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TECHNIQUES

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The Protection of Ancient Chinese Lacquerware

Zhou Bao Zhong

Museum of Chinese History, Beijing



Figure 1. Fragments of lacquerware from the Shang dynasty site in Taixicun, Gaochen, Hebei province. Hebei Provincial Museum. Wengu No. 8:42-9 (1974).

Figure 2. Tomb guardian from the Zhan Guo tombs.

Figure 3. Fragments of a lacquer painting of dancers and hunters from the Zhan Guo tombs.

The craft of lacquerware has an age-old history in China. Records in ancient books and documents and findings from archaeological excavations confirm that raw lacquer has been used since the beginning of the Neolithic age.

In 1978, at excavation sites in Yuyao and Hemudu (Zhejiang province), lacquer-coated wooden bowls from the beginning of the Neolithic age were discovered among other remains. These bowls, which were covered inside and out with a red lacquer coating, are the earliest findings of lacquerware so far, dating back 6000 years.

In 1973, at excavation sites in Gaocheng and Taixicun (Hebei province), containing remains from the Shang dynasty, fragments of lacquerware were unearthed (Fig. 1). Although the objects were broken, the fragments were still bright and colorful. The designs were elegant and it was obvious from a study of the fragments that the original objects were plates and large bowls with black flowers on a red background and designs of *taotai* (a ferocious, mythical animal). Some of the dishes were inlaid with turquoise, which was cut in circular, rectangular, and triangular shapes. At that time, the techniques of carving, lacquer painting, inlay, etc., were already in use. This shows that the art of lacquerware in China had already reached advanced levels from the sixteenth to the eleventh century B.C. (Shang dynasty).

By 1100–221 B.C. (Xi Zhou and Dong Zhou dynasties), lacquerware was widely used and the art, which was fully developed, had become a genuine profession. In Xinyang, Henan, Changsha (Hunan province) and in Jiangling and Suixian (Hubei province) lacquer-coated furniture, household items, musical instruments, weapons, coffins, etc., from the Spring and Autumn period and the Warring States period are continually being discovered.

In 1957, in Jiangtaiguan and Xinyang (Henan province), lacquer-coated coffins were excavated at the Zhan Guo (Warring States) tombs. Among the items found was a colorfully painted wooden animal, 1.4 m high, which was supposed to protect the tombs (Fig. 2), an equally colorful *se* (a stringed musical instrument similar to the zither), and the remaining third of a lacquer painting of dancers and hunters (Fig. 3).

In 1980, in Linli (Hunan province), six mythical animals with heads like tigers and bodies like dragons were discovered at the Jiuliyihao tomb. These figures, 97 cm high, were carved from one piece of wood and painted with a dark brown lacquer.

Figure 4. Carved screen from Wangshan, Jiangling (Hubei province). Hubei Provincial Museum.



In 1965, in Wangshan, Jiangling (Hubei province), a colorful screen carved with animals, from the Chu state of the Warring States period, was excavated (Fig. 4). The screen was in a rectangular frame. Fifty-one different animals, including deer, phoenix, sparrows, frogs, snakes, and boas, were engraved in the middle of the screen. It was done in red, gold, silver, gray, green, etc., on a black background. The animals were done in a lifelike manner and it is truly a masterpiece of lacquer art.

In 1978, in Leigutun, Suixian (Hubei province), the tomb of Zenghouyi from the early part of the Warring States period was disinterred. Twenty-two colorfully painted coffins were discovered. The main coffin was done in black on the outside with red and gold designs on the top and red on the inside walls. One hundred and twenty-four musical instruments, including *bianzhong* (similar to xylophones), were found near the tomb. Among other instruments were colorfully lacquered *zhen* (harps), *paixiao* and *shen* (flutes), dating back 2400 years.

The development of lacquerware flourished between 206 and 24 B.C. (Western Han period). Several areas became established as centers for lacquerware. The technique was perfected and the products were sold throughout the country. Lacquerware became one of the most widely used household items. From 1972 to 1973, the first and third tombs of Mawangdui, Changsha (Hunan province) were excavated. Over 500 pieces of lacquerware from the early Western Han period, dating back over 2100 years, were found in good condition. They were shiny and like new. Inside the outer coffin of the first tomb of Mawangdui were four smaller coffins, one inside the other. The next largest coffin inside the outer coffin was colorfully painted on a black background with wisps of cloud, animals, and gods (Fig. 5). The next largest coffin inside the second coffin was red inside and out, with dragons, tigers, sparrows, and deer (all considered animals that bring good luck) painted in bluish-green, brown, yellow, and white (Fig. 6). The elegantly formed Western Han lacquerware from Mawangdui had magnificent designs of all kinds, such as vessels with cloudlike designs, boxes with phoenix, and *zhunxinshi* dishes (Figs. 7–10).

As time went on, the technique of lacquerware took on new dimensions. Lacquerware inlaid with gold, silver, and jewels from the Tang dynasty (A.D. 618–907) and carved lacquerware from the Song dynasty (A.D. 960–1279), the Yuan dynasty (A.D. 1279–1368), the Ming dynasty (A.D. 1368–1644) and the Qing dynasty (A.D. 1644–1911) greatly enriched the collection of this art form. Lacquerware, one of the more outstanding cultural remains, advanced for several thousand years. Modern lacquerware takes a variety of forms and has developed into an exquisite art form.

Lacquerware from each dynasty is collected in museums in order to preserve forever this magnificent achievement of mankind. Scientists dealing with the preservation of cultural relics do a great deal of research and experimentation on ways to protect lacquerware.

Figure 5. Painted inner coffin from the first tomb of Mawangdui, Changsha (Hunan province). Hunan Provincial Museum.



Figure 6. The third in the series of coffins from the first tomb of Mawangdui. Hunan Provincial Museum.



Figures 7–10. Western Han lacquerware from the first tomb of Mawangdui. Hunan Provincial Museum.



Lacquerware consists of a combination of a substrate and an outer coating. Raw lacquer is an excellent natural paint. If raw lacquer is mixed with pigment, it forms a paint that can be applied on a substrate and becomes a skinlike layer. Only after the stages of polishing, painting, molding, inlaying, carving, and burnishing with gold and silver, does it become “lacquerware.” The coating serves as both protection and decoration.

Natural raw lacquer comes from trees of the angiosperm class. Originally, lacquer trees grew only in the wild. Starting with the Han dynasty, however, they began to be cultivated. More and more lacquer trees were planted in the Song and Yuan dynasties and they began to flourish in the Ming and Qing dynasties. The production of raw lacquer spread over fifteen provinces. The trees grow mainly in high mountainous areas and hilly regions. The lacquer sap is stored in channels within the tree. If the tree is damaged, the channels are broken and the sap flows from the tree. If a cut is made in the bark of a living tree, the milklike substance that flows out is raw lacquer. Fresh lacquer is milky-white or grayish-yellow and changes color when exposed to air.

The raw lacquer is heated, some of the water is removed, and it is mixed with oil (probably tung-oil). Then it is mixed with pigments to obtain bright and colorful lacquer. Raw lacquer does not peel or chip and is a protective, noncorroding, acid-, scratch-, heat- and waterproof, bright and shiny, long-lasting coating.

The substrate forms the physical structure of the lacquerware. Various materials can be used as substrate: wood, bamboo, cane, silk, ramie, leather, porcelain, gold, silver, copper, tin, lead, etc. Since wood is the most commonly used, the following discussion will concentrate on wooden substrates.

Wood is an organic substance that will decay to different degrees according to whether it is buried underground or exposed to air. The decay process can involve the wood rotting, decomposing, growing mold, changing color, becoming infested with termites, drying and cracking, deforming, and/or becoming saturated with water. The natural characteristics of the wood and its environment determine the degree of decay. If wood is immersed in water for a long time or buried in wet soil, it can become waterlogged, sometimes to the point of resembling *tofu*. Wooden substrates that have been excavated contain 100–400% absorbed water and sometimes up to 700%. This particular decay process of lacquerware has therefore become an important area of research. The dewatering of lacquerware must be strictly controlled to prevent or minimize deformation.

Some of the lacquerware buried several thousand years ago is well preserved. Some of it has decayed because of its environment. Temperature, moisture content, the acidity of the moisture, the chemical makeup of the soil, and the quality of the air in the tomb can affect the lifespan of lacquerware. In the first tomb of Mawangdui (Western Han dynasty), the coffins, burial articles, and even the body were well preserved. There were 180 pieces of lacquerware among the burial articles. Inside the lacquerware containers, various fruits, beef, and lotus-root remained. The major factor in the preservation of these items was the depth of the tomb, about sixteen meters. The coffins were surrounded by charcoal, about 30–40 cm thick. The charcoal was covered by about 60–130 cm of thick white soil. The white soil was covered with a thick red clay which does not easily permit seepage. Using this technique, the tomb was sealed securely. The temperature of the coffin chamber was between 15–20°C. When the tomb was excavated, the temperature inside the outer coffin was 18°C. This environment, characterized by low temperature, constant moisture content, lack of oxygen and light, and no bacterial growth, preserved the lacquerware and other cultural relics. When the tomb was uncovered and the chamber opened, the sudden exposure of the lacquerware to the outside air disrupted the relatively stable environment. As a result, the lacquerware began to crack shortly after excavation. Many of

the coffins of the Warring States period and the Western Han dynasty, although buried in tomb chambers, were found to be decayed at the time of excavation. Some, which had not decayed, were found immersed in water. The destruction of lacquerware by saturation is a big problem and the environment of lacquerware is therefore very important.

Lacquerware preserved in museums must be kept in a special environment and well cared for so as to prevent the process of decay and maintain the original condition. While environment has an effect on lacquerware, the process of decay is slow and difficult to observe. It becomes apparent, however, after much time has passed. Change of color, brittleness, drying and shrinking, distortion and loss of luster are caused by exposure to oxygen, light, and air pollution. Lacquerware is prone to shrinkage and expansion of the substrate. The shrinkage is caused by dryness and the expansion by moisture. Therefore environment is a major concern. The temperature must be kept between 18–22°C and the relative humidity between 60–65%. The lacquerware must be shielded from high light-levels and pieces that have been dewatered must be kept in boxes. If the lacquerware coating begins to crack, buckle, or chip, repair must take place immediately so that the substrate is not harmed.

The key to preservation of ancient lacquerware that has been saturated is to reinforce it so that it keeps its form. The excavation of a great deal of lacquerware has demonstrated that raw lacquer is an excellent coating. It is easily applied, durable, and resistant to decay. Some of the substrates had been destroyed by saturation and only the raw lacquer coating remained. If lacquerware is left to dry naturally after it is excavated, it will shrink, crack, buckle, and chip, and finally be destroyed. A great deal of ancient Chinese lacquerware has been found. At times numerous pieces have been excavated from a single tomb. This was the case with the Chu tomb in Xingyang, Henan province, the Warring States tomb in Suixian, Hubei province, and the Western Han tombs in Jiangling, Hubei province, and Mawangdui, Changsha, Hunan province. In order to preserve these rare remains of ancient civilizations, a good deal of research and experimentation has been done by scientists. This falls into two areas.

First, the dewatering of the wood and bamboo substrates of lacquerware, while at the same time maintaining the original form of the object, has been investigated. Second, attention has been given to the choice of the proper types of material with which to fill and reinforce the lacquerware to increase its durability. These two areas of concern are often considered together, though the first is of greater importance. If the original form of ancient lacquerware is to be preserved, the addition of any new material is not desirable. As long as the objects are periodically dewatered, it is not necessary to add any new materials to reinforce them. If, however, the objects are already seriously decayed, they cannot be preserved without reinforcing them with new materials. The purpose of using new materials is to protect the original material rather than to replace it. The new coating material must be of the same quality as the original. In cases where the original material is not available, the use of other materials is acceptable. In this way, lacquerware that has already begun to decay can be rescued before it decays further. When it is necessary to use different materials, it is best to choose those which are removable so that if more suitable material becomes available, the previously used material can be replaced. The various methods of reinforcing saturated lacquerware are presented in the following paragraphs.

Drying naturally

Lacquerware can be placed in a special environment and left to dry naturally. This environment must be very stable. The relative humidity must be above normal, yet not to the point of complete saturation. In this way, the water can evaporate slowly from the objects. The slower the process of evaporation, the better the results. The saturated lacquerware is in a state of equilibrium. In order to dewater the lacquer-

ware, the state of equilibrium must be destroyed. Drying naturally is the best method of gradually changing the state of equilibrium and evaporating the water slowly until dewatering is finally achieved. The various possible environments are listed below:

1. Sealed drying boxes. The lacquerware is placed in a sealed glass box in order to dewater slowly. The condensation on the object inside the box and on the surface of the box must be removed frequently until the weight of the object becomes constant. Then the dewatering process is complete. This method is best suited to the dewatering of small objects.

2. Plastic wrapping. Larger objects that cannot be contained in drying boxes are wrapped in plastic and then placed in sealed containers. These containers are periodically opened so that the condensation can be removed. After a period of time, the object is completely dewatered.

3. High-humidity controlled chambers. The objects are placed in controlled chambers with high relative humidity, which is stabilized at about 95%. The objects are dewatered slowly. In basements with high relative humidity, the dewatering process can be completed in one to three years.

4. Burial. Large objects are buried in wet sand or sawdust. The dampness of the sand or sawdust must be measured periodically and it must be replaced by sand or sawdust containing less water. In this way, the relative humidity of the environment can be controlled and the objects dewatered.

5. Constant temperature. The objects are placed in boxes with constant temperature and relative humidity. The temperature is set at 32°C. The objects are taken out every four hours and immersed in distilled water for ten minutes. They are then replaced in the boxes. The process is continued for several months until the objects are dewatered.

6. Glycerol spraying. In order to keep the surface of the objects moist and evaporate the water, glycerol is sprayed over them. Since glycerol absorbs water, the surface temperature of the lacquerware can be controlled and the water evaporated.

7. Environment controlled by inorganic salts. Inorganic saline solutions can be used to control relative humidity so that lacquerware can be dewatered. The various salts: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, KNO_3 , KCl , NaCl , NaNO_2 , and $\text{Mg}(\text{NO}_3)_2$, are dissolved in water and put in different containers. Each saline solution creates a different level of relative humidity, ranging from 98% to 53%. The lacquerware is first placed in a container of saline solution, which creates the highest relative humidity. It is then transferred to a different saline solution with lower relative humidity, then to a solution with still lower relative humidity, etc. In this way the lacquerware can be dewatered slowly. The lacquerware, however, must not come into direct contact with the saline solution.

8. Silica gel. Silica gel is a common hygroscopic agent. Different quantities of silica gel are placed in different containers. Different degrees of relative humidity are achieved by varying the amount of silica gel. The lacquerware is placed in a drying box, along with a container of silica gel, and dewatering takes place.

These eight methods require different conditions. They are all, however, simple, economical, practical, and have no negative side-effects. In addition, the original form of the object is maintained while dewatering takes place. The drawback of these methods is that they are time-consuming. They usually take several years. In order to use these drying methods, the object must be completely intact, with a solid substrate and low saturation.

Vacuum drying

Saturated lacquerware can be kept under vacuum to be dewatered. These methods require the use of drying techniques. There are three specific methods that can be followed.

1. Vacuum drying. Saturated lacquerware is placed in a vacuum chamber. After the machine is turned on, water is evaporated from the objects. After the vacuum pressure reaches 700 mmHg (9.3×10^4 Pa), the machine is turned off. The vacuum pressure decreases naturally to 500 mmHg (6.7×10^4 Pa). The machine is turned on again and the process is repeated until the object reaches constant weight.

2. Vacuum drying with heat. The lacquerware is first placed in a vacuum chamber at 70°C with the machine turned off. After some of the water has escaped, the machine is turned on for dewatering.

3. Vacuum drying with refrigeration. After the water in the lacquerware has been turned to ice in a low-temperature environment, the objects are transferred to a vacuum chamber where they are lyophilized. The key to using this method is to have a system that can provide low temperature and high vacuum pressure. In a low-temperature refrigerator or a container with dry ice that can reach -20°C, the water can be frozen quickly. This method is suitable for objects with rough coatings and thick wooden substrates or those that are already broken or decayed.

Solution displacement

This is the classic method of dewatering. When the lacquerware is immersed in water mixed with an organic solvent, the solvent can permeate the object by osmosis. Thus the water in the lacquerware is displaced. The advantage of this method is the speed with which dewatering occurs. It is best suited to small, thin objects with smooth textures.

1. Alcohol and ether. Alcohol is used to displace the water in the substrate and then the alcohol is displaced by diethyl ether. Afterwards, the object is placed in an environment at ambient temperature or under vacuum. The diethyl ether then evaporates automatically and the object is dewatered. While diethyl ether, propan-2-ol, propan-1-ol or 2-methylpropan-2-ol can be used, diethyl ether is the most common. This method is best suited to objects that are already decayed or are made of soft wood.

2. Acetonitrile. Acetonitrile is the most effective for dewatering lacquerware and does not harm the original coating. The water is displaced by acetonitrile, which is then displaced by diethyl ether. Afterwards, the lacquerware is placed in an environment at ambient temperature or under vacuum and the diethyl ether evaporates naturally. This method is best suited to delicate objects.

Permeation reinforcement

Organic or inorganic high polymer material can be used to permeate and fill the structure and cells of the wood. In this way, the cells of the wood are supported and reinforced and shrinkage is prevented. This is one of the methods for reinforcing saturated lacquerware.

1. $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$. Aluminum potassium sulfate dodecahydrate is very easily dissolved in hot water. At room temperature, it can barely be dissolved. The state of condensation of $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ changes with temperature. At high temperatures, the $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ and water solution can displace the water in the lacquerware. When the temperature is lowered, $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ crystallizes and remains in a solid state in the wooden structure and the object is reinforced.

2. High polymer material.

(i) Monomer permeation reinforcement. The monomer of high polymer material permeates the wood and polymerizes. Thus the structure of the lacquerware substrate is reinforced.

(ii) Water-insoluble high polymer reinforcement. First, an organic solvent is used to displace the water in the lacquerware. Then the wooden structure is permeated with a water-insoluble high polymer material combined with diethyl ether. When the diethyl ether evaporates, the water-insoluble high

polymer material remains and reinforces the structure. This method is also called the alcohol diethyl ether resin immersion method.

(iii) Water-soluble high polymer reinforcement. A water-soluble high polymer material permeates the substrate of the lacquerware and displaces the water, then solidifies. Among the many kinds of high polymer material are polyethylene glycol, phenolic resins and others. Polyethylene glycol is easy to use, cheap, nontoxic, nonodorous, nonpolluting, and not easily flammable. It also has the reputation of not being harmful to workers.

The steps taken to preserve cultural relics must follow the principle of not changing the original state of the object. The original state includes all the materials of which the object is made. Therefore filling ancient lacquerware with modern high polymer materials or inorganic materials is never the best method. It is only acceptable for those pieces which are already decayed.

Each piece of lacquerware has its own characteristics. Therefore the methods of dewatering and reinforcement must be applied with consideration for the individual piece. These methods should be used only after experimentation and then with great care. New methods should continually be sought.

The Preservation and Handing Down of Traditional Urushi Art Techniques in Japan

Shin Yagihashi

Agency for Cultural Affairs, Tokyo

The traditional techniques of the applied arts and the performing arts are regarded in Japan as “intangible cultural properties.” Active measures have been taken for their preservation and transmission since the enactment of the Cultural Properties Preservation Law in 1950. This law was passed because after World War II there was a great revival in the applied arts, including urushi, but there was no system to deal with the rapid changes in lifestyle that threatened the handing down of these traditional arts.

The new law enabled the government to take measures to preserve those intangible cultural properties that were selected as being threatened with extinction; an amendment to the law in 1954 revised the original selection and introduced the following measures:

1. Designate important intangible cultural properties; acknowledge the holders of intangible cultural properties (or holding groups); and offer financial assistance to them. To date, eighty-one persons are recognized as holders, ten in the field of the urushi arts.
2. Select and record intangible cultural properties, other than *important* intangible cultural properties that need special attention.
3. Provide financial support to establish training institutions and for training activities organized by local government and other bodies.
4. Select traditional preservation techniques that are indispensable for the preservation of cultural property and assist with necessary expenses. (This provision was added after a further amendment of the law in 1975.)

The following is a complete chronological list of all those who have ever been appointed and selected in the field of urushi art.

Holders of important intangible cultural properties in the field of urushi art

Yusai Akaji (1906–1984). Kyushitsu (Fig. 1)

All the holders of *kyushitsu* (sequential lacquer coating technique) are skillful not only in applying urushi but also in molding shapes. Akaji was born in Kanazawa, Ishikawa prefecture, to a family that made *magemono* (bent-wood substrates) for lacquerware (Himono-ya) and was trained in *kyushitsu*. Later he went to Tokyo and became a pupil of the eldest son of the renowned master of urushi art, Kisaburo Watanabe. At first he produced lacquer objects for the tea ceremony, but after World War II he started making creative works and became famous for his technique of *magewa-zukuri*, in which he utilized the *magemono* technique. Usually the entire *magemono-kiji* (wooden substrate) is covered with linen, but Akaji covered each

Figure 1. Yusai Akaji, colored urushi dish in magewa technique, 1961, height 10.2 cm, diameter 42 cm. Notice the simple and forceful shape of the magewa.

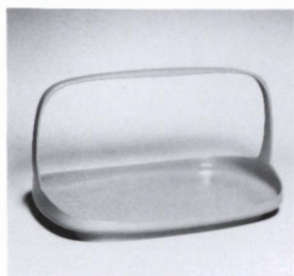


Figure 2. Mashiki Masumura, tray with handle in kanshitsu technique, 1963, 26.6 cm x 46.6 cm x 31.3 cm. Notice the animated and dynamic shape characteristic of kanshitsu technique, in which an object is made by pasting together layers of hemp cloth.

magewa (thin strip of wood used in making *magemono*) and then joined them to form the shape. The slits between each *magewa* correct the distortion caused by the drying of the wooden base so that the *magemono* becomes firm and free from deformity. Furthermore, the *magewa* itself becomes an element of the design and expresses lucid and modern beauty.

Mashiki Masumura (1910–). Kyushitsu (Fig. 2)

Masumura was born in Kumamoto prefecture where he studied the basics of the art of urushi. Later he became a pupil of Yusai Akaji in Tokyo. Masumura excels in the *kanshitsu* (dry lacquer) technique, in which the artist first shapes a prototype in clay, then makes a plaster mold and pastes on linen to make the substrate. In the technique of *kyushitsu* he is skillful in *roiro-nuri*, in which the surface of the top coating is ground down and polished to mirrorlike brilliance, thus adding to the beauty of the form.

Kodo Otomaru (1898–). Choshitsu (Fig. 3)

Choshitsu is a technique of applying urushi thousands of times in order to make a thick layer, and then engraving a design on this surface. Otomaru is from Takamatsu, Kagawa prefecture, famous for *Kagawa-shikki*. From his early teens he engaged in wood carving. Later he went to Tokyo in order to devote himself to the art of *choshitsu*. Originally only a few colors were used for urushi: black, vermilion, yellow, and green, but today a variety of colors is possible. Using these richly colored urushi, Otomaru demonstrated the complicated and delicate effect of urushi and perfected the modern *choshitsu* technique.

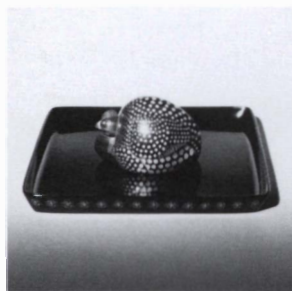


Figure 3. Kodo Otomaru, kogo (incense container) in the shape of a guinea fowl in tsuishu technique, 1970, 4.6 cm x 5.7 cm x 7.7 cm. The shape of the guinea fowl is carved from a lump of urushi made by layers of urumi (red and black) and black urushi applied alternately.



Figure 4. Taiho Mae, small box with cat design in chinkin technique, 1959, 6 cm x 12.5 cm x 26 cm. Except for the whiskers and eyelashes of the cat, the rest is carved in pointillist technique in order to give dimension to the body.

Figure 5. Joshin Isoi, eight-sided food container with designs of plants and flowers in kinma technique, 1955, height 15.2 cm, diameter 46.5 cm. The substrate is rantai, bamboo woven according to the traditional kinma technique and the decoration employs classical designs of plants and flowers.



Joshin Isoi (1883–1964). Kinma (Fig. 5)

Kinma is a technique that uses a special knife called a *ken* to engrave designs on the urushi surface. Colored urushi, such as vermilion, is embedded in the incision and burnished. The lines of vermilion often depict trees and flowers. *Chinkin* exhibits delicately sophisticated lines, whereas *kinma* tends to create accentuated and forceful lines. After Zokoku Tamakaji, who was a leading exponent of *kinma* technique in the late Edo period in Takamatsu, actively put this technique to use, it became the principle technique for *Kagawa-shikki*.

Joshin Isoi learned the art of urushi at Kagawa Prefectural High School of Applied Arts. Not only was Isoi skilled in the classic *kinma* technique, but he also experimented with variations in depth, the angle of the knife blade, and the degree of density of the engraving. Furthermore, he introduced the use of pointillist engraving to express perspective and dimension. It is interesting to note that Isoi devised and developed a new technique for both *chinkin* and *kinma*, which similarly use line engraving for decoration. Isoi taught at the high school where he himself had studied, and worked enthusiastically for the establishment of the Kagawa Prefectural Institute of Urushi Arts.

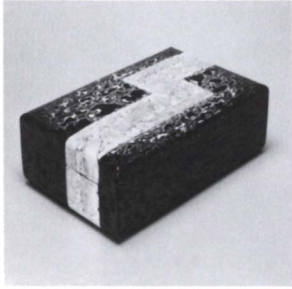


Figure 6. Masami Isoi, box with design of stone pavement in zonseï technique, 1980, 10.5 cm x 17.4 cm x 27.5 cm. Zonseï technique is used on the band of stones. The speckled design of the surface of the earth is expressed in kinma technique.



Figure 7. Shozan Takano, small box with squirrel design in kijimakie technique, 1940, 16.5 cm x 24.5 cm x 34.5 cm. The contrast of the smooth makie surface with the rough surface of the paulownia substrate, and the simplification of the design such as the loquat tree trunk, are particularly effective.



Figure 8. Gonroku Matsuda, shelf with heron makie, 1938, 69.5 cm x 90.5 cm x 39.3 cm. The heron is expressed in shishi-ai togidashi makie and its soft feathers by scratching technique.

Masami Isoi (1926–). Kinma (Fig. 6)

Masami Isoi is the third son of Joshin Isoi. After army service in World War II, he was trained by his father and studied *kinma*. Masami succeeded to the creative techniques of his father, who was widely skilled in many techniques besides *kinma*, introducing new designs one after another. For example, among the traditional techniques of *Kagawa-shikki*, the *zonsei* technique is as famous as *kinma*. *Zonseï* is a technique in which the outline of the design drawn in colored urushi is line-engraved and then either left as it is or filled with colored urushi or gold. Masami Isoi created a new form of artistic expression by uniting the *zonsei* and *kinma* techniques.

Shozan Takano (1889–1976). Makie (Fig. 7)

Makie—sprinkling metallic powder on a wet lacquer surface to form a picture or design—is one of the principle decorative techniques in the art of urushi. Since there are numerous types of *makie* technique, there are a number of holders, each with his own characteristics. Takano was from Kumamoto prefecture and is senior to Mashiki Masumura. After studying basic urushi technique in Kumamoto, he attended the Department of Urushi Arts at the Kyoto Municipal Art College and went on to the Department of Urushi Art at Tokyo National Art College. He was especially successful at the finely detailed *makie* technique of Shosai Shirayama, under whom he studied in Tokyo. The characteristic of Takano's *makie* is that he raises hard urushi in order to make shadows along the sides, thereby creating a forceful effect. Takano's works in *kiji-makie* are modern in style, contrasting the smooth surface of *makie* with the rough surface of the paulownia wood base. He is one of the contributors to the development of the *makie* technique from the delicate and detailed art of the Edo period to one that is adaptable to modern art forms.

Gonroku Matsuda (1896–1986). Makie (Fig. 8)

Matsuda was born in Kanazawa, Ishikawa prefecture. From childhood he was engaged in *makie* and had a well-developed technique. He went on to graduate from the Department of Urushi Art at Tokyo National Art College. For many years he was a professor at his own college, now the Department of Urushi Arts at Tokyo National University of Fine Arts and Music. He was vigorous in the research and study of classical works, the preservation and restoration of cultural property, the training of successors, and the conduct of international cultural exchange, as well as in his own creative work. He was a leading figure in the art of urushi in Japan. He contributed to the establishment of the Wajima Training Center for Urushi Techniques, Ishikawa prefecture, and he was still teaching fervently up to his death. He was not only very skilled in the technique that involves the sprinkling of gold filings, but was also capable of using a variety of materials such as *raden* (shell), *hyomon* (metal) and *rankaku* (eggshell). These techniques were acquired through his profound study of urushi art objects from all over the Orient, including those of ancient China. Apart from the subject of decoration, he actively pursued the quest to produce a durable substrate for lacquer objects that would resist damage and distortion in any conceivable environment.

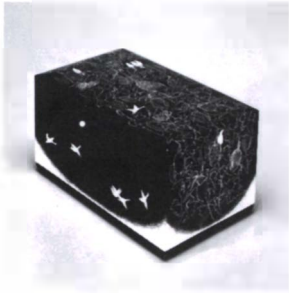


Figure 9. Shogyo Ohba, box with design of snake-gourd in hyomon technique, 1981, 14.6 cm x 15.8 cm x 26.4 cm. The snake-gourd leaves and flying birds are depicted by hyomon technique. The snake-gourd fruit is represented by kawari-nuri technique, in which cracks are made deliberately in the surface of colored urushi.



Figure 10. Naoji Terai, water container in kintai technique, 1976, height 16.4 cm, diameter 18.8 cm. The red blossoms are made by eggshells pasted on red urushi, while white urushi is used for the white blossoms.

Urushi art techniques selected as intangible cultural properties

Shogyo Ohba (1916–). Makie (Fig. 9)

Ohba, born in Kanazawa, Ishikawa prefecture, learned *kyushitsu* from his father and then went to Tokyo where he studied *makie* under Gonroku Matsuda. While he was engaged in the preservation and restoration of classical urushi with Matsuda, he deepened his knowledge of *hyomon* (metal set flush into urushi) and is now the leading exponent of this technique. Ohba's *hyomon* technique is so detailed that even the finest lines express the intensity of his stroke. He is now in Kanazawa, engaged in creative work. At the same time, he is enthusiastically assisting in the training of successors.

Naoji Terai (1912–). Makie (Fig. 10)

Terai was born in Kanazawa, Ishikawa prefecture, and studied under Gonroku Matsuda and others in the Department of Urushi Arts at Tokyo National University of Fine Arts and Music. After graduating, he studied materials for urushi, such as those used in *kintai* lacquerware, at the Institute of Chemical Research. Then he taught for a long time at Ishikawa Prefectural Technological High School, where he himself had studied, as had Ohba and Matsuda. He also served as director of the Wajima Training Center. Besides teaching, he worked on his original *makie* creations and has gained a high reputation, especially for his notable technique of *rankaku*. This technique uses selected parts of quail's eggshells, which are broken into minute fragments and then pasted over the design. The *rankaku* technique was formerly used merely to depict the white sections of the design; Terai, after several improvements, succeeded in expressing dimension and perspective solely by employing this technique. He also made it possible to depict colors other than white and to exhibit gradation. Terai is also very skillful at making *kintai* substrates. Usually, in the *kintai* technique, raw urushi is heated on metal, but Terai has introduced a new method of using an aluminum substrate. He has made use of the nature of the aluminum surface, which forms an oxidized film when electrolytically treated, to absorb urushi.

Each of the holders described here has not only contributed to the preservation of traditional techniques but has also striven to develop the rich expressionistic ability needed to create modern applied arts. They have pursued artistic superiority as well as technical perfection. Each holder has worked to improve his own skill but at the same time has been enthusiastically involved in the training of successors. Today, their contributions have brought about satisfactory results: many young talented artists have been brought into the field of the traditional arts.

The concept of "important intangible cultural properties" was designed to assure the training of successors and the handing down of techniques to future generations. This section is concerned with urushi techniques considered valuable enough to be recorded for future generations.

Hida-shunkei. Hida-shunkei Art Preservation Association

Shunkei-nuri is a technique of applying transparent urushi over wood grain so that the beauty of the natural wood pattern shows through the urushi surface. The Hida region of Gifu prefecture has developed as a large *shunkei-nuri* producing district, and many varieties of *shunkei-nuri* are found in this area.

Noshiro-shunkei. Shojuro Ishioka (deceased)

The Ishioka family, under the special care of the Satake *han* (feudal clan) of Akita prefecture, has handed down this technique from generation to generation, thereby preserving the pure form of the *shunkei* technique of the Tohoku district. This technique differs in minute details from *Hida-shunkei*.

Awano-shunkei. *Giryō Inagawa (deceased) and Shōzō Inagawa*

The technique of *shunkei* is found in various places throughout Japan. Of these, *Awano-shunkei* from Ibaragi prefecture is significant because it is the oldest form of the technique. The wooden substrate for lacquer objects made by the elder brother, Giryō Inagawa, and the urushi coating applied by the younger brother, Shōzō Inagawa, were both completed in the same workshop. The use of a hardwood substrate and the application of transparent urushi without taking measures to prevent the penetration of the urushi into the wooden substrate are the significant characteristics of this technique.

Zonsei. *Sōseki Kagawa (deceased)*

Zonsei is the leading technique of *Kagawa-nuri* (Takamatsu, Kagawa prefecture). The outline of the design in colored urushi is carved with a knife to achieve a very distinctive appearance. Sōseki Kagawa learned the *zonsei* technique from his father and became an outstanding practitioner. His devotion to the *zonsei* technique was highly valued.

Raden. *Kakō Kataoka (deceased)*

Raden is the technique of inlaying engraved shells such as *yakogai*, *awabi-gai*, *shirochogai*, and *kurochogai* in urushi and wooden substrates. In Japan, we sometimes make a distinction between *raden*, which uses *atsugai* (thick shell), and the *aogai* technique, which uses *usugai* (thin shell). Kataoka was especially skilled in using *atsugai*. While active in his own creative work, he was also enthusiastically engaged in the restoration and preservation of the Konjikido of Chusonji, a National Treasure.

Murakami-tsuishu. *Shukō Suzuki (deceased) and Koichi Itagaki (deceased)*

Tsuishu usually means the engraving of several layers of urushi applied one on top of another. However, there is another technique—carving wooden substrates and then applying urushi—that resembles the *tsuishu* technique. The skill of Koichi Itagaki's application of urushi and the engraving by his younger brother Shukō Suzuki have been very highly praised.

Makie tools. *Matabei Komiya (deceased)*

There are various techniques for *makie*, and many special tools for these techniques have been devised. For example, there are numerous *makie* paintbrushes using all sorts of animal hair. Komiya was an outstanding maker of the most complex *makie* brushes, and his talent was highly appreciated by urushi artisans.

Training institutions

Kagawa Prefectural Institute of Urushi Arts, established in 1954, and Wajima Training Center, established in 1966, are the principal training institutions for professional and advanced urushi arts. Fundamental training in urushi techniques is carried out by each urushi-producing district, and urushi techniques are taught in some schools, such as the Tokyo National University of Fine Arts and Music.

Kagawa Prefectural Institute of Urushi Arts, which has a very long history, gives practical training in the traditional techniques of *Kagawa-shikki*, including *kinma*, *zonsei*, and *choshitsu*. The institute also teaches the skills necessary for creative work, such as painting and the molding of forms.

Wajima Training Center has been rebuilt recently and possesses good facilities. The institute offers courses in four different skills: *makie*, *chinkin*, *kyushitsu*, and *kiji* (preparing the wooden substrate). These courses are provided because *Wajima-nuri* is outstanding for its decorative techniques, such as *chinkin*, and for firm and beautiful *kyushitsu* technique. Trainees who are permitted to enter this institution have passed a national qualifying examination.

Both training institutions accept only a limited number of trainees. Because the courses are very advanced, graduates of these institutions now form the backbone of Japan's urushi art world. In addition, the instructors are holders of important intangible cultural properties in the field of urushi art, and they give their time enthusiastically to their students.

Besides the already mentioned individual holders of important intangible cultural properties, there are group designations. In the field of urushi art, the Association for the Preservation of Wajima-nuri (Wajima, Ishikawa prefecture) was approved in 1977 as "a holding group of important intangible cultural properties (*Wajima-nuri*)."

This association consists of about twenty leading technicians from each field of wooden substrate making, such as *rokuro* (lathe-turning), *magemono*, *sashimono* (joinery), and *ho*-body (the production of parts such as legs); of coating, such as *kyushitsu*; and of decorating, such as *makie* and *chinkin*. Since there was traditionally a division of labor in *Wajima-nuri*, practitioners of each process were selected to form this important association.

**Urushi art techniques
selected for the
preservation of
cultural property**

Techniques for the preservation of cultural property include both the materials and tools used in the process of preservation and restoration, and the actual techniques used to preserve and restore cultural property, such as art and craft objects or architectural monuments like temples.

Repair of urushi objects. Daitsu Kitamura (1910–)

Born in Nara, Kitamura studied urushi technique with his father and graduated from the Department of Urushi Arts, Tokyo National Art College. From an early age he worked on the repair of urushi objects in the Shosoin and in temples and shrines. He also researched the urushi technique of the Nara (646–794) and Heian (794–1185) periods. From his long years of experience, he has developed skillful repair techniques and his competence is highly valued.

Repair of urushi objects (raden). Kako Kataoka (deceased)

Kataoka's work has been described in the section on techniques selected as intangible cultural properties.

Manufacture of urushi brushes. Seikichi Izumi (1911–)

Among the urushi painting techniques, surface coating is particularly difficult. The surface should be free from irregularity, painted evenly, and clear of any dust. The making of the urushi brushes used for this process also requires careful work.

Human hair is usually used for an urushi brush. Izumi prefers hair cut from living Japanese women; to be suitable, it must be well dried, it must not have been damaged by chemicals, nor be very oily. Extensive experience is needed to differentiate brushes according to the characteristics of the painting methods employed in different urushi-producing districts. The fact that Izumi's brushes are superior is known throughout the urushi world.

Manufacture of urushi koshigama (Yoshino-gami). Kazuo Konbu

Any dust particles should be eliminated from urushi used for *uwanuri* (final coating) by filtering it through specially manufactured Japanese paper. *Yoshino-gami* (Yoshino-cho, Yoshino-gun, Nara prefecture) used as urushi filter paper is immediately dried on a drying board without first squeezing it to get rid of water; hence the paper is supple and suitable for filtering. At the time of writing, Konbu is the only manufacturer of traditional urushi filter paper.

Production and refining of Japanese urushi. Association of Japanese Urushi for Cultural Properties

Japanese urushi is translucent and lustrous. It also produces good colors and creates beautiful surfaces so that it is indispensable for the preservation and restoration of old cultural properties and the production of urushi artworks. This association is engaged in the planting of urushi trees (Iwate prefecture).

Conservation of Chinese Urushi: Methods and Difficulties

Toshie Nakajima

Tokyo National Research Institute of Cultural Properties

I have experience in the conservation of both Japanese and Chinese *shikki* (lacquerware objects). This paper, however, will discuss problems I have encountered in the conservation of Chinese *shikki*. Although the basic technique of producing lacquerware objects is the same everywhere, each region has its own modified technique and each urushi artist has his own technique. Conservation work, likewise, is conducted by conservators with their own peculiar techniques. Because of such diversity, there are many specialists who work in ways that differ from mine.

Classification of conservation techniques based on types of decoration

In conserving Chinese *shikki*, surface decoration determines the conservation policy. Here I should like to address problems found during the conservation of four typical kinds of decoration: *tsuishu* and *tsuikoku*, *guri*, *chinkin-zonsei*, and *raden*.

Tsuishu (carved red lacquer) and tsuikoku (carved black lacquer)

Many pieces of Chinese *tsuishu* and *tsuikoku* are found with cracks and missing parts because of changes over time and defects in the materials themselves, despite the fact that the objects originally had firm *shitaji* (ground), and surfaces coated with thick layers of urushi, and were clearly carved. Some damage is restricted to the *urushi-shitaji*, but much is rooted in the substrate. This is because, generally speaking, many Chinese *shikki* have roughly made substrates. Damage also differs according to whether the substrate is a joined work or a bent work. In joined works, poor construction at the edges often triggers damage.

First, damaged areas are fixed by injecting raw urushi. The operation is done in several steps. In the first step, raw urushi diluted with a solvent such as ligroin (petroleum benzine) is recommended. However, due consideration must be given to the fact that each object is in a different condition, each requiring steps and methods appropriate to it alone.

One way to determine whether the raw urushi has set is to rub it with a fingernail after it has dried. If set properly, the *urushi-shitaji* on the substrate does not peel off. This does not mean the harder the better. If too much urushi is applied, the area becomes extremely hard as a result of the low penetrability of urushi and this may have unfavorable effects on the surrounding undamaged area. Intuition and common sense are required for the conservator to make proper judgments at this stage.

Once raw urushi has been injected, the damaged area is filled with *kokuso*, a paste made of urushi mixed with various thickeners such as clay and wood powders.

This process consists of several repeated operations as *kokuso* is applied little by little. A knife is used to shape the *kokuso* filling after it has dried completely. *Sabi-urushi* (urushi mixed with pulverized ceramic) is applied over it, if necessary. A spatula can be used for this purpose unless the spreading of *sabi* may cause problems (as when the damaged area is adjacent to fine ground carving). In such cases, the *fude-sabi* technique, which utilizes a *makie* brush to apply a soft paste made from ordinary *sabi-urushi* and water, should be used. *Sabi-urushi*, like *kokuso*, is shaped with a knife after it has dried. This process is repeated if necessary.

The *sabitsuke* (*sabi* coating) is then coated with *hidori-urushi*, which is made by evaporating the moisture contained in raw urushi in sunlight. This urushi becomes transparent as time passes. After it dries it becomes mat, similar to old urushi surfaces. I use this *hidori-urushi* for all my conservation work. One or two layers of *hidori-urushi* are usually applied, followed by *suri-urushi* (raw urushi plus camphor), if necessary.

It is rather difficult to reproduce the same pattern and color tone on the restored area as on the original. There are arguments for and against color matching. The recent tendency is not to match colors, in order to differentiate the restored area from the original. On the other hand, some people believe in coordinating colors with adjacent areas. It is not easy to coordinate the tone of the new color with the original.

Guri (*multicolored carved lacquer*)

In essence, the conservation method used for *tsuishu* can be employed for *guri*. First of all, dust in the hollows of the *guri* and old conservation treatments (coloring) must be removed. The urushi surface will be kept free from scratches and other damage if a *kido* made from a sharpened willow chopstick is used for this operation. If any damage is found after the removal of dust, the area is filled with *kokuso* using a tool such as a bamboo spatula, followed by *sabitsuke* and coating with *hidori-urushi* and *shu-nuri* (urushi colored with cinnabar). Excess *kokuso* and *sabi-urushi* on the surrounding area can be removed when they dry to a certain degree. However, once they dry out completely, it becomes quite difficult to remove them.

Layers of *guri* often become detached from the *shitaji* (ground). In such a case, the *guri* should never be pressed down. Instead, the space should be filled with *mugi-urushi* (urushi with adhesive properties made of wheat flour, rice paste, water, and raw urushi) containing wood powder. This method seems to cause less damage in the future. Even if the restored area is still lifting after this operation, the object as a whole will be in a stable condition and the restored part will not be noticeable once the object has undergone all the necessary work.

Coating with *hidori-urushi* and *shu-nuri* are the next steps. *Suri-urushi* must then be applied over the entire surface once or twice, according to the condition. Finally, excess urushi is carefully removed with soft paper.

Chinkin-zonsei (*incised gold decoration*)

Basically the same conservation policy as for *tsuishu* can be employed. However, in this case, *kokuso* must be infilled using a bamboo spatula and *sabi* must be brushed on in the *fude-sabi* technique in order to keep the line carving free from urushi.

Raden (*shell inlay*)

Most *raden* found on Chinese lacquerware is made of *usugai* (*aogai*), i.e., thin shell. A problem arises if urushi is used to fill the spaces between the inlay and the substrate since the urushi under the shell may cause it to change color. In the past, I have tried urushi for this purpose but have come to the conclusion that a resin adhesive is better. Due care must be taken in selecting such a conservation material, however, so that if urushi is coated over the restored area the drying process is not inhibited.

Further remarks

There are many more points that need care and attention. Some of them are listed here:

1. When *shikki* (lacquerware) is to be conserved, x-radiographs are sometimes taken in order to analyze the technique used for the substrate. Special attention must be paid to the thickness of the *shitaji* (ground) and urushi layers and to the material of the substrate in order to determine the power level needed to obtain a clear image. The conservator and the technician must cooperate fully.

2. Careful studies should be made of the type of material used and how it was applied.

3. In the case of jointed works in which many fine cracks are found, raw urushi diluted with ligroin is applied, wiped off with tissue paper and allowed to dry. This procedure is repeated until the cracks are filled. The greatest possible care should be taken if the cracks are so deep that urushi may leak through to the other side.

4. In many cases, it is hard to detect how the urushi was processed when Chinese *shikki* is coated with thick layers of *tsuishu*. In some extreme cases, the *urushi-shitaji* becomes "sandy." Conservators must bear in mind the possibility of very dilute urushi leaking out before it dries.

5. It often happens that damage on Chinese *shikki* is covered up instead of being repaired. *Shikki* that has undergone this type of repair sometimes suffers problems after being taken overseas.

Repairs using wax

Recently I had the opportunity to conserve some forty pieces of Chinese *shikki* at the request of the Linden Museum in the Federal Republic of Germany. All of them had been repaired with wax. This method of repair seems to have been developed in Europe. Careful observation of these repaired areas revealed that wax injected for the purpose of repair had in turn caused further cracks; both kinds of cracks had to be repaired. Since urushi coated over wax never dries, more time and labor were spent on the removal of the wax than on the conservation of the actual object. This experience shows that the selection of material for repairs should be made carefully.

Conclusion

Studies on the conservation of Chinese *shikki* have just started and most of the problems are left for future consideration. I have come to the conclusion, based on my personal experience, that minimal conservation work should be done and only on areas that are actually damaged. It is the role of conservators to bridge the past and the future by trying to preserve the object while leaving the original material as far as possible untouched.

When restorers are given their assignments, they work upon advice from persons responsible for conservation and display in museums. It is my sincere hope that those in authority will further deepen their knowledge of urushi and its techniques.

The *Kyushitsu* Technique Demonstrated on a *Natsume*

Shogyo Ohba

Lacquer Artist and Restorer

There is great variety in the technique of *kyushitsu* (coating with lacquer), reflecting both the individual *urushi* artist and the district where the *shikki* (lacquerware) is made. The model of the process given here shows four of the various *kyushitsu* techniques: *urushi-nuri*, *maki-ji*, *hon-ji*, and *honkata-nuri*. Until now most models have been made on sample boards or bowls, whether by lacquerware-producing districts, training or research institutions, or individual artists. However, after consulting Naodai Sakashita, a *kyushitsu* artist living in Kanazawa, we decided to make this model using a *natsume* (tea-powder container), an especially difficult *kyushitsu* technique. In September 1984, we started work. Ryozo Kawakita, a woodwork artist of Ishikawa prefecture, made the *kiji* (wooden substrate); Naodai Sakashita worked on the *kyushitsu*, and I supervised the work. The completed *natsume* was presented to Kanazawa Municipal Arts and Crafts College by Naodai Sakashita and is being kept there as study material.

This is a brief explanation of the *kyushitsu* process, based on the technique I learned from my father, from my master Gonroku Matsuda, and from colleagues, as well as the method of application suggested by Sakashita.

Steps in the *kyushitsu* technique

The model consists of four major stages: substrate, priming, intermediate coating, and top coating. These stages comprise seventy steps, the most significant of which are explained here.

I. Substrate.

A. First we cut the wood for the substrate from the trunk of a Japanese cypress. We cut a transverse section a little thicker than the total height of the body of the *natsume* and its lid (Fig. 1). This Japanese cypress had at least 318 wonderfully fine annual rings. Kawakita suggested that the tree was about four hundred years old.

B. *Kidori*. Several round shapes for the *natsume* are drawn on the wood (Fig. 2) and cut out with a belt saw (Fig. 3a).

C. *Arabiki*. The pieces are turned on a lathe until they are a little larger than the final size (Fig. 3b). Usually unseasoned wood is used, since it is easier to cut and shape.

D. Boiling the *kiji* (wooden substrate). The roughly shaped *natsume* is boiled in a large container for two hours, and the resin from the *kiji* flows out into

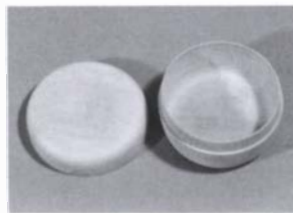
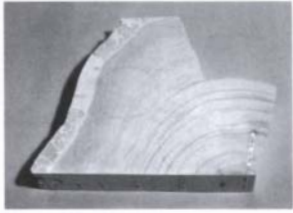


Figure 1. Transverse section of Japanese cypress.

Figure 2. The shape of the natsume is marked out on the wood.

Figure 3. Stages in the production of the wooden substrate.

Figure 4. The final shaping of the kiji is completed.

the hot water. This facilitates the drying of the wood and helps to prevent distortion (Fig. 3c).

E. Drying and heating (followed by at least two years' wait). Since boiling the *kiji* moistens the wood, this moisture must be completely evaporated, so the *natsume* is placed in a drying chamber for ten to fifteen days. Then the roughly shaped *natsume* is placed in an electric oven and heated for seven to eight hours at 80°C; if it is heated above 80°C, the wood will burn. This prevents distortion. The wood is charred to a depth of 2 mm from the surface (Fig. 3d). Then the *natsume* is allowed to stand for at least two years; if it is worked on the lathe immediately after heating, the speed of turning will cause cracks. Some *kiji* manufacturers carve the *natsume* after only six months but this will result in cracks and distortions later.

F. *Nakabiki*. After intermediate carving (Fig. 3e), the *natsume* is left to dry naturally for at least two months.

G. Final shaping. After final lathe-working, the shape of the *natsume* is completed (Figs. 3f,4).

II. Priming.

A. *Kokuso-bori*. When the *kiji* has knots, cracks, or gaps in the wood, that section is chiseled away with a small knife. Sometimes pieces of wood may be used to fill knotholes.

B. *Kijigatame*. This is performed twice. First, raw urushi diluted with ligroin (petroleum benzene) is applied to the *kiji*. Next, raw urushi alone is applied. Urushi penetrates horizontally cut surfaces more easily than vertically cut ones.

C. *Kokuso-kai*. This is performed twice. Small gaps resulting from *kokuso-bori* are filled with *kokuso* using a spatula: *shofu* paste (4 parts) + raw urushi (6 parts) + *kokuso-men* + wood dust. Since the urushi content is high, this *kokuso* is soft. The second *kokuso* consists of raw urushi (10 g) + rice paste (10 g) + *kokuso-men* (1 g) + wood dust (5 g; Sawaguchi 1966).

D. *Hikikomi-sabitsuke*. A thin layer of *sabi* is applied over the *kokuso*. *Sabi* consists of *tonoko* (10 parts) + water + raw urushi (6 parts).

E. *Kokuso-togi*. Grinding powder with water is used to rub down the *sabi*.

F. *Suri-urushi*. Raw urushi is applied.

G. *Kami-kise*. *Minogami* paste (10 parts) + raw urushi (10 parts) is applied. This mixture is called *handa-urushi*.

H. *Sabitsuke*. *Sabi* is applied to the edges of paper covering areas of *kokuso*.

I. Polishing. Sandpaper is used.

J. *Urushi-nuri*.

1. Coating followed by rubbing down. *Kurome-urushi* (dewatered urushi) plus some carbon black is used for the first coat. Subsequent coats are done with urushi alone. Each coat is followed by rubbing down.

2. Edge-making. Urushi has now been applied ten times and the *aikuchi* (where the sections join) has become blunt. *Sabi* is applied once on this part.

3. Heating. Donut-shaped rings are placed in the body and the lid of the *natsume*, to prevent distortion. The rings are made of plaster (7 parts) + cement (3 parts). After this mixture has dried completely, it is ground to shape and placed in the body and the lid (Fig. 5). Then the *natsume* is placed in an electric oven and the heat is increased slowly (about 10°C in two hours) until it reaches 70°C. After eight hours at this temperature, the *natsume* is removed and cooled.

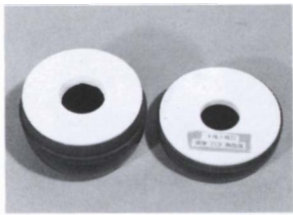


Figure 5. Plaster rings placed in the two parts of the natsume prevent distortion during heating.

4. Rubbing down with charcoal. The *urushi-uwanuri* (see II.J.1) and the *sabi* of the edge (see II.J.2) are rubbed down with charcoal.

K. *Maki-ji*.

1. First *maki-ji*. Raw urushi (10 parts) diluted with ligroin or volatile oil (10 parts or a little more) is applied with a rabbit's hair brush. The surface is immediately sprinkled with *jinoko*, 60-80 mesh (*Wajima nihen jinoko*).

2. *Fun-gatame*. Raw urushi is diluted with ligroin and applied with a rabbit's hair brush. A mixture that easily evaporates is preferred.

3. Second *maki-ji*. *Jinoko*, 80-100 mesh (something like *Wajima sanben jinoko*) is used.

4. *Fun-gatame*, as in II.K.2.

5. *Ji-togi*. The surface is smoothed with emery. The next step is separated into the application of urushi and the *honkata-ji* process; therefore *maki-ji* was performed twice.

6. Preparation for urushi coating.

- a. First coat and rubbing down.
- b. Second coat and rubbing down.
- c. Third coat.
- d. Edge-making and heating.
- e. Rubbing down.

7. Preparation for *honkata-ji*.

- a. *Uwa-sabitsuke*.
- b. Heating.
- c. *Sabi-togi*. The *sabi* is rubbed down with a grindstone.
- d. *Shitaji-gatame*. Excess urushi is wiped off.

L. *Hon-ji*.

1. First *jitsuke*. Raw urushi is placed on the work bench and mixed with some *jinoko*. *Heratsuke* is performed. Too much *jinoko* makes application difficult; not enough *jinoko* causes the *maki-ji* to shrink. The first application is 60-80 mesh (Fig. 6).

2. Second *jitsuke*. 80-100 mesh.

3. *Ji-togi*. The surface is rubbed down using emery with water, so that the *jinoko* covers it evenly in the next process.

4. Third *jitsuke*. >120 mesh. A fine powder is sprinkled on.

5. Heating.

6. *Shitaji-togi*.

7. *Shitaji-gatame*, as in II.J.7.d.

M. *Honkata-ji*.

1. First *jitsuke*. 80-100 mesh. *Tonoko* (10 parts) + water + *jinoko* (a little) + raw urushi (6.5 parts).

Ji = *jinoko* (100 g) + water (40 cc) + raw urushi (50 g; Sawaguchi 1966).

Kiriko = *jinoko* (50 g) + *tonoko* (50 g) + water (45 cc) + raw urushi (50 g; Sawaguchi 1966).

2. Second *jitsuke*. 100-120 mesh.

3. *Ji-togi*. This should be performed lightly.

4. *Uwa-sabitsuke*.

a. First *sabitsuke*.

b. Second *sabitsuke*.

c. Application of *uwa-sabi* (final coat).



Figure 6. *Hon-ji*: first *jitsuke*.

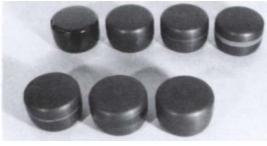


Figure 7. Stages in the intermediate coating procedure.



Figure 8. Kiri-aikuchi-zukuri.

5. *Shitaji-gatame*.

- a. Heating.
- b. *Sabitogi*.
- c. *Shitaji-gatame*.

III. Intermediate coating.

A. Intermediate coating (Fig. 7a). Non-oily urushi such as *nakanuri-urushi* and *roiro-urushi* is used for the intermediate coating.

B. Rubbing down the intermediate coating, *uchi-konaka-nuri* (Fig. 7b). The surface is rubbed down with charcoal and *konaka-nuri* is applied to the inside of the *natsume*.

C. *Kiri-aikuchi-zukuri*

1. *Aikuchi go-zume* (Figs. 7c,8). *Tonoko* (10 parts) + water + cooked rice paste (2 parts).
2. *Aikuchi-sabitsuke* (Fig. 7d). *Sabi* is applied to the *aikuchi*.
3. *Aikuchi-sabitogi* (Fig. 7e). This area is rubbed down.
4. *Aikuchi-nakanuri* (Fig. 7f). *Kuro-urushi* is applied to the *aikuchi*.
5. *Aikuchi-nakanuri-togi* (Fig. 7g). The *kuro-urushi* is rubbed down.

D. *Konaka-nuri*. Urushi is applied.

E. *Konaka-nuri-togi*. The *konaka-nuri* is rubbed down.

F. *Aikuchi-wari: uchi-konaka-nuri-togi*. The *konaka-nuri* is ground down. The *natsume* is placed in water heated to about 50°C (hot to the touch). The expansion of air causes the lid to separate from the body of the *natsume*.

G. *Suri-urushi*. Water is kneaded into the raw urushi, making it easy to handle. The excess is carefully wiped off with paper.

IV. Top coating.

Top coating is the final step. There are two types of top coating: *nuritate* and *roiro-nuri*. For *nuritate* the final coating completes the process. For *roiro-nuri*, after the last *uwanuri*, the processes of rubbing down (coarse and fine), *suri-urushi*, *dozuri*, *sutezuri*, *suri-urushi*, polishing and *kesho-zuri* are done in that order. The *roiro-nuri* process was not performed in this model of the process.

Acknowledgments

I should like to express my gratitude to the Kanazawa Municipal Arts and Crafts College and Assistant Professor Tsuneo Ueda for lending the model of the process and for their great cooperation. Furthermore, I wish to express my appreciation to Naodai Sakashita for making the model and Ryoza Kawakita for his valuable advice on *kiji*-making and the *kiji* process.

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Lacquer Examination and Treatment at the Freer Gallery of Art: Some Case Histories

W.T. Chase

Smithsonian Institution, Washington, D.C.

The treatment of lacquer objects is still in its infancy. Many of our treatments are aimed at symptoms rather than attacking the causes of deterioration. Many of the treatments commonly employed do not adhere to modern conservation principles and may later cause damage that is difficult to undo. In some cases, better treatment procedures can be found by a synthesis of traditional and modern techniques. In this paper I shall illustrate our current thoughts on treatments for lacquer objects with a series of case histories of objects treated at the Technical Laboratory of the Freer Gallery of Art and the Arthur M. Sackler Gallery.

Similar ideas have been expressed by Anita Franke in articles on the restoration of a very large and important Chinese imperial throne with screen that is now in the Museum of East Asian Art in Berlin (Franke 1978, 1982) and recently in a pair of articles by Nicholas Umney (1987a, 1987b). Mrs. Franke used methods and materials very similar to ours described here, and she expresses very similar reasons for their adoption. For details of a conservation treatment of a complexity far beyond any here described, the reader is advised to consult Mrs. Franke's papers.

The current progression is away from making the object look like our conception of it and towards letting as much original material as possible show, and also towards treating the object in such a way that our treatment can be undone in the future. The two ethical principles of conservation that emerge are reversibility and minimum intervention.

Some procedures (cleaning, for instance) are by their very nature irreversible and must be undertaken with great care and with as full knowledge as possible of what their effects will be. Often a choice must be made between procedures; the more irreversible ones should be chosen only if they offer some benefit not available in reversible procedures.

One of the best formulations of the principle of minimum intervention was voiced by the late Per Guldbek, while discussing the conservation of ethnographic objects: "Don't do anything more than you have to, consistent with not getting fired!" Perhaps the Bauhaus dictum "less is more" is another way to phrase it. Minimum intervention frees one from attempting to make something look like new, when all the object really needs for its continued preservation may be the setting down of some minor cleavage and a stable environment. The choice of treatments should be made not only with the end result in mind but also (and more importantly) the least change in the object.

In the specific case of the repair of Oriental lacquer objects, to apply these two principles would mean not using urushi, a material that is totally insoluble after it has set. In some cases (see cleaning of the inkstone box S87.0386a–pp, below) old urushi repairs can be removed mechanically. In others, where surface coats of urushi have been applied to even out the appearance of the restored object, removal is impossible. The color of the newly applied lacquer layers changes slowly with time; many old repairs have discolored and are now impossible to remove without damage. While discoloration can be dealt with, to some extent, by inpainting the discolored areas (see treatment of S87.0373a,b, below) it would be preferable to be able to remove the old, discolored repairs and to redo them in the correct color in a reversible material. Thin layers of old lacquer repairs also render it difficult (and sometimes impossible) to assess the present condition of a lacquer object and say how much of the original remains.

Perhaps a shining example of minimum intervention was demonstrated to the Urushi Study Group participants by the lute preserved at the Kasuga-taisha shrine at Nara, where the original lute had been stabilized and left in fragmentary condition and a replica had been made by a modern lacquer master to show what the lute looked like when new.

The application of the principles above, however, must be tempered with judgment, judgment seasoned with experience and common sense. In conservation we attempt to understand and apply not only the principles of material science and the methods of the craftsman, but also artistic and aesthetic judgment. Our results must succeed on many levels. Perhaps this paper should be viewed not as a plea to discard the traditional methods of lacquer repair practised so successfully by many of our colleagues in Japan and elsewhere, but as a demonstration that other methods of repair, using reversible materials and attempting to minimize intervention in the work of art, can be worthy of consideration.

Some of our Japanese colleagues are also considering and using modern reversible synthetic materials in lacquer repair; Nakasato (1986) used Paraloid B-72[®] in a 5% solution in xylene to consolidate the foundation layers of urushi on two decorated lacquer doors from Ryuzo-ji.

Effective housekeeping procedures

In the case of lacquer objects particularly, one must understand the causes of deterioration and attempt to halt the deterioration by attacking these causes. The primary cause of deterioration of lacquer objects is the movement of the substrate layers, coupled with loss of adhesion of the lacquer (and ground) layers. One of the most memorable things said during the Urushi Study Group's trip was Mr. Nakasato's pronouncement that deterioration of lacquer objects is always due to problems in the substrate or supporting layers.

For that reason, we attempt to keep our lacquer objects at a constant relative humidity. In Washington, D.C., we have standardized on 50% relative humidity, a level that is possible to maintain in our climate year round. Lacquer objects (and wooden objects) often can be seen to change when brought into this climate from the Orient. Any further cracks or cleavage from the change in climatic conditions are repaired, using the methods outlined below, and the objects then seem to be quite stable. As we proceed with the program of the new Arthur M. Sackler Gallery, we plan to exercise care in lending our lacquer objects only to borrowers who can maintain the correct level of relative humidity. Some of our lacquer objects are so fragile and vulnerable both to climatic change and to dangers in handling that they will not be lent at all. Conversely, it is planned to have the climatic conditions in the storage and exhibition areas adjustable so that special conditions required by lenders can be accommodated.

We are also careful to keep dust to a minimum, maintaining a good filtration system, and keeping the lacquers in closed cabinets, or in vitrines while on display. Gloves are used in handling the lacquer objects in the collection, to avoid fingerprints. The most effective, reversible treatments in terms of minimizing intervention are good housekeeping procedures.

Conservation treatments

For this paper, we reviewed the examination and treatment records of some eighty-three lacquer objects in the collection of the Freer Gallery of Art and selected specific case histories for presentation below. We have also treated a number of objects for private owners, usually because of the extremely challenging nature of the problems involved; we have been able to learn a great deal from these treatments of objects from outside the collection. Two are included in the case histories.

We have also recently completed the examination and treatment of approximately one thousand objects for the opening exhibition of the Smithsonian Institution's new Arthur M. Sackler Gallery. Included among these objects were forty-three Chinese lacquer pieces, many of which presented interesting problems in treatment. Five case histories of objects now on exhibition in the Sackler Gallery are included below.

Before we discuss specific case histories, let us see what generally happens in our laboratory when a lacquer object is treated. The object has usually been brought to the laboratory for correction of a particular problem, either in appearance or stability. Before any treatment is done, the object is given a thorough technical examination, including careful examination under a low-power stereomicroscope and examination of fluorescence in ultraviolet light. We use both a high-powered mercury arc lamp with Wood's glass filter (longwave ultraviolet) and a strong shortwave ultraviolet lamp. Operators always wear ultraviolet protective goggles for eye protection and to eliminate the fluorescence of the cornea, which adds flare. Visual acuity and perception of the colors of the fluorescence are much improved when wearing ultraviolet protective goggles.

The examination usually enables one to detect any repaired or re-lacquered areas. In many cases, x-radiography is used as well, both to detect old repairs and to ascertain the underlying structure of the object.

The technical examination has enabled us to formulate a treatment proposal, which is then discussed with the curators responsible for the object. After any necessary changes are made, work can proceed. Curatorial involvement is particularly necessary in the case of lacquer objects; in addition to the initial review of the treatment proposal, constant contact must be maintained with the curatorial staff as the work goes forward and options in treatment thoroughly discussed when the need for choice arises.

After a technical examination, objects are often cleaned. Cleaning is usually done with distilled water or a weak detergent mixture and cotton swabs; in some cases, organic solvents such as petroleum benzine (V.M.&P. naphtha, ligroin, petroleum ether), toluene or xylene are used to remove greasy surface accretions. Occasionally, the traditional Japanese polishing powder (*tsunoko*) is used; we have been using the modern version of this material, made from finely-divided anatase (titanium dioxide), with some success.

Consolidation of loose areas, or areas with cleavage and lifting of lacquer, is often done with wax or wax-resin mixtures, applied hot (60–70°C) with a small tacking iron. The heat used in application of the wax mixture softens the lacquer and allows it to be laid back into the correct position. In the case of small loose flakes without distortion, plastic resins such as the polyvinyl acetates or the methacrylates (Acryloid B-72[®], an ethyl methacrylate-methyl acrylate copolymer, or Acryloid B-48N[®], N-butyl methacrylate) are used, generally in solution in acetone or toluene, although we have also employed these resins in emulsion form. The same materials are used for fixing loose inlay, especially mother-of-pearl. In the case of extremely fragile lacquer pieces, or ones where the original surface is heavily deteriorated and loose, it seems safer to consolidate first and then to clean.

Small losses in the lacquer coat can be filled at the same time as consolidation, by employing some pigment of an appropriate color in the wax mixture. Larger losses, or losses at corners or rims, are usually filled with a harder wax mixture, containing some carnauba wax. This mixture can be carved to shape and then polished to the required sheen.

Rebuilding of larger losses can be done with a number of different materials; we have employed the harder wax mixtures, AJK (Alvar[®]-jute-kaolin) dough, and Japanese paper impregnated with polyvinyl acetate, all with success.

After the piece has been cleaned and the lacquer and inlay are in stable condition, inpainting is done with reversible paints. We have used colors ground in dammar resin (Maimeri[®] colors), methacrylate solution colors (Magna[®] and our own colors ground in Acryloid B-72[®]), and colors based on vinyl acetate emulsions (Liquitex[®] and Winsor & Newton). Inpainting must be done after polishing with *tsunoko*, if this step is included in the procedure.

In some cases, where the lacquer has lost its sheen or gloss, an overall surface coat may be applied. Usually this is a very thin application of the British Museum wax formula, commercially available as Renaissance Wax[®]. In some cases a thin coat of synthetic resin varnish may be applied to the surface to produce a harder sheen. In the past, we have used a 2% solution of polyvinyl acetal resin (Alvar[®]) for this purpose; recently we have been relying on the waxes, where necessary. Many objects retain sufficient sheen to make a surface coating unnecessary.

All of the materials applied in these treatments are removable later, if necessary. In fact, in one case, we removed a wax coating that we had applied two years before so that an object could be polished by Japanese traditional methods. Wax fills of cracks have the additional advantage over lacquer fills that the wax can extrude from the crack if climatic change causes the crack to close up, thus preventing further spreading of the crack. All of these materials are also easily distinguishable from the original lacquer, a fact that may serve later scholars well.

**Case histories:
wax fills and
reattachment of
cleavage**

1. A shop signboard (FGA #V31.77)

In 1977 we were requested to treat a large Japanese Meiji period lacquered signboard, or storefront sign panel, for a private owner. Since this was a rush job, no photographs were taken. The signboard was carved with three Japanese characters and an imitation of a seal impression. It was quite large (106 cm x 33 cm), and lacquered all over with red and black lacquer. The lacquer had extensive cupped cleavage, with flakes about 1 cm x 4 cm curling up, with both ends standing above the surface; in Western painting conservation we would call this “extensive tented cleavage.” Many losses were present. The signboard had been treated before, with a thermoplastic adhesive, possibly polyvinyl acetate emulsion. Extensive remains of the old adhesive could be seen on the surface, and were quite distracting. Some of the lacquer flakes had been glued down in the wrong positions.

old adhesive could be seen on the surface, and were quite distracting. Some of the lacquer flakes had been glued down in the wrong positions.

First the old adhesive was removed by soaking with cotton swabs and a 1:1 mixture of acetone and toluene. The adhesive turned gelatinous and could be scraped off. Flakes which had been wrongly restored were removed and cleaned.

The cleavage was set down and loose fragments were reattached by the use of a wax-resin mixture. The wax-resin mixture was the same as that used for oil painting consolidation and relining, i.e., 2000 g unbleached beeswax, 1000 g dammar resin (Singapore gum dammar in lumps preferred), 1500 g paraffin, m.p. 56–58°C, and 500 g gum elemi (Bradley 1950).

To make the mixture, an aluminum pan is placed on an electric hotplate and the dammar resin is put in and melted. The melted dammar (and the whole mixture until cooled) is quite flammable; care should be taken not to overheat it, and avoid open flames in its proximity. After the dammar is melted, the beeswax is placed in the pan and stirred as it melts. When the mixture is uniform, the paraffin and the gum elemi are added, with stirring. Then the pan is removed from the hotplate and the mixture strained through cheesecloth into a shallow tray made of aluminum foil. Just after the mixture has set, it is scored with a sharp knife into blocks of a convenient size. It is then allowed to cool completely to room temperature; the blocks are removed from the aluminum foil, snapped apart and stored for use.

Incidentally, the author first encountered the use of this material for laying down cleavage in lacquer in 1965 when he was a student in the Objects Conservation Department of the Metropolitan Museum of Art, New York, where a large Coromandel screen was being repaired using exactly this method.

The wax-resin mixture was applied to the lacquer with a small, electrically heated spatula kept warm enough to thoroughly melt the mixture (60–70°C). The lacquer and substrate were thoroughly infused with the wax-resin mixture, and the tacking iron was held in the wax pool, not touching the lacquer, until the lacquer softened from the heat (usually about a minute). The lacquer was tested for softness by touching the raised portion lightly with the tacking iron or a wooden stick held in the other hand. After softening, the lacquer could be pressed back into place. A piece of glassine paper was then placed over the area, and the tacking iron used to iron the area flat, extruding any extra wax around the edges. The tacking iron was then set aside, and continuing pressure exerted on the area, either with the fingers or a cool, smooth piece of metal, until the wax had set. The glassine paper could then be peeled back and excess wax removed with ligroin or petroleum benzene. Usually only a preliminary removal of the wax was made at this stage, and work proceeded to the next area of cleavage.

After all of the loose cleavage had been tacked down, areas of loss were filled with a harder wax mixture: 38 g carnauba wax, 38 g paraffin wax, 10 g microcrystalline wax (Bareco 145[®]).

This was pigmented to suit with dry pigments; in this case, Venetian red iron oxide, raw umber and Mars black (ferro-ferric oxide) were used.

Any excess wax mixture remaining on the surface was removed with petroleum benzene; V.M.&P. naphtha was used here. The entire signboard was given a very light coat of the wax filling mixture dissolved in V.M.&P. naphtha, which increased the gloss, especially on the black background, making the signboard look more even and less weathered.

Figure 1. Late Zhou dynasty Chinese eared cup, red and black lacquer over wood, Freer Gallery of Art #47.24, overall view.



Figure 2. Eared cup #47.24, bottom view after repair; the repair can be seen at the upper right corner of the foot.



2. Zhou dynasty eared cup (FGA #47.24; Figs. 1 and 2)

A fragile and somewhat deteriorated Chinese lacquer drinking cup from the late Eastern Zhou dynasty, said to be from Changsha (Lawton 1982(135):183), was brought to the laboratory for repair of several small pieces of wood and lacquer which had flaked off from the foot, probably due to handling. The cup is 5 cm high and 17.1 cm long. The pieces were reattached using wax-resin mixture (see above), colored with burnt umber and vermilion. The cup was also infused with wax-resin mixture in the break area to consolidate it; some small fills were made with the same mixture to tone the area of loss. The treated area coincided with the most heavily distorted area seen at the upper right of the foot in Figure 2. An “invisible” fill was impossible, due to the heavy distortion of the surface. The lacquer of the cup was very glossy, and no general surface treatment was necessary.

This treatment was done in August 1967. When the piece was re-examined in the store of the Freer Gallery in June 1986, no change in the repaired area was visible.

3. Ming dynasty red lacquer dish (AMSG# S87.0392; Figs. 3–6)

This deeply-carved red lacquer dish, 3 cm high by 17.25 cm long, has a pattern of peonies and leaves set against a yellow background (Lee 1971:174). It was very dirty when received by the Arthur M. Sackler Gallery for inclusion in the opening exhibition in 1987. In addition to the general cracking and minor losses such as the one described below, some large areas, especially the leaves, had suffered heavy losses and had been recarved. Some loose pieces had been glued back.

The piece was cleaned with distilled water and cotton swabs. The smaller crevices were cleaned with cotton rolled on the end of sharp bamboo skewers. The cleaning evened out the color of the object and made the yellowish background evident (Figs. 3, 4). Visible remains of old adhesive were removed with acetone.

One area of loss in the background, near the right edge of the dish about one-third of the way from the top, was large enough to be quite distracting. The loss is about 0.5 cm x 0.8 cm in extent, and the black, rough ground layer is revealed. The pigments of the ground were tested by x-ray diffraction and by microscopy, and proved to be orpiment and iron oxide.

The area of loss was coated with 10% Acryloid B-72[®] in xylene as a separator. After this had dried, the area was filled with the wax filling mixture mentioned above (38% carnauba, 38% paraffin and 10% microcrystalline wax), colored with raw sienna, Mars yellow and indian red. As can be seen in Figures 5 and 6, the compensation of this area of loss has integrated the appearance of the object.

Figure 3. Ming dynasty Chinese deeply carved red lacquer dish with peonies and leaves on a yellow background, Arthur M. Sackler Gallery #S87.0392, condition before treatment.

Figure 4. The dish shown in Figure 3, after treatment.



Figure 5. Detail of loss in background on #S87.0392, after cleaning but before filling.

Figure 6. The same area as Figure 5, after filling.



Figure 7. Yuan dynasty Chinese multi-part inkstone box in black lacquer over wood with mother-of-pearl inlay, Arthur M. Sackler Gallery #S87.0386a-pp. This shows the inner portion of the box, assembled. Figures 8–11, opposite, are details of the small tray on the upper right, just beneath the cover. Photograph by Otto Nelson, courtesy of the Sackler Foundation, New York.



4. Yuan dynasty multiple-part inkstone box with mother-of-pearl inlay (AMSG# S87.0386a-pp; Figs. 7–11)

The object, 30 cm high by 31.6 cm long by 24 cm wide (Lee 1971:138–140; Yonemura 1987:46), is composed of an outer case with top and bottom decorated in red lacquer using the *qiangjin* technique, surrounding an inner set of boxes made from black lacquer with mother-of-pearl inlay on the outside. Figure 7 shows the inner set of inkstone boxes, assembled. The object was in precarious condition when received by the Arthur M. Sackler Gallery for inclusion in the opening exhibition in 1987.

The outer red box (not shown here) has major losses on all of its surfaces, along with extensive cupped cleavage of the remaining lacquer. Many old repairs, done in a brighter-colored red lacquer which no longer matches the original, complicated the treatment. We decided not to include the outer box in the opening exhibition but to leave its treatment for a later date.

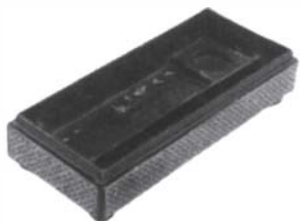


Figure 8. One tray (#S87.0386d) showing the general condition before repair.

Figure 9. The interior of the tray shown in Figure 8. Note the general cracking, cleavage, lifting and loss of lacquer.

Figure 10. Detail of interior of the tray, before treatment, showing cupped cleavage rising 5 mm above the wood surface.

Figure 11. The interior of the tray after treatment.

The inner boxes have wooden inserts inside them to hold inkstones and water droppers, which are included with the set (Figs. 8, 9). The construction of the boxes includes a reinforcing fabric which covers the outside bottom, feet and sides of each box and wraps part-way into the interior. A sample of the fabric was removed from a large area of lacquer loss on the foot of one box and was identified as a bast fiber, probably ramie. On the inside, the black lacquer has been applied directly over the wood.

The lacquer inside the boxes was in a precarious condition, with many losses, old repairs, and much cleavage and lifting of the lacquer (Figs. 9, 10). In some cases, the lacquer has lifted 5–6 mm above the surface. Old repairs (the gray areas in Fig. 10) complicated the problem. The box was quite dirty on all surfaces, and many losses were evident both in the lacquer coat and in the mother-of-pearl on the outside. Old black lacquer repairs and reinforcements to the corners on the outside obscured some of the design; this was especially noticeable on the vertical framing pieces of the inlay towards the corners of the boxes, and can be seen clearly in Figure 7.

We made one test of complete consolidation and filling of all losses on one of the small boxes just under the top of the piece. Similar methods to those used on the street sign panel were applied, with the difference that smaller tools had to be made to work on these boxes. Pigmented wax-resin was used for the consolidation and elimination of cleavage. It was applied hot, lightly ironed, and the excess removed with petroleum benzene (ligroin). Losses on the inside were filled with the same material; removal of excess wax also removed the dirt and dust on the inside. The result is shown in Figure 11. The lacquer is now stable. Shortage of time before the exhibition forced us to set down only the worst and most precarious areas, and leave the rest of the interior untouched.

The mother-of-pearl inlay on the outside was dirty and, in some cases, loose. Cleaning and consolidation were done under a low-power stereomicroscope. An initial washing, section by section, was done with water on cotton swabs, taking care not to loosen any mother-of-pearl. When a loose piece of inlay was encountered, it was glued down with 10% Acryloid B-72[®] in xylene. The spots of harder dirt (which did not respond to washing) on the inlay were removed mechanically by cutting them away with a very sharp small scalpel blade, taking care not to scratch the inlay. The blade was held nearly parallel to the surface of the inlay, to lift the crusty dirt away. Similar methods were used to reveal any inlay covered by old lacquer repairs.

Work began on this object in February, 1986 and was completed in July, 1987. It took approximately six man-months full time. Difficult areas such as the back corners of the lower box (Fig. 7), where the support is no longer in plane, were treated with Acryloid B-72[®] for consolidation, followed by filling losses with a putty made from Acryloid B-72[®] and dry pigment. We considered methods for compensating the losses in the mother-of-pearl inlay, possibly cutting new pieces of inlay and setting them in with synthetic resin, or filling the areas of loss to the correct plane with wax and then inpainting the inlay with pearlescent colors. After cleaning and consolidation, however, we decided that compensation was not necessary.

**Case histories:
Replacement of
loose pieces with
synthetic resin**

Synthetic resins have been used in the case histories above for setting down small areas of loose pieces, notably in the multiple-piece inkstone box just discussed. Here we show some more examples of their use.

1. Yuan dynasty deeply carved red box (AMSG# S87.0390a,b; Fig. 12)

This box is 7.9 cm high by 17.6 cm long (Lee 1971:162; Yonemura 1987:38). When received, it was quite dirty, with many small loose pieces in both the carved areas and the background. The insides of both the top and the base had been re-lacquered sometime in the past, as had the bottom of the base. The lacquer surface was cracking and lifting throughout; many of the cracked areas seemed quite stable and would probably stay in place during normal handling, but others were less secure. Some consolidation of the object was necessary to prevent further losses. Interestingly, on this object, the yellow color in the background seemed to have been applied after the red layers had been carved, as it frequently overlapped onto the vertical walls of the red carved areas. The yellow layer was quite thin and broken up. Small pieces of the yellow easily fell out: it required consolidation. The yellow was identified by x-ray diffraction as orpiment.

Treatment began with cleaning with cotton-tipped bamboo skewers, moistened with distilled water. This revealed many more loose pieces, especially in the yellow background. The treatment continued, alternately cleaning and readhering loose pieces with 10% Acryloid B-72[®] in acetone. For the consolidation of larger areas, a hypodermic needle was used to inject Acryloid B-72[®] underneath a section of carved lacquer. The excess was removed with acetone. Areas of loss were left unrestored on this piece. The black areas inside the piece and on the bottom of the base were gently polished with a soft cloth to remove fingerprints. The larger cracks in the carved lacquer on the underside and at the rim were left untreated; the underlying reinforcing fabric can be seen clearly through the cracks.



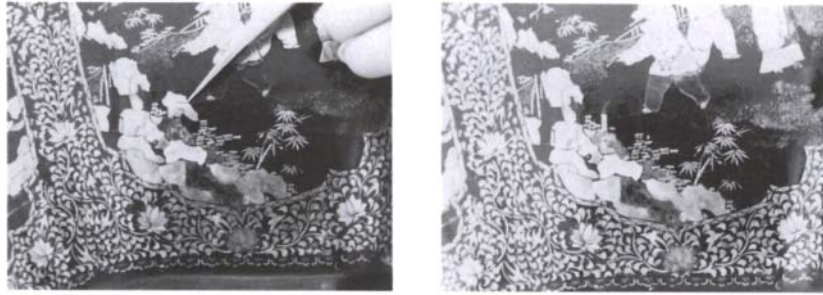
Figure 12. Yuan dynasty Chinese red lacquer box, deeply carved, Arthur M. Sackler Gallery #S87.0390a,b. Photograph by Otto Nelson, courtesy of the Sackler Foundation, New York.



Figure 13. Qing dynasty Chinese octagonal black lacquer box with mother-of-pearl inlay, Arthur M. Sackler Gallery #S87.0407a,b. Photograph by Otto Nelson, courtesy of the Sackler Foundation, New York.

Figure 14. One piece of inlay being fitted back into the surface.

Figure 15. The surface after the loose inlay has been glued into place. The color of the replaced piece is slightly darker than the rest in this photograph, possibly due to the continuous layer of adhesive behind it and to the direction of the lighting for the photograph.



2. Qing dynasty octagonal black box with mother-of-pearl inlay (AMSG# S87.0407a,b; Figs. 13–15)

This octagonal box, 24.9 cm high by 25 cm in diameter (Lee 1971:209; Yonemura 1987:47), had lost four pieces of inlay which were found in the packing surrounding the object after transport.

Some of the remaining inlay did not have a continuous adhesive behind it, as could be seen when a small area of the box was wetted with petroleum benzine (ligroin). The solvent could be seen to penetrate behind the mother-of-pearl and darken it. However, it was decided at this stage only to readhere the loose pieces and leave the rest of the inlay alone; a close watch will be kept on the security of the rest of the inlay.

The four pieces were readhered with 10% Acryloid B-72[®] in acetone. The most difficult part of the job was finding out where the inlay pieces went. After gluing them back, their appearance was slightly darker than the rest, due to the adhesive which holds them securely in place (Figs. 14 and 15).

3. Edo or Meiji period Japanese circular covered box (FGA #04.348; Figs. 16 and 17)

The box, or tea caddy, is 5.5 cm high and 4 cm wide (Fig. 16). It probably dates from the nineteenth century, and may have been made in imitation of designs by Korin (Yonemura 1979:87). Of the three thick pieces of mother-of-pearl inlay on the top, one had fallen off entirely and another was loose. The loose piece was removed so that a good adhesive join could be made. Under the mother-of-pearl the original adhesive could be seen; it was dark reddish-brown, and looked as if it were unpigmented lacquer (Fig. 17). A small sample was removed for solvent testing and proved to be insoluble in alcohol, acetone, 1:7 nitric acid, and 1:4 methylene chloride (heated).

The mother-of-pearl inlay pieces did not fit snugly back, because the adhesive on the back had blistered. It was removed mechanically and the leaves were adhered with polyvinyl acetate emulsion (Borden's Polyco 199[®], now out of production). The same adhesive, mixed with powdered gold, was used to compensate the very small losses in the lacquer around the inlay.

The lead inlay, which shows gray in Figure 16, has small, white patches of corrosion on it. The white material was insoluble in cold and hot water, toluene, and ethanol. The white corrosion product was identified by x-ray diffraction as hydrocerussite. It has been checked repeatedly since, and no spreading of the corrosion or new spots have been seen; each time it has been decided to leave it alone. Lead corrosion products on lacquer will be dealt with in more detail below.

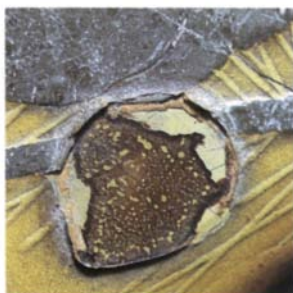


Figure 16. Edo or Meiji period Japanese circular covered box in gold lacquer over wood with inlays, Freer Gallery of Art #04.348, after treatment.

Figure 17. Detail of #04.348 with missing inlay, showing lacquer adhesive which held the inlay in place.

Case histories:
Structural repair with synthetic resin

1. Here the statue, shown before repair, is attributed to the Song dynasty but the date has since been revised to Tang in the Freer Gallery of Art accession records.

Table 1

	<i>Parts by weight</i>
Alvar 770®	100
polyvinyl acetal (Shawnigan Chemical)	
Acetone	130
Methanol	50
Amyl acetate	40
Xylene	100
Water	60



Figure 18. Tang dynasty Chinese dry lacquer statue of the Buddha Sakyamuni, Freer Gallery of Art #44.46, before repair. Note breaks and unevenness along bottom edge. Figure 19. The interior of the base of the dry lacquer statue shown in Figure 18, after repair with AJK dough. The fabric support for the dry lacquer can be clearly seen.

1. Tang dynasty, seventh-eighth century A.D., Chinese dry lacquer statue, seated Buddha (FGA #44.46; Figs. 18–20)

This statue is nearly lifesize (height 99.5 cm, width 72.5 cm). It depicts the Buddha Sakyamuni, but the individual detail of the face suggests that it was actually a portrait of a Buddhist monk; dry lacquer portraits of similar quality were often produced during the Tang, Liao, and Song dynasties (Freer 1972:173).¹

The statue is made in the classical dry lacquer technique, with layers of cloth saturated with lacquer built up over a clay core which is removed after the lacquer is dry; this can be clearly seen in Figure 19, a photograph of the interior of the base of the statue after treatment. Wooden reinforcements were used in the arms. The hands and earlobes are missing.

In 1959 a piece of the lower proper left front edge was pulled off the statue while it was on exhibition; an area about 5 cm x 5 cm was lost, and some of the remaining underlayers were loosened. Polyvinyl acetate emulsion was used to impregnate the area and to attach a piece of Japanese mulberry paper to hold the loose fragment in place. Impregnation with PVA emulsion was repeated in 1962, but problems of visitors removing and disturbing the broken lower edge of the statue continued.

In November 1969 we decided to fill in the skinned portion of the drapery along the lower front of the statue and even out its contour so that it would look better and not present such a tempting target for visitors. Figure 18 shows its condition at this time. First, the loose portions of the bottom and the drapery areas which were skinned were consolidated with Vinac B-15® (polyvinyl acetate) 10% in methanol, applied by repeated brushing. This rendered the areas quite strong. Next, any spots which were to be filled were brushed with an emulsion made from Alvar®, the adhesive component of the AJK (Alvar-jute-kaolin) dough which was to be used as a filler. The same emulsion was used to make the AJK dough (see Table 1).

The emulsion was thinned with xylene and water for the brush application. Then the AJK dough was made by mixing jute flock (which we had cut from commercial jute mailing twine) and kaolin (C.P.) into the emulsion to the right consistency, a little stiffer than library paste. We used about two dry measures of jute flock to one of kaolin. A little commercial whiting (chalk) was added to the later batches, to improve the surface finish in the solidified dough. Some of the AJK dough was kept sealed up wet in containers, for use as a putty, but most of it was formed into slabs about 0.5 cm in thickness and allowed to set.

After drying, the slabs were cut to fit the areas being repaired and set in place with wet AJK dough. Heat was used to bend the slabs to the correct contour before attaching them. Small spines were cut from the set dough and adhered to the surface to form the backbones of the centers of the drapery folds. The repair was allowed to dry, and more AJK dough added as putty where necessary to compensate for shrinkage. A putty was made from the Alvar® emulsion and kaolin alone to fill small holes and even out the surface. The whole area was finish-sanded to smoothness with 600-grit carbide paper, being careful not to touch the original.

The filled areas were then inpainted with Magna® polymer paints, thinned with toluene and applied with an airbrush. The fills were inpainted a uniform brownish gray so as to remain easily visible. Since these polymer paints dry quite mat, the fills were varnished with a light coat of MS2B® varnish, 25% in petroleum benzene, to bring up the gloss.

The entire statue was then lightly cleaned and polished by rubbing with British Museum wax (available as Renaissance Wax® from Picreator Enterprises Ltd, London). The wax restored some sheen and life to the lower portion of the statue, especially the drapery which had been repainted a uniform gray at some time in the past. After completion of the restoration (Fig. 20), the statue was returned to exhibition in 1969, on a new, fitted base, and remained there in a stable condition until

fall, 1987, when it was moved for gallery renovation.

The restoration of this object was another case where the curator (in this instance, the late John A. Pope) and the conservator worked very closely together, and decisions were made jointly. We had thought of attempting to complete the earlobes and possibly the hands; I made a trip to the Metropolitan Museum, New York, in 1968 to measure and draw the extant earlobes on a similar sculpture. We decided that the repair to the bottom edge should be done first, and then we would decide whether any more compensation of missing areas would be done. We all felt that the statue looked much improved after the treatment described above and no more compensation should be attempted.

Along with the conservation treatment of the piece, some of the dull blue paint from the chest area was identified by R.J. Gettens as being azurite, and possibly original. This paint was left intact in our treatment. Also, a fragment of wood was removed from the inner end of the wooden core of the proper left arm for carbon-14 dating to determine the age of the sculpture. The wood appeared to Gettens to be *Cryptomeria*, a tree that grows to some age in the Orient. The carbon-14 date was reported as A.D. 510, somewhat earlier than the seventh eighth century date now given (Long 1965). This could be either because the wood came from the inner rings of a large tree or because of re-use of an old piece of wood. At least the possible Tang date has not been disproved.



Figure 20. The dry lacquer statue shown in Figure 18, after repair.

2. Japanese Heian or Fujiwara period dry lacquer statuette of a Bodhisattva (FGA #16.418; Figs. 21 and 22)

This statuette had been in the collection since 1916. It was extremely dirty and in somewhat bad repair when it was treated in 1961. It is 53.2 cm high and 40 cm wide, and was made in a dry lacquer technique similar to that of Tang statue discussed above. Figure 21 shows the statue before treatment. It was cleaned with detergent and water on cotton swabs, which removed most of the dirt. Since the black lacquer with gold surface under the dirt was very hard and compact, some of the more resistant dirt was abraded away using fine carborundum powder. Old repairs are evident in a number of places on the statue; the most visible is that on the proper left arm.

The large hole on the top of the proper right knee was filled with Japanese mulberry paper and polyvinyl acetate emulsion, probably Polyco 199®. A layer of paper was adhered from the inside first; it was then coated from the outside with the emulsion and allowed to dry. Inpainting was done with the same emulsion mixed with earth colors and whiting. Numerous other loose pieces of the lacquer (earlobes, one finger, etc.) were glued in place with the same emulsion. Figure 22 shows the statue after cleaning and filling the loss in the knee.

Figure 21. Fujiwara period Japanese dry lacquer statue of a Bodhisattva, Freer Gallery of Art #16.418, before cleaning and repair. Note hole in proper right knee. Figure 22. The statue shown in Figure 21, after repair and cleaning.





Figure 23. Late Zhou Chinese eared cup on stand, red and black lacquer, Freer Gallery of Art #49.1.

Figure 24. The interior of the eared cup shown in Figure 23, showing damage due to wood shrinkage at the center of the bowl.



3. Chinese Zhou dynasty stem cup (FGA #49.1; Figs. 23 and 24)

This cup, from the fifth–fourth century B.C., is also reported to have been found at Changsha (Freer 1972(112):177; Lawton 1982(134):181). It is 23.5 cm high and 17.9 cm wide. While the cup was in remarkably good condition, the shrinkage of the wood support had caused two problems.

First, the stem had become somewhat smaller than the base. Some unlacquered wood showed on the upper surface of the base where the cone-shaped base meets the stem, and the joint was loose and wobbly. The joint was secured by the injection of polyvinyl acetate emulsion (Jade 403[®]), thinned to a thick, creamy consistency with water. The object was allowed to set under its own weight; after a few minutes the excess emulsion which had extruded from the joint was removed with swabs moistened with distilled water. The cup was then allowed to set, undisturbed, for two hours. The areas of exposed wood and a few small losses around the outer edges of the base and the top were then inpainted with Magna[®] polymer colors thinned with toluene; a little Acryloid B-72[®] was added to the paint to increase its gloss so that it matched the original lacquer.

The second problem caused by wood shrinkage could be seen inside the bowl of the cup, where the horizontally-oriented wood of the bowl had shrunk with age, while the vertically-oriented wood of the stem had not, leaving an area at the center of the dragon raised above the rest of the surface. The lacquer in this area was stable; no loose cleavage was detected. A repair to make the lacquer at the center go back into the same plane as the lacquer in the rest of the bowl would have necessitated removing the lacquer and cutting down the wood of the stem, which would have been too drastic a treatment. We decided to leave this area alone for the present.

4. Chinese lacquered ewer, late Warring States-early Han periods, third century B.C. (FGA #49.22; Figs. 25–27).

This lacquer ewer is also supposed to have come from Changsha, according to a letter from J.H. Cox, dated 16 November 1949:

The Ch'ang-sha lacquer ewer...according to one of the eye-witnesses of the excavation, came from one of the deep-hafted water-filled tombs characteristic of the late Warring States period and Early Han Dynasty. In fact there still remain traces of the white preservative clay...Such clay occurred only in these deep-shafted tombs and never in the case of the brick tombs common in the Han Dynasty.

The ewer is 15.6 cm high, 30.7 cm long and 15.3 cm wide (Lawton 1982(138):189). The black lacquer lies directly over the carved wood, with a broken layer of brown lacquer over it. The handle was detached when we received the object.

A large area of repair could be seen at the bottom, where the inset for carving out the interior of the body probably existed. The repair in the bottom was camouflaged by applications of a medium brown lacquer, which was peeling and blistering in some places, as was the brown lacquer on the rest of the object.

Peeling lacquer (especially the brown) was reattached by using a small brush to run polyvinyl acetate emulsion (Polyco 199[®]) around the lifting edges. The handle was reattached with new walnut pins, using polyvinyl acetate emulsion as the adhesive. The old pins (one is shown in Figure 26, which also demonstrates the thinness of the original lacquer) had shrunk badly and seemed not to have much strength. One additional pin was added at the front for extra strength where the handle had shrunk and no longer fitted the contour of the body. The repaired ewer is shown in Figure 27.



Figure 25. Late Zhou Chinese ewer, lacquer over wood, Freer Gallery of Art #49.22, before repair.

Figure 26. Detail of the handle attachment in the top spout area, from the ewer shown in Figure 25.



Figure 27. The ewer shown in Figure 25, after repair.



Lead inlay problem

Lead inlays in Japanese lacquers have posed a continuing problem in our museum, and it is a problem that we should like to investigate more deeply. In a number of cases, white, powdery corrosion has formed on the surface of inlays while the objects were on display; one object had been put into a newly-constructed exhibition case, the subfloor of which was constructed of plywood. Since the predominant corrosion product on the surface was lead formate, we assume that the urea-formaldehyde glue in the plywood had emitted formaldehyde which transformed to formic acid and attacked the lead. Lead formate is soluble in hot water, so the formate could be removed from the surface of the lead. Underneath the spots of lead formate, the lead had pitted deeply; the pitting was compensated with wax (the normal filling mixture) darkened with graphite and thinned with petroleum benzine (ligroin). Within the pits, and on one other box, hydrocerussite was also detected. This may be due to transformation of the lead formate to lead carbonate by atmospheric carbon dioxide, and the exact mechanisms of corrosion of these lead inlays would be a good subject for future study. It is clear, however, that lacquer boxes with lead inlay should be kept in a suitable environment free of formates.

**Case histories:
Cleaning and
compensation**

1. Japanese Tokugawa lacquer chest, Namban style, Momoyama-Edo period, early seventeenth century (FGA #79.50; Figs. 28–29)

This chest, of imposing size (53.3 cm high, 106.3 cm long and 45.3 cm wide), is reputed to have been sent as a gift from the second Tokugawa Shogun to Urban VIII, the Barberini Pope (Christie, Manson, and Woods 1976). Its treatment was very long and involved, and only the cleaning and compensation will be mentioned here. The surface of the outside of the chest when received looked quite yellow (Fig. 28). Longwave ultraviolet fluorescence showed a light yellow fluorescence on all the outer surfaces. This led us to suspect that the chest had been varnished, and a sample of the surface coating which was submitted to the Smithsonian's Conservation-Analytical Laboratory showed that the outer coating was mainly shellac.

The shellac was removed by exposing it to alcohol compresses and then swabbing off the soft, gelled material with cotton swabs. Some spots of repaint were removed with acetone. The cleaning considerably brightened the chest, especially the mother-of-pearl (Fig. 29).

After cleaning, losses were filled with the usual wax filler mixture and pigments. Losses in the mother-of-pearl were filled with unpigmented wax, which matches the mother-of-pearl remarkably well. As a final treatment, the chest was waxed with Renaissance Wax® (British Museum wax mixture) to restore its gloss. After many months of work, the overall appearance of the chest was much improved.



Figure 28. Tokugawa period Japanese black lacquer chest with gold paint and mother-of-pearl inlay, Freer Gallery of Art #79.50, showing the condition upon receipt, with two baroque trestle supports.

Figure 29. One end of the chest shown in Figure 28, partially cleaned. The semicircular top and the upper left corner of the body have been cleaned.



**2. Chinese Song dynasty thirteenth century basketwork sacrificial box
(AMSG# S87.0373a,b; Figs. 30–33)**

An oblong lidded box with sides made of finely-woven basketry, this object stands 18.7 cm high. Other dimensions are: length 44.9 cm, width 19.7 cm (Lee 1971:101; Yonemura 1987:44–45). Losses in the lacquered surface had been filled with pigmented urushi during previous treatments; the old repairs had changed color and were quite visible (Fig. 32). The box was cleaned by our usual methods (Figs. 30 and 31). After cleaning, the old repairs were inpainted with acrylic polymer paints (Liquitex[®]), with gloss medium added to enhance the sheen. Inpainting made an especially dramatic difference at the corners, as can be seen in Figures 32 and 33. This inpainting can be easily removed with solvents, should the need arise.

Figure 30. Song dynasty Chinese red lacquer and basketwork sacrificial box with painted designs, Arthur M. Sackler Gallery #S87.0373a,b. Condition as received.



Figure 31. The box shown in Figure 30, after treatment.



Figure 32. One corner of the box shown in Figure 30, after cleaning but before inpainting.



Figure 33. The area shown in Figure 30, after inpainting.



Acknowledgments

Thanks are due to past and present members of the staff of the Freer Gallery of Art, the Arthur M. Sackler Gallery, and the Sackler Foundation. The past Directors, John A. Pope, Harold P. Stern, and Thomas Lawton were always encouraging in finding new and improved methods of treatment. Milo Beach, Acting Director of the Freer and Sackler Galleries, agreed to the publication of treatments of the objects under his care. Ann Yonemura, Assistant Curator of Japanese Art, assisted with helpful suggestions, and Takashi Sugiura, former Head of our Oriental Paintings Conservation Studio, helped in demonstrating Oriental lacquer restoration techniques.

Particular credit goes to the staff members of our Technical Laboratory. The late R.J. Gettens helped and encouraged me with the treatment of many of the pieces, notably 44–46; some of the treatment of this object (and a number of the other objects represented here) was done earlier by Elisabeth FitzHugh. Ilona V. Bene treated many of the pieces described here, including V37.72, 04.348, 16.418, and 79.50, the Namban chest, with which John Winter and Lynda Zycherman were also very involved. Jane Norman treated Sackler Gallery objects S87.0392, S87.0373a and b, and S87.0390a and b; Jane, Paul Jett, Stephen Koob, and I all worked on the inkstone box S87.0386a–pp. The skilled work, helpful advice, and excellent laboratory notes of all of them have made this paper possible.

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Some Thoughts about Conserving Urushi Art Objects in Japan, and an Example of Conservation Work

Kenichi Kitamura

Lacquer Artist and Restorer

The conservation of urushi art objects in Japan has two distinctive aspects. The first is that most urushi treasures have been restored, not by those who are specialists in conservation, but by those who are actually engaged in producing lacquerware using traditional techniques inherited from their masters. The second aspect is that experience acquired during the conservation of urushi art objects has revealed a great deal about both the techniques and the modes of artistic expression used in old urushi art objects.

In Japan today, outstanding urushi objects are designated cultural properties under the Cultural Properties Preservation Law. Conservation work is conducted under the guidance of the Agency for Cultural Affairs as part of a national program. As in the past, those who create urushi art objects are engaged in conservation. We have inherited traditions based on the foundations laid by our ancestors, but we must also try to develop new techniques for conservation by applying our knowledge of contemporary science.

This paper discusses problems that I have encountered and their solutions, together with a specific example from my experience.

Approach to conservation

It is our responsibility to recognize outstanding works by our predecessors and to hand down these cultural assets to future generations. We demonstrate this sense of responsibility in our methods of conservation and our approach to the management of cultural property during conservation work. We should attempt to learn from and to share both the spirit and the expertise of our predecessors, who created the urushi objects that we conserve.

We should try to preserve the object in its present condition and to determine what needs to be restored immediately and what should be left for future conservation work. First, we try to preserve the object in its present condition. Second, we try to determine what needs to be restored immediately; and, finally, we try to determine what should be left for future conservation work.

It is important to conduct extensive research prior to any conservation and to keep a complete record of conservation work. When deciding whether the present condition should be changed or not, we should never rely only on our personal judgment: Specialists should always be consulted.

Problems and solutions

Urushi objects are often so aged that they are on the verge of collapse. Therefore, a conservator is like a medical doctor who diagnoses his patient: He must judge

which parts should be treated and which should be left alone as well as select a method of treatment. Suppose an urushi object has a few small dents on its surface. A conservator must decide whether these dents were caused by contact with other objects, or whether they are traces of *raden* (shell inlay) or gold or silver *heidatsu* (applied metal foil) patterns that have peeled off. If the latter is the case, the dents should not be treated as scars and filled in, but should be left as they are.

In order to make proper judgments under such circumstances, a conservator needs to be completely knowledgeable about changes in modes of expression and techniques. Also, he should have a mastery not only of the techniques of conservation, but also of producing replicas based on academic study.

Prior to any conservation treatment, the condition of the object should be meticulously recorded in order to prevent possible misjudgments in future generations. During conservation, the construction of the substrate and the condition of the *urushi-shitaji* (ground) may be revealed in the damaged areas. Since these serve as important evidence for studying the techniques and materials of the period in which the object was made, the conservator should try to record the findings accurately and preserve undamaged areas whenever possible.

Optical analyses using x-rays, ultraviolet, etc., are essential when there is a need to investigate internal damage and materials that cannot be detected by the eye alone.

Occasionally, the object is restored to its original state, for example, when dirt on the surface seems likely to accelerate deterioration, or when the original urushi is obscured by past conservation work, provided that such measures are in the best interest of the object. Even if some measures seem harmless, it is necessary to ask for approval because the work may be interpreted as changing the current status of the object.

One of the most impressive lacquerware objects I have conserved is a *makie koto* (zither), a National Treasure kept at Kasuga Taisha (Fig. 1).

First, I moistened the surface using a soft brush dipped in lukewarm water. Then, I used soft Japanese tissue to remove the moisture by pressing gently. By cleaning in this way, designs that were dim became clearer. As a result, it became easier to study the *makie* technique and to determine the types of *makie-fun* (metal powders) that had been used. Unusually for this period, in addition to gold, blue-gold, and silver powders, copper powder had been used.

When objects are structurally unstable, lost parts should be replaced only after consulting specialists. New replacement parts must be recorded or have some engraved mark to identify them. To make a *shippi* (hide) box in the Shosoin (Fig. 2), raw leather was spread over the wooden form, then hardened by applying urushi, and removed from the form to make the substrate. As Figure 3 shows, nearly half the lid was lost before conservation. The ideal way to replace the lost parts would be to use the same material as in the original. But raw leather easily loses its shape and is highly unstable, so I decided to apply the *kanshitsu* technique, that is, linen cloth layered with *nori-urushi* (rice-paste and urushi), to repair this *shippi* (Fig. 4).

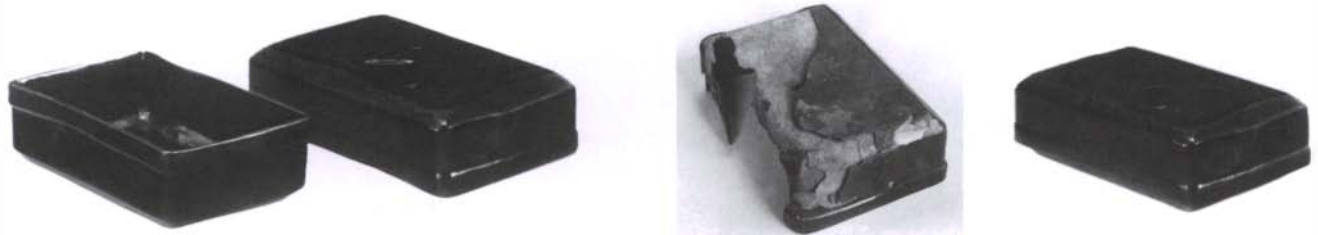


Figure 1. Makie koto (zither), Heian period, eleventh century.

Figure 2. Shippi (hide) box from the Shosoin.

Figure 3. The shippi box in Figure 2, before conservation. Nearly half the lid has been lost.

Figure 4. The shippi box in Figure 2 after restoration using the kanshitsu (dry lacquer) technique.



Urushi is not the only material used to make lacquer art objects. A variety of materials, such as dyed cloth and metal clasps, and many techniques are combined to make the object. This is why it requires careful attention to avoid changing the condition of an object by applying urushi to parts that need not be touched. Take, for example, a *makie tebako* (cosmetic box) equipped with *uchibari* (decorative cloth applied inside the box) and *himokanagu* (metal fittings for cords). The *uchibari* must be removed before conservation, in cooperation with specialists, in order to prevent it being stained by excess urushi. When the conservation work is over, the *uchibari* can be replaced in its original position with *urauchi* (*washi* paper applied to the back of the cloth for reinforcement). *Himokanagu* should also be removed when possible and put back after conservation. If they are not removable, they should be covered with paper to keep them free from excess urushi. Conservators should also be extremely careful when dealing with *mitsudae* (a kind of oil painting) or *kingin deie* (painting with fine silver and gold powder mixed with animal glue), which tend to darken if they come into contact with urushi.

It is most desirable to use high quality Japanese urushi for the restoration of lacquer art objects. But if the *shitaji* (ground) is *doroji*—an urushi substitute made of *nikawa* (animal glue) mixed with *gofun* (powdered shells) and *tonoko* (clay)—it is often difficult to restore using only urushi. It is also difficult to restore solely with urushi if the entire surface of the object is colored with a mixture of *nikawa* and pigment. In these cases, use of other approved materials should be considered with the guidance of conservation scientists.

With the basic principle of maintaining the present condition, it is customary not to do any repair even if there is damage to the decoration. If a case arises, however, in which repair is needed to balance the overall structure, the first step is to seek the approval of specialists. Then a study of the original technique and material can be started to determine which techniques and materials will be most similar to the original.

According to this principle, no “antiquing” or artificial *craquelure* should be added to urushi objects. If the restored parts do not match the original and need “antiquing” for purposes of continuity, this should be limited to those areas where it is absolutely necessary. In addition, only material that can be removed later should be used.

Some urushi objects repaired in the past have had “antiquing” or *craquelure* added artificially. Those with urushi *koshoku* (“old color”) and *danmon* (cracking) over the entire surface have lost their original appearance, because the painted urushi cannot be removed. Professional conservators should refrain from such repairs. Black urushi may turn brown as time elapses, so attention must be paid to the color of the repaired area. Once-matched color may become unmatched as the original color ages. A similar problem exists with *shu-urushi* (urushi colored with cinnabar) and other colored urushi. Since in-depth scientific studies of color changes have not yet been made, future research and study are awaited.

These thoughts are based on my personal experience and that of my seniors. Urushi art objects which require conservation show various kinds of damage and there is no single pattern of conservation. A conservator is always faced with contradictory problems. He must try to find the most suitable solutions and make decisions. He should never let dogmatism based only on experience dictate conservation. He must face the object with a modest attitude of exploration, and try to improve his own technique.

An example of conservation

Since 1982, I have conserved nineteen urushi art objects, made between the Sengoku period (Japan) and the Tang dynasty (China), which are kept at the Linden Museum in Stuttgart, West Germany. I went to the museum to meet Dr. Klaus J.

Brandt, head of the Oriental Department and in charge of conservation. We took pictures of the objects to be conserved, recorded their size and condition, and discussed conservation policy. After returning to Japan, I submitted a plan for the method, duration, place, and cost of conservation. I signed an agreement and started work on the objects. The conservation of one object, the lid of a *heidatsu gosu* (round box) is described here in detail (Fig. 5).

The conservation policy agreed upon was as follows:

- The present condition should be maintained by using urushi. Acrylic resin (Acryloid B-72®/Paraloid B-72®) can be considered for use only on the vermilion back of the lid.
- The exposed substrate can be left as it is as long as it does not cause any problem from the point of view of conservation.
- Fallen flakes should be returned to their original positions as long as these can be identified. Otherwise they should be put aside and kept as they are.
- Many points of similarity were found with four pieces of silver *heidatsu gosu* owned by the Shosoin (Fig. 6). The *gosu* owned by the Linden Museum can be restored to its original state using the Shosoin *gosu* as reference.
- The conservation process will be recorded.
- Conserved objects will be kept in double boxes made of paulownia wood.

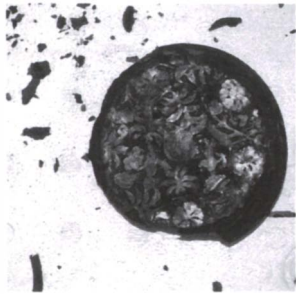


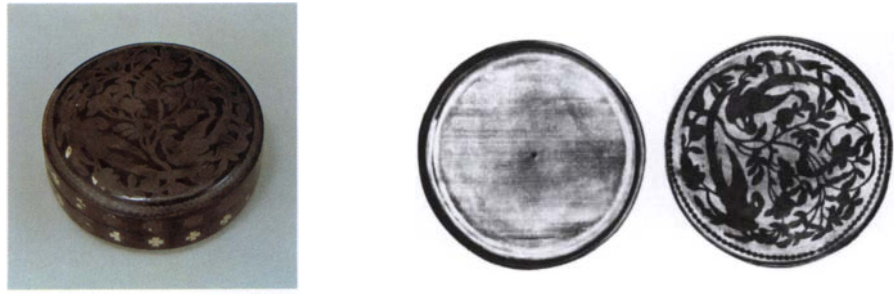
Figure 5. The lid of the *heidatsu gosu* (round box).

The condition before conservation was recorded. The box is 10 cm in diameter and 1.6 cm high. The substrate is a straight-grained round plate made of maple wood, about 2 mm thick, around which 1.5 mm strips of the same material are wound approximately seven times (Figs. 8,9). It is not clear whether this ring is made of seven concentric circles or one long strip wound in a coil. It has not been determined, either, if a *rokuro* (wheel) was used for winding. The height of the lid can be measured, although only a small part of the side remains. Both the substrate and the urushi layers are so deteriorated that it is almost impossible to handle them. The structure of the substrate can be observed because the urushi layers have peeled off from the back of the lid.

The *kyushitsu* (layer sequence) consists of fine linen cloth (fifteen threads per cm²) applied over the whole surface along the wood grain (Fig. 10). Over the thin *shitaji* (ground), black urushi is applied; the *uwanuri* (top coating) is *suki-urushi* (transparent urushi). The back of the lid consists of linen cloth, priming, black urushi, and vermilion *nikawa* (animal glue). The upper face of the lid is silver *heidatsu* (0.25 mm thick silver plate) with a design of small birds flying among trees and flowers (Fig. 11). At the center, three baby birds stretch their heads out of a nest, waiting for their parents to bring food. The fine lines of the picture suggest the skillful use of tools. The design is not made from a single sheet: silver sheets were joined together for the flower branches. Around the circumference of the lid a design called *renjumon* (a chain of round beads) is found. The sides of the lid have six-petaled flowers placed at regular intervals. In both cases, a semicircular chisel is believed to have been used to cut the designs in the silver plates. The worked silver sheets are a little higher than the surface of the surrounding urushi and there is no trace of the urushi surface having been polished with charcoal. These two facts suggest that the urushi over the silver sheet was carefully peeled off after the final coating. Parts of the silver sheets used for the *heidatsu* have become displaced because of the deformation of the substrate. Other parts have been lost together with the ground. Even the remaining parts are in danger of peeling off in the near future.

The structure of the substrate is the same as that of the silver *heidatsu gosu* in the Shosoin, which was x-rayed by Mr. Hoko Kimura (see Fig. 7). The design is also similar; the only difference is that this box is slightly smaller. The body of this

Figure 6. One of four silver heidatsu gosu in the Shosoin.
 Figure 7. X-radiograph of the heidatsu gosu in the Shosoin.



heidatsu gosu has been lost, but assuming that it was similar to the Shosoin *gosu*, it would have had the structure of an *inro* lid. The sides of the lost body would probably have had six-petaled flowers of silver *heidatsu* like those on the side of the lid.

Prior to conservation work, photographs were taken of the entire lid and of individual details, in order to record the state of damage. X-rays were also taken for comparison with the Shosoin treasures (Fig. 13).

Conservation work sometimes includes fumigation with methyl bromide gas. In this case this process was omitted since there was no trace of insect damage.

Consolidation by injecting urushi from outside was not enough because of the deterioration of both the substrate and the urushi layer. In any case, use of urushi proved to be impossible because the entire back of the lid was painted in vermilion animal glue. After much thought, I attempted to remove the urushi layer from the substrate. This was done successfully by carefully using a thin, stainless steel, dental spatula (Fig. 12). The pieces of the urushi layer were placed temporarily on a distribution diagram made previously, in order to prevent any mistake in repositioning them at a later stage of conservation.

The substrate of the lid and the back of the urushi layer that had been removed were then impregnated with urushi. Impregnation was done in several steps, starting with a 30% solution and gradually increasing the concentration. In order to

Figure 8. Diagram of the heidatsu gosu showing the construction.

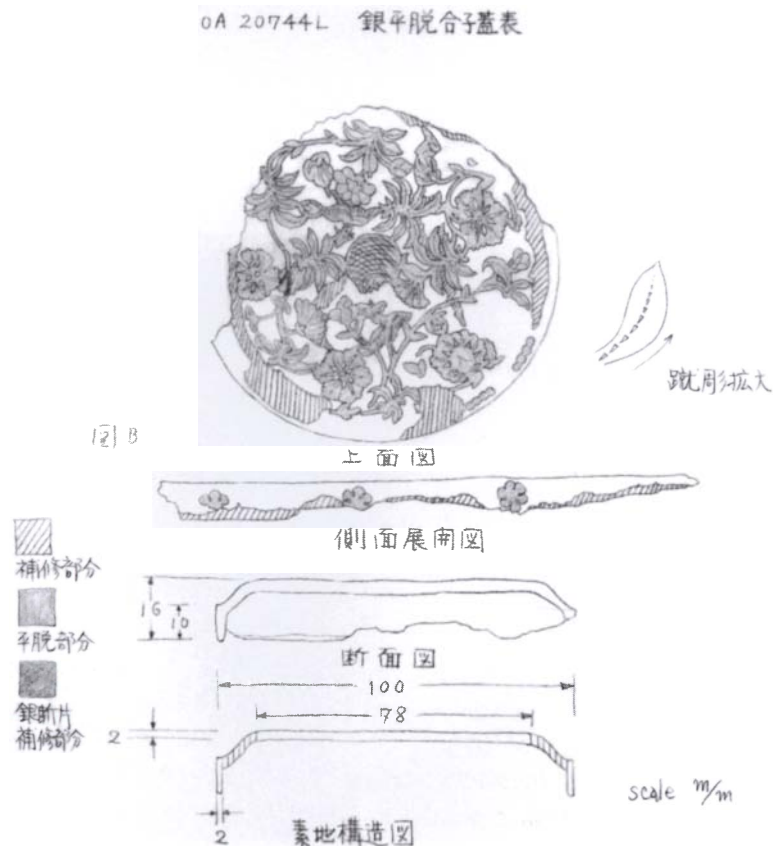




Figure 9. The substrate of the replica of the heidatsu gosu showing the method of construction.

Figure 10. A fine linen cloth is applied along the grain of the wood.



Figure 11. The upper face of the lid showing the heidatsu design of birds, trees, and flowers.



Figure 12. The urushi layer was removed from the substrate using a dental spatula.



Figure 13. X-radiograph of the lid of the heidatsu gosu from the Linden Museum.



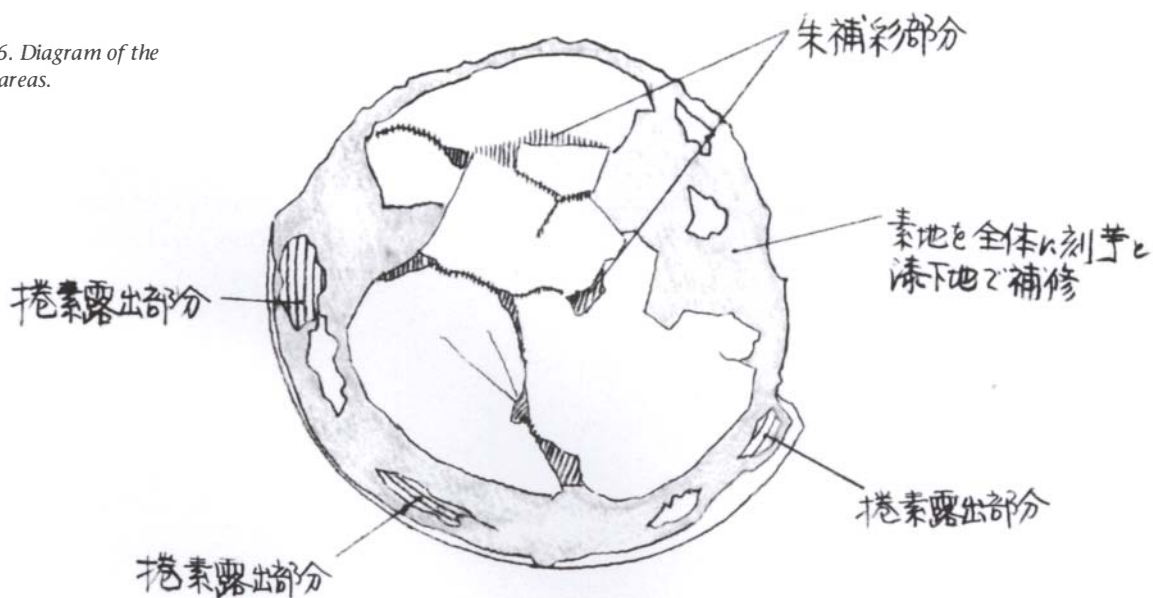
Figure 14. Photograph of the completely restored heidatsu gosu taken for record purposes.



Figure 15. The replica of the heidatsu gosu made for the Linden Museum.



Figure 16. Diagram of the restored areas.



prevent warping of the urushi layers as they hardened, they were kept under pressure. Raw urushi was injected into the cracks on the face of the lid.

Mugi-urushi (urushi with adhesive properties made of wheat, rice paste, water, and raw urushi) was used to adhere the urushi layer in its original position. *Kokuso* (made of *mugi-urushi* mixed with burnt linen fiber and wood powder) was used to fill holes in the substrate and large cracks, using a bamboo or metal spatula; the *kokuso* surface was smoothed with a graver.

Kiriko, made of *jinoko*, *tonoko*, water, and raw urushi, was applied over the *kokuso* with a spatula. Then the surface was polished, varying the size of stone according to the areas of *jitsuke*, and the *kiriko* was “set” by impregnation with raw urushi.

Sabitsuke (*sabi* coating) was done by applying a mixture of *tonoko* and water to the *kiriko* base with a spatula. *Sabitogi* (polishing of the surface) was carried out using a stone which has a slightly coarser grain than that used for *kiriko*. *Sabidome* (fixing) was done by impregnation with raw urushi.

Depending on the size and position of the area to be painted, either a *makie-fude* or a *jinuri* brush was used to apply black urushi to form a base coat. The *shitanuri* (base coat) was polished using *togizumi* (charcoal) and water. Intermediate coating (*nakanuri*) was applied like the base coat, and polished in the same way. *Suki-urushi* (transparent urushi) was applied with an *uwanuri* brush as a top coat. The vermilion areas on the back of the lid were consolidated by applying a solution of acrylic resin (Acryloid B-72[®]/Paraloid B-72[®]).

The entire tone was adjusted. Because urushi newly applied on restored areas often stands out, it needs to be toned down for balance. A vermilion color similar to the original was applied over the cracks on the back of the lid.

Photographs were taken and records were made of the completely conserved object (Fig. 14). Diagrams were drawn to indicate restored areas (Fig. 16).

In order to prevent sudden changes in the environment, I made special paulownia wood boxes for storage. It is important to avoid low relative humidity.

I also made a complete replica of the original box, based on the information gained about the substrate and techniques of manufacture, which was sent to the museum with the restored object (Fig. 15).

Conclusion

This was the first time that I had been involved in an international conservation project. Sometimes I was troubled by the unfamiliar paperwork and the need to balance different opinions which were rooted in different cultures and traditions. Still, the conservation work was completed successfully thanks to Dr. Klaus J. Brandt, Professor Motoo Yoshimura of Kansei Gakuin University who introduced this project to me, Ms. Toshie Nakajima who did the conservation work on objects after the Meiji period, and many other supporters.

Apprenticeship and Conservation

Susanne Barchalia

The Royal Danish National Museum

Apprenticeship is a fairly common form of education in Denmark. It is still quite normal for a young person to make a contract with an older master in order to learn the particulars of a specific trade. I myself served an apprenticeship in a silversmith's workshop, so the idea of submission to a craft training was not entirely foreign to me. After four years of training as a silversmith, I was accepted by the Conservation School of The Royal Danish Academy of Fine Arts, where I trained as a conservator.

I wanted to become an apprentice again to specialize in the conservation of lacquer. The National Museum of Denmark's Department of Ethnography has a large collection of east Asian lacquer. Some of these objects were in a very poor state of preservation, so the Museum wanted a conservator to have an advanced education in Japan and then return to take care of the treatment of these objects.

As a result of the introductions of various people, a Japanese master lacquerer invited me to stay and work for a year at his workshop in the northern part of Kyoto (Fig. 1). To be taught the traditional skills of a Japanese lacquer workshop, it is very important to have recommendations from people whom the master trusts.

Figure 1. A traditional lacquer workshop in Japan.



In Japan it takes eight to ten years of apprenticeship to attain the level of a traditional master artisan. A Japanese master willing to pass on his knowledge will not accept a student whose mind is prejudiced. The openmindedness shown by the master demands a similar openness from the student, who must be willing to receive the teachings of the master without reservation.

It is usually very difficult for a Westerner to understand this total submission because we are used to learning from a critical dialogue between equals, whereas in Japan one looks, listens, and learns. So, obviously, one has to change one's behavior totally and try to achieve the reticence expected if one wishes to acquire any knowledge from a Japanese master.

My purpose was not to learn lacquer technique from the beginning, but to be taught the basic principles of lacquering in order to apply them in my daily work as a conservator. At the workshop I was introduced to techniques that had been developed by the masters over the past seven generations.

Almost all craft traditions in the world are based on knowledge that is crucial in making the works of a particular workshop a specialty. Likewise, all crafts have their own technical language, which is almost impossible to learn except through practical work. Getting to know this language is an important part of the education; it works as a kind of code or guarantee between people of the same trade.



Figure 2. Sample boards showing steps in the process of lacquering, from the basic shape (top left) to the finished product (bottom right).

The process of lacquering

The lacquer master had already planned a course of practical work for me before I arrived. His wood-turner had prepared a number of basic objects in Japanese cypress (*hinoki*) on which I was able to practice, in a simplified manner, the traditional lacquer process.

The process of lacquering can be divided into two phases: the treatment of the basic shape and the coating.

Before the grounding begins, one has to produce wood spatulas and polishing stones suited to the basic shape. The spatulas are cut with a knife from pieces of *hinoki*. Pumice stone is used for polishing.

An illustration of the lacquering process I practiced on rectangular pieces of *hinoki* is shown in Figure 2. The same process is used for objects of very different appearance and size, such as boxes, bowls, trays, and furniture.

The grounding of the basic shape

If the basic shape is fairly thick, as in this case (0.5 cm), the object will shrink and expand too much with changes in climate. To avoid this, the wood-turner makes a jointed construction designed to reduce this effect. Then the ground layer is applied with a spatula. It consists of different sorts of pulverized clay together with lacquer and water. When this layer is dry, after approximately twenty-four hours, the shape is polished with water and pumice stone. The second coating of the ground layer is the same as the first and is also polished.

When the process of grounding is finished, the coating of the lacquer can begin. The lacquer is hardened for eight to ten hours in a humidity chamber with a relative humidity above 90%.

As the grounding material consists of lacquer mixed with clay and water, it does not require high humidity to harden, but hardens under ordinary conditions.

Before the final layer of lacquer is applied, the workshop is given a thorough cleaning to remove dirt and dust. The lacquer, which is of very high quality, is filtered through fine layers of rice paper until no impurity remains.

Decoration

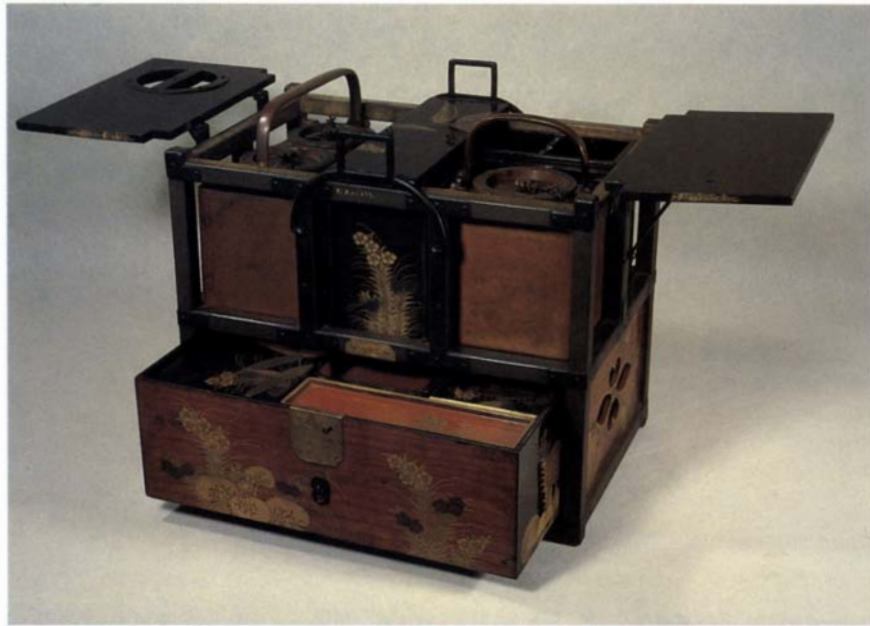
A Japanese lacquer workshop is usually divided into two parts: one for the process of lacquering and one in which the work of decoration is done. Here the lacquer master's wife instructed me in the three most common methods of decoration: flat decoration (*hiramakie*), relief decoration (*takamakie*), and decoration below the surface (*togidashimakie*). *Makie* means "sprinkled picture." Metal powder is sprinkled through a bamboo straw onto a wet lacquer base. The metal powders used for *makie* are usually gold and silver, which are sold in many grades and shades of color (blue, yellow, red, black, etc.).

I finished my stay at the workshop by practicing my newly learned skills on twenty-five serving trays.

The purpose of the lacquer workshop

Part of the collection of Japanese lacquerware at the National Museum of Denmark can be traced back to the establishment of the Royal Cabinet of Curiosities (Det Kongelige Kunstkammer), which was organized in 1650 by King Frederick III. These approximately one hundred objects are now the nucleus of a fairly large ethnographical collection. Today the Japanese collection contains approximately 3500 objects, most of which can be traced back to the nineteenth and first part of the twentieth centuries. The objects are mostly works made for export (Fig. 3).

Figure 3. A picnic set from the Danish National Museum (no. EAC 133), late seventeenth or early eighteenth century.



The state of preservation of the collection varies considerably, from intact objects to very deteriorated and porous materials. Very few objects in the collection had been treated before. The main causes of deterioration were:

1. Changes in climate, which meant that objects with thick wooden substrates, such as export lacquers, had changed in volume. This resulted in cracks in the wooden base and in the flaking off of the lacquer layer.
2. Ultraviolet from sunlight or from lighting in the exhibition cases.
3. Fingerprints, dirt, dust, wrong polishing materials, etc., which had left the surfaces of many objects open to deterioration.

Establishing the lacquer workshop

It has always been a basic principle at the National Museum of Denmark to treat and preserve objects in accordance with their original materials and their nature. The museum made premises available to me in Brede, just outside Copenhagen, where I established a workshop according to European traditions, but using materials imported from Japan.

Building up a lacquer workshop does not require vast financial resources. The difficulties were centered on creating a workshop that would be able to cope with any task, at any time, of whatever character. In Japan, the changing climate of the seasons is used as an important part of the lacquering process. In the dry winter season the process of grounding is done, while the last layers of lacquer are applied during the humid periods. Naturally, such considerations are not possible in a museum context, where exhibitions and loans to other museums are often arranged at very short notice.

The workshop is equipped with a humidifier so that the climate can always be adjusted according to the steps in the process of treating the objects. In order to dry, the lacquer has to go through a chemical process: hardening. Urushiol, which is the main constituent of lacquer, absorbs oxygen when changing from a fluid to a solid state. This process must be even and slow and take place in a humid atmosphere.

For this purpose a humidity chamber is used, which is a wooden box with a pair of detachable sliding doors. The best type of wood for such a humidity chamber is *hinoki*, Japanese cypress, because this type of wood both absorbs and emits moisture, without changing its characteristics. This is necessary for the hardening process. *Hinoki* is very expensive and can be difficult to find in Europe; a conifer, pine, or spruce, may be used as a substitute. The humidity chamber has to be wetted regularly with water in order to maintain the relative humidity permanently above 90%. The climate outside determines how many times the cabinet has to be moistened. The humidifier is therefore a very useful piece of equipment during dry periods.

The ideal surrounding is a south-facing room with good light and a wood floor, which can help to maintain the correct humidity. The environment should be free from dirt and dust.

The materials and tools used in the lacquering process are not available in Europe. As these things cannot be ordered through any stores, contacts with Japanese suppliers are very important. Contacts with suppliers of top-grade products are usually made through the master.

Some of the tools I use I make myself, for example, the wood spatulas for the grounding processes. The brushes for laying down paint flakes, lacquering, and decoration should be very robust and made of hair, either rat, rabbit, or human. In Japan there are workshops that specialize in making brushes for various crafts.

Concurrent with the establishment of the lacquer workshop, the exhibition and storage conditions for the Museum's collection were improved. Each exhibition case is equipped with a humidifier and a thermohygrograph; the relative humidity is controlled at 55–60% and the fluorescent lighting does not exceed 150 lux. Objects hitherto stored in antiquated conditions are now in a new, air-conditioned, dark storeroom.

A treatment process in the Japanese tradition

In order to gain some knowledge of conservation and restoration methods relating to Japanese lacquer, I visited several museum workshops in Japan. I spent the most time at the National Museum in Tokyo where the head conservator and lacquer master explained the basic principles for treating Japanese lacquers, such as fixing loose layers, mixing filling material and grounding, surface cleaning methods, and treatment of damaged surfaces. I have chosen to describe a standard treatment process for a Japanese lacquer object that is representative of the type of problems I encounter.

1. The object is documented by means of photographs, x-radiography, and infrared photography.

2. If possible, samples are taken for cross sections to permit examination of the ground and lacquer layers.

3. Flaking in the color layer is fixed with a mixture of *kiurushi* (unrefined lacquer) and ligroin (petroleum benzene, BP 80–110°C). The process of readhering flakes begins with a weak solution of *kiurushi* in ligroin and finishes with 100% *kiurushi*. After each operation the object is put into a humidity chamber for between one and three days.

4. Small cracks, insect attack and other typical damage to the wood base are improved with *kokuso*, which is a mixture of urushi, rice paste, cotton fibers, flour, and sawdust. A larger crack can, depending on the stability of the object, be filled with new wood, strengthened with paper or cloth, and then built up with the same number of ground and lacquer layers as the original.

5. The ground layers, which normally consist of urushi, clay, and water, can be porous and powdery. This may be due to insufficient urushi or to the use of animal (pig's) blood as a substitute for urushi. This condition can be stabilized with *kiurushi* and ligroin.

6. When flakes in the ground and color layers have been readhered, missing areas can be built up with the same layers of grounding as in the original, rubbing down between layers. The ground material, *sabi*, consists of clay (for example, ceramic clay fired at 800°C), urushi, and water. Each ground layer must dry for about twenty-four hours at room temperature, and then be polished with pumice and water.

7. To seal the surface, urushi is rubbed in.

8. After the grounding process is completed the lacquer used can have many different qualities and colors. The black lacquer (*roiro*) that I import is colored with iron oxide powder (Fe_3O_4). Red lacquer can be bought in many shades. I color raw lacquer myself with cinnabar because the lacquer often changes color during hardening, becoming darker. This can be corrected if one mixes the materials oneself.

9. When the lacquer layer has hardened in the humidity chamber (after eight to ten hours), it is polished with charcoal and water. I use charcoal from *hinoki*. The annual rings in the wood should be as close together as possible; if the gap between the rings is too large, the result is a porous material that can cause "stripes" in the polishing.

10. Through the years, many lacquer surfaces have lost the depth and luster that are so characteristic of Japanese lacquerwork. In the past shellac was used to revive this effect but, as Japanese urushi generally does not harden if European materials are present, it is necessary to remove them before conservation with solvents that do not damage the original lacquer. Dirt and dust can be removed with ligroin. Degraded surfaces can, after cleaning, be revived with *kiurushi*, which is rubbed into the surface and then hardened in the humidity chamber. The treatment is continued until the desired surface effect is achieved. Old fingerprints can be removed in the same manner.

11. Decorations, either *makie* or inlays of mother-of-pearl, bone, metal, etc., are rarely dealt with in my workshop.

Dry Lacquer Statues of Japan

Kyotaro Nishikawa

Tokyo National Museum



Figure 1. Gobju (one of the eight supernatural guardians of Buddha), Kofukuji temple, Nara. Because the lower part has been lost, the technique can be observed in detail. The hemp cloth layers, the thickness of kokuso-urushi and many other points can be studied.

Today, the word *urushi* brings to mind delicate, beautiful, lustrous, compact works of art. In the past, however, *urushi* techniques have also produced huge and dramatically impressive works of art: dry lacquer statues.

In the middle of the sixth century, Buddhism was introduced to Japan from the Korean peninsula. Over several decades, the religion took root and many temples were erected to house Buddhist images. Together with Shintoism, the traditional religion of Japan, Buddhism began to play an important role in Japanese history.

At first, Buddhist images were made of gilt bronze or wood. But in the seventh century, two new techniques were introduced from China: *kanshitsu* (a dry lacquer technique) and *sozo* (a clay statue technique). Many dry lacquer statues were made between the eighth century and the beginning of the ninth century. Today, many works of that period can be seen in the Nara area. Because then, as now, *urushi* was an extremely expensive material, dry lacquer statues were made mostly for large temples in and near the capital.

According to an eighth century record, the statues of the four Deva kings erected in Daianji temple in Nara in the middle of the seventh century were created in dry lacquer. This is the earliest record of complete dry lacquer statues. However, extant wooden statues, such as the *Kudara Kannon* in Horyuji temple, which were made in an earlier period, used dry lacquer for partial surface modeling. This indicates that the technique was in use before the seventh century.

Among extant dry lacquer statues made by the beginning of the ninth century, seventeen are designated as National Treasures and thirty-one are designated as Important Cultural Properties. These are all highly important works in the history of Japanese statuary and are under the protection of the Japanese government.

Figure 2a. Sharihotsu (one of the ten great disciples of Buddha), Kofukuji temple, Nara, height 1.55 m, hollow dry lacquer, polychromed, A.D. 734.

Stages in the construction of the statue of Sharihotsu.

Figure 2b. The basic framework (W) is made and clay (M) is put on as modeling.

Figure 2c. Hemp cloth layers (LL) are applied using urushi.

Figure 2d. The back of the statue is cut open to remove the clay, leaving the interior hollow (E), and kokuso-urushi (K) is applied as surface modeling.

Figure 2e. Cross section of the finished statue.

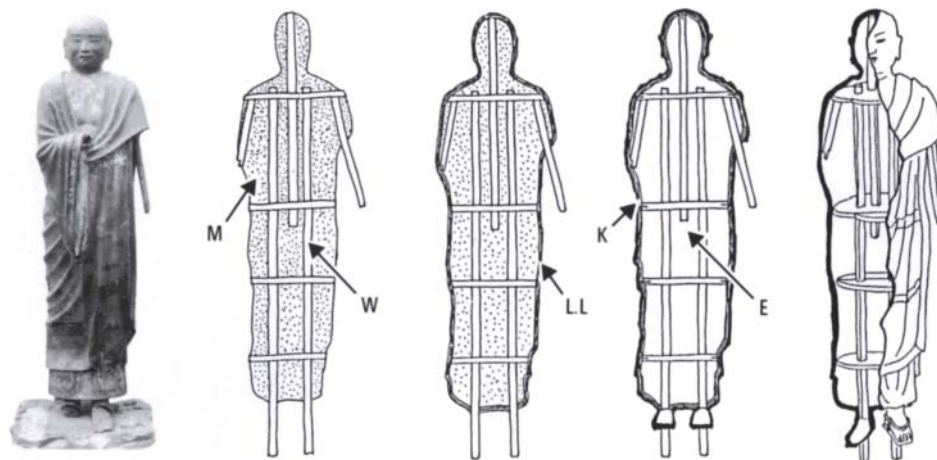


Figure 3a. Ashura (one of the eight supernatural guardians of Buddha), Kofukuji temple, Nara, height 1.6 m, hollow dry lacquer, polychromed, A.D. 734.

Figure 3b. Diagram of the internal framework of the statue of Ashura.

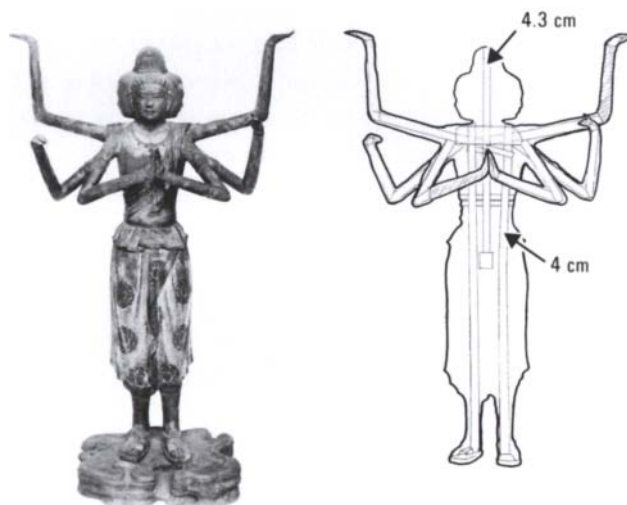


Figure 4. Amoghapaśa, Hokkedo hall of Todaiji temple, Nara, height 6.33 m (the largest standing dry lacquer statue), hollow dry lacquer, gold leaf pasted on, eighth century.



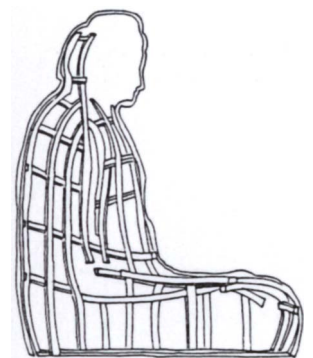
Figure 5a. Zochoten (one of the four Deva kings).
 Figure 5b. The internal framework of the statue of Zochoten.



Figure 6a. Tamonten (one of the four Deva kings), Hokkedo hall of Todaiji temple, Nara, height 3.1 m, hollow dry lacquer, polychromed, eighth century.
 Figure 6b. The internal framework of the statue of Tamonten.



Figure 7a. Bhaisajyaguru, Saiendo hall of Horyuji temple, Nara, height 2.5 m, hollow dry lacquer, gold leaf pasted on, second half of eighth century.
 Figure 7b. The internal framework of the statue of Bhaisajyaguru.



Two dry lacquer techniques

Dakkatsu kanshitsu (*hollow dry lacquer; Figures 1-7*)

1. A simple framework is made using wooden poles. Clay is put over the framework to make a rough form. Then the structure is dried.
2. Over the dried structure, three to ten layers of hemp cloth (similar to canvas used in Western oil painting) are pasted, using urushi. After each layer, the structure is dried.
3. A rectangular opening is cut into the back of the layered structure, through which the clay and wooden framework are removed. Then, to strengthen the assembly, a wooden frame is inserted in the hollow statue and the opening is sewn up with hemp thread. In some cases, only the clay is removed and the wooden poles are left to form the inner frame.
4. Wooden arms and feet are attached to the inner wooden frame. Iron wires are used to form the core of details, such as ears and fingers. For veins on the face of the statue, hemp string is pasted on, and thin wooden boards are used as a core for fragile parts of the garments.
5. Over the surface of this basic form, *kokuso-urushi* (a paste of kneaded urushi, incense powder, clay powder, sawdust, and sometimes hemp fiber) is applied and modeled.
6. There are two choices for the final finish: either gold leaf is pasted over a black urushi coating or various mineral pigments mixed with a thin solution of animal glue are painted over a *hakudo* coating (white clay mixed with a thin solution of animal glue).



Figure 8. Head of Buddha, Toshodaiji temple, Nara, height 81.5 cm, wood-core dry lacquer, late eighth century. The area where the *kokuso-urushi* layer has come off clearly shows the wood-core surface. This example shows that the details of the eyes were not carved.

Mokushin kanshitsu (*wood-core dry lacquer; Figures 8-10*)

1. A rough shape is carved from wood, usually Japanese cypress. Carving is done either from a single block of wood or from several blocks put together. In many cases the inside of the block is hollowed out, to prevent cracking during drying.
2. Over this carved wooden statue, *kokuso-urushi* is thickly applied as modeling. For details, iron wire is used as in the hollow dry lacquer technique, Step 4, above.
3. The application of the final finishing follows the process of the hollow dry lacquer technique, Step 6, above.

Kokuso-urushi

Since *kokuso-urushi* is a high quality modeling material, it was used even after the ninth century when dry lacquer statues were no longer made. Even today *kokuso-urushi* is used to compensate for errors in carving or as a filling for joints or knots in wood. Urushi itself was often used as a ground coating material and also serves as an important bonding agent for timber composites in carved wood statues. Until the nineteenth century, urushi and *kokuso-urushi* were important materials in the history of Japanese sculpture.

The use of urushi and *kokuso-urushi* as modeling materials made it possible to create statues with balanced style and delicate surfaces. The style itself followed that of the Tang dynasty and thus exhibits realistic, classical, and sophisticated beauty. Although the dry lacquer technique originated in China, most of the remaining works are in Japan.

Figure 9a. Ekadasamukha (eleven-headed Kannon), Shorinji temple, Nara, height 2.1 m, wood-core dry lacquer, gold leaf pasted on, end of the eighth century. Stages in the construction of the statue of Ekadasamukha.

Figure 9b. Main wood block (A), arms (B and C), and blocks used for the hanging draperies on each side (D and E).

Figure 9c. The rough shape is carved, with a window (a) through which the interior of block (A) is hollowed out; a square wooden block (F) is joined on for the feet.

Figure 9d. Kokuso-urushi (G) is applied to the surface.

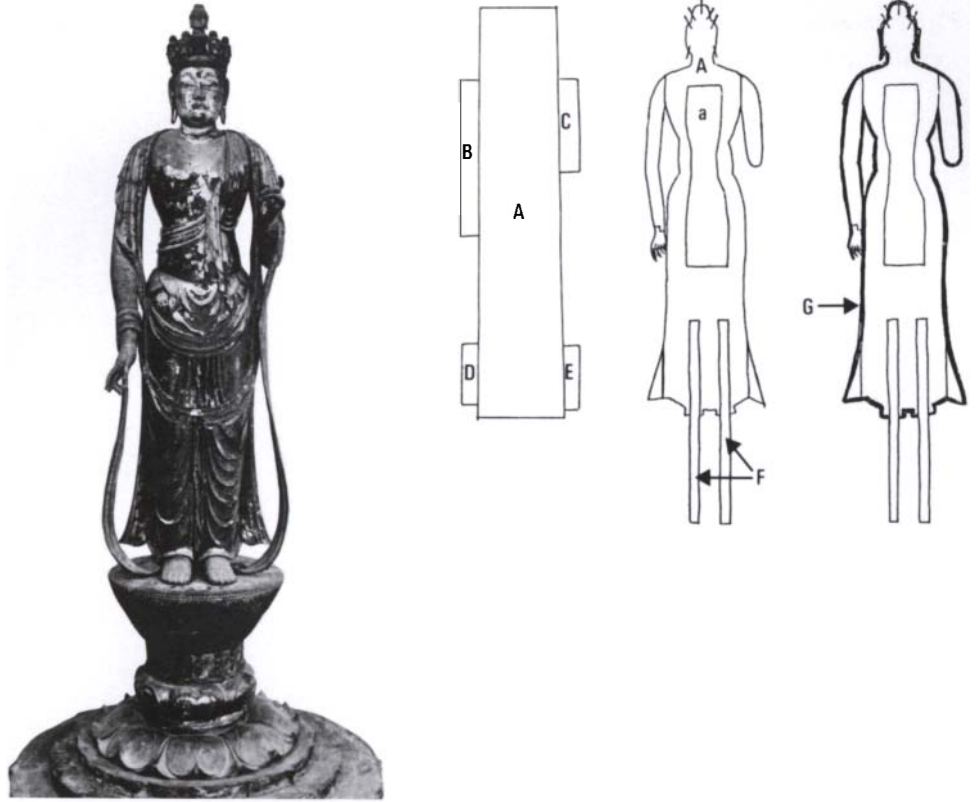
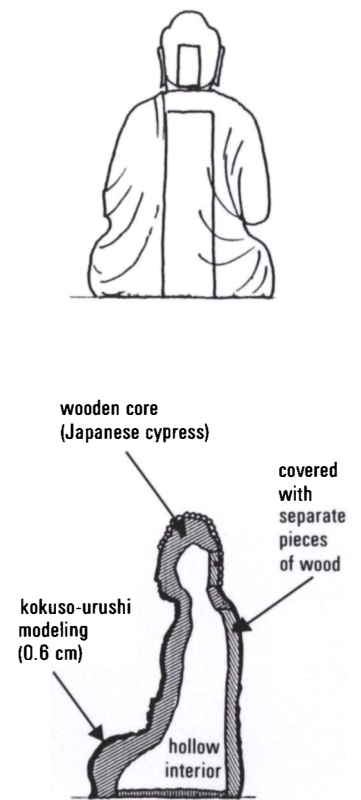


Figure 10a. Shakamuni, Saidaiji temple, Nara, height 70.8 cm, wood-core dry lacquer, gold leaf pasted on, late eighth century.

Figures 10b and 10c. The statue of Shakamuni showing the wood-core construction.



Chinese Lacquer

Alena Skálová

Private Conservator

The application of natural lacquer is one of the oldest techniques in Chinese craftsmanship. It is one of the techniques that influenced the characteristic features of fine art not only in China itself but in the Far East in general.

Lacquer is made from the sap of the *qi shu* (lacquer tree, *Rhus verniciflua*), cultivated in central and southern China. Originally, it was probably used to reinforce implements and utensils and to glue parts together. For these purposes the sap was used in its natural form, in the cold state. In the course of time, however, the properties of hot processed lacquer came to be used to decorate objects made of other materials. Finally, implements and utensils were made of lacquer. This lacquerware served ceremonial (or ritual) purposes, and it was used in everyday life by the upper classes of Chinese society. Here, the decorative possibilities of the medium were developed to their full potential.

The characteristic properties of lacquer—durability and workability—were utilized for various purposes. Its strength and durability provided an excellent protection for the materials used as a base, such as wood and metal, against the effects of weather or insects. Its workability made possible grinding; polishing; carving in deep and shallow relief; coloring first with black and red dye, and later with other colors; layering in various thicknesses; and inlaying with various materials.

Characteristic of the Neolithic period is the black earthenware found in Wujiang, Jiangsu province and in Yüyao, Zhejiang province, decorated with material similar to lacquer. Vessels made from lacquer alone have been found in excavations dating from the sixteenth to fourteenth centuries B.C. (Shang dynasty). During the first millennium B.C. the range of lacquerware objects increased as new decorative techniques were introduced, for example, inlaying with precious stones, or wood (*xiang qian*), or mother-of-pearl (*luo tian*). This last technique underwent a complicated development. While the oldest specimens (Western Zhou period, tenth to eighth centuries B.C.) consist of thick layers of lacquer inlaid with entire cubes of mother-of-pearl, products characteristic of later periods are very delicate: thin layers of lacquer are inlaid with finely cut slices of mother-of-pearl and polished to a glossy luster. Very often mother-of-pearl of different colors was used for an artistic effect. Later on, another technique was developed: applied decoration with gold and silver, both sheets and pieces of wire. After the fourteenth century A.D. (Ming and Qing dynasties) applied decoration alone was rarely used; more often it was combined with inlaid mother-of-pearl. This combined technique, which was at first used only to decorate the backs of mirrors, gradually developed into an independent form of decoration.

Applied decoration combined with inlay is very similar to the technique of incised decoration filled with gold (*qiangjin*) or silver (*qiangyin*) where the motifs used for decoration such as landscapes, figurative scenes, etc., conform to the spirit of Tang paintings.

Sometime around the fourth century A.D. a new technique called dry lacquer (*tuo dai qi*) arose. The center for dry lacquer under the Tang dynasty (A.D. 618–907) was in Sichuan. To manufacture dry lacquerware, a piece of cloth is fixed to a clay or earthenware core over which layers of lacquer are applied. Thus the completed product is very light. This method was mainly used for making bowls, cups, trays, toilet boxes, vases, etc. But during the third to fifth centuries A.D. an earlier version of this technique was used to make Buddhist statues.

Another widespread technique was carving in lacquer (*diao qi*). In this method, many layers of lacquer (from thirty-eight to over two hundred) were applied to a substrate of wood or metal. The lacquer was then carved in either deep or shallow relief. Typically in the Ming period, the whole surface was ornamented with motifs of flowers and fruits. The technique evolved into complicated pictorial compositions of landscapes, architecture, and figurative scenes.

A variation of the carved lacquer technique is through-cut lacquer (*tixi*). Layers of lacquer of different colors, at first black and red, and later also other colors, were applied successively. The decoration was then carved, uncovering the individual layers according to a deliberate pattern. The oldest known specimen of this technique is a fan handle from the Southern Song dynasty (thirteenth century A.D.). This technique probably evolved from the manufacture of long leather shields during the Tang period and the epoch of the Five Dynasties (A.D. 907–960). The cores of these shields were formed of leather (most frequently camel leather) over which seven alternating layers of black and red lacquer were applied. The decoration was created by uncovering the individual layers to form the desired pattern. This technique reached perfection in the latter half of the Song dynasty.

Besides the traditional decorative techniques, whose variety can hardly be treated in detail in this brief introduction, there is another combined technique that has no Chinese name. In the West it is known as “Coromandel lacquer,” after the part of the Indian coast from which it was shipped. Coromandel pieces were made chiefly for export and the oldest known specimens date from the late seventeenth century (the Kangxi period). This technique, combining carving, lacquer, and polychromy, was used in south China in workshops producing some small toilet boxes and similar minor items, but mainly large pieces of furniture: tables, dressers, wardrobes, cabinets, and, especially, screens.

Generally, a screen has an even number of panels (four, six, eight, or twelve) 177 to 275 cm high. Both sides are usually decorated. As a rule, the front has figurative scenes while the reverse bears motifs of flowers, birds, or cultural objects. I should like to emphasize here the artistic qualities of Coromandel lacquer and its connection with painting in colored ink. The contour lines of each motif, not only the general outline, but also the details of attire, features of faces, etc., were cut into the surface layer of black lacquer. Thus, the fine black lines of the lacquer, combined with the polychromy of the exposed underlying layer, resemble a fine ink painting, in a different and more durable medium.

In China today there are three principal places where lacquerware is produced. Beijing is the center of lacquer carving. Fuzhou in Fujian is the center of lacquer painting, especially of modern techniques using multicolored lacquer, gold dust, and applied decoration with mother-of-pearl and eggshell, and this technique is slowly growing into a new medium of modern painting. Finally, Sichuan remains the traditional center of dry lacquer manufacture.

As an epilogue to this introduction, I would like to point out that the qualities of genuine Far Eastern lacquer contribute to the overall artistic quality and aesthetic effect and do not change in the course of time, unless treated unsuitably or damaged. They cannot be replaced by other materials or different technologies.

Restoration of a Chinese screen

After study at the Tokyo National Research Institute of Cultural Properties, followed by ten years of practice in Europe, I was given the job of restoring a Chinese screen.

This screen is in the collection of the Residenz Museum in Munich. It dates from the Kangxi era (1662–1722) and consists of ten panels, each 184 cm high and 47 cm wide, decorated with carvings in lacquer depicting fantastic landscapes painted in the Tang style. There are mountains, and lakes with boats floating on them. Architecture is represented by pavilions, studios, and ornamental bridges. Figurative scenes show the lives of intellectuals.

At the edge of each panel of the screen there are borders with a design of “fortunate” motifs and objects. The first border from the center contains stylized flowers: lotuses and tendrils. There follows a wide band of cult objects: vases, fumigators, vessels with offerings, symbols of immortality such as Buddha’s hand and the mushrooms of immortality, musical instruments, the mythical three-legged frog, coins, fans, palm leaves, and gongs. In the third marginal band there are flying cranes in colorful clouds, also a symbol of immortality.

When I was given the job of restoration, the screen had already been repaired several times. The first repair was done in the traditional way with original materials, probably in China. This repair can be detected only by minor changes in the color of the lacquer covering the repaired area.

In the second and third repairs, European materials were substituted for the original Chinese ones. The areas where the black lacquer was damaged had been filled with chalk combined with glue. After polishing, the surface had been coated with black oil paint. These repairs respected the form of the original lacquer carvings.

For the fourth repair, red wax had been used to fill chips, large cracks, and irregularities in the lacquer caused by the warping of the wood. This red wax covered not only the damaged areas but also the surface of the lacquer around them, so that the sharp contours of the relief were obscured. Indeed, in some places the carvings themselves were entirely obscured. A coat of black oil paint over the red wax had been intended to reproduce the rich gloss of lacquer, but it had dulled in the course of time. The original chalk layer with delicate shades of polychromy was overlaid with thick, harsh-looking oil paint. Visible traces of brush strokes on the surface of the screen contributed to the general disharmony.

Figure 1a shows a detail of the screen before restoration. In the center panel, traces of the repair using red wax are visible as is a test area in the polychromy. After consultation with the owner (Bayerische Verwaltung der Staatlichen Schlösser, Gärten und Seen, Munich), the second, third, and fourth repairs using unsuitable European methods and materials (oil paint, wax) were removed. The surface was then consolidated using traditional materials. Only the oldest Chinese adhesives, those complying with the overall aesthetic effect (even if the color of the lacquer had changed), were left in place (Fig. 1b).

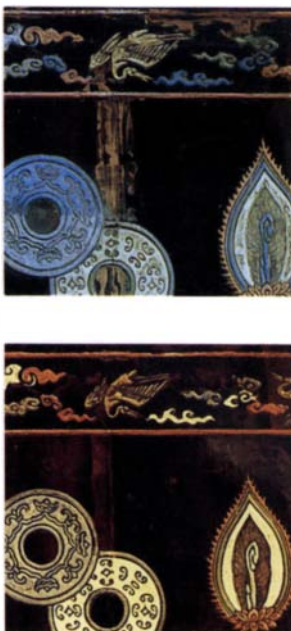


Figure 1. A detail of the screen (a) before restoration, (b) after removal of later repairs.

Figure 2. Areas filled with chalk (a) after removal of the oil paint and (b) after restoration.



Figure 3. After the removal of black oil paint.



Figure 4. After the removal of the red wax.



Figure 5. After repair, and removal of oil paint from the polychromy.



Figure 6. Red wax adhesive applied over the original relief.



Figure 7. Black oil paint that had penetrated under the surface (a) was removed, revealing the earliest repair (b) made with traditional materials.





Figure 8. A test area in the polychromy reveals the original coloring.

After the oil paint was removed, the areas filled with chalk could be seen. Figure 2a shows that the form of the original carvings was respected. The chalk combined with glue used in earlier repairs was unsuitable due to its high moisture content. Because of this it was necessary to replace the chalk with material similar to that used originally, while respecting the form of the carvings (Fig. 2b).

The condition after the black oil paint had been removed can be seen in Figures 3a–c. The red wax spoiled the aesthetic effect and covered a large undamaged area around the repair. Figures 4a–c show the condition after the red wax was removed from the surface of the black lacquer as well as from the cracks and fissures, and the areas filled with glue. The real extent of the damage to the surfaces of both lacquer and wood could now be seen.

Figures 5a–c show the condition after repair, including removal of the oil paint from polychromed areas. Test areas showed the insensitive application of red wax adhesive over the original relief (Fig. 6). The mechanically damaged black lacquer surface had been covered with black oil paint that at first concealed the defects; later, however, it penetrated under the surface and dulled the lacquer (Fig. 7a). This heterogeneous layer had to be removed entirely, thus uncovering the earliest repair, which had been done in China in the traditional way (Fig. 7b). After consultation with the owner, this earliest repair was left as it was. A test area in the polychromy after the oil paint was removed showed the original coloring (Fig. 8).

This ten-panel screen was restored from 1984 to 1986. The problems we encountered with the repair indicate the need for a unified approach to the restoration of Asian artifacts. The materials commonly used in the West can never provide the qualities found in Far Eastern cultural objects: color, shine, luster, and overall aesthetic effect. Moreover these Western materials usually penetrate the surface around the damaged area, which makes it difficult (if not impossible) to redo the repair at a later date in the traditional manner with materials similar to those used to create the original.

Acknowledgments

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Essay on Shells That Became Cherry Blossoms

Yoshikuni Taguchi

Lacquer Artist

Shells, whose origins are in the wide oceans of the earth, have many uses. Some shells are a source of food, some shells have monetary value, and some shells are appreciated solely for their beauty. In the art of urushi, which uses shells as a material, the beautiful colors of the shells are appreciated all the more since they cannot be adequately reproduced in urushi.

The appreciation of beauty is something of which only human beings are capable. Fish, animals, and birds cannot feel the beauty of things around them. Even human beings cannot appreciate beauty unless their stomachs are full. In earliest times, shellfish were merely a source of nutrition. This is proved by the various shell mounds, consisting of many layers of discarded shells, that have been found in different places in the world. It took people a long time to notice the beauty of shells because they were too busy surviving. Ancient hunters decorated themselves with flowers, shells, and animal fangs only after their hunger was satisfied.

When prehistoric peoples started to create beautiful objects, they used shells and urushi as decoration. Red urushi combs and ornamental hairpins dating from the Jomon period (pre-200 B.C.) have been excavated at Torihama Kaizuka. Bracelets and knives made of shells were found at Kosaku Kaizuka in Funabashi, Chiba prefecture. Scarlet ornamental hairpins from the first half of the Yayoi period (200 B.C.–A.D. 250) were found in the Aman ruins. Earrings made of shell have been found in various other places.

Shells were also used as money. For example, during the Ying period in China, *takara* and *koyasu* shells were treasured as coins. It may be hard to imagine shells being used as money. However, even now shells are sold as material for urushi in shops and thus have monetary value. In European casinos, mother-of-pearl discs have been used as coins for roulette; the sound made by these shells is similar to that of silver coins.

Having been fished from the ocean to be eaten, shells are further used for decoration because of their beauty. Therefore people who handle shells should show great appreciation. Shells conceived in beautiful places in the ocean serve as food, architectural decoration, and craft materials on earth. Mother-of-pearl, *awabi*, and *hakuchogai* are used mainly for craftwork.

Shells are also used to decorate altars. They comfort worshipers with their beautiful colors, seeming to shine with the mercy of God. One may say that this is the most precious use of shells.



Figure 1. Scales on the ryuto raden ryoka-gata bon (tray) from the Yuan dynasty in China.

The colors of shells match the colors of the ocean as well as the colors of the fish living there. The motion of fish swimming catches the mind of an artist. To express such beauty, I use silver leaf, platinum leaf, and gold leaf on the back of a shell. There are many designs that vividly represent fish scales using shells. In the *ryuto raden ryoka-gata bon* (a tray with a design of dragon and waves inlaid in *raden*) of the Chinese Yuan dynasty (1279–1368) shells were used for the body of the dragon (Fig. 1). First, they were cut into pale red or blue scales and inlaid. Then they were engraved in *kebori* technique to express the scales dynamically. The fine ripples were expressed with *aogai*. Shells were also used for patterns of trees, flowers, and birds on other art objects. All are examples of how effectively the colors of shells were used and how exquisitely the artist's images were expressed.

There are many kinds of shells. The spiral shells that are used for *shikki* (lacquerware) include mother-of-pearl, *hakuchogai* (a bivalve), *kichogai*, and *kokuchogai*. *Awabi-gai* is a spiral shell, although it looks like a univalve, for only a small part of the shell has a spiral. Mother-of-pearl and *awabi-gai* have been used since ancient times because they are hard enough to cut patterns easily. When collecting *awabi*, the women divers take *kuro-awabi* first, for it is quick to flight and sticks hard to the rock. It is oval and the inside of the shell is green and lustrous. *Ezo-awabi* is a thin shell with uneven "pleats." The inside is mostly green. It is good for making fine patterns on *shikki*. *Madaka-awabi* and *mekai-awabi* are more red than blue; the pink or purple parts are rare and valuable. The color of *sazae* resembles mother-of-pearl but is greener. This shell is small and suitable for making sharp curves.

When *raden* is inlaid on a column in a building, the shells are used whole. First a design is made on Japanese paper and placed over the shells. Then the shells are cut with a fretsaw on a stand to fit the curvature of the column. The natural curves of the shells are retained in cutting and the shells are polished. The flower patterns on the ends of the roller, which is thinner than a column, of the *shitan raden-jiku* (hanging scroll) in the Itsukushima shrine were made in the same way. The same method was also used for the national treasure, *ho-o raden kagari tachi* (sword) of the Heian period (794–1185).

The shells used since ancient times have reflected the aesthetic preferences of each country. Although a very beautiful *awabi* existed in Japan, it was not used for a long time. Instead, mother-of-pearl was used in the Nara, Heian, Kamakura, and Muromachi periods (710–1568), under the influence of the Tang culture. Mother-of-pearl appealed to the Japanese because of its luster, which was an apt metaphor for the life of people who enjoyed sunshine though all seasons. *Awabi* began to be used in the Muromachi period (1392–1568). In the Momoyama period (1568–1600), new patterns of gorgeous maples in autumn and beautiful cherry blossoms in spring became popular. Since these patterns were made on *kin-makie*, *enashiji*, *aokin* (all techniques that make abundant use of gold) and on silver, the blue and red colors of *awabi* matched them well.

Some of the *raden* methods use *atsugai* (thick shell) and make a flat surface. In one of these methods, when applying *nakanuri* (intermediate coating), shells are inlaid so that they are slightly higher than the *nakanuri* surface. When *roiro-shiage* (polishing) is done, the entire surface becomes even. When making *ikakeji* (lacquerware thickly coated with gold dust and polished to look like gold), shells are inlaid still higher than the *urushi* surface. Tin foil is pasted over the entire surface and dried. Then the *raden* is ground with a whetstone until the entire surface becomes level. After that, the tin foil on the *urushi* is peeled off. As a result the *raden* will be slightly higher than the *nakanuri* surface. When *ikakeji* is then done on the *nakanuri*, the entire surface becomes level.

The two *atsugai* techniques mentioned above are quite often seen nowadays but were not so popular in the Heian and Kamakura periods. Outstanding examples of *atsugai* technique include the Chusonji Konjikido *raden* and octagonal *shumidan* (altar) from the Heian period and the *magaki-giku raden suzuribako* (ink-stone box with a fence and chrysanthemum design) of the Tsurugaoka Hachiman shrine from the Kamakura period (Fig. 2). In all these examples, which are designated national treasures, the impression given by the *raden* is soft, even though the material itself is hard.

In the *usugai* technique, thin shells are placed on the *nakanuri* and *urushi* is applied three times to raise the surrounding *urushi* area to equal height with the shells. Then the *urushi* covering the surface of the shells is scraped away. The *suhama-u raden suzuribako* (ink-stone box with cormorant design) of the Heian period is a masterpiece of *usugai* technique. When *raden* is applied over the surface of a *shikki* in such a way that the *raden* forms a pattern, then the shells are kept a little higher than the surface of the *urushi*. In the final coating of such a design, care should be taken with the handling of the brush so that no dust remains on the final coating and no extra *urushi* is deposited around the shells. In my *nuritate-shiage* technique, in which only one coating of *urushi* is applied over the *nakanuri*, a knife or a spatula is used to scrape *urushi* off the shells. Thus the shells theoretically become slightly lower than the *urushi uwanuri* (final) surface. Such a condition is also seen in *ikakeji* of the Heian period. It is this condition that makes the outline of the *raden* uniquely soft.



Figure 2. The magaki-giku raden suzuribako (ink-stone box) from the Tsurugaoka shrine, Kamakura period.



Figure 3. Meigetsu-wan (Momoyama period). Also called warigai cherry-blossom bowl set, it was given to Meigetsu-in in Kamakura by Urakusai Oda, a younger brother of Nobunaga.

東京芸術大学資料館所蔵

名称に明月椀 又は名に椀の割貝の椀と記す 鎌倉の明月院に寄進された物の一部の古椀
 織田有楽斎が寄進した物所有者は信長弟の次子大坂冬の陣には東西の割貝に奔走した人茶室に余生を送つたことゆゑに理有有楽斎に任じていた

調査 明月椀 弁柄本朱塗立 内外(塗立) 木地塗り
 (松山研次) 温り色 木地(松材) 漆下地 薄堅地

アワビの薄貝で割貝法 (割貝鮑の桜の花) 一箇

中塗りの段階で磨り付けた貝の上掛け乾かした後に貝の表面の漆の紐の上に布を張つて置る 緑の紐は黒漆

汁椀身花10枚 飯椀身の花11個

花9個 花10個 花9個

密陀絵盆 江戸中期 材魚木

密陀の青緑色 緑廻り角茶色 茶色

輪郭を取らない緑の葉の描き行きの色の流を感じて力強い葉の綿指 葉の点描に果実の肌を感じる 木の幹は片足筆の様に描きつけた

素木果目 木地塗り下地あり

緑の岩絵自具の粉粒の点描 枝茶に赤と黄の緑梅葉 葉は青緑葉

上糸尾足朱 蝶りヒレ足朱 突の色黄口朱 突の色の点描及紫色 盆の中央裡面と 盆の中の縁廻り青緑色

東京 藝術 大学

Figure 4. Meigetsu-wan research data. Shiruwān (soup bowl), height 7.5 cm, diameter 13.2 cm; meshiwān (rice bowl), height 9.9 cm, diameter 14 cm; hirawān (flat bowl), height 5.4 cm, diameter 13.2 cm; tsubowān (vase-shaped bowl), height 7.3 cm, diameter 11.1 cm.

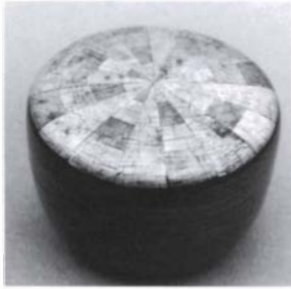


Figure 5. Hira-natsume (tea powder container) using *warigai* technique, made by Yoshikuni Taguchi. Silver leaf and gold leaf on the reverse of the shells create a unique variation. Gold dust sprinkled on the side of the natsume; horizontal lines scratched;



Figure 6. Okigai design by Yoshikuni Taguchi. Shells are placed one by one on the side, thus creating a variety of patterns. Gradated kin-hirame-fun on the surface of the lid; togidashi. Figure 7. Silver tsubuoki sample board made by Yoshikuni Taguchi. The shell particles are of the same size as gin-hirame.

Meigetsu-wan, a set of bowls, in Meigetsu-in in Kamakura, are also known as “cherry blossom bowls” (Fig. 3). The cherry blossom designs are made from shells from the ocean. Urakusai Oda, a younger brother of Nobunaga who lived in Yuraku-cho, Tokyo, donated this bowl to Meigetsu-in in the Momoyama period. Urakusai worked as a mediator between Nobunaga and the Toyotomi family. He then devoted the remainder of his life to the tea ceremony. Some of the bowls now belong to the collection of the Tokyo National University of Fine Arts and Music.

After a long chilly winter, spring comes and new leaves sprout on the trees in Tokyo at the beginning of April. Cherry buds grow in the sunshine day by day. In the middle of April, the cherry trees come into full bloom. According to Japanese custom, people gather under the cherry trees, drink *sake*, enjoy themselves, and relax. As they go home, they walk on numerous cherry blossom petals on the road. Five of these petals placed on the hand make a cherry flower. It is from this image that the famous *Meigetsu-wan* cherry blossoms on vermilion *urushi* bowls were born. They look like cherry blossoms in the moonlight, suitable for Meigetsu-in (literally, the temple of the bright moon). There are eleven flowers on the *meshiwan* (rice bowl) and ten flowers on its lid; there are ten flowers on the *shiruwan* (soup bowl) and nine on its lid. The *tsubowan* (vase-shaped bowl) has nine flowers and the *hirawan* (flat bowl) has nine also. They are all single-petaled cherry blossoms. The wooden substrate is Japanese cypress. Hemp cloth was pasted on the edges and *urushi-shitaji* (priming) was applied. *Bengara-nuri* was used for the *nakanuri* (intermediate coating). Shells were then placed in position and the final *urushi* coating of a mixture of *bengara* (red ochre) and vermilion was applied. Lastly, *urushi* on the surface of the shells was scraped away with a spatula or knife.

With regard to the *raden* parts, *awabi-gai* was cut to make the cherry blossom petals. Japanese paper was pasted over the five-petaled cherry blossoms made of shells, using paste that is soluble in water. On a wooden stand with a thick cover, the shells were cracked finely, through the paper, with a knife that had round edges and would not cut, or with rectangular sticks of wood or bamboo. This is known as *warigai* technique. Positions for the shells were marked on the *wan* (bowls). After that, *roiro-urushi* or *kijiro-urushi* was applied with a brush to the reverse of the shells. They were then placed on the burnished *nakanuri* surface. After drying, the Japanese paper was dampened so that it could be removed from the shells with a small brush. Then *urushi* consisting of vermilion and *bengara* was applied and, after drying, *urushi* on the surface of the shells was scraped away (Fig. 4).

In general, *warigai* technique is used to paste flat pieces of shell on a curved surface (Fig. 5). The cracks that appear on the shells give a new impression to the flat surface of the shells just as wrinkled Japanese paper gives an entirely different effect compared with unwrinkled paper. The lines separating *raden* and *ikakeji* found on *urushi* objects of the Heian and Kamakura periods are similar to the fine lines on cloth that has been tie-dyed. The *botan karakusa raden-bako* (inlaid box) is an example of *warigai* from the Muromachi period. Since the surface of the box itself is flat, cracks in the shells create a unique contrast.

Other techniques similar to *warigai* include *okigai* in which small pieces of shell are used as in mosaic (Fig. 6) and *tsubuoki* in which still smaller pieces are used to make patterns (Fig. 7). Eggshells were also used instead of shells on sword sheaths in the Edo period (1600–1868).

Mugi-urushi is generally used to paste *atsugai*, but the amount of starch in the mixture depends on the individual *urushi* craftsman. Pure flour is used. First, the flour and water are kneaded until they have the consistency of an earlobe. *Kiurushi* (unrefined *urushi*) is added gradually so that the mixture becomes sticky. This *mugi-urushi* is used to paste not only shells but also other materials.

When *atsugai* is inlaid on urushi, it should be placed deep into the *nunokise*; if it is not embedded deeply enough, it may peel off. To inlay *atsugai*, urushi is baked onto the reverse of the shell for two hours at 120°C, so that it adheres well. After that, the baked urushi surface is given a slightly mat finish with charcoal.

A much stronger way of pasting *atsugai* is to use *nikawa* (animal glue). *Sanzen-bon nikawa* is soaked in water overnight; then it is boiled to a thick consistency over low heat. Finally, it is filtered through a cloth strainer. During use, it should be kept heated over a water bath. Adding this thick *nikawa* gradually to *kiurushi* strengthens the adhesive power of the urushi. I think now that it is better to use this for *atsugai*. In some cases, hemp fiber and powdered spruce may be mixed with urushi to make it easier to dry.

When pasting *usugai*, *roiro-urushi* or *kijiro-urushi* is used to paste small square pieces of shell. Cut patterns should be pasted when the *roiro-urushi* or *kijiro-urushi* is half dry, or *nikawa-urushi* should be used. It is also much better to have a thin coating of urushi baked on the reverse of the shell before it is used. The temperature is the same as for *atsugai*. I use a domestic iron for this purpose because the temperature can be easily adjusted.

The national treasure, *nashiji kiri-mon raden koshigatana* (short sword) in Itsukushima shrine, made in the Nambokucho period, uses the *warigai* technique. There are several horizontal rough cracks which give an impression of vigor. It is a very rare example in which *awabi* was used.

It is more difficult to make *warigai* from *Mexico-gai* (compared to *aogai* and mother-of-pearl) because *Mexico-gai* has brilliant patterns like the scales of a pine tree trunk which easily peel off when the shells are cracked (Fig. 8).

Urushi began to be used as an adhesive in Japan from the middle of the Jomon period. An earthen vessel was excavated from Juno Deitanso in Saitama prefecture. The vessel had been repaired with urushi so that it could be reused. I was struck with admiration to realize that urushi had been used for this purpose since ancient times.

People often place great value on an old tree of historical interest. Urushi is an inconspicuous tree. It cannot become any other kind of tree, no matter how much it wishes to do so. However, the urushi tree has valuable sap, which may be likened to human blood, and we should make good use of it. Significant works of art are national properties in any country. They should be well preserved and kept in good repair. Each country has its own remarkable materials. Each should make the best repair by using such materials. I myself think my life is like that of an urushi tree.



Figure 8. Hira-natsume (tea container) using warigai of Mexico-gai, made by Yoshikuni Taguchi. The lines on the lid are kin-hirame-fun and kin-hira-makie.



Appendix:
shells used in raden

<i>Aogai</i>	<i>Patelloida (Chiazacmea) striata</i> (Quoy et Gaimard), from the Ryukyu islands; literally “blue shell.”
<i>Awabi-gai</i>	General name for <i>haliotis</i> ; <i>gai</i> and <i>kai</i> mean shell.
<i>Ezo-awabi</i>	<i>Haliotis discus hannai</i> (Ino), a sub-species of <i>kuro-awabi</i> (q.v.).
<i>Hakuchogai</i>	<i>Pinctada maxima</i> (Jameson), also known as <i>shirochogai</i> ; <i>haku</i> and <i>shiro</i> mean white.
<i>Kichogai</i>	The yellowed edge of an aged <i>hakuchogai</i> (<i>ki</i> means yellow).
<i>Kokuchogai</i>	<i>Pinctada margaritifera</i> (Linne), more correctly known as <i>kurochogai</i> ; <i>kuro</i> and <i>koku</i> mean black.
<i>Koyasu</i>	Trivial name for <i>takara</i> (q.v.).
<i>Kuro-awabi</i>	<i>Notohaliotis discus</i> (Reeve); “literally black <i>awabi</i> .”
<i>Madaka-awabi</i>	<i>Haliotis (Nordotis) gigantea</i> (Gmelin).
<i>Mekai-awabi</i>	<i>Haliotis (Nordotis) gigantea sieboldi</i> (Reeve).
<i>Mexico-gai</i>	Resembles <i>madaka-awabi</i> ; the main part is deep blue-green and the rest is spotted.
<i>Sazae</i>	<i>Batillus cornutus</i> (Lightfoot).
<i>Takara</i>	The cowrie (genus <i>Cypraea</i>).

Urushi Technique in the Prehistoric and Antique Periods in Japan

Toshikatsu Nakasato

Tokyo National Research Institute of Cultural Properties

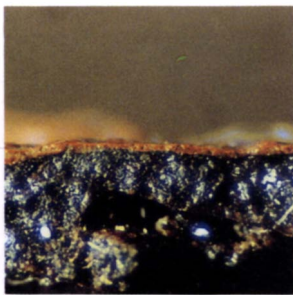


Figure 1. Cross section of rantai-shikki (lacquerware with a woven bamboo substrate) found in the ruins of Korekawa.

Urushi began to be used in Japan very early in the prehistoric period, about 5000 B.C. It was greatly influenced by the superb works and techniques introduced from the mainland in the sixth century A.D. (when Japan had just begun to develop as a nation) and in the seventh and eighth centuries. After the ninth century, the relationship with the mainland was severed and urushi art developed in its uniquely Japanese style until the end of the Antique period in the twelfth century.

Almost all the fundamental techniques employed in present-day urushi work are believed to have developed during this Antique period. However, over the centuries many changes in technique occurred as the art form developed. As a result, techniques used today are not exactly the same as the techniques used in the Antique period.

This paper will discuss urushi techniques from the Antique and even earlier periods with special emphasis on *urushi-shitaji* (priming), *raden* (shell inlay), and *makie-fun* (sprinkled metal powders) and will describe the differences between earlier techniques and those used today.

Urushi-shitaji (priming)

Urushi-shitaji is a general term for *sabi* and *jinoko* and is the ground coating. *Sabi* is *tonoko* (finely ground baked clay) mixed with water and kneaded with an equal amount of raw urushi; *urushi-jinoko* is *jinoko*, which is coarser than *tonoko*, kneaded with raw urushi.

In the early technique of urushi work in Japan, around 5000 B.C., urushi was applied directly on wood in layers, and *urushi-shitaji* was not essential. However, towards the end of the Jomon period, around 500 B.C., *rantai-urushi* wares, which employed woven bamboo as a substrate, were introduced. Thus, *shitaji* became an important technique for covering the mesh surface.

A *rantai* (woven bamboo) vase, found in the ruins of Korekawa, dating from the end of the Jomon period, has a clear, dark brown *shitaji*, and includes transparent quartz particles along with a sandlike substance (Fig. 1). Although no scientific investigation has been done, urushi is likely to have been used as a binder.

Rantai combs were also made in this period, and *urushi-jinoko* was used to give shape to the combs. Among the ten combs excavated at Terachi, some were shaped by *kokuso* (a paste made of urushi, clay powder, sawdust, etc.) and others by *urushi-shitaji*. The *urushi-shitaji* of this period are extremely solid and have scarcely any cracks.

Figure 2. Hemp and shitaji (priming) from the Hachimanyama tumulus.
 Figure 3. Urushi-shitaji from the Hachimanyama tumulus.

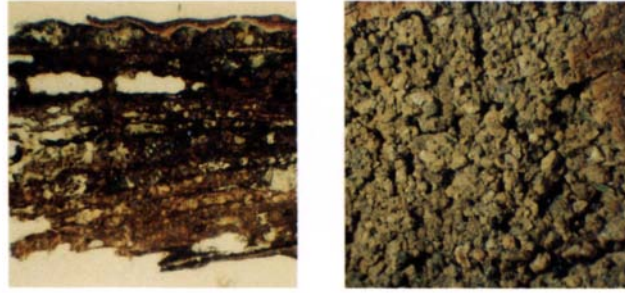
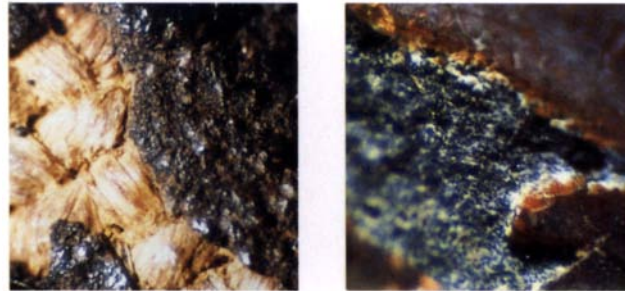


Figure 4. Urushi-shitaji used to bind cloth in a shippi-bako (leather box) from the Horyuji treasures.
 Figure 5. Black urushi-jinoko used in a stage mask from the Horyuji treasures.



Urushi techniques around A.D. 400–500 show retrogression. The technique was greatly simplified: in most urushi articles of this period only black urushi was applied and *urushi-shitaji* was seldom used.

From the years 700 to 800, when relations with the mainland became active, the technique of *kanshitsu* (dry lacquer) was introduced, and along with it the technique of *urushi-shitaji* reappeared. Some articles of this period include *kanshitsu-zo* (statues), as well as *kanshitsu-men* (stage masks), *soku-hachi* (bowls), *soku-bako* (boxes), *shippi-bako* (leather boxes), and *shikkan* (coffins). Among techniques known for making coffins, *urushi-shitaji* is found in both *kanshitsu-kan* (dry lacquer coffins) and *toshitsu-kan* (coffins with only urushi applied). Examples of *kanshitsu-kan* were found in the Kegoshi-zuka tumulus and the Anpuku-ji collection and of *toshitsu-kan* in the Takamatsuzuka and Hachimanyama tumuli.

In some of these coffins, *urushi-jinoko* was used for its original purpose of simply coating the hemp cloth (Fig. 2), but in others, *urushi-shitaji* was used as an adhesive between layers of cloth. In the latter case, each layer of *urushi-shitaji* was made 1–1.5 mm thick because the silk cloth used for the coffin is very thin. In both cases, the *urushi-shitaji* is usually coarse and not much different from present-day *jinoko*. However, it is interesting to note that the *urushi-shitaji* of the Hachimanyama tumulus, in particular, is uniformly round and finer (Fig. 3).

As mentioned earlier, *urushi-shitaji* was originally used to coat hemp cloth. However, there are other uses of *urushi-shitaji*, for example, to adhere cloth as on a *nunokise shippi-bako* (leather box; Horyuji treasures; Fig. 4) using hemp, or to shape objects such as the urushi stage mask (Horyuji treasures; Fig. 5).

Types of *urushi-shitaji* can be distinguished from each other according to the materials used and by their particular characteristics: they may be *urushi-jinoko*, black *jinoko*, or clear brown *shitaji*. *Urushi-jinoko* is seen only in large-scale works such as coffins. Black *jinoko* was used for the shaping of boxes, for example, those excavated from the Nishinoyama tumulus, and wooden stage masks, but the material cannot be identified. Clear brown *shitaji* was used in leather boxes and stage masks, but these materials also cannot be identified. In Chinese sculpture of the same period, we find *nerimono* (a molding substance). Again, the materials used are not specified, but the *urushi-shitaji* is similar in appearance to those previously described.

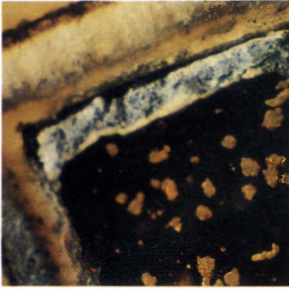


Figure 6. *Katawaguruma makie-tebako (cosmetic box with waterwheel design; twelfth century) with black urushi-shitaji.*

The *urushi-shitaji* of the twelfth century is represented by the so-called *Chusonji-jinoko* of Chusonji Konjikido. This *urushi-shitaji* was used for filling spaces between *raden* (mother-of-pearl inlay) and is characterized by its ability to make a 2 mm layer in a single application. *Urushi-shitaji* diluted with water seems to have been used when narrow spaces between intricate *raden* designs were filled. This *urushi-shitaji* is similar to present-day *urushi-jinoko*, being light brown in color with coarse particles. There is no evidence of the use of *tonoko* in the twelfth century.

It should be noted that in the interior decoration of the Konjikido, only the left and right *shumidan* (altars), which were worked on at a later date, have black *urushi-shitaji* between the *raden* designs. This special *urushi-shitaji* is found in almost all the *raden* objects of this period (Fig. 6) and may have been an essential technique for decorative works. However, what the material was and what sort of effect it achieved have not yet been discovered. This technique was handed down and used until the early thirteenth century, when it became extinct.

Raden

In the Antique period, only *yakogai* (*Lunatica marmorata* Linne) was used for *raden*. The process is still a mystery. Considering other techniques of the Antique period it is easy to figure out how the shells were made into sheets; however, the tools used to cut out the designs are not familiar. Since these tools have not been passed down, and since there have been no related archaeological discoveries, the only clue is the carved surface of the *raden* itself.

Investigations of the marks on the surface of *raden* (Figs. 7,8) belonging to the twelfth and thirteenth centuries reveal an interesting fact. Presumably something like a wire with a round, narrow, cross section was used to make the cuts. In order to employ a wire as a saw, one only needs to make incisions. The result will not be much different from today's wire-saw blade. The cross section of the tool is thought to have been round because the *irizumi* (cut edge) of the *raden* fits the tool, as is shown in Figure 9.

How this blade was fixed to its wooden frame is unknown, but saws similar to present-day steel saws have been found in excavated ruins of the eighth century. Furthermore, it is known that a more typical bow-shaped saw was used in China. Hence, we can imagine the shape of the *raden* tool then in use. The instrument used for cutting agate in the Izumo district proves that by sprinkling emery, a hard rock can be cut with simple twine.

Even in the *raden* of the Tang period (A.D. 618–907), traces of a wire blade with a round cross section are found. This technique developed steadily and was used in the twelfth century during the elaborate project at the Konjikido. The *raden* of the Konjikido amounted to a total of several tens of thousands of pieces, so these works could not have been completed by only a few skilled artists in a short period of time. Therefore, the work of producing *raden* must have been done by a simple method requiring little skill and carried out by a large number of people. In the thirteenth century this method was still in use and reached its peak.

Figure 7. *Raden (shell inlay) from Chusonji.*
 Figure 8. *Detail of the raden in Figure 7.*
 Figure 9. *Method of cutting raden with wire.*

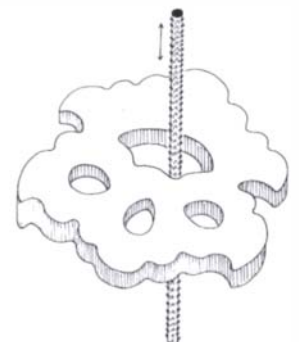


Figure 10. Raden from the Shigure kura (saddle; thirteenth century) showing the marks of a blade with a round cross section.



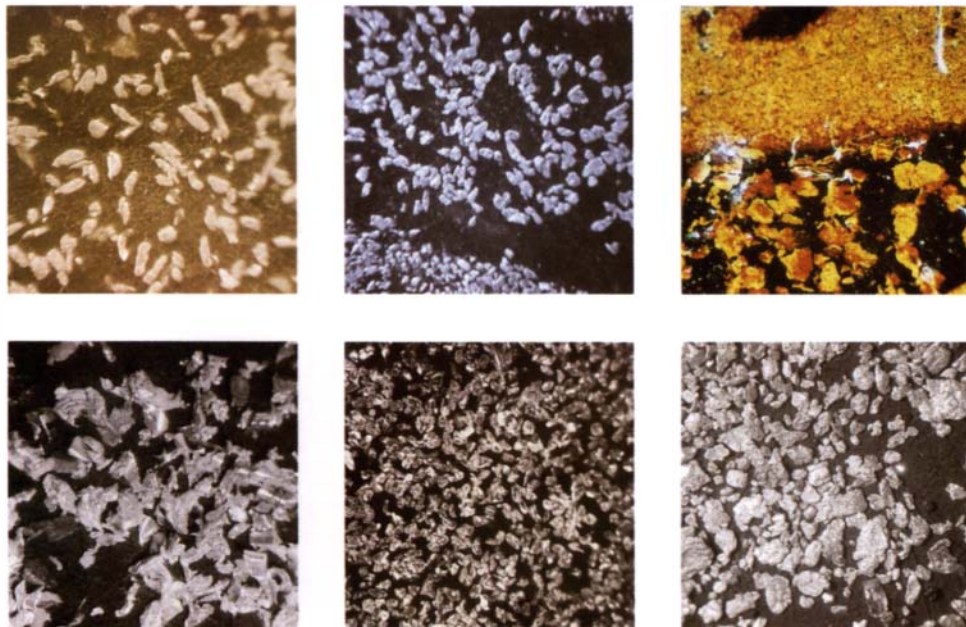
Among the principal remains from this period, the Fusenryo *makie-raden tebako* (cosmetic box) in the Suntory Museum, the Shigure *raden kura* (saddle) from the Eisei Bunko, and the *sakura-raden kura* in the Tokyo National Museum are well known, and there are other excellent works, especially *raden* saddles. The *raden* of the Shigure saddle shows traces of a blade with a round cross section and such exquisite technique that it cannot be imitated today even with a wire-saw (Fig. 10).

The general standard of *raden* technique in this period was high, due not so much to the skill of the artists as to the introduction and improvement of tools. In fact, one *raden* product demonstrates the process of improvement in the blade: the Matsukawabishi *raden kura* (Konda Hachiman). Interestingly, this saddle shows traces of square blade marks similar to the wire-saw blade of today. However, since this kind of blade is found only in this one example among the remains from the thirteenth century, it may be an exceptional work.

Traces on the cut surface of *raden* should also be considered. For example, one *raden* in the Konjikido shows a U-shaped cut surface that gives a smooth outline and creates its peculiar atmosphere. The *raden* of the *makie koto* (zither; Kasuga Taisha), also dating from the twelfth century, possesses sublime expression from having the sides of the *raden* sliced almost vertically.

There are several possible reasons for such great differences in the process of cutting *raden*. First, the *raden* of the Konjikido was mass-produced whereas that of the *koto* was carefully created as an offering for a god. Secondly, there was difference in the precision of the tools. In mass-production the tools are inevitably less accurate. Trying to cut by force with a blunt blade will naturally make a U-shape. Thirdly, the skill of the artists may have been different. For the creation of the Konjikido many artists were gathered from Kyoto, but not all these *raden* artists had superior skills. The *makie koto* and the Konjikido display contrasting characteristics in the *raden* works of the twelfth century. The *raden* of the *makie koto* is far superior to the *raden* technique of the Shosoin and it is considered to be one of the best *raden* relics in Japan.

Figure 11. Makie-fun (metal filings): (a) rice-grain shape (twelfth century), (b) circular shape (twelfth century), (c) hirame-fun (thirteenth century), (d) Filing shapes, (e) present-day maru-fun (round shape), (f) gold dust.



Makie-fun

Japanese *makie* dates back to the eighth century and early *makie-fun* may well have used more natural materials such as sand gold. The shape of *makie-fun* changed from a rice-grain shape, to an oval shape until the thirteenth century when it developed into a round shape.

Makie-fun which were generally very coarse were called *yasuri-fun*. This name comes from the Edo period (1600–1868) and has been brought into common use. However, the ancient *makie-fun*, which were finer than *yasuri-fun*, are better called “ancient filings.”

Ancient filings are those *makie-fun* used from the eighth to the twelfth centuries. Recent investigations show that these ancient filings have different characteristics from the *makie-fun* used from the thirteenth century onward. The most significant characteristic of the ancient filings is the long, narrow, rice-grain shape. From the thirteenth century the shape gradually becomes more circular.

Besides the rice-grain shape, the filings before the twelfth century can be broadly grouped as follows: wedge-shaped, triangular, and whisker-shaped. Different metals yield different shapes of filings: for gold, rice-grain shape and for silver, wedge-shape are the most common; for greenish gold, triangles and wedge-shapes are found. Such categorization merely notes the tendency and is not absolute. There are many *makie* remains dating from the eighth to the thirteenth centuries, yet each example of *makie-fun* possesses different types of unique filing shapes; hence it is difficult to find similar shapes of filings even among these remains. The significance of this is still unknown but perhaps the making of filings was originally done by individuals. *Shokunin tsukushi-e*, which pictures many artisans at work, depicts a man making *makie-fun* next to a man engaged in *makie*.

Hirame-fun (metal flakes, literally “flat-eye dust”), found in remains from the latter part of the twelfth century, became popular in the thirteenth century.

Apparently some kind of significant change took place in the *fun* manufacturing method. The method described in the contemporary *Wakan Sansai zu-e* shows the process of first making *hirame-fun* and then *sai-fun* (a very fine powder). This suggests that the process goes back to the thirteenth century when *hirame-fun* was popularly used.