moderately glossy, saturated surface more impervious to handling and wear than an unvarnished paint.

This same practice was followed in the creation of the deep blue woodwork and trim in the first-floor meeting room of the Canterbury meetinghouse. There is a plant resin varnish-based blue glaze on top of the earliest layer of blue paint on the woodwork, which would have produced a glossy, saturated surface. An 1865 letter from Daniel Boler at the Watervliet Ministry to Orren Haskins, cabinetmaker at Mount Lebanon, attests to the practice. "In the present case as touching the use of varnish on the wood work of our dwellings in the sanctuary at the Mount," Boler wrote, "we have unitedly decided to have what varnish is used put into the last coat of paint."²⁷

The majority of Shaker recipes discovered during this research are for architectural paints, perhaps because building exteriors required regular repainting and thus a significantly greater investment in raw materials; to reduce the frequency of repainting, Shaker craftspeople probably strove to create the most durable and yet inexpensive paints possible. Some of the titles of these architectural paint recipes offer clues to this ongoing search. Recipes such as "A cheap paint more impervious to water or weather than other common paints"; "A Substitute for paint";

"A Durable whitewash for Brick Buildings & Out Buildings or Fences of Wood"; "Whitewash to prevent mould"; and "Cheap paint" show predictable, but perhaps conflicting, desires for frugality and durability.

Linseed oil, expressed from flax seeds and produced as early as 1717 in Connecticut, appears most frequently as the binding media in architectural and furniture paints, and Shaker communities often purchased it in large quantities.²⁸ In 1848, fifty-eight gallons of linseed oil were purchased to paint the meetinghouse at Watervliet, which was one of several Shaker villages that actively supported the cultivation of flax. John S. Cogdell commented on the use of linseed oil after he visited the Mount Lebanon community on September 5, 1816:

Their houses were never more than five story, but large, commodious and well-built: all-glazed and painted: yellow with red tops. Meetinghouse white with black top:—they were newly painting their houses—the colours not ground fine—and as a reason the colours looked livelier longer... when fine it soon became dull—linseed oil—dryer: sugar of lead... We examined the Chamber of a friend on one side of the passage & on the other a Sister—floors painted yellow where there is wood dark green or olive. spitting basins with sawdust and chaff—their straw mat. bed and chair, floor cloths—made at home and painted color of the floor. Brooms—dustpan—and everything in its place—each marked by neatness.²⁹

Dryers such as sugar of lead (lead acetate), red lead, massicot, and litharge (sometimes spelled litherage in the recipes) were added to linseed oil-based paints to speed the drying process, or dryers were added to heated linseed oil to produce a boiled drying oil prior to grinding the paint.



Fig. 10. Analysis shows that the built-in drawers and cupboards from the Enfield, New Hampshire, Shaker community, shown here in their current setting at the Winterthur Museum, were painted with an oilbound paint composed primarily of the brilliant yellow pigment chrome yellow and white lead. Courtesy Winterthur Museum, Winterthur, Delaware.

The binding media analysis indicates that the exterior paints and the interior paints on wooden elements are predominantly oilbound. In addition, the many generations of whitewash contained protein and carbohydrate additives, consistent with the numerous Shaker whitewash recipes that called for an odd assortment of additives:

To make a Brilliant Stock Whitewash for inside or out
 Take clean lumps of well burnt lime. Slack the same in hot water, then add 1/4 lb of whiting or burnt Alum pulverised— 1 lb of loaf sugar or any other sugar, three pints of rice flour made into a paste starch or jelly & one pound of clean glue dissolved.³⁰

Shaker journal entries indicate that until the populations in the villages started to decline after the Civil War,³¹ whitewashing the walls and washing the woodwork was an annual event, and exteriors were repainted

with two to three coats of paint each time. In November 2, 1840, Levi Shaw of the Canaan Upper Family (near Mount Lebanon) noted in his journal, “Finish painting the New House the second time over.” On November 3 he finished painting the Brethrens Shop and began to paint the Sisters Shop, the latter of which he finished the next day. On November 5, he wrote, “Painted the front side of the New House

over, which makes the third time over. The Elders came here today & held meeting with us in the New meeting room this evening for the first time.”³² Shaw’s journal documents that he was whitewashing various buildings in the community in 1841 and again in 1862, when he painted the Sisters Shop three times over.

Shaker objects that survive relatively intact provide some insight into the brilliant paint colors used on furnishings and functional wooden forms such as buckets, boxes, pegboards, and even architectural moldings and flooring. And although certain colors such as deep red, salmon pink, lemon yellow, bright orange, dark blue, and olive green appear to have been used repeatedly on furnishings and architectural elements, a given color was not always created with the same combination of pigments. The pigment yel-

low ochre ($\text{FeO}_3 \cdot \text{H}_2\text{O}$), sometimes described as French yellow in Shaker receipt books and expense records, was frequently used in interior and exterior paints, but the evidence of this study indicates that it was not used as often in yellow paint as was chrome yellow (PbCrO_4) (fig. 10). Red lead (Pb_3O_4), iron earth pigments such as burnt sienna ($\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$) and burnt umber ($\text{Fe}_2\text{O}_3 + \text{MnO}_2$), whiting (CaCO_3 , also called Spanish white), red ochre (Fe_2O_3), chrome green ($\text{Fe}_4[\text{Fe}(\text{CN})_6]_3 + \text{PbCrO}_4$), Prussian blue ($\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$), verdigris ($\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{Cu}(\text{OH})_2$), Venetian (or iron oxide) red (Fe_2O_3), and white lead ($2\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2$) also appeared regularly in Shaker recipes and in actual paint samples. Vermilion (HgS) and zinc yellow ($4\text{ZnO} \cdot 4\text{CrO}_3 \cdot \text{K}_2\text{O} \cdot 3\text{H}_2\text{O}$) appear less frequently and only on furnishings, not on architectural elements.

Polarized light microscopy (PLM) was used to identify the pigments in jars and boxes of raw pigments in the collections of Hancock Shaker Village and the Shaker Museum in Old Chatham, New York. X-ray fluorescence analysis confirmed this initial analysis and identified the presence and proportions of specific inorganic components such as lead, iron, chrome, carbon, mercury, and sulfur. Pigments in the Hancock Shaker Village collections which accession records identify as having come from the Canterbury Community were copper acetate (verdigris), red ochre, iron oxide red, yellow ochre, chrome yellow, and white lead. Hancock pigments from unknown sources include a combination of vermilion, chrome yellow, and red lead in a container labeled "The Ansbacher Manufacturing Company, N.Y." Additional raw pigments in the Shaker Museum collec-

tions and believed to have been used in Mount Lebanon were identified as a combination of Prussian blue and calcium-based fillers, red ochre, and yellow ochre.

The presence of a specific pigment can in some instances help to date a given paint layer or provide a clue to how a paint color may have changed over time. Zinc yellow was not commercially available until after 1850, and its presence in the original yellow tempera paint layer on a carpenter's cupboard from the Mount Lebanon community means the object was probably made and painted after 1850, despite its published date of ca. 1820-40. Chrome green (a synthesized combination of Prussian blue and chrome yellow), the predominant green pigment found on green beds and green oval boxes, was available soon after the introduction of chrome yellow in the first quarter of the nineteenth century. Chrome green is not a stable pigment and tends to turn blue when exposed to light.³³

Prussian blue is the most common blue pigment found in both furniture and architectural paints. It is a very high tint-strength pigment, which means that only a small amount of the pigment is enough to turn a light paint noticeably blue. Prussian blue was often used in combination with chrome green, white lead, and whiting depending on the hue and intensity of the color desired. It also was used very sparingly in many generations of whitewash coatings on the interior walls of the Canterbury Shaker Village meetinghouse and dwelling house to produce a brighter, cooler white.³⁴

Prussian blue was first synthesized in Berlin in 1704, and by 1831 a manufacturer in New Bedford, Massachusetts, was produc-

ing more than ten thousand pounds of the pigment a year. Thus it would have been readily available to the Shaker communities.³⁵ A relatively permanent pigment, Prussian blue will nonetheless discolor to brown when exposed to alkaline conditions, for example if Shakers used a high pH soap as part of their normal cleaning routine. Based on expense records for painting the Watervliet meeting-house in 1848, Prussian blue was also comparatively expensive.³⁶ Hendrickson's receipt book documents spending twelve dollars per pound for Prussian blue. Verdigris, by contrast, cost only forty cents a pound, while Saxon green (probably smalt with a greenish color) was purchased for three dollars per pound.

According to Hendrickson's list, the cheapest pigments included whiting (for priming) at two cents per pound, white lead at eight cents per pound, and French yellow (ochre) at three and a half cents per pound. It also establishes that the 1848 recipe for "Red Paint for Meeting House Shed"—"25 lbs. Venitian Red/16 lbs. Spanish Brown/20 lbs. Red Lead/9 lbs. French Yellow/5 lbs. Shelack/15 Galls. Linseed Oil/For priming use 36 lbs. Spanish Whiting"—included comparatively inexpensive ingredients.

Notably, many painted Shaker wooden objects used a thin, penetrating paint (with a high binder-to-pigment ratio), a technique the Andrewses used, often erroneously, to date and interpret Shaker furniture. Often described as a stain in the literature, this paint does contain pigment particles, not dyes, and generally survives as a distinct layer on top of the wood substrate. This thinly applied paint is comparatively translucent, so the figure of the wood is still visible. In *Shaker Furniture*,

the Andrewses claimed that "in the finishing of furniture, paint preceded the thin, red stains and later varnishes."³⁷ Unfortunately, this assessment does not always hold true: thick, opaque paint layers have been identified on objects that date to the mid-1800s.

The multicolored Shaker Spirit or "Gift" Drawings produced in Mount Lebanon during a great period of spiritual revival from approximately 1841 to 1856 could provide revealing insights into the colors used in furnishings and interiors. These bright watercolors were stored in the dark for more than seventy-five years until they resurfaced in this century. The pigments have not suffered the damaging effects of light exposure, and because the colors were not varnished or coated they have remained quite pure and intense. Analysis of three Gift drawings from the Hancock Shaker Village collection indicates that the same types of pigments found in the paints on furniture and architectural elements were also used in these three Drawings.³⁸

The relationship of the Spirit Drawing paints to paints on furnishings and architecture deserves further investigation, as does the changeover to commercial paints and varnishes after the Civil War and the precise identification of whether shellac ever came into common use in the communities as a furniture varnish. Research into all of these areas will help define what makes Shaker objects unique, and how Shaker painting and varnishing methods were influenced by The World.

Susan L. Buck is a furniture conservator at the SPNEA Conservation Center in Waltham, Massachusetts. She has an M.S. from the University of Delaware/ Winterthur Graduate Program in Art Conservation and an M.B.A. from Boston University. One of her areas of particular interest is the study and analysis of historic paints on furniture and architecture.

NOTES

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- 1 Shery Hack, Curator of Buildings, Canterbury Shaker Village, Inc., conversation with author, summer 1994.
- 2 Edward Deming Andrews and Faith Andrews, *Shaker Furniture* (New York: Dover Publications, 1937), 1. *Shaker Furniture* was the first comprehensive book on the furnishings produced by the sect.
- 3 Andrews and Andrews, *Shaker Furniture*; Andrews and Andrews, *Religion in Wood* (Bloomington: Indiana University Press, 1966).
- 4 All samples were examined with an Olympus BHT Series 2 Fluorescence microscope with UV (300 to 400 nm. with a 420 nm. barrier filter) and V (390 to 420 nm. with a 455 nm. barrier

filter) cubes. Richard Wolbers, Nanette Sterman, and Christopher Stavroudis, *Notes for Workshop in New Methods in the Cleaning of Paintings* (Santa Monica, Calif.: Getty Conservation Institute, 1990), and Richard Wolbers and Gregory Landrey, "Use of Direct Reactive Fluorescent Dyes for the Characterization of Binding Media in Cross Sectional Examinations," *AIC Preprints* (15th Annual Meeting, Vancouver, B.C., 1987): 168-202, for additional information about cross-section microscopy techniques.

- 5 The author is working with Amy Snodgrass at the Center for Conservation and Technical Studies, Harvard University Art Museum, Richard C. Wolbers, assistant professor at the Winterthur/ University of Delaware Art Conservation Program, and Janice Carlson, museum scientist at the Analytical Lab of the Henry Francis du Pont Winterthur Museum, to conduct further analysis of the inorganic and organic components of the paint and finish layers using SEM, FTIR and XRF. Funding for this analysis was provided by the Samuel H. Kress Foundation, and access to the Winterthur Analytical Lab equipment was part of a 1994 Winterthur Research Fellowship. The bulk of this study was conducted during a Winterthur Research Fellowship in April 1994.
- 6 The cross-section samples from this bed reacted positively for the presence of proteins, carbohydrates, and oils when the fluorescent biological stains Fluorescein isothiocyanate (FITC), Triphenyl tetrazolium chloride (TTC), and Rhodamine B (RHOB) were applied. When applied to the cross-section samples, these biological stains react by turning identifiable colors when specific organic components are present.
- 7 This recipe for paint containing milk was found on microfiche in the Library of Congress Collection. The book has a handwritten label on

the front: "Blue Dyes Receipts & Miscellaneous Writings by Abigail Crosman." It is on the same page as a recipe entitled "Cement for Leather or Wood":

Paint for Wood

Spanish White	4 lbs
Unslacked Lime	8 oz
Burgundy Pitch	4 oz
Boiled Linseed Oil	6 oz
Simerd Milk	4 qts

The lime to be slacked in water. Exposed to the air mix all with a little the milk at first as it may not mix ridely at first.

NB. This is for 25 square yds & will cost lefs than 25 cts color with any thing to suit—

- 8 *Receipt Book, Concerning Paints, Stains, Cements, Dyes, Inks, &c. Rosetta Hendrickson A Present from Eld. Austin (Watervliet, N.Y., about 1848-49), 15:*

To get Paint off from Wood

Pour about one handful of soda to a quart of water. Let this be applied to the paint on doors, drawer faces or whatever be required or desired, as hot as possible with a cloth & the better you can apply the Soda & Water, the easier the paint will come off. Care should be taken to not let the wood get wet where there is no paint, lest it become stained. Wash or rinse off with water, and it is done. NB. The soda and water may be used until it is as soap, with paint.

- 9 In 1867 the Averill Paint Company of Philadelphia established a patent for premixed paints, and the Sherwin Williams Company in Cleveland began manufacturing standardized paints in 1879. See Nell Du Vall, *Domestic Technology: A Chronology of Events* (Boston: G.K. Hall and Co., 1988), 405, 410.
- 10 I received a photocopy of Gore's advertisement from the Gore Place Society, Waltham, Mass.
- 11 T. O. Green, "The Birth of the American Paint Industry" (Master's thesis, University of Delaware,

1965).

- 12 "Millennial Laws, or, Gospel Statutes and Ordinances adapted to the Day of Christ's Second Appearing. Given and established in the Church for the protection thereof by Father Joseph Meacham and Mother Lucy Wright The Presiding Ministry and by their Succesors The Ministry and Elders. Recorded at New Lebanon Augst. 17th, 1821 Revised and re-established by the Ministry and Elders Oct. 1845," Winterthur Museum and Library.
- 13 Millennial Laws, 1845. See Section IX, Rules 3 through 5.
- 14 Crosman receipt book, Library of Congress (see note 6).
- 15 Shaker collection, Library of Congress.
- 16 Stephen Stein, *The Shaker Experience in America* (New Haven, Conn.: Yale University Press, 1992), 138.
- 17 The author thanks Jerry Grant, former assistant director at the Shaker Museum in Old Chatham, N.Y., for suggesting this book as a resource.
- 18 *Mackenzie's Five Thousand Receipts* (Philadelphia: James Kay, Jun. and Brother, 1829), 23, and P. F. Tingry, *The Painter and Varnishers Guide* (London: printed for G. Kearsley by J. Taylor, 1804), 80.
- 19 See Hendrickson receipt book, 1. To make "Tere-de-Sena" stain, the painter was instructed to heat raw sienna (hydrated ferric oxide, $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$) to produce burnt sienna and then to add approximately four ounces of Chinese vermilion to one pound of burnt sienna in raw linseed oil. The mode of application follows:
- Thin with raw Oil, and apply with a bit of sheepskin, or woolen cloth, (Sheepskin the best:) after which when sufficiently dry — say, 24 hours after staining, rub it off thoroughly.
- This may first be done with the common Corn Broom partly worn, applying it briskly to the stained work, after which, rub off again with a

- piece of Flannel of woolen cloth.
- It is said that this kind of stain never fades or darkens by age, and when applied to light-colored wood, it gives a kind of Mahogany color; especially when under a coat of varnish.
- 20 Book of Recipes, Church Family, microfiche XI-B-21, Library of Congress.
- 21 Charles Flint, *Mount Lebanon Shaker Collection* (Mount Lebanon, N.Y.: Mount Lebanon Shaker Village, 1987), 19.
- 22 The presence of a gum size was characterized by a pale yellow autofluorescent material trapped in the pores of the woods which reacted positively for the presence of carbohydrates with TTC. Additional analysis with FTIR also indicated the presence of a gum in these areas.
- 23 These recipes are from the Library of Congress collection and the collection of the Western Reserve Library. They are available on microfiche in the Joseph Downs Collection of the Winterthur Museum and Library.
- 24 Plant resin varnish is distinguishable by its bright white autofluorescence in cross-section under ultraviolet light at 125x, 25x, and 500x magnifications. The presence of plant resin components was confirmed with FTIR analysis conducted at the Winterthur Analytical Lab.
- 25 Joseph Godla, "The Use of Wax Finishes on Pre-Industrial American Furniture" (Master's thesis, Antioch University, 1990), 44.
- 26 Journal entries in the Watervliet Day Journal (or Book of Records) kept by Ebenezer Rice and beginning October 2, 1856, are revealing in this regard. On September 12, 1892, Rice noted, "I went to Dayton. The painters finished painting the veranda. The brethren helped the sisters wash. The whitewashers came to whitewash some of the buildings." Shaker Collection, Library of Congress.
- 27 Timothy Rieman and Jean Burks, *The Complete Book of Shaker Furniture* (New York: Harry N. Abrams, 1993), 62.
- 28 Green, "Birth of the American Paint Industry," 109.
- 29 The author thanks E. Richard McKinstry, librarian of the Joseph Downs Collection of Manuscripts and Printed Ephemera, Winterthur Museum and Library, for bringing this manuscript to my attention.
- 30 Recipe Book, Church Family, Library of Congress.
- 31 The Shaker communities were unable to hold on to younger members, especially young men, during and after the Civil War, but why populations began to decline around this time is beyond the scope of this analysis, which focused on prewar furnishings and architectural paints.
- 32 Levi Shaw Journal, Canaan Upper Family, Winterthur Museum and Library.
- 33 Rutherford Gettens and George Stout, *Painting Materials* (New York: Dover Publications, Inc., 1966), 107.
- 34 The author and Alex Carlisle studied the architectural paint history of the Canterbury Shaker Village dwelling house from June to September 1994 as part of a Historic Structures Report on the building coordinated by Ann Beha Associates, Architects, Boston, Mass.
- 35 Green, "Birth of the American Paint Industry," 49.
- 36 Hendrickson receipt book, 33.
- 37 Andrews and Andrews, *Shaker Furniture*, 43.
- 38 James Martin and Moyna Stanton, "Report on the Technical Examination and Paint Sample Analysis of A Type of Mother Hannah's Pocket Handkerchief, by Polly Jane Reed; The Gospel Union, Fruit-Bearing Tree, by Polly Collins; and A Bower of Mulberry Trees, by Hannah Cahoon" (Study for Hancock Shaker Village, Williamstown Regional Conservation Center, Williamstown, Mass., August 28, 1992).