A RATIONAL LOOK AT THE CLASSICAL ITALIAN COATINGS

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Abstract

This article describes the author's thoughts about varnish and his approach toward understanding the puzzle that classical Italian varnish has become. Significant clues were derived from both the physical appearance of the surfaces of classical Italian violins and observations of the visible fluorescence from their varnishes when irradiated by an ultraviolet lamp. To illuminate the influence of earlier painting techniques on the surface coatings applied by Italian violin makers from ca. 1550 to 1750, the author refers to two historical documents from the 12th and 15th centuries that describe varnish composition and methods of application. Correlation of observations, scientific studies, and historical records has led the author to the conclusion that the Byzantine finishing system is the likely original conceptual basis for the classical Italian coatings.

Over the years I have become convinced that a working methodology used by the Byzantines to finish painted objects was the original conceptual basis for Italian violinmakers during the so-called classical period (*ca.* 1550 to 1750), when it came to varnishing [1]. I refer to this methodology as "the Byzantine finishing system" because it evolved from their tempera painting practices. In principle, the same method was used to execute full oil paintings on panels and, later, on canvas. Indeed, until very recently, the buildup of most coatings could be considered to be based still on the same logical functionality of the various steps that had been deemed necessary by the Byzantine-influenced craftsman of the Middle Ages. It is the intention of this article to explain the rationale behind this hypothesis and discuss a few plausible practical implications of the use of this system in the creation of a transparent coating.

During the entire 19th century wonderful myths about the

mystery of classical Italian varnish were woven. Some of these would even have us believe that all knowledge about this substance was buried with Antonio Stradivari on December 19, 1737. We, of course, know this not to be true, because outstanding and definitely "classical" varnishes can be seen on instruments made by members of the Bergonzi and Guadagnini families (to name but a few) right up till the end of the 18th century. But it is a fact that the consistent high quality of Stradivari's varnishes was never reached again. Already within a few decades after Stradivari's demise, even the ardent violin fancier Count Cozio di Salabue [2] was unable to acquire more than scant information about this fabled substance. This is surprising since several (presently high-ranking) classical makers were still active in Cremona, and the Count's contacts included Stradivari's heirs and the last truly great exponent of classical making, Giovanni Battista Guadagnini.

Ever since Count Cozio's attempts, violin makers have tried to unearth that holy grail of lutherie, the recipe for the classical Italian varnish. Although many makers have used satisfactory varnishes since the end of the classical era, not everyone who has expressed an opinion on the nature of classical varnishes has been equally "hindered" by extensive knowledge about this subject. The majority of ideas and hypotheses about the classical Italian varnish, put forward over the years, seem to have been based on personal preference and gut feelings rather than on objective observation, scientific data, historical practices, or an understanding of basic varnish technology.

Certainly, until the middle of the 20th century, many by now influential authors have participated in the "prize shooting" for the true classical varnish recipe. This has left us with a quagmire of perpetuating misconceptions and unsubstantiated "facts" about (classical) varnishes and very little reliable information with which to continue our search. The few exceptions to this trend, e.g., Geary Baese's well-researched *Classic Italian Violin Varnish* [3], are of a more recent date. But by and large, the search has remained focused on the discovery of a redeeming varnish recipe, and collectively we have not made significant progress toward understanding what it is that qualifies a varnish for the adjective "classical." One might ask what factors have seduced us to categorize varnishes as different as those used by Andrea Amati, Domenico Montagnana, and Nicolo Gagliano under the same name?

Simone Sacconi's monumental study into Stradivari's methods, *I "Segreti" di Stradivari* [4], set a new standard for publications that deal with all technical aspects of violin making. *I "Segreti"* made us poignantly aware of the fact that, in addition to the skill and artistry of the luthier and the materials used, the

construction system, working methods, and even the exact individual tools employed exert an important influence on the functional and aesthetic qualities of an instrument. In recent years a number of reputable scholars, both individually and collectively, have contributed much to further our knowledge in this direction. The 1998 publication *Giuseppe Guarneri del Gesù* [5] is an exemplary result of such collaborations. A clear example of this influence of methods and tools is the Cremonese method of first drilling the *f*-hole circles and then mapping out the rest of the *f*-hole to the pre-drilled circles. This influence is not always as deliberately calculated as in this example. In fact, often the idiosyncrasies that are the natural result of a particular maker's tools and methods will help to authenticate his instruments with a higher degree of certainty.

The system behind the buildup of the different layers of a painted and/or varnished artifact and the methods used to apply these layers influence the appearance and performance of the finished work—even more so when these different layers are all transparent. What we experience when we look at a transparently varnished object is not due to the varnish alone, but also the interaction between the substrate (in our case, wood) and anything that is in between this substrate and the physical surface of the last layer. All the various layers that may have been applied to a substrate are together called a "coating," and the last layer of a coating is usually a varnish of some sort. Especially in the case of transparent coatings, substrate treatments will also influence the appearance of the total coating.

In short, everything that is done to a white violin, including the way in which the wood surface is finished, influences the appearance of the instrument's varnish. This is why it causes misunderstandings if, as long as we are not sure of what it consists, we refer to transparent classical coatings simply as "classical varnish." It is even questionable if we should call such a substance, about which we know so little, a varnish. If, for instance, pigments were involved in its coloration, then at least from a technical point of view this varnish should be called a paint.

Like most of us, compared to what I have learned about varnishes, I have learned a terrifying amount about what does not work. However, I have become certain that the qualities that we admire in classical varnishes today cannot be attributed solely to a substance that was once held in a container.

Classical Varnish or Classical Coating?

Traditionally, the coatings seen on Italian violins made between 1550 and 1750 are collectively referred to as "classical" varnish. We do, however, make a few general subdivisions corresponding

to their towns of origin. These subdivisions are based on the similar appearance of the varnishes that were typically used by makers working in the same location. The appearance of the varnish is often a decisive factor for an expert when determining the origin and maker of an instrument.

Not surprisingly, not only do classical varnishes differ enormously in color and thickness, but their mechanical properties also vary per locality, maker, and period. This is evident from the different effects that aging and wear have on the appearance of the varnish films. Some varnishes seem to have chipped off readily, while others wear away gradually, or get pushed around by contact. Some develop a very fine *craquele*, while others wrinkle up even to the extreme that separated islands of varnish are formed. Some varnishes have pinholes (technically known as "cratering") in their surface, and some classical varnishes even show all of these technical faults at the same time.

So what common factors among these coatings have caused us to categorize them as "classical varnishes"?

- First, of course, is their vibrant and luminous optical appearance. Admittedly, the same degree of "exuberance" is not exhibited by all varnishes on instruments made in the classical period.
- Second, when viewed under ultraviolet illumination of ~370 nanometer wavelength, classical varnishes (as a rule) reveal a unique opaque yellowish-white fluorescent layer underneath the colored varnish.
- Third, the fibers of the wood used on classical instruments generally exhibit a stunning resistance to dirt. Sometimes (as on the edges of scrolls) this extends more than 1 mm into the wood when all of the varnish and ground have long since worn away. Usually, these areas also still retain their vibrant and luminous appearance.

Certainly, the second and third factors cannot have anything to do with the colored varnish itself. Also, the first and third factors don't even seem to be dependent on the presence of the ground, let alone the varnish. This suggests that there must be *at least* one more component contributing to the "classical illusion" and that our reasons for categorizing a varnish as classical, in reality, have more to do with the other layers in the coating than with the varnish itself.

It is evident that, to avoid confusion when discussing classical varnish, we should distinguish between the different layers in this coating and the actual varnish. It is also worth noting that even if we get the actual varnish right, it will not necessarily look

right without the other "classical" layers underneath.

There is, however, a fourth common factor among classical coatings, hardly ever mentioned, which can only be attributed to the varnish itself: Classical varnishes, in general, must have been very easy to apply! Regardless of whether the quality of the woodwork underneath represents the epitome of controlled refinement or a more artistic approach, even the most strongly colored coats are always uniform in color strength all over the instrument. The coats seem to have simply fallen over any roughness in the woodwork like a blanket of snow. Tool marks in the woodwork often only become visible as darker areas because the surrounding varnish has worn away. Never do we see any evidence of overlapping coats, and rarely dripping of the varnish. Only occasionally can minimal creeping into tight places be observed. I have never seen any brush marks or brush hairs on an Italian instrument made before 1750, or any other faults that could have been ascribed to the actual application of the varnish. This suggests that however varied classical varnishes appear in their dry state, they had very similar physical characteristics while being applied. And if not identical, they most likely were related in type.

Historical Perspective

The violin is considered by many to be aesthetically superior to other instruments. In any case, it does not require a higher level of craftsmanship than that exhibited by the lutes, viols, or harpsichords of the same period. If anything, quite the reverse is true. Even though the reputations of some classical makers have reached an almost mythical status today, in their time most were fairly ordinary craftsmen. They certainly would not have thought of themselves as the "inspired artists" that misled romantics have later made them out to be. Indicative of the relatively low social status of these men and their craft at that time was Count Cozio's patronizing attitude toward G. B. Guadagnini and the unlucky circumstance that it apparently did not cross the Count's mind to consult members of the Bergonzi family or Lorenzo Storioni for information on varnish and varnishing techniques. This should in no way diminish our respect for the classical makers or their work. But if we want to research their working methods objectively, it should be done in this context.

It is intriguing that some of the earliest violins known to us were already coated in perfect "classical" varnishes. We need not believe the fable that Andrea Amati invented a whole new type of varnish at the start of the classical period and that its secrets were passed on to seemingly unconnected violin makers in different regions for the next 200 years (to be collectively abandoned around 1750). It is simply much more likely that classical var-

nishes and/or their ingredients were already well known by 1550 and that these products must have been more or less readily available in the different localities where they were used.

In contrast to artists who quickly embrace new technologies in order to express their ideas, craftsmen tend to go with what has been tried and proven over several generations. This would place the origins of classical varnish back at least into the Renaissance. There are several instruments and other artifacts that substantiate this hypothesis.

In April 2004 I was allowed to examine three early Italian stringed instruments in the collection of the Ashmolean Museum in Oxford, UK:

- Bass viol with cello features by Antonio and Girolamo Amati, Cremona, 1611
- Viola (for Charles IX) by Andrea Amati, Cremona, 1574
- Lira da braccio by Giovanni Maria (dalla Corna) Bresiano, Venice, *ca.* 1525

In daylight, the very well-preserved varnishes on these instruments appeared to be similar, and under ultraviolet light illumination they appeared to be identical. It is especially noteworthy that the lira da braccio was made some twenty-five years before the first-known dated instrument by Andrea Amati and the generally accepted start of the classical period of Italian violin making.

Although the Renaissance had a large impact on academic, artistic, and philosophical aspects of society, it did not have a direct influence on the man in the street. Craftsmen still worked according to the hierarchy and codes that the Byzantines had brought to Europe during the so-called early Middle Ages. Also, the raw materials and the way in which these were produced did not change much. Certainly, because of expanding trade routes, the provenance of materials sometimes changed, and new raw materials were introduced constantly. But these mainly added to the choice, and most did not simply disappear around 1750. In any case, regardless of whether we think that violin makers of the classical period made their own varnishes or bought them ready made, they would have been dependent on the raw materials used in other crafts. This must have been true because the average violin maker did not use much more than half a kilogram of varnish a year. Even in their time this did not create much of a buying force for any of the component substances. So it is among the methods and materials used by the craftsmen of the Medieval and Renaissance periods that we have to look for the origins of those used by Italian violin makers from around 1550.

Contrary to popular belief, classical varnish did not disappear

overnight. Throughout the entire period of its use, the various components of classical coatings were subject to variation and gradual change. Not only was there a large variety in the colored varnish coats, it is evident that the much praised "ground layers" differed considerably. It is only when the optical quality of whatever substance was applied underneath these ground layers finally diminishes beyond recognition—somewhere between 1750 and 1800—that we no longer recognize and categorize the many different Italian coatings as "classical varnish."

The following seems to me to be a plausible explanation for the disappearance of classical varnishes: Between 1600 and 1700 the fashion in woodwork finishes changed from the Medieval taste for the soft luster of gold to the hard and glossy preference of the Rococo period. All over Europe attempts were made to emulate the technically superior Japan lacquers. During the Middle Ages these had been a highly prized rarity and were imported from China overland. This caused enormous interest in fast-drying spirit varnishes with the result that, thereafter, oil varnishes also had to be hard and glossy. This change in concept caused changes in varnish formulations and quality criteria for the raw ingredients of oil varnishes.

Because of wars, famines, and diseases, Europe's population had been fairly stable for the best part of a millennium, with the majority of people living a semi-enslaved existence. After the second pestilence (*ca.* 1630), the fast growth of the now slightly less-enslaved population caused an increase in the demand for all kinds of goods, and more people then had to be paid for their labor. As a result, the production of all kinds of goods had to be increased and rationalized. At the same time, the advances made by the emerging science of chemistry started to influence the until-then mostly alchemically inclined processing techniques of raw materials. It has added greatly to the confusion surrounding classical varnish that all of these changes took place (in retrospect) within a relatively short period of time. This has given some the impression that only one crucial (and now lost) element had been responsible for all that is admirable in classical coatings.

Observations Based on UV Light Comparison

With the discovery of the unique yellowish-white fluorescent layer (stimulated by ultraviolet illumination at ~370 nm) that is present underneath the colored varnishes of classical instruments, some of the magic qualities of classical varnish were reattributed to this layer that has since become known as the "classical ground." Not only is this layer on most instruments of the classical era of a very similar color, it is usually also very opaque. When illuminated by the specified ultraviolet light, even heavily

flamed wood can be almost obscured by it. There is general agreement that, if this yellow-white fluorescent layer is not detected on an otherwise fine-looking instrument, there is reason to suspect that the instrument may not have been made during the classical period or that its varnish is not original. This unique ever-presence on instruments with quite varied top layers suggests that classical makers used similar materials up to the top, the varnish layer. This suggests that they used a communal system. But because of its ever-presence, the ground layer has also been credited for too many of the qualities that make classical coatings so desirable.

Most varnish materials have a unique fluorescent color under UV light, but this does not mean that a fluorescent color is unique to one material or composition. A specific fluorescent color, therefore, offers no means of positive identification. In fact, various waxes, drying oils, and resins all show a yellowish-white fluorescence, as do countless combinations of various other materials. Also, the fluorescent color of a material can be affected by the production processes to which it may have been subjected. Fluorescence tests can, however, be helpful as a tool to exclude noncompliant materials, and they can often help us to distinguish between various layers of a coating.

The ground layer on classical instruments can be very thin and not detectable in daylight, or it can be obviously present to the naked eye as a thick, clear layer underneath the colored varnish. In general, ground layers are thicker on less-refined instruments, especially those of the later classical period, as for example on many instruments by Giuseppe Guarneri *del Gesù*, Domenico Montagnana, and Lorenzo Storioni.

The scientific research by Claire Barlow and James Woodhouse [6-8] at the University of Cambridge has revealed that random samples of classical ground layers contain uncolored particulate matter. In modern terms these would be classed as filler materials. This does not mean that filler materials are necessarily present in all the ground layers of all classical makers. It does, however, point to a trend, which would be in accordance with a very likely reason for its use: to provide a smooth and even surface on which to apply the colored varnish.

As a rule, filler materials will only remain highly transparent upon drying of their medium, if this medium contains drying oils. In addition to this, under UV light, the varnishes on many light-colored instruments, e.g., those of the Milanese school, appear to be simply a continuation of the ground layer. Consistent with this, the mechanical properties of these varnishes are often more "ground-like." Their surfaces are usually comparatively hard and wear-resistant, they often look and feel leaner or less fatty, and there is much less evidence of thermo-plasticity among them.

These types of varnish do not get pushed around by heat and pressure as easily as do the more strongly colored varnishes. All of this suggests that the ground coat has the characteristics of an oil varnish and served the same purpose as the gesso used by the ancient schools of painting.

Under UV light illumination it can also be verified that where the colored layer of the varnish seems to have chipped away from the ground, it is in fact often the yellow-white fluorescent ground layer that has chipped away from the wood. In doing so, it has taken the colored "varnish" with it. The C-bout area on the back of well-preserved violins made by Antonio Stradivari during his "Golden Period" will usually provide ample opportunity to witness this. The bare spots that result from this chipping always look just as good in daylight as areas that still have ample ground left on them, even if the chipping has occurred decades ago. As in the case of heavily worn areas, this suggests again that the optical qualities of classical coatings and the presence of a classical ground layer are not necessarily related.

The opposite scenario goes a long way toward proving this point. An example is a cello made by Ludovico Rastelli of Genoa, dated 1840, which is almost completely covered in original varnish. In daylight this instrument appeared to have a very nice, but not "classical," ground or varnish. However, under UV fluorescence test conditions, its ground did have a "classical" appearance. My opinion is that even at this late date of 1840, Ludovico must still have been able to buy or make a near-enough classical ground layer. But whatever he applied to his cello underneath this ground layer did not exhibit the same excellent optical appearance, as it would have if it had been made 100 or even fifty years earlier. This caused the sum total of the coating on this cello to appear not quite classical, even though the appearance of its ground layer under ultraviolet illumination suggests that Sig. Rastelli was still using the same system as the truly classical Italian makers.

Historical Practice: A Plausible Explanation

From a comparative study of Medieval European sources on painting and varnishing, the general working methods of finishing painted works, be they on stone, wood, metal, or canvas, become apparent. Because they were both written by practicing artisans and span the last three centuries leading up to the Renaissance, the early 12th-century *De Diversis Artibus* by Theophilus [9] and the early 15th-century Italian manuscript, *Il Libro dell'Arte* by Cennino d'Andrea Cennini [10], are of special interest to these studies.[1,2] A comparison between these two texts

shows that many of the materials and methods of the 12th century were still commonly in use in the 15th century. Cennini's work gives a thorough impression of the kind of painting technology that was available in the period preceding the start of the classical period of violin making. During the entire Middle Ages, moveable paintings were still primarily made on wooden panels, and Cennini gives a complete description of all the steps necessary to finish a panel painting.

After the surface of the board was effectively flattened (Theophilus [9] already recommended using scrapers and shaving grass or horsetail for this), it was coated with two sizing layers. Although in Cennini's panel painting method both of these were made from hide glue, he explained that the two layers served different and definite purposes [ch. CXIII, ref. 10]. The first sizing application served to influence certain qualities of the wood so that it would better take on the rest of the painting. The second one was used to prevent the next layers from sinking in. In more general terms, these can be described as being a primer and a sealer.

In chapter LXXXXIIII Cennini [10] instructed that, whether on iron, stone, glass panel, or wherever, we should work in the same way, always sizing first. The gesso or ground that followed was made of mineral filler (usually chalk or gypsum) and a binder (usually hide glue). Next, the actual colored part of the painting was applied, usually in an egg tempera medium. Finally, the painting was finished with an oil varnish, known as *vernice liquida*, which could be bought in several varieties.

As I have argued above, the coating system of the classical Italian violinmakers consisted of at least three steps, the middle one being a transparent ground. It bears an intriguing resemblance to the system used in the original Byzantine tradition. Because this finishing system had been imbedded in the cultural heritage of artists and craftsmen for centuries prior to the start of

1. In the custom of the time, Theophilus is a pseudonym, probably for the German monk Roger of Helmarshausen, by whom several works still exist. Although Theophilus was obviously more schooled in metal- and glasswork, his manuscript contains a fair amount of information on painting.
2. This is the foremost source on Medieval painting technology. Cennini's work is, by comparison with others, very organized. To describe the course of study to be followed by the apprentice painter, he repeatedly used architectural figures of speech, e.g., "with steps rising," and "gates opening"—a clear sign of the alchemical influence on his work. Cennini also was very adamant in his opinion that, of all of man's works, the theoretical pursuits are the loftiest, and next to them is painting because it combines theory with skill of hand. Apart from a wealth of information on painting techniques, *Il Libro dell'Arte* offers its readers an intimate view of the values of another age.

the classical period, I believe that when it came to varnishing, it would have been a logical, and possibly an even unquestioned, method to adopt for any craftsman of the Renaissance or Baroque eras. Let's try to superimpose this system on classical coatings and see where this may lead. The various steps in the Byzantine finishing system and their purposes can be described as:

1. Priming: To prepare the substrate so that it will accept the coating and to improve specific substrate qualities. This does not necessarily imply that any substances are applied to the substrate. Sometimes, simple smoothening or degreasing operations, e.g., when painting on glass, could be considered enough. The tool marks left by scrapers and horsetail can be seen on many classical instruments. Wood treatments to harden, color, or protect against fungal and insect attack also fall into this category.

2. Sealing: To seal the substrate so that the gesso (in violin making, referred to as the ground) will not sink in excessively. This does not need to result in a smooth surface, because accomplishing that was the job of the gesso. In the case of classical coatings, the sealer could also have given the wood fibers some extra protection. Oddly enough, where it occurs, the chipping away of ground layers seems to be most prominent on heavily flamed maple. If, in these instances, a ground or varnish had been applied without first applying a sealer, one would expect to see the opposite, because the more open character of heavily flamed wood provides better "anchorage" of the ground to the wood. The use of too much sealer could explain the occasional strong tendency of ground layers to chip away.

3. Grounding: To provide a stable and even foundation for the actual painting. The term "even" should be interpreted not only as in "smooth," but also even in its acceptance of paint or varnish. It has already been argued that providing evenness also seems to have been a function of the classical ground.

4. Painting: To apply color or an image. Recreating the intense and luminous colors of especially some later Cremonese instruments and doing this in as thin a layer, as is sometimes evident, almost certainly required the use of highly pigmented varnishes. If a varnish holds particulate matter, such as pigments, it is, technically speaking, a paint. So, in reality many classical violins were not just varnished, but were first painted and than possibly varnished.

5. Varnishing: To protect the painting from outside influences (moisture, dirt) and, equally important, to equalize differences in the surface texture and gloss level. In historical painting methods,

different pigments often required different media. In addition, paintings from the Middle Ages were made using a variety of techniques and materials, e.g., plaster and gold leaf, in one painting. This made the equalization of the finished product a very important part of the process.

It is evident that steps 1, 3, and 5 of this system overlap with what visual inspection reveals about the "construction" of classical coatings. In many cases, reasonable argumentation for the presence of step 4 can be made also. Whether a sealer was ever used in classical coatings (as in step 2 of the Byzantine system) cannot be ascertained so easily. If, however, the ground layer is based on an oil varnish, and the primer turns out not to be responsible for the occasional chipping away of this ground, then there must (at least on some instruments) be a sealer that causes this peculiarity.

Early trade directives were, of course, not like pan-European regulations that had to be followed at the risk of losing one's license. They should be seen more like a "code of good conduct." In practice, we may therefore expect to see quite a bit of variation on this system. Ultimately, it was the judgment of the master overseeing the work, as well as the work itself, that dictated which materials or compositions were going to be used for each of these steps, and whether all steps needed to be carried out.

The relevance of the Byzantine finishing system to the variations seen in classical Italian violin coatings can be speculated on as follows. If the ground layer holds filler material and is transparent, it must be based on a drying oil. It could then, in some traditions, also have been used as a sealer (step 2). This would cause (among other things) firm adherence to the wood, resulting in less chipping away of the ground and varnish. The ground layer could also double as the varnish (step 5). This would make the varnish light in color and extremely tough and wear resistant, which would result in a more gradual appearance of the wear.

If the medium for the ground layer was of sufficient quality, it may even have been used without filler, making the ground indistinguishable from the varnish. In cases where the varnish provided color, obviously step 4 (the painting) could have been omitted. For paint with dilute pigmentation, it is possible that a violinmaker would not have deemed it necessary to apply the protective unpigmented varnish of step 5. Even if exactly the same compositions for each step were to have been used by the different violinmakers, considerable variation in outward appearance would have been achieved by simple variations within this system. Also, five steps might not always have been used to produce the classical coatings.

Materials Dictate Method of Application

It is well documented that, for a 16th- or 17th-century craftsman, it would have been common to buy readymade "standard" varnishes at the local apothecary. It would also have been a normal practice for the craftsman to customize these varnishes according to his needs, by adding oils, resins, colors, or even other varnishes. The practice of customizing varnishes from a communal local source, combined with their use within a standard system, can explain both the close similarity between instruments made in one town and period and the degree of variation that we are seeing in classical varnish films, while still allowing for overall easy application characteristics.

Identification of *vernice liquida*-type varnishes as the most likely starting point formulations used by the Italian violinmakers of the classical era was documented by Geary Baese in *Classic Italian Violin Varnish* [3]. Apart from the scientific and historical source documentation that Mr. Baese brought to our attention in favor of these varnishes, it may be noted that when properly made, the higher quality, uncolored *vernice liquida*-type varnishes exhibit the yellow-white fluorescence that is typically emitted by the classical ground layers.

In addition, there is an interesting curiosity about the reported application method for *vernice liquida*-type varnishes that has largely gone unnoticed: These varnishes were usually applied by hand! This has a bearing on the evenness of varnish application as witnessed on classical instruments. It was not for want of brushes or solvent, but because of several calculated and well-understood advantages that this combination of application method and varnish type offered the Medieval craftsman. As Cennini [10] warned, they needed to minimize the risk of the varnish penetrating the paint layer, as this would have ruined the freshness of their egg tempera painting. On complicated, three-dimensional ancona surfaces, they also could, with this method, achieve a thin and very even varnish application with relative ease.[3] In addition, the superior durability of a varnish film resulting from an undiluted varnish was even more appealing to the Medieval mind than it is to us.

The usual interpretation that application by hand was done with a rubbing motion is not very practical, especially when applying gold-colored glazes on tin foil for which application by hand is also mentioned. Rubbing will not result in varnish films of even thickness; consequently, in these instances, the color

3. An ancona is a combination of painting and sculpture in which the frame (not necessarily a rectangle) is an integral part of the work. There can also be three-dimensional features, such as glass, precious stones, or modeled plaster, mounted within the painted surface.

would not end up even. Cennini's [10] second note on varnish application (with a sponge rolled under the hand) shines some light on this dilemma. This is, in principle, a description of what we know as a modern invention by the name of "paint roller." Paint rollers work well because they make use of the inherent physical qualities of paint. The pull of the roller on the paint film causes it to split exactly at the same level with every passing of the roller. After several passes, a paint film of even thickness automatically results. During the entire application process, it is important (especially for transparent layers) that the physical qualities of the paint do not change, as this would influence the splitting position in the layer, resulting in an uneven layer.

Pad or tampon printing, which is executed by a stamping or patting motion, works on the same principle and can be performed very well with the fleshy part of the hand or the fingertips. In his chapter titled "How to Make the Golden Tin," Cennini [10] literally described the process above. Colored layers were patted on, not rubbed! Applying a transparent paint or strongly colored varnish in a thin and even layer over a relatively large and complicated surface like that of a violin would have been (and still is) a lot easier to accomplish by a tampon/pad printing method than with a brush. This method of application is, however, not compatible with the use of (fast) evaporating solvents, because solvent evaporation during application would change the physical qualities of the paint.

And so we see that the formulation criteria of the early *vernice liquida*-type varnishes were not only influenced by a desire for lasting quality, but also by the intended application procedures for these varnishes. When seen in their proper context, it becomes clear that historical oil varnishes should not be regarded merely as archaic predecessors of later oil varnishes, but in their own right as a quite sophisticated solution to the demands of their time.

Summary and Conclusions

What we are used to referring to as "classical varnish" is in fact a multilayered coating. The effect that this coating's primer has on the wood is of decisive importance to our qualifying the coating as "classical." Although there is a lot of variation to be seen among classical coatings, the actual varnish components of these coatings are of a similar type that used to be referred to as *vernice liquida*. Much of the variation that one might ascribe to differences in the varnishes can be explained by different uses of a communal system that underlies the buildup of these coatings.

Our habit of talking about classical coatings as classical varnishes causes us to think about and classify them as varnish. This

not only frustrates research into the exact nature of these coatings, it can also limit our willingness to consider anything that is not runny or brushable. Thinking about the application (of at least the colored part) of classical coatings as painting, and doing this from the appropriate historical perspective, will allow us a much more original and creative approach toward "varnishing."

REFERENCES

[1] R. Hargrave, The Holy Grail, *The Strad*, Vol. 116, No. 1379, pp. 52-56 (Mar. 2005).

[2] Cozio di Salabue, *Technical Studies in the Arts of Musical Instrument Making*, A. Dipper and D. Woodrow, Eds. (publ. by A. Dipper, Toynton, 1987).

[3] G.L. Baese, *Classic Italian Violin Varnish* (publ. by the author, Fort Collins, 1985).

[4] S.F. Sacconi, *I "Segreti" di Stradivari* (Libreria del Convegno, Cremona, 1972).

[5] C. Chiesa, J. Dilworth, R. Hargrave, S. Pollens, D. Rosengard, and E. Wen, *Giuseppe Guarneri del Gesù* (Biddulph Publ., London, 1998).

[6] C.Y. Barlow and J. Woodhouse, Firm ground? A detailed analysis of ground layers under the microscope (Part 1), *The Strad,* Vol. 100, No.1187, pp. 195-197 (Mar. 1989).

[7] C.Y. Barlow and J. Woodhouse, Firm ground? A detailed analysis of ground layers under the microscope (Part 2), *The Strad,* Vol. 100, No. 1188, pp. 275-278 (Apr. 1989).

[8] C.Y. Barlow and J. Woodhouse, Of old wood and varnish: Peering into the can of worms, *Catgut Acoustical Soc. J.,* Vol. 1, No. 4 (series II), pp. 2-9 (Nov. 1989).

[9] Theophilus Presbyter, *De Diversis Artibus*; early 12th century, Eng. transl. by J.G. Hawthorne and C. Stanley-Smith (Univ. Chicago Press, Chicago, 1963; repr. by Dover Publ., New York, 1979).

[10] Cennino d'Andrea Cennini, *Il Libro dell'Arte*; early 15th century, Engl. transl. by D.V. Thompson, Jr. (Yale Univ. Press, 1933; repr. by Dover Publs., New York, 1954).