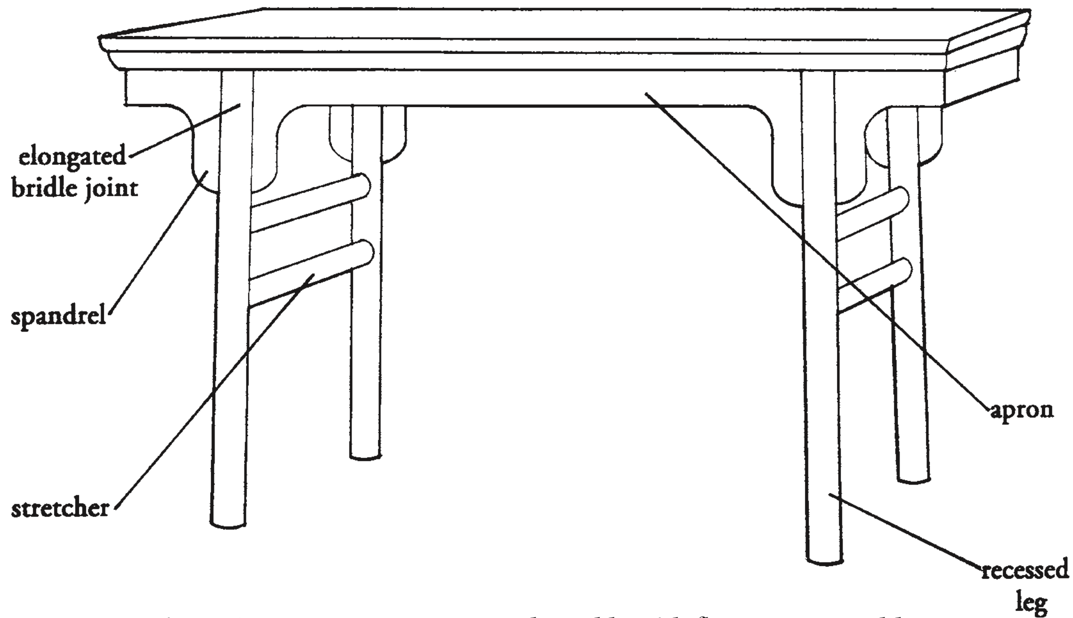

Figure 1: Long, narrow, rectangular table with flat top, recessed legs and elongated bridle joints.

Figure 2: Damaged top of black lacquer table.

Loss Compensation of Lacquer on Two Chinese Tables

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Introduction

TWO CHINESE LACQUER TABLES, ONE black and the other red, came to our lab for the treatment of four major problems: surface accretions, structural instability, delamination of the lacquer, and significant losses in the lacquer. This paper addresses the last of those problems, that of compensating for the losses in the surface lacquer and the ground layers underneath the lacquer.

The tables were quite similar in dimension and form. Classic representatives of the late Ming Dynasty period, they are characterized in the literature as long, narrow rectangular tables with a flat top, recessed legs and elongated bridle joints. *(fig. 1)* In this style the top is flat rather than having turned-up ends, and the legs are recessed from the sides and ends of the top rather than flush. The elongated bridle joint characterizes the connection between the apron, spandrels and legs.

We began with a review of current conservation standards concerning loss compensation in general and a review of previous efforts by other conservators to compensate for lacquer losses specifically. In reference to the former, whatever would be done needed to be retreatable, be stable and detectable, not overlap existing material, and be visually acceptable. In reference to the latter, a review of other treatments revealed that the problem was not new; much work has been done on loss compensation in lacquer, mostly using waxes and wax/resin combinations.

But another significant factor guiding our approach was the client's expectations. The tables were privately owned and would be returned to light use in a residence; therefore, the material used to replace the losses needed to be durable. Moreover, the client wanted the loss compensation to be virtually invisible at close range. Both of those expectations required qualities inconsistent with the performance characteristics of materials employed previously by other conservators. Wax and wax/resin combinations do not produce a usable, durable surface regardless of the mixture. By the same token they do not look like 400 year-old lacquer except at a distance far greater than six inches, no matter how carefully detailed, and especially not with surfaces as large as the ones in question. For those reasons and several others having to do with adhesion, shrinkage and reproducibility, we determined that the loss compensation materials would have to come from other sources.

Black Lacquer Table

Description

Except for metal rings on the ends of the legs, the black table was completely covered in a uniformly black lacquer without decoration. The lacquer, which was originally smooth and glossy, was now heavily cracquelured and dull, with major losses on the table top and lower ends of the legs. At one end of the table top the roughly 200 square inches of loss extended through the surface lacquer, the thick ground layer underneath and the woven fiber (ramie) liner sitting atop the wood substrate. *(fig. 2)* Moreover, the wood itself was eroded away in a small area allowing one to look through the top to the floor below. Obviously the damage was extensive, thought by the curator to have been caused by water dripping on the table top over a long period of time.

While the losses across the table top were substantial, the losses to the feet were equally impressive (or dismaying) in their own way, as were previous efforts to repair/obscure them. *(fig. 3)* This type of damage to the lower end of table legs is common because of moisture wicking up the legs from condensation on the cool stone floors of traditional Chinese dwellings. The erosion of the lacquer and the wood substrate extended from three to six inches up the legs.

Loss compensation on the top

As previously noted, the losses on the top ranged from the erosion of the glossy surface lacquer to varying degrees of loss in the ground lacquer to large areas of complete loss of all layers. The initial possibilities for overall compensation included fitting a tinted glass top or covering the areas of loss with a sheer black fabric without attempting to match surface texture, capping the entire top with a photo-reproduction, or filling the areas of loss with a wax/resin mixture (previously noted) and then drawing, carving or impressing a semblance of the surface appearance into it. These methods were all considered and rejected for one or more reasons including technical difficulty, lack of durability, high expense, or aesthetic unaccept-ability.

Ultimately we chose to compensate for the ground losses first, matching their surface appearance to the surrounding exposed original ground. Then, if possible, we would replicate the surface lacquer over the original ground and the replacement ground to produce a relatively uniform old, undamaged surface. If efforts to replace the surface lacquer did not succeed, at the very least the final surface would be a convincing representation of a much less damaged surface. Our methods are described below.

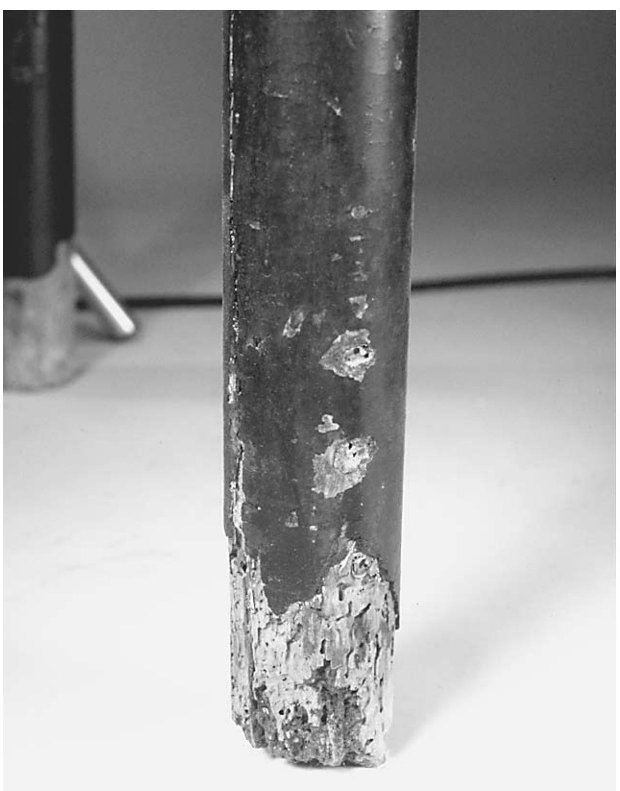

Figure 3: Typical damaged leg of black lacquer table.

Ground Losses

Our strategy for replacing the ground losses was to use silicone impressions of original surfaces to cast replacements that would be fitted into the areas of loss. Because there was so much variety in the extent of the damage, there was no one representative area in the eroded ground that could be cast in multiples and cut to fit. With this in mind, multiple silicone molds were taken across the top. (The open cracks in the table were filled with glass micro balloons to block the silicone flow. The micro balloons were significantly easier to remove than wax or other dam materials.)

Desired qualities for the replacement ground were excellent surface reproduction, nominal shrinkage, a hard final surface, colorability, long-term stability, cohesion and adhesion. After extensive testing of different acrylic, polyester and epoxy resins, a bulked epoxy was chosen. The epoxy was tinted with brown and black dry pigments to approximate the color of the aged ground and cast as a consistent 1/16″ layer equal to the average thickness of the original layer.

The questions of which mold to use for a given area of loss had both conceptual and practical implications. Clearly the degradation of all surfaces had proceeded incrementally, with the erosion initially in the glossy surface and then making an irregular advance through the ground layer to the wooden substrate. Placing a single replica of a less damaged area into a loss adjacent to a more damaged original surface (and vice versa) would create an unnatural border between the two. The solution was to cut several smaller replacement casts from different molds. By this means the discontinuities in surface quality where the original and replacement surfaces met were still noticeable but much reduced.

The profiles of the irregular edges of the losses were transferred to the replacement casts with carbon paper and tissue paper. These paper patterns were glued to the casts and cut on a back bevel with a jeweler's saw. The casts were then detailed for profile and thickness, abraded on the back, and adhered with hide glue. To further obscure the border lines the black cutting dust was brushed into them while the hide glue was still damp.

At this point in the treatment, all of the previously exposed wood substrate was covered with a reproduction ground layer. Clearly the top was still badly damaged, but because the losses appeared to have been confined to the glossy surface lacquer it looked significantly less damaged than it had at the start of treatment.

Lacquer Losses

The next phase of the treatment sought to develop a workable combination of method and material for infilling some of the missing glossy lacquer. This would make it possible to obscure at least some of the discontinuities between original and replacement ground as well as improve the overall appearance.

Many approaches were tested for producing a believable final surface, falling roughly into dry systems and wet systems. A dry system such as that employed in the previous phase entailed casting an extremely thin film separately and then adhering it to the eroded ground. A wet system entailed pouring a self-leveling liquid directly onto the surface and then impressing the distinctive aged cracking pattern onto the surface as it hardened. Each system was evaluated for the stability of the materials, degree of irreversible intrusion to the original surfaces, feasibility, and plausibility of the final surface. As work progressed it became clear that the stability of materials was less of an issue than how to do it, how to undo it, and how it looked.

Wet systems as a group failed to meet standards for reversibility or feasibility. Details of the wet systems considered and tested were included in an addendum to the treatment report but will not be presented here.

The reversibility of dry systems was not an issue. Tests for feasibility and appearance quickly revealed however that there was a significant issue with the topography of three surfaces: the uneven eroded ground, the uneven underside of the synthetic lacquer film and the very even glossy side of the synthetic lacquer film. *(fig. 4)* The dilemma became one of how to adhere the two uneven surfaces while preventing them from telegraphing their irregularities to the glossy show side. In fact, when the first thin film was laid down this is exactly what happened.

When a less flexible film was laid down in an effort to mask the uneven ground, the irregularities elevated the film above the adjacent surfaces. Efforts to level the underside of the thinner film and/or the ground with inert fill similarly lifted the film. Further efforts to flatten the film over the ground with heat and pressure caused losses in the fine detail of the glossy surface. These and other tests of different materials and application methods eventually led to the conclusion that while each had the potential to solve a part of the problem, none solved it entirely.

Ultimately, compensation for the losses in the glossy surface lacquer never went beyond the developmental stage. With the earlier compensation for the ground losses we had succeeded in significantly reducing the apparent damage to the top. Without a viable means of replacing the show surface however, we were unable to eliminate it. This was, of course, something of a disappointment, but fortunately much of what we had learned in compensating for the losses on the top was directly applicable to the treatment of the legs.

Loss Compensation on the Legs

Compensation methods for the losses to the legs were refinements and adaptations of the techniques developed (and sometimes discarded) for the top. After the grime and old fill were removed,

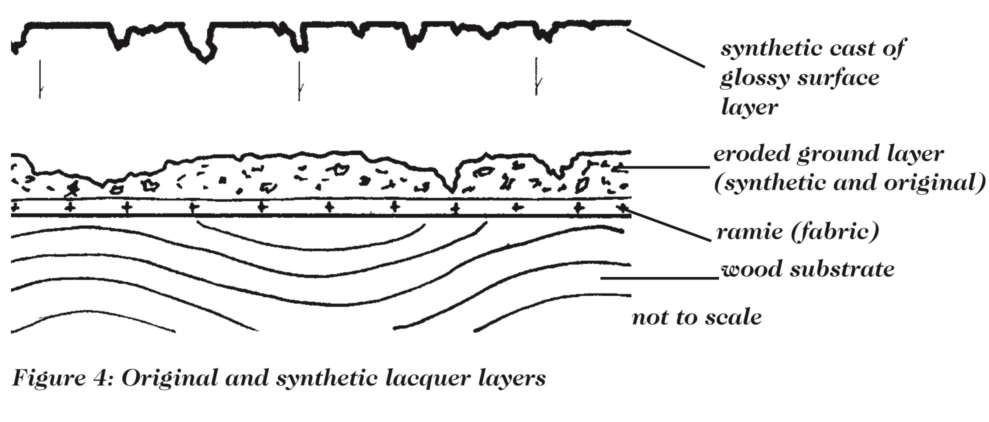

Figure 4: Original and synthetic lacquer layers

the exposed wood and adjacent lacquer were consolidated with two applications of 20% Acryloid B-72 in acetone. Paste wax was applied as a barrier coat on the adjacent lacquer, and the cylindrical wooden substrate was reformed with a bulked epoxy and trimmed to an offset approximately equal to the thickness of the film of synthetic surface lacquer to be applied.

The surface quality of the lacquer on the legs was entirely different from the heavily cracquelured top. A separate curved silicone mold was taken from an intact area above the losses and used to cast an extremely thin smooth film for each leg. These casts were then individually fitted and scribed to the irregular edge of the original lacquer.

Adhering the casts required an acceptable adhesive and good visibility to monitor slippage. Sheet BEVA 371 emerged as the adhesive of choice but not without some adjustments to the method of heat activation. Activating it with a Teflon iron produced distortion and dimensional changes in the film, and adhered sections would release when the iron was applied to an adjacent area. The ideal system would hold the cylindrical film in position with perfectly even pressure around the leg, heat the entire film evenly and simultaneously to 140° F, and at all times be translucent to monitor shifts in position. As serendipity would have it, three condoms provided perfectly even pressure and a waterproof casing while the leg was suspended in a bucket of water heated to the melting point of the BEVA. *(fig. 5)*

Figure 5: Activation of sheet BEVA 371 to adhere synthetic film to leg.

Red Lacquer Table

Description

Unlike the black lacquer table, the surface of the red table was highly decorated with an incised design of peonies, birds, butterflies and geometric shapes toned with pigments and gold powders, but not heavily cracked. *(fig. 6)* Relatively speaking the losses were much smaller; the largest measuring one inch across as compared to eighteen inches on the black table. Further distinguishing the two was the quality of the losses. On the black table there were tremendous variations in the degree of damage, with large areas of damaged but original surface. On the red table the losses were small but complete, penetrating cleanly to the wooden substrate. Our strategy was to level the losses in the ground layer with a fill material and then apply a thin film or skin to take the place of the lost lacquer surface. Losses in the decorative paint and gold were replaced separately by a paintings conservator.

Loss Compensation

Just as with the black table, we wanted to use the surface of the red table to provide the silicone molds for casting replacement lacquer. Fortunately most of the geometric incising was a repeating pattern so molds could be taken from areas matching the losses. "Artistic" license was required in only small areas to complete the design. A major loss on the top included a significant part of an incised butterfly of which there was no duplicate elsewhere; no attempt was made to recreate this missing design element.

An acrylic emulsion bulked with phenolic micro balloons was used as the fill material. During early tests we found that it was essential that the filler be colored similarly to the color of the table because the filler acted much like a bole does in gilding, helping to impart color and depth to the very thin films that would be placed on top of it. After drying, the mounded filler was compressed with plexiglass cauls and then leveled with a felt block and a small amount of methyl ethyl ketone (MEK). The MEK softened the acrylic binder so that the fill could be leveled to the surrounding area by light rubbing with the felt block; it did not affect the original lacquer surface.

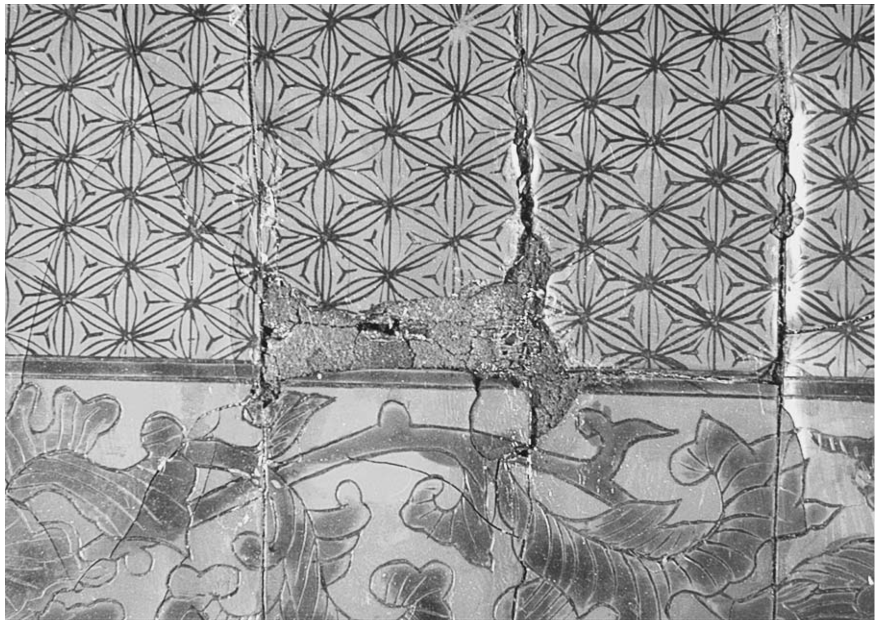

Figure 6: Shallow loss on red lacquer table.

The next step was to select a material for creating the thin film that would replicate the lost lacquer layer. This film-forming medium would need to form a continuous film on a silicone mold, allow colorants to disperse uniformly and be fairly flexible when dry. Some commonly available materials formed a film that was simply too brittle (e.g. Acryloids B-67 and B-72, nitrocellulose lacquer, polyester) while with others it was impossible to control the sheen of the dried film consistently (e.g. polyurethane, oil-phenolic resin, epoxy). The two best possibilities were an acrylic emulsion (K-6 Glossy) from Kremer Pigments and a soya oil/alkyd resin from the Rustoleum Company.

With two good options for the film material, the challenge of coloring the films was addressed. Given the hue, value and chroma changes as the test films dried, many trials were necessary to match the color of the dried film to that of the table. It was at this point that the acrylic dispersion was chosen over the oil-resin mixture. The Kremer product required various additives to improve its working qualities but was extremely quick to dry. Conversely the films created with the Rustoleum product were excellent right out of the can but took overnight to dry. With the fast-drying acrylic film multiple trials could be done in hours rather than days.

After experimenting with combinations of nearly all of the commercially available red pigments, we determined that cinnabar (HgS) and Pozzouli red in combination were the correct colorants. The literature on traditional Chinese lacquer indicates that cinnabar was one of the original pigments in the red lacquer; it imparts a distinctive tone that can not be reproduced with modern vermilions. Barium sulfate was added to the mix to render the film slightly whitish in appearance (just like the slightly faded original lacquer) as well as render it x-ray opaque.

Finally, the liquid acrylic mixture was brushed onto silicone molds to form a thin film. When dry, the film was removed, trimmed to size and adhered to the underlying fill after activating the acrylic binder with MEK. All of the films were polished with an agate burnisher to bring up the sheen slightly and provide an appearance of hardness similar to the original lacquer.

The results of this approach were virtually indistinguishable from the original surface. The question of why we didn't use it on the black table is a reasonable one but easily answered: the losses were much smaller, the substrate was level, and there was no craquelure pattern to reproduce or telegraph.

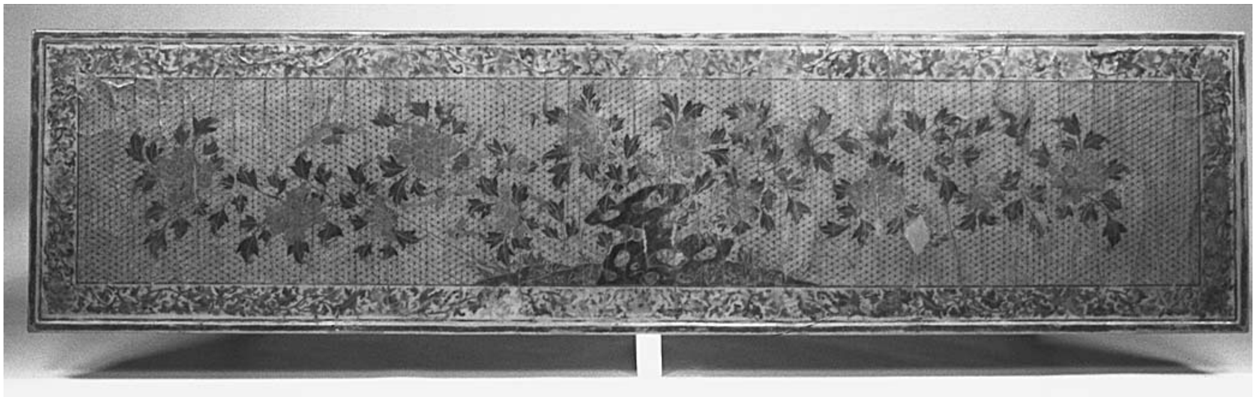

Figure 7: Red lacquer table after treatment.

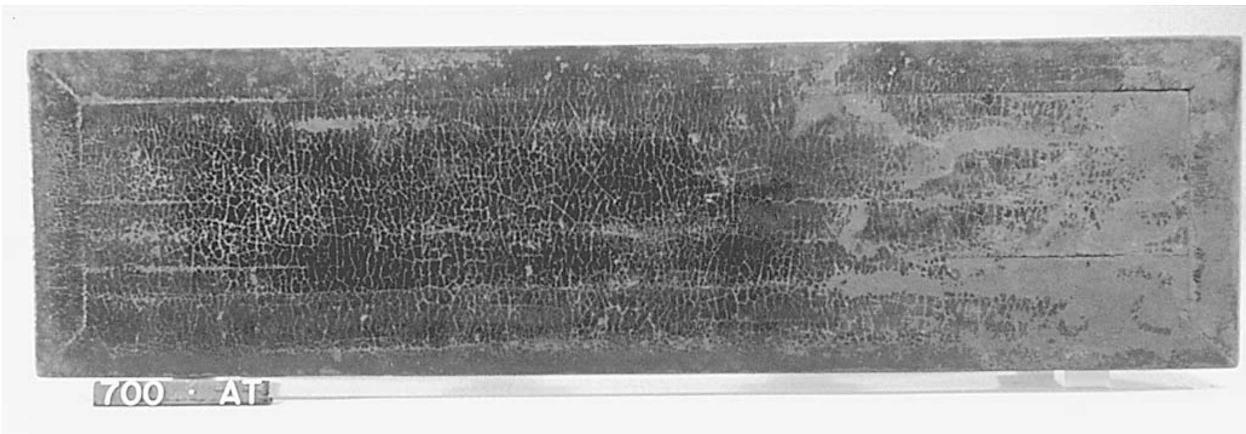

Figure 8: Black lacquer table after treatment.

Conclusion

The treatments of these two lacquer tables illustrate several approaches to loss compensation in lacquer. The treatments also raise these questions that we offer for debate: 1) did we meet the client's expectations? and 2) did we meet conservation standards?

From the client's perspective the treatment of the red table was more successful: the apparent damage was eliminated and the loss compensation was virtually invisible. *(fig. 7)* Conversely, the treatment of the black table was less successful: the apparent damage was significantly decreased but not eliminated, and the loss compensation was detectable by the careful eye. *(fig.8)*

But from a conservation perspective do we reach the same conclusions? To return for a moment to the standards cited earlier in this paper, the work we did on both tables was removable, stable, detectable (by one means or another) and did not overlap existing material. But what about the final standard of visual acceptability? From a conservation standpoint at what point was the work on the black table visually acceptable, and did we work past that point? And was the red table visually acceptable long before we stopped working on it?

Visual acceptability is a basic issue in loss compensation, and a moving target as well. The question of how far to go in achieving it is influenced by both ethics and finances. Each time the question is posed, the answer can change.

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