Establishing conservation in an unconventional venue in Okinawa

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1. INTRODUCTION

A new conservation initiative was established at the Okinawa Institute of Science and Technology (OIST) in November 2011. The OIST Art Conservation Program was envisioned as a way to use the cutting-edge scientific resources available at the university to help in the preservation and study of Okinawan cultural property. Reversing the usual order, the Program secured the support of OIST without already having access to an art collection or museum, as the university itself had no artifact collection. Therefore, partnerships with local museums soon had to be established, a conservation lab space had to be found, and projects had to be chosen that incorporated both technical study and conservation treatment.

OIST is a new international science graduate university located on the hilltops of Onna Village, Okinawa, seen in figure 1. Okinawa is a fitting location for such a university as the islands have an international history of their own, which has greatly influenced its art and culture. Additionally, the unforgiving climate combined with the destruction of the Battle of Okinawa during World War II makes the preservation of Okinawa’s cultural property a critical issue. OIST’s scientific capabilities have sparked creative thinking in the care of Okinawan artifacts.

With university and local support, partnerships were created between OIST and two museums. These led to collaborative art and science projects such as the treatment and study of two sanshins (Okinawan stringed instruments), and the study of archaeological ceramics.

2. ESTABLISHING THE ART CONSERVATION PROGRAM

2.1 BACKGROUND

2.1.1 Okinawan History

Okinawa is a Japanese prefecture consisting of a group of islands south of mainland Japan in the East China Sea. The main island is referred to as Okinawa Island or Okinawa-hontō. Okinawa’s strategic location in the region (between Japan, Korea, China, and Southeast Asia) is an important characteristic in understanding its complicated history. From the late 14th century until 1879, Okinawa was known as
the Ryukyu Kingdom. It was an independent kingdom largely dependent upon trade, although still heavily influenced at times by Japan and China (Kamakura 1978). The international links of the Ryukyu Kingdom have influenced Okinawan art and culture, and today it is still common to find foreign artifacts in archaeological excavations as exemplified in local museum collections.

Okinawan culture is distinct from that of mainland Japan and traditionally has had its own customs and language. This unique material culture can be seen through architecture, textiles, pottery, and other crafts (Kamakura 1978). Despite this vibrant culture, Okinawa Prefecture has been economically less well-off than the rest of Japan (Kerr 2000), which contributed to the decision to invest in the construction of OIST on Okinawa Island.

2.1.2 Conservation at the Okinawa Institute of Science and Technology

OIST has been in development since 2001 and was officially inaugurated as a university in 2011. The university attracts people from all over the world to perform world-class interdisciplinary research with the added goal of internationalizing the Japanese higher education system. One key reason for building the university in Okinawa was as a means to support the local economy and provide more opportunities for the Okinawan people. Although the campus is located on a small island, modern technology keeps it connected with the rest of the world and facilitates researchers in their ability to make advancements in their fields.

Drawing on my experience as an objects conservator, I created the Art Conservation Program, envisioning it as having three main missions: (1) to contribute to the study and understanding of Okinawan art through the use of OIST’s advanced scientific equipment; (2) to contribute to local preservation efforts through conservation treatment, condition survey, training, and other initiatives; and (3) to provide a link between OIST and the community via art and culture. It is our hope that the research and treatment performed by the Program would be a highly visible way to highlight OIST’s commitment to local cultural institutions.

2.1.3 Conservation in Okinawa

To assess need and familiarize myself with Okinawan culture, I first toured the many cultural institutions on the island. Such institutions are plentiful and include large comprehensive museums, smaller historical museums, and castle ruin sites. Despite the large number of museums, none of them employs a permanent conservator. There is a highly respected paper conservation studio that is run by the Toma family. They obtain contracts for paper conservation projects from both within and outside of the
Okinawa. The largest Okinawan museums sometimes hire temporary conservators with paintings or lacquer specialties. In extremely special cases, artifacts may be sent to mainland Japan for treatment. However, most museums go without conservation assistance, and at smaller institutions it is more common for collections staff to perform minor treatments of objects. Except for myself, there are currently no other objects conservators in Okinawa and the overall need far exceeds what the few conservation professionals present can handle.

Due to the lack of objects conservation in Okinawa, I saw a niche for myself. After determining the need for conservation and securing the involvement of OIST, it was necessary to secure the support of local museums. In time, the following two museum partnerships were formed.

2.2 MUSEUM PARTNERS

2.2.1 Yomitan Museum of History and Folklore

The Yomitan Museum of History and Folklore is a small history museum located in Yomitan Village near Okinawa Island’s central west coast. The Yomitan Museum was first to agree to collaborate with OIST. Their collection focuses on the Yomitan area, which has a history as a port village. The museum is built next to the Zakimi Castle World Heritage Site, and its collection contains many archaeological finds from this site. Additionally, due to the museum’s close proximity to the ruins of the old Kina pottery kiln, its collection also boasts many ceramic vessels made at Kina. These include large pots as seen in figure 2, which include both food storage containers and burial urns.

Fig. 2. Large 15th–17th century ceramic jars from Kina Kiln on display at the Yomitan Museum (Courtesy of the Yomitan Museum of History and Folklore)
Textiles are also a strength of the collection, such as kimonos made from locally woven *Yuntanza Hanauri* fabric (fig. 3). The focus of the collaboration with the Yomitan Museum is artifact conservation with associated research. To begin, I performed a condition survey of the museum’s artifacts on view. This included textiles, tools, household living items, musical instruments, archaeological ceramics, and other archaeological items such as shell ornaments, stone tools, and metal coins. The survey showed that many artifacts were in need of conservation and helped in the selection of appropriate projects. The most common condition issues observed were unstable pottery joins, structural instability of organic materials from past insect damage, and flaking decorative surface layers.

### 2.2.2 Naha Municipal Tsuboya Pottery Museum

The second museum to partner with OIST was the Naha Municipal Tsuboya Pottery Museum. This modern museum is located at the site of the old Tsuboya Kiln, and the kiln ruins are actually incorporated into the museum’s exhibits. The Tsuboya area is located within the capital city of Naha, which is in the southern region of Okinawa Island. Tsuboya has a long history of ceramic production illustrated by the fact that *tsubo* means jar or pot in Japanese. The Tsuboya Museum’s collection is predominantly composed of modern, historic, and archaeological ceramics from the Okinawan islands with a focus on the Tsuboya area. When I first met with Tsuboya Museum curator, Taro Kuranari, I was told that the museum had a strong desire to scientifically study Okinawan ceramics. More specifically, questions had arisen regarding methods to differentiate between pottery made on Okinawa Island and pottery made on Ishigaki Island. Ishigaki Island is part of Okinawa prefecture and is located 411 km southwest of the main island. According to Mr. Kuranari, pottery from the two islands have distinct clay sources yet similarities in style. Frequent trade between them has made differentiating...
between vessels from the two islands quite difficult (2012). After being presented with these exciting questions, a collaboration was formed to use OIST’s scientific facilities, to research and characterize pottery from select kilns on the Okinawa Island and Ishigaki Island. See Section 4 for more information on this study.

2.3 SETTING UP THE CONSERVATION LAB

After securing museum partners, the Art Conservation Program was still without a proper working space. It was decided that it was most appropriate to create a conservation lab on the OIST campus. Initial setup concerns included securing an appropriate space, lab furniture, microscopes, and other equipments. Consumable treatment supplies such as adhesives, solvents, and paints also had to be purchased. OIST retrofitted a science lab to become a conservation lab (fig. 4). The space includes a fume hood, sink, cabinetry, and a window for natural light. Museum quality furniture was installed, and necessary equipment was purchased. One challenge has been to find appropriate supplies from within Japan. In addition, it was necessary to find ways of properly communicating the needs of a conservation lab to OIST, as these were often quite different from those requested by other OIST researchers.

I also participated in the design and purchasing of analytical equipment for OIST’s physics common resources department in order to optimize their ability to be applied to the study of art objects. The most involved equipment discussions surrounded the purchase of a Raman spectrometer with a specialized horizontal exit for the nondestructive analysis of artifacts (fig. 5). As necessary, I consulted with conservation scientists and invited colleagues to visit OIST in order to assist with the setup of the Program. After completion of the conservation lab, treatment and in-depth research projects began.
3. SANSHIN PROJECT

3.1 SANSHIN INTRODUCTION AND HISTORY

One of the first projects that the Program undertook was the analysis and treatment of two early 20th-century Okinawan sanshins (stringed musical instruments) from the Yomitan Museum (figs. 6, 7). These two sanshins were selected for study and conservation due to their age, unstable condition, and unusual appearance. They predate World War II, which is significant given the mass destruction that the war had on Okinawa (Kerr 2000) as well as the rapid deterioration of artifacts caused by the humid environment.

The word sanshin literally means “three strings.” The Chinese originally transported similar instruments to the Ryukyu Kingdom in the 14th and 15th centuries. These instruments evolved into the Ryukyuan sanshin (Yomitan Museum of History and Folklore 2012). In turn, the sanshin was the precursor to the mainland Japanese shamisen instrument (Tokugawa 1978).

In the Ryukyu Period, sanshins were played at court and in processions, for example, during the annual or biannual tributes to China. The first accurately datable written source mentioning the sanshin is the diary of Uwai Kakuken, a Japanese senior councilor, which says that the sanshin was played during a Ryukyu envoy to Kagoshima in 1575 (Tokugawa 1978). Over time, Okinawan sanshins evolved from being expensive items used by the samurai class into later being used by the general public (Yomitan Museum of History and Folklore 2012).

Typically, sanshins have a wooden armature. The neck (so in Okinawan language) may be made from dark wood, such as ebony, or lighter wood coated with urushi lacquer. The top of the neck curves backwards and three tuners extend out from it. The tuners are often made from wood with carved bone.
Fig. 6. Sanshin A, before treatment. Artist Unknown, Okinawan Sanshin, early 20th century, wood, leather, lacquer, textile, bone, 77 × 19 × 8.3 cm, Yomitan Museum of History and Folklore, 4482 (Courtesy of the Yomitan Museum of History and Folklore)

Fig. 7. Sanshin B, before treatment. Artist Unknown, Okinawan Sanshin, early 20th century, wood, leather, lacquer, textile, fur, metal, bone, plastic, 79 × 20 × 8 cm, Yomitan Museum of History and Folklore, no accession number (Courtesy of the Yomitan Museum of History and Folklore)
tips. The sound box, or chiigaa, of a sanshin is typically composed of python skin stretched over the wooden frame. Pythons are not native to the area. However, in line with Okinawa’s international history, python skins were imported from Southeast Asia (Higa 1983, 256). The perimeter of the chiigaa is usually wrapped with a decorative ornate fabric.

Although the above materials are typically used in sanshin manufacture, Okinawans also have a tradition of utilizing unconventional materials under special circumstances. For example, the kankara sanshin was developed due to the scarcity of supplies after World War II. The sound box of the kankara sanshin is made using a hollowed-out tin can (Tamaki 2013), demonstrating the resourcefulness of the Okinawan people.

3.2 LEATHER IDENTIFICATION ANALYSIS

The leather covering the two sanshins in this study did not appear to be the typical python skin (figs. 6, 7). This led to questions regarding what occurred in the economic climate of the early 20th century that necessitated the use of another type of skin. The skins covering both sanshins are brown in color with clear hair follicles. The follicle pattern resembled that of a cow or a goat, but obscuring resinous coatings applied to the surfaces of the leathers prevented definitive identification.

The interdisciplinary environment at OIST led to discussions with professor Sasha Mikheyev of the Ecology and Evolution Unit, where it was decided that DNA sequencing of the leathers might allow for the identification of their animal origins. Subsequently, DNA was extracted from small samples of leather (less than 1 mg) taken from unobtrusive areas. The extraction process involved purification of the DNA following lysis, precipitation, washing, and elution procedures (Qiagen 2006). The DNA was then amplified using a polymerase chain reaction (Folmer et al. 1994). Ultimately, the amount of extracted DNA was too small and contaminated to be properly identified. Contamination was most likely due to degradation, leather processing, the presence of the resinous surface coating, and years of human handling.

It was then decided to use high-performance liquid chromatography–mass spectrometry (HPLC-MS) to identify the animal origin of the leather through protein analysis. The protocols proposed by Prof. Mikheyev and OIST scientist Dr. Stephen Aird were first performed on test pieces from a rawhide drum cover that had been obtained from a local musical instrument store. After satisfactory results were obtained with the test rawhide, the protocols were carried out on samples of the sanshin leathers. Before analysis, the samples were digested into their peptide components using the enzyme trypsin and suspended in a liquid solution. HPLC-MS was then performed at OIST’s mass spectrometry facility. Analysis consisted of ionizing the digested samples and then separating the solution components by mass. HPLC-MS tentatively identified both leather samples as bovine collagen based on the presence of peaks of characteristic protein mass values. This suggests that both sanshins are covered with cowhide, which would have been a likely choice if python was not available. Contamination was found in the HPLC-MS samples as well. Therefore, further tests will now take place to confirm the results and to ensure the effectiveness of the developed digestion and analysis protocols.

3.3 SANSHIN TREATMENT

While OIST biologists were performing leather identification, I began conservation treatment of the sanshins. Both sanshins have a base wood armature construction with urushi lacquer coating the neck, leather covering the sound box, and a decorative textile band around the sound box perimeter.

Before treatment, Sanshin A (fig. 6) was in fair condition. Damage included broken strings, broken tuners, small lacquer losses, a torn and fraying textile band, and insect damage to the leather resulting in unsightly “skinned” lighter spots scattered all over the leather (fig. 8). The skinned areas were addressed by covering them with small pieces of thin Japanese tissue paper toned with acrylic paints that were then adhered using an aqueous methylcellulose solution (fig. 9). Covering the areas of
Fig. 8. *Sanshin* A before treatment, showing insect damage to leather covering (Courtesy of the Yomitan Museum of History and Folklore)

Fig. 9. *Sanshin* A after loss compensation of insect damage using toned Japanese paper fills (Courtesy of the Yomitan Museum of History and Folklore)
damage with Japanese paper allowed them to be aesthetically integrated with the rest of the leather cover. Repairs to the textile were also made using toned Japanese paper and methylcellulose. The lacquered neck was cleaned overall using mineral spirits. More unsightly areas were cleaned further using a 1% (w/v) phytic acid chelating solution in distilled water with Triton X-100 and methylcellulose as a thickener, as outlined by Schmuecker (2011, 181). The few small lacquer losses were filled with Flügger acrylic putty burnished to increase gloss, then inpainted with powdered pigments mixed with B-67 in xylene. Lastly, the strings were retied in place and the broken tuners were repaired using fish glue bulked with cellulose powder. After treatment, proper archival housing was created for Sanshin A before returning the artifact to the Yomitan Museum. The object is now in stable condition and able to be exhibited (fig. 10).

Treatment of Sanshin B (fig. 7) is currently underway. Before treatment, the lacquer on the sanshin's neck was actively flaking and much of it was already lost (fig. 11). Cross section analysis of a lacquer flake showed that there were thick ground layers underneath a relatively thin lacquer coating (fig. 12). The large ratio of ground to lacquer as well as the lack of built-up urushi layers suggests application flaws. The flaking was likely a result of both inherent vice and storage in poor environmental conditions. To relax the lacquer, the neck humidified briefly by enclosing it in a plastic bag with damp blotters. After testing, it was determined that aqueous fish glue worked best to consolidate the flaking lacquer. Therefore, fish glue was diluted with distilled water and wicked under the lacquer flakes using a brush. After consolidation, treated areas were weighted while drying to keep them in place (fig. 13). Additional treatment of Sanshin B will involve textile stabilization and leather aesthetic compensation.

Fig. 10. Sanshin A after treatment (Courtesy of the Yomitan Museum of History and Folklore)
Fig. 11. *Sanshin* B before treatment, showing flaking and lost urushi lacquer (Courtesy of the Yomitan Museum of History and Folklore)

Fig. 12. *Sanshin* B, lacquer cross section showing thick ground layers and thin lacquer top layer, visible light (Courtesy of Anya Dani)
4. CERAMIC PROJECT

Another major project currently underway is the comparative study of 17th–18th-century Okinawan archaeological ceramics from seven historically significant kiln sites. Six institutions provided material to be included in this study. Okinawan pottery is made in both earthenware and stoneware varieties. It is wheel-thrown and traditionally fired in wood burning climbing kilns. Okinawa has a rich international ceramic history that is still culturally relevant and active today. In particular, economic changes, rapidly evolving ceramic technology, and increased ceramic production during the 17th–18th centuries all make that time period uniquely important and interesting for study. Significant milestones during this time include the introduction of ceramic glazing techniques to Okinawa by Korean potters that were brought to Okinawa by the Japanese (Kuranari 2012).

This project aims to characterize the ceramics in the study as well as to differentiate between pottery made on the Okinawa Island vs. those made on the Ishigaki Island. Included in OIST’s common resources division, XRD and XRF are being used to analyze the ceramic sherds. Differences in mineralogical phase composition are being determined with XRD in order to both characterize the pottery and to help determine original firing temperatures. XRF analysis has been able to identify trace elements in the ceramic sherds, which sheds light on slight differences in the clay body composition between the two islands. Future studies of these ceramics will include thin-section petrography and SEM-EDX to further understand their composition and to identify temper inclusions.
5. CONCLUSION

The Art Conservation Program at the Okinawa Institute of Science and Technology has successfully created links between the University, the Yomitan Museum, and the Tsuboya Museum. Establishment of the Program required gaining university and museum support, establishing a conservation lab, and choosing appropriate projects. A condition survey of objects on view at the Yomitan Museum has been completed and artifacts from the museum are being treated. OIST scientists have been working to identify the unusual leather coverings on two Okinawan sanshins, and initial HPLC-MS results suggest that they are cowhide. This project was spurred by having myself, an art conservator, working in such close proximity with OIST biologists.

Creating a conservation research and treatment program at a science university has been greatly beneficial. OIST has been able to use its resources to benefit the community while also contributing to the understanding of Okinawan art. Local museums have had artifacts treated, received conservation assistance, and had access to the scientific equipment and personnel at OIST. In the future, the Program will continue its work with local museums and strive to make connections with other cultural institutions in Okinawa, mainland Japan, and abroad. As art conservation itself is a diverse field that incorporates art and science, such a program fits perfectly within an interdisciplinary and innovative institution like OIST.

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FURTHER READING


SOURCES OF MATERIALS

Acryloid (Paraloid) B67, Cellulose Powder, Fish Glue, Isinglass (sturgeon glue), Methyl Cellulose, and Triton X100

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