**The Analysis of East Asian and European Lacquer Surfaces on Rococo Furniture**

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The Rococo furniture collection at the J. Paul Getty Museum, recently reinterpreted for this publication, has benefited from more than a decade of development and scholarly research into the analysis of lacquer coatings. Nine pieces in the Getty collection feature surfaces with Chinese or Japanese lacquer, or their European imitations, and it is this group of objects that have driven, in part, the development of a new analytical protocol for the study of these materials. Together, Museum conservators and Getty Conservation Institute scientists designed and implemented an approach using organic chemical analysis that generates reproducible data that allow for meaningful comparison. The results presented in this catalogue draw on data collected over a ten-year period that have been reexamined using the most recent improvements in spectral data processing and an expanded reference library.

## ***Understanding East Asian Lacquer in the West***

East Asian lacquer arrived in Europe by the sixteenth century; however, knowledge of the botanical origin and physical properties of the popular yet mysterious material remained relatively unknown even well into the Rococo period. Western accounts as early as 1655 identified lacquer as a “glue called cie [*qi* in Mandarin], which sweats out of the trees,”[[1]](#endnote-1) but even a basic understanding of the use of the raw material eluded Europeans, and scientific experiments failed to reveal how the cured material could be dissolved.[[2]](#endnote-2) Not until the publication of Fr. Filippo Bonanni’s studies of Chinese lacquer in 1720, followed by Fr. Pierre d’Incarville’s work in 1760, was the transformation of the raw material into the finished lacquer object first understood in the West.[[3]](#endnote-3)

Asian lacquer is the product of a group of trees in the family Anacardiaceae that forms a hard film through enzymatically catalyzed oxidation and polymerization. While the botanical source of the raw material and the practice of lacquer making is now better understood,[[4]](#endnote-4) Asian lacquer remains challenging to differentiate visually from European imitations, particularly once cut into pieces and incorporated as a decorative veneer on fashionable eighteenth-century French furniture. Light-induced damage and the application of restoration varnishes can alter its appearance and further complicate accurate identification. These problems have led to misattributions of European imitation lacquer objects as Asian lacquer, and, conversely, Asian lacquer for European, in many museum collections.

## ***Analysis at the Getty***

In the late 2000s, a joint project between the J. Paul Getty Museum and the Getty Conservation Institute was initiated to use chemical analysis to definitively distinguish Asian lacquer objects from their European counterparts. An innovative analytical strategy was developed that combines the previously separate fields of Asian lacquer analysis and research into European resins and oils.[[5]](#endnote-5) The resulting protocol, which relies on the instrumental technique of pyrolysis gas chromatography–mass spectrometry with thermally assisted hydrolysis and methylation (THM-py/GC-MS), uses a small sample removed from a 1 to 2 mm2 area of the object. Working layer by layer with a microchisel and a stereomicroscope, the foundation, finish, and decoration layers can be separated and analyzed individually.[[6]](#endnote-6) The THM-py/GC-MS analysis separates and characterizes each of the hundreds of molecular compounds that are present in each sample. The results can be compared to a reference library (compiled at the Getty in collaboration with colleagues from around the world) of thousands of molecular compounds that are known to be associated with specific raw materials used in the production of lacquer and varnishes, both in Asia and in the West. These results, in turn, can be used to characterize the craftsperson’s original mixture of organic materials that were used to create the finished lacquer product.[[7]](#endnote-7)

Further study of these objects with complementary instrumental techniques, including X-ray fluorescence spectrometry (XRF) and scanning electron microscopy with energy dispersive spectroscopy (SEM-EDS), provides elemental information about the use of inorganic materials such as decorative metallic powders, pigments, and clays. Cross-section microscopy, X-radiography, and ultraviolet-induced visible fluorescence photography lend additional clues to determine the original manufacturing techniques and identify later restorations.

The analytical techniques used at the Getty not only readily distinguish European lacquer from Asian lacquer, but can often reveal the regional origin of Asian examples. Prior to recent research conducted at the Getty, the belief was widely held that Asian lacquer objects originating from Japan and China were exclusively composed of *urushi*-type lacquer (*urushi* in Japanese and *qi* in Mandarin),[[8]](#endnote-8) a valuable sap, painstakingly harvested from trees of the species *Toxicodendron vernicifluum*.[[9]](#endnote-9) However, based on research conducted for this catalogue, it is now known that two other types of less expensive lacquer were frequently mixed into Chinese and Japanese export lacquer during the seventeenth and eighteenth centuries: *thitsi*-type lacquer (often called Burmese lacquer),from Southeast Asian trees of the genus *Gluta*, and laccol-type lacquer (also known as Vietnamese lacquer), from trees of the species *Toxicodendron succedaneum.*[[10]](#endnote-10)

## ***Japanese Lacquer***

Much of the Asian lacquer used for the decoration of French eighteenth-century furniture was taken from dismantled pieces of seventeenth-century Japanese lacquer produced for export to Europe. THM-py/GC-MS analysis of numerous examples has shown that this export lacquerware was almost always made using a combination of *urushi* and less expensive *thitsi* lacquer, as detected in the Van Risenburgh corner cupboards (72.DA.44.1–.2; [cat. no. 4](4)), the Van Risenburgh black lacquer commode (65.DA.4; [cat. no. 5](5)), and the Joseph commode (55.DA.2; [cat. no. 14](14)). It appears that Dutch demand for more Japanese lacquer objects at lower cost may have contributed to the widespread use of *thitsi* lacquer, even though it is generally considered a less desirable material for the manufacture of lacquer objects. Dutch East India Company (VOC) records confirm that *thitsi* lacquer cultivated in Cambodia, Siam, and Burma was sold by Dutch traders to the very Japanese lacquer craftsmen from whom they purchased finished wares for export to Europe.[[11]](#endnote-11) It is now understood that seventeenth-century Japanese export lacquerwares typically have a foundation layer made of finely divided clay, bound with *thitsi* lacquer (or *thitsi* mixed with *urushi*) and drying oil, sometimes with the addition of starch or glue. This is readily apparent in the second and third foundation layers on the Joseph commode (55.DA.2; [cat. no. 14](14)), which are primarily bound with *thitsi* lacquer, with a large proportion of drying oil as well as starch. Based on organic analysis, it is known that significant amounts of drying oil were typically added to the black upper lacquer layers and on occasion small amounts of so-called wood oil (exudate from trees of the genus *Dipterocarpus*), possibly present in the two Van Risenburgh corner cupboards (72.DA.44.1–.2; [cat. no. 4](4)),and gum benzoin (from several species of trees in the genus *Styrax*).[[12]](#endnote-12)

## ***Chinese Lacquer***

The Chinese export lacquer of the late seventeenth and early eighteenth century, in contrast, frequently is made from a laccol-type lacquer, occasionally with small proportions of *urushi* added in the upper finish layers.[[13]](#endnote-13) Laccol-type lacquer was detected in all four pieces of Chinese lacquer in the Getty Rococo collection, which includes the Dubois *secrétaire* (65.DA.3; [cat. no. 13](13)), the two Dubois corner cupboards (78.DA.119.1–.2; [cat. no. 12](12)), and the Van Risenburgh red commode (72.DA.46; [cat. no. 6](6)). *Toxicodendron succedaneum* trees, from which laccol-type lacquer is derived, are endemic to the region around Vietnam and southern China and therefore would have been available to craftsmen working around the southern port of Guangzhou.[[14]](#endnote-14) Much like Japanese export ware, Chinese export lacquer was made using a simplified process in comparison to high-quality domestic production, relying on less expensive *urushi* substitutes and the addition of considerable amounts of drying oil to reduce both the cost and the time required for production. Typical examples, as seen in a cross-section sample from the Van Risenburgh red commode (72.DA.46; [cat. no. 6](6)), usually have two foundation layers, with a paper interlayer, applied directly to the wooden substrate. The foundations frequently use blood as a binding material; markers for what is presumably pig’s blood were detected in both the Van Risenburgh red commode and the Dubois red *secrétaire*.[[15]](#endnote-15) The foundation is usually followed by the application of two lacquer finish layers composed of laccol, with the addition of a significant amount of drying oil (such as tung or perilla oil) and occasionally so-called cedar oil (probably derived from *Cupressus funebris*), as observed in the Van Risenburgh red commode.[[16]](#endnote-16)

## ***The Reuse of Japanese and Chinese Lacquer Panels in French Furniture***

The panels of Japanese and Chinese lacquer that were used to decorate contemporary pieces of Parisian high-style furniture in the mid-eighteenth century were supplied to cabinetmakers primarily by *marchands-merciers*, who were both merchants of objets d’art and interior decorators for the fashionable elites.[[17]](#endnote-17) The precious panels were split and thinned by cabinetmakers so that the lacquer could be utilized in the same manner as a sheet of wood veneer. As described by the eighteenth-century cabinetmaker André-Jacob Roubo, the delicate and risky procedure required sawing the panels down the middle so that the lacquer from both faces of the original screen, chest, or cabinet could be used. This was doubtless a challenging task, even for highly skilled veneer sawyers, since the panels were often substantially wider than the tropical timbers that they sawed on a daily basis. Once the panels were split, Roubo directed that they be thinned with planes on a padded workbench. He wrote that the panels should not be thinned to less than about *une ligne* (2.25 mm) to ensure that they would retain their structural integrity. Interestingly, direct study of the Asian lacquer panels presented in this catalogue shows that they were often thinned to a substantially greater degree. Analysis of cross-section samples showed measured thicknesses of 0.75 mm on the Van Risenburgh black commode (65.DA.4; [cat. no. 5](5)) and just over 1 mm on both the Dubois *secrétaire* (65.DA.3; [cat. no. 13](13)) and the Van Risenburgh red commode (72.DA.46; [cat. no. 6](6)). Manipulating such thin sheets of lacquer is especially remarkable when one notes that at these thicknesses the wood substrate accounts for only about half the thickness of the sheet. The discrepancy between Roubo’s text and the findings reported here may be explained by the fact that Roubo was writing some years later than the time when these objects were made, and in Roubo’s time, the Neoclassical style was firmly established. In Neoclassical forms, lacquer panels were typically applied to flat surfaces, while the panels examined here from the Rococo period were all applied to curved surfaces, requiring the panels to be bent to conform to the substrate. It seems reasonable to believe, then, that craftsmen of the Rococo thinned their panels to the extreme in order to facilitate bending, while later craftsmen were instructed to maintain thicker panels for added stability when they were to be used without bending.[[18]](#endnote-18)

Roubo gives further details about the delicate procedure of gluing the panels of Asian lacquer to the furniture carcasses. He instructs that the edges of the panels should generally be hidden by gilt bronze mounts. Surrounding the Asian lacquer panels, the rest of the surfaces of the furniture were to be coated with an imitation of the base color of the lacquer, achieved with European materials, to seamlessly blend the two into a unified object. This blending can be observed on all the Getty pieces, particularly on legs and corners, which would have been difficult and time consuming to veneer with pieces of Asian lacquer. The technique is particularly effective on the Van Risenburgh commode (65.DA.4; [cat. no. 5](5)), where the Japanese lacquer cartouche at the center is complemented by, and almost indistinguishable from, the surrounding European imitation lacquer. These European lacquers became known as “japanning,” likely due to the notion recorded in period accounts that “the finest [lacquer] comes from Jappan [*sic*].”[[19]](#endnote-19) In some cases, European imitation lacquers were also used to simulate fully decorated panels of Asian lacquer without the use of any true Chinese or Japanese lacquer veneer on an object, as can be seen in the Van Risenburgh *cartonnier* (83.DA.280; [cat. no. 3](3)).

## ***The Imitation of Chinese and Japanese Lacquer***

Europeans turned to a wide range of plant resins and oils in their attempts to imitate the materials of East Asian lacquer.[[20]](#endnote-20) In the eighteenth century, spirit-resin varnishes, or alcohol-soluble mixtures of resins, were widely used and valued for their gloss, transparency, and quick drying times. Oil-resin varnishes were also used, particularly for dark-colored finishes or exterior applications where they were valued for their durability despite their tendency to darken. Much about the development of these European finishes was researched by the art historians Walter Holzhausen and Hans Huth who published seminal texts on the topic in 1959 and 1971, respectively, that laid the foundation for a modern understanding of the history of lacquer workshops and the objects they produced.[[21]](#endnote-21)

In eighteenth-century France, the development of European imitation lacquer was led by Jacques Dagly, who opened a workshop in Paris in 1713, bringing with him lacquer knowledge from Spa and Berlin.[[22]](#endnote-22) As the eighteenth century progressed, it was the prolific Martin brothers, whose family had worked as *vernisseurs* in Paris for two generations, who developed a closely guarded recipe for a superior oil-resin varnish that became known as *vernis Martin.*[[23]](#endnote-23)The Martins were so successful in the use of European lacquer that by the end of the eighteenth century the term was generally used to denote any high-quality lacquer finish, whether executed by the Martins or others.[[24]](#endnote-24)

To devise an ideal European lacquer, craftsmen balanced the mechanical properties of the dried film and working properties of the liquid varnish with the cost and availability of raw materials. A coating needed to be hard enough to be polished to a high gloss but with enough flexibility to prevent cracking. Period treatises frequently recommend the use of harder resins such as sandarac from North Africa, copal from Latin America, or shellac from India combined with softer resins such as larch turpentine or colophony. Other materials, acting as plasticizers and/or solvents, were occasionally added, including camphor, elemi, and essential oils, although these were known to significantly slow the drying of the film.[[25]](#endnote-25) The use of sandarac, likely with the addition of camphor as a plasticizer, is seen in the red lacquer of the Van Risenburgh commode (72.DA.46; [cat. no. 6](6)). The Dubois corner cupboards (78.DA.119.1–.2; [cat. no. 12](12)) also have a period spirit-resin varnish consisting of the harder resins sandarac and shellac, with the addition of pine resin to soften and add flexibility to the coating. The use of amber has also been reported in varnishes of this period, particularly where a hard, durable surface finish was desired; however, these recipes were difficult and dangerous to prepare, requiring long periods of intense heating to fully dissolve the fossilized resin. While no amber varnishes could be definitively identified in this set of objects, oil-resin varnishes were observed on several pieces, including on the black BVRB commode (72.DA.44.1–.2; [cat. no. 4](4)), where lacquer consists of drying oil mixed with pine resin and copal.

A wide range of recipes was circulated in France in treatises by Pierre Pomet, Filippo Bonanni, André-Jacob Roubo, Jean-Félix Watin, and Le Pileur d’Apligny; however, changes in terminology over time make direct interpretation of these recipes difficult.[[26]](#endnote-26) Many materials available to craftsmen in the Rococo period derived their names from the port cities through which they were traded. Venice turpentine, in the seventeenth century, denoted resin from *Pistacia therebintus*, or the turpentine tree,also known as Chios turpentine or Pistachio turpentine, grown on the islands of Cyprus and Chios and related to the tree *Pistacia lentiscus*,which produces mastic resin.[[27]](#endnote-27) However, by the late eighteenth century when Watin was writing about the Martin varnish recipe, Venice turpentine was synonymous with larch turpentine from *Picea decidua*. These issues with naming also extend to common turpentine, colophony, and rosin, described here collectively as “pine resin” coming from several different species in the genus *Pinus*. The term “copal” highlights further ambiguities in naming as it can refer to both fresh and partially fossilized resins collected from several different genera of plants, including *Daniellia*, *Guibourtia*, *Hymenaea*, and *Agathis*,known to grow throughout Asia, South and Central America, Africa, and the Pacific Islands. These copals are often grouped into types by their places of origin or trade, and possess a wide range of material properties generally linked to their degree of fossilization and chemical structure. In general, it appears that the copal available to Parisian craftsmen of the mid-eighteenth century would have been primarily fresh, or “soft,” copal, originating in South and Central America, while partially fossilized, or “hard,” copals from East Africa were first imported into Europe in the late eighteenth century. The East African hard copals, along with hard copals from New Zealand, became widely available in Europe only in the nineteenth century.[[28]](#endnote-28)

Using the same technique and sampling protocol described for Asian lacquer samples, the composition of European lacquers can be clarified and connections can begin to be made to the aforementioned historical recipes. With a single sample, an oil-resin varnish can be easily distinguished from a spirit-resin lacquer, and frequently specific ingredients, including shellac, larch turpentine, pine resin, sandarac, gum benzoin, elemi, and hard copal, can be clearly identified. This was of particular importance in the analysis of the Van Risenburgh *cartonnier* (83.DA.280; [cat. no. 3](3)), where oil-resin varnishes likely containing pine resin were detected on the *pagodes*, *bout de bureau*,and *serre-papiers*, which were chemically distinct from the shellac-based spirit-resin varnish used on the clock.

Despite significant recent analytical developments, the complex mixtures, botanical similarities, and uncertainty surrounding historical terminology means that the Getty’s current analytical protocol has some limitations, particularly with respect to polycommunic acid-containing compounds such as sandarac, soft copal, and Baltic amber.[[29]](#endnote-29) While many molecular markers, detectable by THM-py/GC-MS, can often lead to the precise identification of resins and oils, the results cannot yet be used to accurately estimate the relative proportions of these raw materials used to make the varnish. This makes direct comparison with recipes listed in period sources difficult.[[30]](#endnote-30)

As research into the materials of both Asian and European lacquer making continues,[[31]](#endnote-31) it is hoped that increased knowledge of historical recipes, workshop practice, and connections between *vernisseurs*, *marchands-merciers*,and *ébénistes* as well as traders and lacquer makers in East Asia will lead to a more complete understanding of furniture production and cultural exchange in the Rococo period.

***Bibliography***

{{Augerson 2011}}; {{Bonanni 1720}; {{Bonanni 1723}}; {{Bonanni 1733}};{{Bonanni 2009}}; {{Burmester 1983}}; {{Czarnocka, Lindgren, and Stein 1994}}; {{Garner 1963}}; {{Hagelskamp, Heginbotham, and van Duin 2016}}; {{Heckmann 2002}}; {{Heginbotham et al. 2008}}; {{Heginbotham et al. 2016}}; {{Heginbotham and Schilling 2011}}; {{Holzhausen 1959}}; {{Huth 1971}}; {{d’Incarville 1760}}; {{van Keulen 2014}}; {{Koller and Baumer 1997}}; {{Kopplin 2010}}; {{Kumanotani 1995}}; Langenheim 2003}}; {{Le Pileur d’Apligny 1779}}; {{ Lockyer 1711}} ; {{Lu and Miyakoshi 2015}}; {{Martini 1655}}; {{ Matsen, Petisca, and Auffret 2017}}; {{Miklin-Kniefacz et al. 2016}}; {{Moffatt et al. 2015}}; {{Niimura and Miyakoshi 1996}}; {{Niimura et al. 1996}}; {{Pastorova et al. 1997}}; {{Petisca et al. 2011}}; {{Pomet 1694}}; {{Roubo 1774}}; {{Roubo et al. 2013}}; {{Sargentson 1996}}; {{Scalarone, Lazzari, and Chiantore 2002}}; {{Scalarone, Lazzari, and Chiantore 2003}}; {{Schilling et al. 2016}}; {{Walch 1997}}; {{Wan et al. 2007}}; {{Watin 1778}}; {{Watin and Prévost de Saint-Lucien 1772}}; {{Webb 2000}}.

1. {{Martini 1655}}. [↑](#endnote-ref-1)
2. The Royal Society in London carried out scientific analysis of lacquers in 1663, and in 1690 Grand Duke Cosimo III of Tuscany commissioned Giuseppe del Papa to investigate the material; both had limited success. {{Kopplin 2010}}. [↑](#endnote-ref-2)
3. {{Bonanni 1720}}; {{Bonanni 2009}}; {{d’Incarville 1760}}. [↑](#endnote-ref-3)
4. {{Heckmann 2002}}; {{Kumanotani 1995}}; {{Lu and Miyakoshi 2015}}. [↑](#endnote-ref-4)
5. For European oils and resin publications, see {{Burmester 1983}}; {{Kumanotani 1995}}; {{Niimura et al. 1996}}; {{Niimura and Miyakoshi 2000}}. For developments in Asian lacquer research, see {{Koller and Baumer 1997}}; {{Pastorova et al. 1997}}; {{Scalarone, Lazzari, and Chiantore 2002}}; {{Scalarone, Lazzari, and Chiantore 2003}}. [↑](#endnote-ref-5)
6. {{Heginbotham et al. 2008}}. [↑](#endnote-ref-6)
7. {{Schilling et al. 2016}}. [↑](#endnote-ref-7)
8. Asian lacquer objects were also produced in Southeast and Southwest Asia, but for the purpose of this publication the term “Asian lacquer” is used to refer specifically to those objects and materials coming from China and Japan. Lacquer objects from the Islamic world were the first to influence the development of European lacquer, with these objects streaming into Venice and Genoa in the early sixteenth century through the established Eastern trading routes. See {{Kopplin 2010}}, 230. [↑](#endnote-ref-8)
9. {{Garner 1963}}. [↑](#endnote-ref-9)
10. The three species can be distinguished in part by their primarily polymeric unit, a substituted catechol, from which they also draw their commonly used names: *Toxicodendron vernicifluum* contains urushiol (known as *urushi*), *Toxicodendron succedaneum* contains laccol, and *Gluta usitata* and *Gluta laccifera* contain thitsiol. See {{Petisca et al. 2011}}; {{Heginbotham et al. 2016}}; {{Heginbotham and Schilling 2011}}. [↑](#endnote-ref-10)
11. {{Heginbotham and Schilling 2011}}. [↑](#endnote-ref-11)
12. {{Heginbotham and Schilling 2011}}. [↑](#endnote-ref-12)
13. {{Matsen, Petisca, and Auffret 2017}}. [↑](#endnote-ref-13)
14. {{Wan et al. 2007}}. [↑](#endnote-ref-14)
15. {{Heginbotham et al. 2016}}; {{Miklin-Kniefacz et al. 2016}}. [↑](#endnote-ref-15)
16. {{Heginbotham et al. 2016}}. [↑](#endnote-ref-16)
17. {{Sargentson 1996}}. [↑](#endnote-ref-17)
18. {{Roubo 1769}}; {{Roubo et al. 2013}}; {{Hagelskamp, Heginbotham, and van Duin 2014}}. [↑](#endnote-ref-18)
19. Lockyer writes in 1711 in *Account of the Trade in India* that “the finest comes from Jappan.” See {{Lockyer 1711}}. “Right japan” and especially “old japan” were considered superior products, having an air of exclusivity. Quotation from {{Kopplin 2010}}, 66. [↑](#endnote-ref-19)
20. In addition to plant resins, shellac, an exudate from the insect *Laccifer lacca,* was also used as a component of eighteenth-century lacquers {{Webb 2000}}, 103. [↑](#endnote-ref-20)
21. {{Huth 1971}}; {{Holzhausen 1959}}. [↑](#endnote-ref-21)
22. {{Kopplin 2010}}, 90. [↑](#endnote-ref-22)
23. For a fuller discussion of the Martin family, see {{Czarnocka, Lindgren, and Stein 1994}}. [↑](#endnote-ref-23)
24. It is believed that the term *vernis de Martin* (as opposed to *vernis Martin*) was used in the eighteenth century to distinguish genuine lacquer produced by the Martin brothers from other imitations {{Kopplin 2010}}. [↑](#endnote-ref-24)
25. Essentials oils are the volatile aromatic compounds of plant resins based on mono- and sesquiterpenoids and should not be confused with triglyceride oils and fats. Oil of spike from lavender and oil of turpentine were the most common essential oils used in the period; see {{Moffatt et al. 2015}}; {{Langenheim 2003}}; {{Walch 1997}}. Watin notes that camphor is considered a solid essential oil, and he writes that Monsieur Eller told Watin that copal is more easily dissolved in spirit of wine if the spirit is “camphorated”; see {{Watin 1778}}, 258. [↑](#endnote-ref-25)
26. See {{Pomet 1694}}; {{Bonanni 1723}}; {{Bonanni 1733}}; {{Roubo 1774}}; {{Watin 1773}}; {{Le Pileur d’Apligny 1779}}. Bonanni was translated into French in 1723 by A. A. J. Dezallier d’Argenville and again in 1733 by Laurent d’Houry and is therefore included in the French treatise. [↑](#endnote-ref-26)
27. {{Koller and Baumer 1997}}. [↑](#endnote-ref-27)
28. {{Augerson 2011}}; {{Langenheim 2003}}, 304–5. [↑](#endnote-ref-28)
29. {{Keulen 2014}}. [↑](#endnote-ref-29)
30. For example, commonly used pine resin also shares some chemical compounds with Baltic amber, sandarac, copal, and even shellac, making the precise linking of some individual compounds to specific ingredients impossible. [↑](#endnote-ref-30)
31. The systematic approach to the analysis of Asian and European lacquer developed at the J. Paul Getty Museum and the Getty Conservation Institute (GCI) allows researchers to collect reproducible data that can be used for comparison of objects and collaboration across institutions. The analytical technique has been taught to over sixty scientists and conservators through the GCI’s Recent Advances in Characterizing Asian Lacquer (RAdICAL) workshop series, and the participants in turn contribute valuable data back to the system. The increased understanding of these materials helps build a network of colleagues and a set of well-studied objects to inform future research into lacquer manufacture. [↑](#endnote-ref-31)