# THE USE OF WAX FINISHES ON PRE-INDUSTRIAL AMERICAN FURNITURE

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## Introduction

The application of analytical methods to historic furniture finishes has given conservators a better understanding of the objects they are treating. Combining this new ability to characterize extant coatings on artifacts with written documentation of the colonial era has allowed for the low piecing together of knowledge on period finishing practices. This information has been forwarded to curators and collectors and has already assisted in the more appropriate interpretation of some American furniture. However, there are times when the results of analysis appear to be at odds with the materials that might be expected. Wax is such a material. Both curators and conservators have concluded that wax was a primary finishing material used by eighteenth century cabinetmakers. Yet, it is rarely identiable as an early layer in the cross-sectional examination of furniture samples.

This study had several objectives. The first was to examine documentary evidence regarding the use of wax by American cabinetmakers. Second, with the aid of sophisticated analytical methods, confidently identify furniture with early wax coatings in place. And finally, to address some of the conservation issues related to wax finishes.

## Availability of Waxes

Like most materials that would later be used as varnishing or coating materials, the group of materials collectively known as waxes were not readily available to the earliest settlers of North America.[1] The honey bee *(Apis mellifera)*, producer of beeswax, is not native to North or South America. Two other waxes, bayberry and spermaceti, were not common domestic items until the eighteenth and nineteenth centuries. Sources of both were available at the time of initial settlement, but were not fully utilized for another hundred years.

English settlers brought the honey bee to this continent, not for the by-product beeswax, but for honey and pollination. The existing records regarding beekeeping in New England indicate that bees were being kept in Newbury, Massachusetts in 1640 and Salem by 1641.[2] Even in Essex County, Massachusetts, perhaps one of the least likely spots for successful beekeeping due to its cold blustery winters, salt marshes, and lack of floral pasturage, the initial hives survived.[3] The bees spread as feral hives were established by escaped domestic bees. In fact, bees spread into the forests in advance of the settlers. John Josselyn, who makes no mention of honey bees in his list of important insects he found on his first trip to America in 1638, makes a point of their presence on his second trip in 1673,

> …the honey-bee, which are carried over by the English and thrive there exceedingly.[4]

Thomas Jefferson, writing a hundred years later confirms the spread of the honey bee:

> The bees have generally extended themselves into the country, a little in advance of the white settlers. The Indian, therefore, called them the white man's fly, and considered their approach as indicating the approach of the settlement of whites.[5]

While bees spread into the wild, their domestication on a significant scale occurred slowly. Honey was still imported into the colonies in 1670.[6]

Several factors contributed to the slow development of beekeeping and until it was well established, there could be no American source of beeswax on a commercial scale. First, there were a limited number of cultivated fields of crops, such as clover and alfalfa, that modem beekeepers rely upon so heavily. Second, poor roads and slow, horse drawn vehicles limited beekeepers from spreading their hives over a wide territory in the seventeenth century. Third, disease and insects were a common problem to early beekeepers. Finally, it was common practice to kill the bees in the fall when harvesting their honey.

Until 1860, when Lorenzo Langstroth's innovations perfected the movable frame hive, large scale commercial beekeeping was virtually impossible. The movable frame allowed the removal of individual frames or portions of hives without destruction of the hive or killing of the bees. Prior to this, bees were kept in a wide variety of hives, ranging from the straw skep to simple wooden boxes and log hives; these which were often destroyed when harvesting the honey.

A look at early probate inventories gives an indication of how common beekeeping was in the late seventeenth and eighteenth centuries. Of the 109 inventories included in Cumming's *Rural Household Inventories 1675-1775*, six included listings for stocks or hives of bees, which almost certainly carried a high enough value to be included on the inventory of even the wealthy.[7] Of the 109 rural households, only about 5% kept bees. Wax was not being produced on a large scale. Up until about 1725, wax was probably an article of local trade. Only quantities of several pounds appear in any of the records up through the first decade of the eighteenth century. At this point we begin to see mention of small quantities being exported. In 1714, Joshua Hempstead of New London, Connecticut, shipped 281/2 pounds of beeswax to Madeira, Spain.[8] Throughout the rest of the century it appears that the production and exportation of beeswax increased exponentially.

By the 1730s Samuel Grant, a Boston upholsterer and merchant, was exporting beeswax in quantities as large as several hundred pounds,[9] no doubt the production of many beekeepers. Grant may have dominated the Boston trade in this commodity, since Captain Betty, who had a ship bound for Barbados in 1740, seems to have had trouble finding beeswax. In a memorandum he issued seeking goods to be exported, he placed specific quantities on a long list of goods he desired for shipping, however, he would accept "what bees wax can get".[10] By late in the century thousands of pounds of beeswax were being exported,[11] with much of it going to England. A British writer bemoaned their lack of beeswax production, "There is hardly enough produced in England to answer the need for lip-salve alone".[12] Increases in domestic use curbed the exportation of beeswax after the turn of the century.[13] The spread of the wax moth during the same period caused a decrease in production and negatively affected exportation.[14]

During the early years of the eighteenth century beeswax had considerable value. From the time of its first publication, the *Boston Gazette* regularly included a catalogue of sundry merchandise. In 1719 the price for a pound of beeswax was 2 shillings 2 pence,[15] roughly comparable to the value of a chair listed in inventories of the same period.[16]

By no means was the use of beeswax as a varnish or polishing material among its primary uses. Medicinal preparations, candles, sealing wax, the nicer arts, and manufacturing are included in a period list of the most important uses of beeswax.[17]

Bayberry wax was also used during the eighteenth century. It is a product of the genus Myrica[18] bush found in coastal regions of the United States. The fruit of the Myrica is boiled in water and the resulting wax is skimmed from the surface. Several cabinetmakers' account books have listings for bayberry wax and they may have substituted it for the more commonly used beeswax.

During the second half of the eighteenth century the sperm whaling industry developed considerably and spermaceti wax became available.[19] It saw some use in medicines, but candles were its primary use. Because of its low melting point (41 - 49 Celsius),[20] spermaceti wax was of little use in furniture finishing and is not mentioned in any of the literature or manuscripts pertaining to the subject.

Carnauba hard wax is a plant wax from South America. Although it is used extensively in wax polishes today, it was not reported as being exported out of Brazil until 1845.[21]

**Review of Guidebooks**

Much of the information on early finishing practices available today has been culled from the various guidebooks on the subject. Guidebooks were period publications that described materials and techniques for craftsmen. From the guidebooks, we know that wax was used as a coating for furniture made in France and other European countries during the eighteenth century.[22] Although virtually all of the guidebooks are of European origin, scholars have extended their reasoning to state that a considerable amount of the furniture made in North America during the same period was also originally given a protective coating of wax as its only finish. While this documentary evidence is contrary to the types of finishes we observe on the furniture of our museum collections today, it is generally recognized that degraded original finishes have been replaced or over coated through the years. The purpose of this portion of the study is to add to the documentary evidence suggesting the use of wax as a primary finishing material on American furniture of the eighteenth century.

There were several sources of information on the manufacture and application of furniture finishes available to the craftsmen of early America. The first source, and probably among the most important, was the tradition in which the cabinetmaker was trained. While a formal guild did not exist, most cabinetmakers did undergo an extensive apprenticeship and carried these skills through their working life. A second source of information was the various guidebooks. Although most were published in Europe, there was limited distribution in North America. Various encyclopedia of arts and trades containing many recipes were also available. Finally, newspapers occasionally would print recipes for various finishing methods.

Guidebooks have been discussed in earlier work[23] and are familiar to many with an interest in early finishing practices. There are several guidebooks that stand out from the others in their thoroughness as well as their originality. Stalker and Parker's *A Treatise on Japanning and Varnishing* (1688), Watin's *Gilder and Varnisher* (1751), Dossie's *Handmaid to the Arts* (1758), and Tingry's, *The Painter's and Varnisher's Guide* (1803), provide the clearest discussion of varnishing practices. Judging from the frequency that these works were borrowed, in whole or in part, to be included in other works implies that

they were respected during the period. The list below thoroughly covers the period 1688 to 1816:

1. *Stalker and Parker*[24] (1688): This British treatise on japanning and varnishing is the earliest existing sample to have received wide distribution. It contains no information on finishing with wax. There are recipes for two general types of varnish: the first is a shellac based spirit; the other type of varnish is called "white" varnish. This recipe consists of a long list of resins which appear in guidebooks throughout the next century. The recipe includes portions of sandarac, mastic, Venice turpentine, copal, elurni, benzoin, amine, and rosin. This type of recipe, with its many ingredients, possibly speaks more of the period's fascination with alchemy rather than with practical finishing methods actually used on everyday furniture.

2. *The Builder's Dictionary*[25] (1734): The varnish section of this text is made up of earlier writings from at least two sources. The first section is borrowed from a Mr. Boyle, probably Robert Boyle[26], a seventeenth century writer on painting. The latter part is taken almost directly from Stalker and Parker. The dual authorship provides some duplication. For instance, there are two recipes for white varnish, one identical to Stalker and Parker, the other a combination of rosin and amber dissolved in spirits of turpentine. Various spirit varnishes are the mainstay; however, there is a recipe for common varnish, a type of essential oil varnish made of rosin dissolved in spirits of turpentine. Again, there is no mention of wax finishing.

3. *L'art du peinture, doreur, vernisseur*[27] (1755 and 1776): The varnishing sections of 1755 edition begins with the comment that wax, not varnish was the finishing material of choice in mid-century Parisian furniture shops.[28] However, the 1776 edition includes no such statement. Both editions describe the three general types of varnishes: spirit, essential oil and fixed oil.

4. *Handmaid to the Arts*[29] (1758): Dossie prefers seedlac varnish for all varnishing except work made of light colored wood on which the amber color of seedlac may be a problem. In this case, he recommends the use of white varnish. Again, no discussion of wax. The varnish section of this book was reprinted in its entirety in Philadelphia in 1793.[30]

5. *L'Art du Menuisier*[31] (1774): Roubo provides us the first detailed description of finishing with wax. Although he includes directions for applying other types of coatings, wax seems to be the most common method.

There are descriptions of two methods of wax polishing which can be referred to as the **hard wax** and **soft wax** methods.

The hard wax method requires a polisher made from a bundle of marsh grass tied together to form a small two inch diameter cylinder, approximately four inches long. Wax is applied by loading the end of the polisher with wax, and then rubbing it on the surface to be coated. The repeated burnishing during the lengthy polishing process works the wax into the pores of the wood to create a smooth, consistent surface. Roubo warns against using cork in place of the grass polisher as it may generate too much heat, causing veneers to lift. After filling the pores of the wood a blunt, rounded, wax scraper is used to remove any excess wax from the surface. Finally the surface is buffed with a fine cloth, imparting an even, glossy surface.

The second type of wax polishing described by Roubo is termed soft wax because of the addition of tallow to the wax. This process is recommended only for solid wood (not veneered) furniture. During the application of the wax the furniture is heated by placing a pan of hot coals nearby to aid in the penetration of the wax into the wood. While the surface is heated, the wax is applied with a brush and then later buffed with a cloth. Such a technique used on veneered furniture may soften the glue causing veneer to lift.

Much of France's high style furniture of the eighteenth century included veneered surfaces made up of woods of many colors. For this work, Roubo recommends a white varnish. The recipe he includes has sandarac as the primary resin.

6. *The Cabinet Dictionary*[32] (1803): This dictionary includes lengthy discussions under both headings "polishing" and "varnishing." For furniture varnishes, again sandarac is the predominate resin.

The section on polishing is broken down into three types: oil polishing, hard wax, and soft wax. The use of linseed oil is described as being the most common practice. Hard beeswax is sometimes used on the inside surface of furniture, where "it would be improper to use oil". Surfaces polished with the hard wax were then rubbed with brick dust to remove excess wax left on the surface. The third type of polish mentioned is soft wax, beeswax mixed with turpentine. The combined ingredients form a paste-like material which was much easier to apply. The consistency allows this type of soft wax to worked into the pores of the wood without either the elaborate polishing or heating of the surface necessary in the techniques described by Roubo. Sheraton also discusses the addition of various colorants to his soft wax mixture.

7. *The Painter's and Varnisher's Guide*[33] (1804) and (1816): Tingry, in a somewhat more scientific manner, discusses the different types of varnishes. He gives detailed observations of a number of recipes consisting of a wide range of resins. He writes at length about fixed oil varnishes, and it seems from his work that they had become quite popular in Europe at this point. Tingry also discusses the use of wax coatings on everysday furniture.

It is important to note that spirit varnishes were recommended from a very early date. Sandarac and seedlac are the most commonly recommended resins throughout the eighteenth century. Fixed oil varnishes are mentioned by Watin, but only after the turn of the nineteenth century do they appear to become common. The European guidebooks do not mention wax as a coating before the mid-eighteenth century. When wax polishes do finally receive notice, they are recommended for only ordinary work, with finer grades of furniture being either polished with oil or coated with spirit varnish. Printed matter of American origin describing finishing materials and techniques was rare and perhaps even non-existent prior to the nineteenth century. Therefore, we must depend on other documentary sources, such as tax records, account books, court records, and newspaper advertisements for information about finishing practices and to provide a comparison of the methods being recommended in the guidebooks with those actually being used in America.

**American Finishing Techniques**

Although oil polishing is not mentioned in the guide books until Roubo in 1774, it has long been believed to have been one of the primary finishes used on Colonial American furniture. Linseed oil, the drying oil used in oil painting, was not available in large quantities and not often used in architectural painting prior to 1700.[34] However, it was certainly available in quantities large enough to be used as a furniture finishing material. Oil and ground pigments were used to produce the decorative painting found on late seventeenth century furniture.[35] Its use may have naturally extended to include transparent finished areas as well. This seems increasingly likely when one considers that few records have been found indicating that resins were being imported prior to 1700.

As early as 1640 Connecticut residents were directed to plant flax, the source of linseed oil[36] and limited quantities of the oil were available late in the century.[37] As the earliest records of linseed oil presses date from after the turn of the eighteenth century, it is likely that some of the early oil was being imported.[38] Few cabinetmakers' account books from the first quarter of the eighteenth century have been found to verify its use by cabinetmakers; however, it was being sold by Boston japanner Nehemiah Partridge in 1713.39 Linseed oil appears frequently in the account books of cabinetmakers later in the century. A recipe for an oil varnish consisting of only linseed oil and pigment appears in the account books of cabinetmaker Isaac Byington.[40]

Roubo suggested olive oil for polishing. While it is not commonly believed to have been used much in this country, its use is suggested in several American newspapers.[41]

Even from the time of Stalker and Parker's work in 1688, resinous varnishes were the preferred coating material. All of the early guidebooks contained recipes for spirit varnishes. The most common resins seen in the early guidebooks are shellac (or seedlac), sandarac, and amber. Pine rosin, also known as colophony and turpentine, is also frequently mentioned. All of the above were offered for sale by Boston painter John Gore during the 1760's.[42]

Of the 63 period cabinetmaker account books surveyed for this study, these are the only resins mentioned by name, suggesting that the varnishes used in this country were simpler in composition than those suggested in the European guidebooks.

Resins were available and being used at a surprisingly early date. Rosin, the residue of distilling spirits of turpentine[43] was probably the most accessible to early craftsmen. A parcel of rosin, along with other painting materials appears in the inventory of George Corwin, a shopkeeper, of Salem in 1684-5.[44] The large pitch, turpentine, and resin business was established early to serve the British shipping industry.[45] It would only follow that a by-product of that industry was available to local craftsmen. In fact, rosin appears in cabinetmakers account books throughout the eighteenth century and into the nineteenth.[46]

Sandarac is another resin mentioned in the guide books, which was apparently available quite early. The 1719 inventory of Boston japanner Joshua Roberts, includes a small parcel of "gum sandrick".[47] William Randle, a japanner with known ties to cabinetmaker Nathaniel Holmes[48], purchased 10 pounds of gum juniper, which was probably sandarac.[49]

Shellac and its less pure form, seedlac, appear in American documents throughout most of the eighteenth century. (not surprisingly, as they are suggested in the earliest guidebooks) John Merrett, for instance, offered seedlack as well as many other painters' supplies for sale in 1738[50] as did others throughout the century. Thomas Johnson's probate inventory of 1767 includes six pounds each of gum seedlack and gum shellack.[51] Johnson most likely did finish work for several cabinetmakers, judging from the contents of his shop at the time of his death.[52] Even cabinetmakers in secluded rural areas were using shellac in the second half of the eighteenth century.[53] It has been reported in past literature that shellac was not often used in eighteenth century America, however, there is considerable evidence suggesting it as one of the most commonly used resins.

If resins and oil were both preferred and available, where does wax fit into the picture? Perhaps the earliest reference to beeswax finishes is in *The Mechanick Exercises* by Joseph Moxon.[54] Moxon recommends beeswax as a polish for hardwood items turned on the lathe. This indicates wax finishes were likely the material used for finishing the turned, jointed chairs of the seventeenth and early eighteenth centuries.

The shift from porous woods such as oak to finer grained woods such as walnut and mahogany seems to have corresponded with the shift to resinous finishing materials. By the second half of the eighteenth century cabinetmakers in isolated locations such as the upper Connecticut valley had access to resins, so availability of alternative materials was probably not the incentive for using wax. However, rural craftsmen were often more reliant on local sources for their materials.[55] Wax may have been the choice simply because it was all that was available in rural areas. This does not explain its use in urban

areas, where it most assuredly saw some use. For instance, Boston cabinetmaker, William Howell, had only beeswax in his shop at the time of the probate inventory in 1717,[56] suggesting it was his primary method of finishing.[57]

A tiered level of output from urban cabinet shops may have created a situation in which finishes were chosen based on the quality of the piece. The Boston furniture industry was a very specialized trade, with carvers, turners, and japanners offering very specific services.[58] Much of the finishing of furniture, in Boston and presumably in the other large cities, was likely carried out by the japanners.[59] It has been suggested that some of their skills were protected in the manner of a guild.[60] Whether cabinetmakers relied on japanners by choice or out of necessity, it is plausible that they counted on japanners for their higher quality finishing needs, while treating the more common articles themselves. Perhaps this explains the presence of beeswax as the only finishing material in shop of William Howell.

Lesser, everyday use goods, were probably those which recieved a beeswax finish. Roubo suggests the use of wax on ordinary goods. Period account books indicate that cabinetmakers produced a wide range of goods. Window sash, coffins, sleigh parts as well as simple utilitarian furniture were among the items produced by most cabinetmakers, both urban and rural. Timothy Loomis, Jr., of Windsor, Connecticut is a good example. In 1774 he made a "Crown case of Drawers," no doubt a high style, pediment-topped chest-on-chest. During the same period he also built many coffins, sashes, beehives and did such mundane work as turning 56 pegs.[61] Beeswax was a staple in the Loomis shop, and was perhaps used to coat the more ordinary items. It is not surprising, however, to find varnish in the Loomis family shop as early as 1743, as they would not have had the services of a japanner in rural Connecticut.[62]

The idea of differing quality levels receiving different finish treatments seems to be supported by the records of cabinetmakers who were known to use resin finishes, such as Major John Dunlap. His records include a recipe for a shellac based varnish[63] and his probate inventory includes a listing for varnish.[64] Yet, through the years, he had several entries in his account book for beeswax.[65] This is not an isolated case. There are similar entries in the records of other cabinetmakers.

**Use of Wax as a Finishing Material**

An entry in the journal of Samuel Sweat of Kingston, New Hampshire demonstrates the use of what was probably a wax finish on a clock case during the year of 1772. Over four days Sweat records the construction of the piece from planing out the stock to receiving his payment. On the fourth day his entry reads:

> A fine pleasant morning. Stained the clock case and polished it and set it up about 3 o'clock. Then received **1£. 7s. 0d.** fee of Mr. Purinton. . . .[66]

This is obviously not a high style clock, but one that was more common. His options for polishing materials were oil and wax. As he was to be handling the case later in the day to "set it up" (probably refers to the installation of the works), wax seems a more likely choice. Also the application of oil over so recently a stained surface may be problematic if the stain were itself oil based. The description illustrates two of the advantages of wax finishes: they are quickly applied and are almost immediately ready for handling.

A nineteenth century writer later suggested that coffins were an excellent place for a beeswax finish:

> Coffins are frequently waxed, instead of being varnished, as it is done quickly, and ready for immediate use when the rubbing process is finished.[67]

Coffins are among the most frequently noted items made by cabinetmakers. There are several listings in Solomon Cole's account book for "staining and polishing coffin".[68]

At the time that Watin and Roubo recommended the use of wax finishes, French case furniture was often heavily embellished with intricate marquetry and gilded bronze mounts. However when denuded of its metal mounts, the case surfaces were either flat in plane or slightly curved. This is just the sort of surface that would lend itself to the elaborate wax polishing Roubo recommends. As the century progressed and the Neo-classical became more popular, flat veneered surfaces became quite common, both in Europe and in this country. It is interesting to note that in *The New Complete Dictionary of Arts and Sciences* of 1778, under the heading of "veneering," there is a British description of polishing with wax that predates Sheraton's by a quarter of a century.

> When sufficiently scraped, the work is polished with the skin of a sea dog, wax, a brush, and a polisher of shave grass, which is the last operation.[69]

This same text makes no mention of wax in its varnishing section. Why wax would be recommended only for veneered furniture initially can be perplexing until one takes into consideration the normal practice of applying varnish. In many of the guidebooks recommendations are made to varnish in front of a fire so the surfaces are warmed and the varnish will flow more evenly.[70] Just as Roubo warns that spreading wax with a cork may generate enough heat to soften the glue and cause veneers to lift, working in front of a fire would certainly have caused similar problems. He also cautions against using his soft wax method on veneered furniture because of the heating involved with that technique. The use of hard beeswax polishes may have initially been seen as an alternative to varnishing in treating veneered furniture. It is interesting to note that the probate inventory of the shop of William Howell, discussed earlier, included many items suggesting he was making veneered furniture in the William and Mary style.[71] Again, beeswax was the only finishing material in his shop. Howell was working in the earliest years of the eighteenth century, perhaps before the craft specialization that is known to have eventually come to Boston. Its possible that beeswax may have used not only on the everyday items produced in his shop but also the high style, veneered goods as well. The use of beeswax on veneered furniture may have had a considerable history before the development of the neo-classical period.

Although the neo-classical influence on furniture began in the 1760's in England, it did not really become common in this country until about 1790. Interestingly, this is about the same time one begins to see more and more recommendations for wax finishes in the published literature.

In about 1800, recipes for wax polishes actually began to appear in newspapers around the country. Sometimes titled "Varnish for furniture," many of the snippets seemed to be based on the same recipe as that published in *Dr. Willich's Domestic Encyclopedia*.[72] During the first three decades of the nineteenth century numerous recipes for wax polishing were published in domestic encyclopedias and journals, as well as in books of cabinetmaking. All of the published American directions for wax polishing were of the soft wax variety, a combination of beeswax and spirits of turpentine.

These directions for wax polishing were all far simpler than the elaborate polishing with hard wax Roubo recommended. This suggests that while some high style, expensive goods were being treated with wax utilizing Roubo's methods, more often, soft wax was used. Perhaps it was the broad flat surfaces that so nicely avail themselves to the tedious polishing with the shavegrass polisher that brought about the popularity of wax polishing in Europe. But, this technique apparently gave way to the simpler use of soft wax in America as most of the published recipes contain turpentine. The ability to control the viscosity by the addition of turpentine allowed it to be applied with a brush and this method of application could also be carried out without heating the furniture. This may explain its apparent popularity on veneered, American federal furniture. The paste-like consistency of the soft wax meant pigment could easily be added and it would be easier to use on furniture with more complex surfaces, including those that were carved and molded.

In addition to beeswax finishes used on high style veneered furniture, it appears its major use continued for on everyday furniture. This is substantiated in another recipe book.

> Many cabinet-makers are contended with waxing common furniture, such as tables, chests of drawers, and etc.[73]

The 1793 *London Cabinet-Makers' Book of Prices* actually gives separate prices for polishing with wax containing turpentine. The hard wax method, which we have been calling Roubo's method, was twice the value of oil polishing, and the soft wax, or wax - turpentine mixture, was one and a-half times the cost of oil polishing. [74] None of the American pricing guides reviewed for this study offered a similar breakdown of finishing practices.[75] In fact, the only added expenses for any finish work were for coloring.[76] This suggests a certain uniformity prevailed when wax was used as a finish, and in finishing practices in general. Judging from documentary evidence, when wax was used in this country it was most likely the less expensive wax - turpentine mixture. It is difficult to estimate how popular the use of beeswax finishes became in this country, but it must have been extensive, as the "rubbing of furniture" was included in a list of reasons why the export of wax decreased in this country between 1790 - 1800.[77] Wax most assuredly saw considerable use during the closing years of the eighteenth century into the first two decades of nineteenth century. That is not to say that it completely displaced varnishing. Cabinetmakers, no doubt, learned to adapt their varnishing practices to suit the special needs of veneered surfaces.

The use of wax apparently began to decline in the 1820's when another form of polishing was gaining popularity. In the past it has been suggested that the smooth surfaces of the federal period paved the way for the introduction of French polishing in this country. However, there is convincing evidence indicating that it wasn't until approximately 1820 that it saw much use here. In 1833, a British writer describes French polish as a "composition invented in Paris, and brought to this country after the peace of 1814."[78] In what appears to be the earliest American description of the process, Thomas Gill of Philadelphia writes in 1818 that French polish:

> … has long been employed by the French for varnishing their rich cabinet furniture… and, no doubt, will come into general use amongst us when the mode of performing the process is better known.[79]

The rise in the popularity of French polishing the 1820's probably played a part in the demise of wax polishing. This new method of applying varnish was compared to that of applying wax in the

*Cabinet-Makers Guide* and was found to have certain advantages.[80] The advent of French polishing, combined with more commercial development of oil resin varnishes in this country[81] would eventually supplant most wax finishing. Both were considered preferable to wax because of their more durable nature and their brilliant gloss.

**Composition and Appearance of Wax Finishes**

The period documents suggest a number of variations in the composition of wax mixtures. Solvents, resins, drying oils, dyes and pigments are often included. A typical recipe not only describes how to make the wax but also some of the reasoning behind its use:

> Melt over a moderate fire, in a very clean vessel, two ounces of white or yellow wax; and when liquified, add four ounces of good essences of turpentine.… The essence soon penetrates the pores of the wood, calls forth the colour of it, causes the wax to adhere better, and the lustre which thence results is equal to that of varnish, without having any of its inconveniences.[82]

Of the two types of wax polishing, hard wax no doubt provides the greater gloss. Roubo describes the resulting layer as being extremely even and as glossy as a mirror.[83] The inclusion of a relatively slow drying solvent (turpentine) in soft waxes will result in a slow shrinkage or settling of the wax into the pores as the turpentine evaporates. So, rather than the even, glossy layer produced by the application of the hard wax, one would expect a rather dull finish. A good description of the appearance of a soft wax finish appears in *The Painter and Varnisher's Guide:*

> It does not possess in the same degree as varnish, the property of giving lustre to the bodies on which it is applied, and of heightening their tints. The lustre it communicates is dull.[84]

Another book suggests that wax produces a very good gloss, although it does not wear well.[85] It's true that a freshly applied wax finish does produce a brilliant shine, but, with shrinkage and handling it quickly becomes dull.

Several of the descriptions stress the importance of thin layers, which may explain the difficulty in locating early wax layers in microscopic cross-sections. Quoting again from Tingry,

> …make the stratum of wax as thin as possible in order that the veins of the wood may be more apparent.[86]

Some questions have been raised regarding the appropriateness of this dull appearance on period furniture.[87] The importance of gloss is constantly stressed in the period literature and it probably is safe to assume that the flatness of a wax finish was considered a compromise. Again, it was more likely used on the everyday furniture rather than on the high style objects.

> There are some circumstances therefore, under which the application of wax ought to be preferred to that of varnish. This seems to be the case with tables of walnut-tree wood, exposed to daily use, chairs, moulding, and for all small articles subject to constant employment.[88]

A hard wax finish could perhaps duplicate that gloss seen on the high style furniture often depicted in portraiture of the period. But the overwhelming evidence is that the glossy sheen was the result of the more popular resin finishes.

The combination of the guidebooks' consistent recommendations for the use of resinous varnishes and the presence of these materials in the account books of a number of cabinetmakers and japanners suggests that this was the most common approach to finishing furniture throughout the eighteenth century. There may have been geographic areas where resins were not readily available causing craftsmen to rely more heavily upon the locally available materials such as linseed oil and beeswax. Craftsmen who had access to varnish making materials may have reserved it for their more stylish work, perhaps because a wax or oil polish could be applied in much more expedient manner on common furniture. It may also be that the varnishes were prized, especially by those in rural areas, and its use was allocated exclusively for more expensive work. It is quite common to see entries in account books involving quantities of varnish as small as 'one gill' indicating it was not a material used carelessly.

It appears the use of wax was common on joined, turned furniture such as chairs early in the eighteenth century, but was a substitute for the more desirable resinous varnishes on case goods. Beeswax apparently won acceptability on higher style furniture toward the turn of the nineteenth century. Whether it was an extension of the complex European technique of polishing with hard wax, or simply a method of coating the veneered furniture of the Federal period without the excessive heat usually accompanying varnishing, that brought about this popularity is difficult to say. Remnants of wax on actual artifacts is very difficult to find now, yet consumption by cabinetmakers was considerable.

**Identification of Wax through Technical Analysis**

Much of the work that has been done to determine the chemical nature of beeswax has been carried out with gas-liquid chromatography; however, infrared spectroscopy is quite satisfactory for the detection of beeswax.[89] Other tests such as solubility and melting point can and have been used. Both of these methods require larger test areas, a simple coating history, and a certain amount of confidence regarding the possibility of the presence of wax. Thin layer chromatographic analysis of extracts of natural waxes has been used as a method of identification but, because of the large sample size required, this method is of limited use in the field of conservation.[90]

Fourier Transform Infrared Spectroscopy (FTIR) was chosen for this study because of recent advances in its application to the study of art objects. Mary Baker, et.al., have demonstrated its usefulness in the differentiation of various coating materials commonly used in historic furniture finishing.[91] Tsang and Cunningham have had success in using a microtome to cut thin sections from samples of paintings on canvas which had been embedded in polyester resin; these sections could then be analyzed, layer by layer, with the aid of a microscope-equipped FTIR unit.[92] Derrick and Stulik have recently combined similar sample preparation techniques with a mapping technique to study the more complex transparent layers of furniture finishes.[93]

These developments, combined with the desire to take as small a sample as possible, and to identify the wax layer as part of a representational cross section using available resources (i.e., equipment, technical expertise), made FTIR with a microscope the obvious choice. Wax can be identified in a number of ways, however, it was considered desirable to establish its location in the strata and identify it in the same step.

Fluorescence microscopy was chosen as a necessary first step to sort through the many samples is an effort to limit the IR tests to samples with a strong likelihood of including wax. Under UV illumination, wax layers are located almost by process of elimination as they are devoid of any of the autofluorescence associated with natural resins and are not prone to staining by any of the commonly used biological dyes.

So, while FTIR was chosen partially because it allowed the wax to be identified as part of a stratum, the ordering of the layers of the stratum was actually established during the initial microscopy stage of analysis.

The selection of objects to be included in this study was made after simple visual inspection of hundreds of pieces of furniture. While furniture with what appears to be an intact and original wax finish is very rare, the furniture at the SPNEA's Sayward-Wheeler House has long been believed to have a wax finish based on its surface sheen and texture.[94] In such cases, the wax is quite obvious by touch. Wax finishes that have later varnish coats over are much more difficult to locate. The single most revealing feature of such a overcoat is the very light appearance that often comes with a poorly adhered finish.

Two types of samples were analyzed. Whenever possible, where no subsequent resin layer appeared to have been later applied over what appeared to be a wax layer, the surface was heated with a rheostat-controlled heat gun and a very small sample was scraped onto a glass cover slip. The low melting point of waxes allows them to be softened at a low temperature and easily sampled. The other type of sample was a cross section of all layers on the surface. The second type of sample was taken for the purpose of being embedded in a resin before further analysis. It was decided that an embedding media that could serve two purposes was needed, a material that could first be polished for reflected fluorescence microscopy as well as a material that could be cut with a microtome to provide thin samples for transmitted FTIR. It was desirable to obtain a clear record of the strata before moVing on to FTIR.

Because of problems of possible wax dissolution and/or melting due to heat caused by the curing process, polyester embedding resins were abandoned in preference of epoxy.[95] Before thin sections were made, the samples were all polished in preparation for viewing with fluorescence microscopy. The samples were examined with UV illumination on the Olympus BH-2 microscope at the SPNEA Conservation Center. Photographic slides were taken during microscopy to serve as a record and to be used as a guide in setting the aperture for the FTIR analysis. The FTIR analysis was conducted on the Mattson Cygnus 100 FTIR with a Spectra-Tech IR-plan microscope attachment at the Smithsonian Institution's Conservation Analytical Lab under the guidance of Mary Baker.

The epoxy appeared to be similar in hardness and workability to the polyester. However, there was a problem with the thin sections, which is most likely inherent in the wax surfaces of the samples. Any surface that was coated with what was believed to be wax did not adhere well to the epoxy and separated when sliced to the 20 micron section. This created problems with all of the samples believed to be original wax finishes with no later overcoat. The sample with resinous overcoating above the wax layer remained intact.

While a great deal of effort went into the preparation of the thin cross sections, they were of limited use with the FTIR due to problems of differentiating the finish layers through the IR microscope. Fortunately, numerous samples were taken of just the material that appeared to be wax after removing any overvarnish.

The largest group of furniture included in this study comes from the Sayward-Wheeler House in York, Maine. The fact that this furniture remains in its original setting makes it particularly valuable artifactual evidence. It also houses the only group of furniture known to the author as having its original wax finish in place. This group of furnishings dates from between 1745 and 1775, and has a strong attribution to a local joiner by the name of Samuel Sewell.[96]

After a number of cross-sections from pieces with a Sewell attribution substantiated the belief that the furniture had a single layer of finish (see illustration 1), several samples were taken utilizing the heat and cover slip method. These samples were transferred to the diamond cell and analyzed with FTIR. All of the samples taken in this manner gave similar spectra, very closely matching the beeswax spectrum (see figure 1). Many attempts were made to employ FTIR on a cross sectional sample of furniture from this group; however, no attempts were successful.

Samples were taken from of two chests which could be considered to be more in the mainstream of New England design. The two chests of drawers, are believed to have been made by John Chipman of Salem, Massachusetts, between 1775 and 1795[97] (see illustration 2). Both are in the USSD collection (63.072 and 69.111). While any original wax coating had been overcoated with a resinous finish, a cross section taken from an area in which the over layer was missing revealed a simple layering which did provide a good spectrum for beeswax. FTIR was run on a cross section that had the overvarnish in place. This resulting spectrum is seen in figure 2. While it does have beeswax peaks it is also contaminated with those of natural resins.

Another high style piece of furniture from the Salem area was sampled. This desk bookcase (USSD 63.080) was made about 1770 and originally owned by Robert Hooper of Marblehead.[98] What appears to be wax in the cross section was confirmed by samples taken with the heat and cover slip method for FTIR.

A tambour desk from SPNEA's Langdon house was also sampled (42.1355). The desk was made in Portsmouth, New Hampshire in the first decade of the nineteenth century (see illustration 3). Profuse amounts of wax appeared when areas without the overvarnish were heated. A spectrum of the wax closely matched that of the beeswax standard (see figure 3).

Samples were taken from several other objects that were convincingly proven to be wax finishes. This furniture included a large federal bookcase (SPNEA 71.450) made in Portsmouth, New Hampshire and a tall case clock made in Fredrick County, Maryland (private collection).

**Results of Technical Analysis**

Methods that had reportedly worked well for others did not lend themselves well to the analysis of very thin, often inconsistent layers of wax. Even selecting an embedding material proved problematic. While the combined use of microscopy and IR provides satisfactory evidence of the wax layer, it is still considered advantageous to obtain the IR spectrum as part of the cross section to eliminate any doubts about a layer's position within the stratum.

Visualizing the layers through the IR microscope is the biggest deterrent to the proper setting of the aperture when dealing with transparent layers. Ultraviolet illumination would help. The mapping technique used by Derrick may have application, however, due to the thinness of the wax layers, the 15 micron increments would have to be decreased. It would also be useful to take confirming readings in parallel rows moving transversely across the sample. Another problem with the use of FTIR in the

examination of thin sections is the tendency of the embedding medium to penetrate the porous wood. Portions of this wood are inevitably included in the analysis of the thin wax layer. The strong IR absorbance related to the embedding medium precludes the detection of the often minuscule layer of wax.

All of the wax found appears to be beeswax. It is impossible to say with complete certainty if the beeswax found on this furniture was its original coating. However, there are indications that it was. Of the samples discussed, only those from the SPNEA side chair (1977.201) exhibited any significant fluorescence when stained for the presence of lipids. The set of chairs may have originally been oil polished. None of the samples had the small bits of autofluorescing natural resins in the upper pores of the wood usually associated with an early resin varnish that has been removed.

The high success rate of finding beeswax in the samples should not be construed as an indication of a high occurrence of wax finishes. Hundreds of objects were carefully screened prior to sampling to provide relative assurance that beeswax would be found.

Veneered Portsmouth furniture of the Federal period matches the profile established by documentary research for furniture that might be expected to have a wax finish. The Sayward-Wheeler House furniture, made by rural craftsmen Samuel Sewell, also fits the profile. Made by, a joiner who built bridges and houses in a rural setting. It is not surprising that he would use a locally available material on his furniture. We must ask ourselves, if the finishes on the furniture are the freak preference of one rural joiner or, as Myrna Kaye suggests, because of its undisturbed state the furniture is more representative of that which would have been found in the average American home.[99]

The sampled furniture from Salem is not so easily explained. This is very fashionable furniture made in an important port city. One would think varnish resins should have been readily available. It predates the period when we expect to see wax was used on high style objects. Perhaps it is best explained as a preference of the local craftsmen. Reverend Bentley of Salem, writing in 1795, complained that gum lacca (shellac) brought into port there was of little use to the craftsmen as they were unfamiliar with its use, implying that the crafts were in a rather primitive state.[100]

**Conservation Concerns Related to Original Wax Finishes**

The problems facing the conservator in the treatment of furniture with wax finishes are twofold: the removal of later overvarnishes, and the reestablishment of a consistent protective layer. Although these may seem simple tasks, there are complicating factors which need to be considered.

The earliest treatments of furniture with wax finishes have been, to some degree, compromises. While the removal of the later varnishes has not presented too difficult a problem, application of a new coating material that has been a great challenge.

It was reported in 1987 that the use of adhesive tapes can be used for removing resinous varnishes with underlying wax.[101] This method has been quite successful in removing a large percentage of the varnish film. This is then followed by a quick wiping with a cloth saturated with ethanol to clear any residue. One problem with this approach is the very inconsistent condition in which we find wax surfaces. At times there are large amounts of underlying wax and the overvarnish releases quite easily when removed in this fashion. However, in other cases where the piece was scraped before application of the varnish, little wax remains. Here the varnish is better adhered and the adhesive tape must be well attached to the varnish if it is to pull it away from a surface coated with only the remains of a wax finish. The

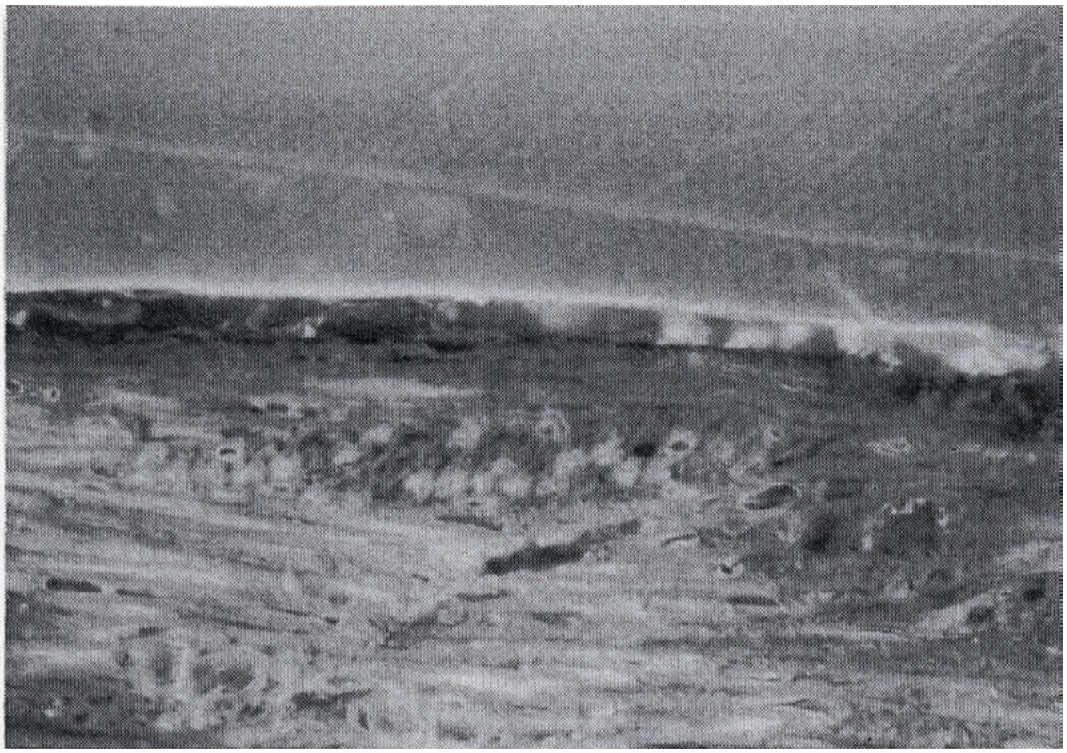

**Illustration 1:** Cross-section analysis of furniture from the Sayward-Wheeler House was consistently found to be a single layer of wax (Sample SW15, 250x, UV illumination).

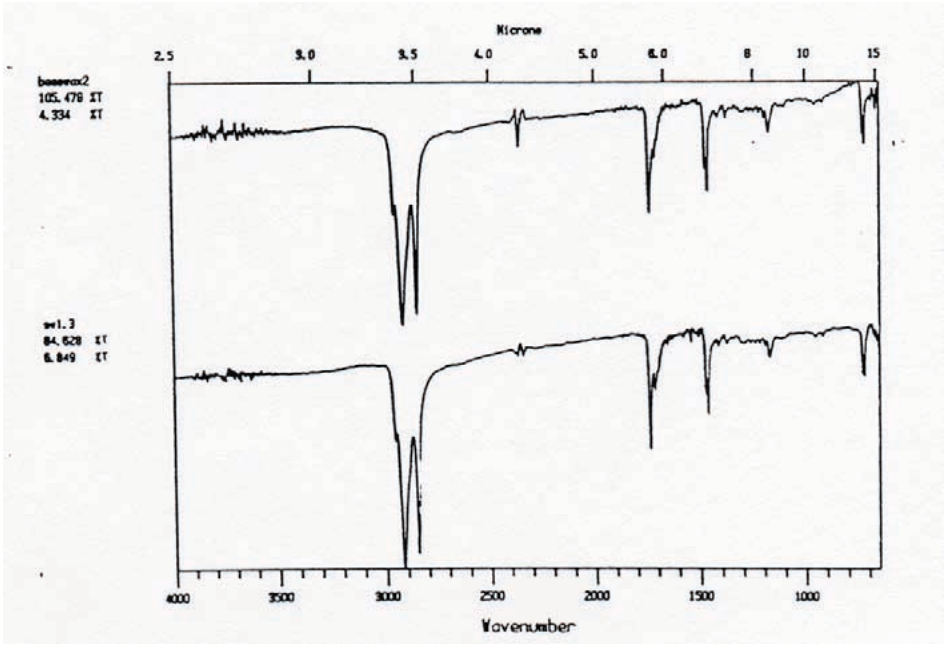


**Figure 1:** IR spectra of coatings from this group closely matched the beeswax standard (Sample SW1).

**Illustration 2:** Tambour desk, Portsmouth, NH, 1800-1815 (SPNEA, 1942.1355, photographed by David Bohl).

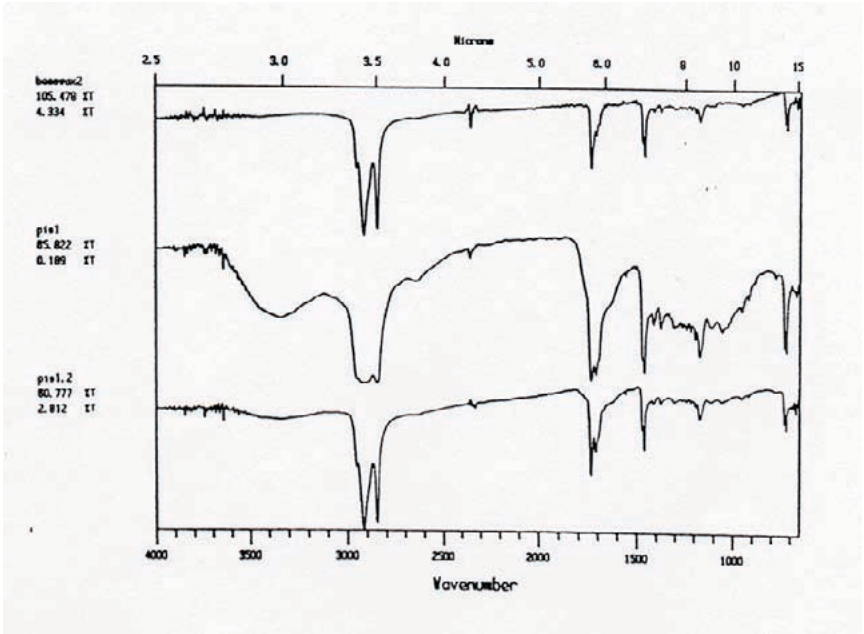


**Figure 2:** Comparison of coating sample from above desk with beeswax standard (Sample Pis1).


**Illustration 3:** Chest of drawers to John Chipman, Salem, MA, 1775-1790 (USSD, 63.72.2, photograph by David Bayne).

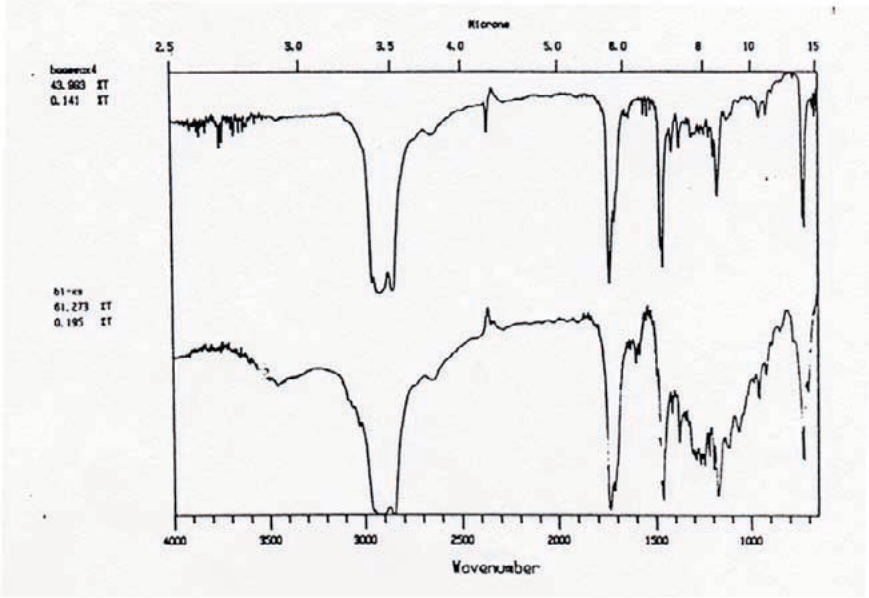


**Figure 3:** IR spectrum taken from cross section. Beeswax spectrum is contaminated by adjacent natural resin (Sample B1).

problem is that such a strong bond also causes small amounts of the wood to be removed (and some of the wax) as well. This can be compensated for by differing the type of tape or adjusting how much pressure is used apply the tape. Unfortunately, it sometimes is difficult to gauge how well a varnish is adhered and this can change from one another on a single piece.

Another method of mechanical removal which leaves the wax is place is simple scraping. The method used at SPNEA was to form special scrapers of plexiglass and use them as one would use an ice scraper, to remove the resinous overvarnish. Again, this method of removing the varnish while leaving the wax does a fairly thorough job. The only problem here is that scraping too aggressively can burnish the surface and result in an uneven appearance.

The most controlled method that was been used for the treatment of two pieces (breakfront and tambour desk) is the use of a solvent gel. In both cases the overvarnish proved to be an alcohol soluble spirit varnish. A gel of the following the formulation was used:

200 ml propanol
50 ml deionized water
8 ml ethomeen C-25
1.5 gr carbopol 940

Beeswax solubility differs substantially from that of most natural resins used in varnish making. This propanol-based gel is effective in cleaning off spirit varnishes, however; cases in which the wax has been overcoated with an oil/resin mixture, the varnish is likely to be much more tenacious. Other, more polar solvents will have to be used, always keeping in mind the solubility of the underlying wax. Solubility tests are always advised before proceeding. If no solvent tests give the desired results, one must return to the mechanical methods listed above.

In several cases at SPNEA overvarnishes have been removed to reveal a surface with so much wax that it is a wonder that any varnish ever stuck to it in the first place (the sides of the breakfront bookcase and the tambour desk). In these situations it is possible to simply buff the cleaned surface with a soft brush. However, it is more common to find surfaces where the wax has either abraded away through use prior to its recoating or perhaps scraped or abraded away as a part of the preparation for the recoating. In any case, a very uneven, often visually unsaturated surface is the result. After all, there was probably a reason the piece was refinished.

There are many problems associated with finding an appropriate material to fill any losses in a patchy wax layer and build up a suitable body and gloss. First of all the material must adhere to the wax surface. Second, it must have the visual appearance of a wax finish; a rather dull but even sheen. This can be difficult to achieve with conventional resinous varnish materials. It should also be possible to remove the overcoating without damaging the wax. One final criterion, not necessary but helpful, is a material that can somehow be differentiated from beeswax when viewed microscopically as a cross-section. However, written documentation may be our only method of recording the new coating.

To this point no material has adequately satisfied all of these criteria. The most common treatment in the past was to simply overcoat with either beeswax or microcrystalline wax. Both will be impossible to remove without removing the original beeswax. While both are irreversible, at least beeswax is compatible with the original, and its application can perhaps be justified when one considers that any wax

finish was probably maintained throughout its history with repeated applications of wax. The treatment with either wax is a compromise in terms of being a successful conservation treatment, but to this point considered more attractive than the alternatives.

Of the resins that could possibly be used for compensation (those with solubility parameters sufficiently different from that of beeswax), shellac is the only one that has been given serious consideration. While acrylics are a possibility, problems of poor adhesion on wax surfaces eliminate them from serious consideration. Empirical tests have found shellac to adhere well to wax in some cases. Fumed silica can be added to the shellac to produce a flatter appearance more closely resembling that of wax. However, additions such as the silica can hinder already questionable adherence to the wax. Even with the silica, it is difficult to simulate wax with shellac or most other resins.

Perhaps the more appropriate use of a resin would be its use as an isolation barrier. Shellac prepared with silica, as mentioned above, could be applied to a wax finish. This could be followed with the application of beeswax. Such a treatment would have the appearance of an original wax finish, be reversible, and there would be no confusion about it being original. Bruce Schuettinger of Antique Restorations (New Market, MD) has reported success in this application of shellac as an isolation layer on top of wax. It has been suggested that shellac that has not been dewaxed would tend to have a more compatible nature to that of the underlying wax and, therefore, adhere better.

**Possibilities for Future Research**

Most known cabinetmaker account books of New England have been thoroughly examined for information on finishing practices. Similar searches should be conducted on account books from New York and south. Valuable information could also be found in merchant records, importation records, and probate inventories.

Alternative sample preparation methods need to be tried for FTIR samples containing wax. Also UV illumination to assist in aperture setting for FTIR may prove useful in the study of transparent layers.

The use of an isolation barrier on to which additional layers of wax can be applied seems to be the most promising treatment for damaged wax finishes. Several options have been suggested and are worthy of further investigation. Melvin Wachowiack has proposed that cellulose ethers as a film forming material that will wet well to a wax surface. Morgan Phillips has reported success with acrylic emulsions with the appropriate wetting agent. The author has had success in preliminary tests isolating wax with layers of free acids dissolved in an aromatic. The acid forms a matt layer on the wax and can be removed with water of a pH of about 8.5.

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