A Report on the Reproduction of *Ruri-no-shosyaku* and *Ruri-no-uogata* Glass Ornaments

Takeomi Sakoda

This paper reports on the findings obtained and challenges encountered through reproducing *Ruri-no-shosyaku* (lit. ruler-shaped glass ornament) and *Ruri-no-uogata* (lit. fish-shaped glass ornament). Six treasures were chosen for this reproduction project, including a blue ruler-shaped ornament (Middle Section 111), a yellow ruler-shaped ornament (Middle Section 112), and four fish-shaped ornaments (Middle Section 128, No. 2 to No. 5).

Previous studies have determined that only the blue fish-shaped ornament No. 4 was made of soda lime glass, while the other five were made of lead glass. On the other hand, there are few reports from the perspective of glassmakers on the relationship between the conditions of preparation/ melting of glass materials and the resultant colors. In this project, the author prepared a number of colored glass ingots to reproduce the ruler–shaped and fish-shaped ornaments. By preparing and melting the glass materials, I was able to gain detailed knowledge of the relationship between the composition and coloration of the glass.

Surface decoration techniques used on the original treasures such as grinding, line engraving, and coloring are still unclear, because there are few historical documents from the time or previous studies available for reference. In order to clarify the materials and techniques, I repeatedly observed the originals under the microscope and duplicated the techniques by making prototypes. I experimented with dozens of different types of abrasives in order to replicate the quality of the polished surface of the originals. Furthermore, various kinds of engraving tools in different materials and shapes were prepared to duplicate the details on the reproductions.

Fragments of Shitan Pagoda

Michihiko Kasugai

A set of fragments of the *Shitan* Pagoda (lit. Rosewood Pagoda) preserved at the Shosoin is extremely precious components of a small-scale building, demonstrating the architectural features of the Nara period. Although it is considered that the fragments were preserved en masse in the ancient chest No. 206 (South Section 174), not all are currently available as a complete set, remaining in a totally separated state. Meanwhile, we have gathered and sorted out rosewood fragments detached from other diverse treasures, in which we have found some fragments related to the Shitan Pagoda. Through this study, for the first time the entire fragments of the Shitan Pagoda have been examined, including the related fragments, in order to determine whether or not the original form can be restored.

First, individual ID numbers were assigned to every piece, in order to classify them according to the type of building component. As a result, it was found that 24 types of components exist, including 74 pieces of *Kumimono* (bracket complex), 285 pieces of eave area, 104 pieces of handrail, 32 pieces of rooftiles, and 76 pieces of unidentified components, a total of 495 pieces.

Next, a partial restoration was attempted by combining the components of the Shitan Pagoda on drawings. In this process, two possibilities were considered regarding the type of bracket complex employed; the *Futatesaki* bracket complex and the *Degumi* (a single-stepped bracket complex). Although it is very likely that the Futatesaki complex was used, the possibility of Degumi complex being employed was also undeniable. After all, the absence of bracket arms in the overhang direction has led us to the conclusion that it is impossible to specify the original form of the bracket complex. In addition, with regard to the handrails, it was presumed that the Shitan Pagoda may be a part of a multi-storied structure based on the remains of handrails of different types and sizes. On the contrary, however, taking into consideration obvious differences in size as well as the existence of *Nobori-koran* (sloped handrails on both sides), it has been suggested that the fragments may not be the components of a multi-storied building, but rather a miscellany of components of multiple small-scale buildings.

The study has also provided new insights into the method of processing components. The Shitan Pagoda were created not only using conventional construction methods of assembling components, but also by gluing components together. Although it has already been recognized that there must exist some components to attach to the core wood, it has become apparent that a processing method called "*Yosegi* (combination of wood of various grains, colors or textures to create decorative patterns)" was adopted. In addition, the cross section of the rafters as well as the sides of the handrail's *Jifuku* (the lowermost horizontal beams) and the *Hirageta* girders were coated with resin, possibly as an adhesive, suggesting that metal fittings may have been attached. The scientific analysis has revealed that the adhesive is frankincense. From this perspective, it is possible that the Shitan Pagoda were a part of a highly decorative craftwork rather than a small-scale building.

As stated above, we attempted to restore the fragments of the Shitan Pagoda as much as possible based on the existing components/parts, which was, however, insufficient to provide a clear result. Further examination is expected in the future.

Conservation Survey of Synthetic Adhesives and Consolidants Used in the Treatment of the Shosoin Treasures

Masumi Kataoka

This paper aims to provide an overview of the use of synthetic adhesives and consolidants in the conservation treatment of Shosoin Treasures. In this study, conservation records of past treatments were thoroughly revisited, and the author surveyed the use of synthetic adhesives and consolidants in order to clarify in which objects, when, and how, they were applied. The current condition of those objects with earlier treatments was also examined .

The 1950s saw the beginning of modern conservation action to preserve the treasures, and a series of conservation projects has been conducted since then. The projects have targeted the restoration and conservation of objects in a fragile condition, including horse saddles, leather objects such as shoes and belts, lacquerware, *Gigaku* masks, and gilt bronze bells. All these projects have been outsourced to craftsmen and conservation studios. Saburo MAKITA (1905−1993), a well-known restorer of Japanese armour, and Taitsu KITAMURA (1910−1992), a master craftsman of lacquerwork, were the two experts mainly involved in the earlier projects.

From 1959 to the present, over 340 objects have undergone interventive conservation treatment at the Shosoin. In these treatments, synthetic adhesives and consolidants have been used alongside those of traditional materials such as wheat starch paste, animal glue, *funori* and *urushi* lacquer. Among these projects, there are nearly 130 cases where a synthetic material was used in the treatment. The earliest case was found to be a set of horse saddles (M12-3) treated in 1964, where an unknown type of synthetic adhesive, possibly polyvinyl acetate was used to fix the unraveled seams of leather straps. An epoxy resin, Araldaite, was used to reattach the detached metal pieces of leather belts treated between 1971 and 1975. Acrylic adhesives came to be used in the treatment of Shosoin lacquerwares from 1971 but were limited to cases in which there was a painted decoration on the surface and any conventional treatment with urushi could disturb the appearance.

Currently, there seems no condition issue or failure attributed to the synthetic adhesives other than yellowing of the epoxy resin. Since the degree of intervention was greater with objects treated earlier, their reversibility appears unrealistic in many of these cases. In order to extend the efficacy of the treatment and elongate the cycle of future retreatment, the nature and ageing of the added conservation materials also need to be taken into account when considering the care and long-term preservation strategy of such objects.

Pest Control by the Shosoin Treasure House

Makoto Takahata

The *Shoso* repository is a wooden architecture built in the Nara period that was originally used as a storehouse for items cherished by Emperor Shomu as well as those related to Todaiji Temple. Among the objects preserved in the Shosoin, those composed of animal and plant materials are most likely to become food or nesting sites for insects, making them susceptible to insect damage. Consequently, pest control measures to protect the treasures from insects have been undertaken since the Nara period. This paper reports on the measures taken since the Showa era to protect the Shosoin treasures from insect damage. Since the Showa era, the Office of the Shosoin Treasure House has protected the treasures from insect damage through insecticide treatments using methyl bromide fumigation, low oxygen treatment, and insect repellents. Furthermore, the office strives to detect pests at an early stage, mainly by conducting treasure inspections and periodic pest surveys. Whenever pests are detected, the staff works to prevent the spread of damage by undertaking environmental improvements and insect control measures in response to the situation. Although the Shosoin treasures have been protected and handed down since the Nara period mainly through visual inspection, a deeper comprehension of both the materials and properties of the treasures and the history of conservation at the Shosoin is likely essential in order to ensure the future preservation of the treasures.