

# Science and Technology Group Annual Report FY2015

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## 1 Introduction

The goal of the Art Conservation Program at OIST is to contribute to the preservation and understanding of Okinawan material culture through collaborations with both the Yomitan Museum of History & Folklore and the Naha Municipal Tsuboya Pottery Museum. Collaborative work with other OIST research units as well as with conservation professionals from abroad is ongoing. In FY15 our work largely consisted of performing conservation treatments to preserve artifacts for the future, research for and significant involvement with the *Kitagama x OIST* exhibition, research into the use of blue glazes in local ceramics, and investigating the use of femtosecond lasers to cut paint cross-section samples.

## 2 Activities and Findings

### Conservation Treatments of Yomitan Museum Artifacts (Completed)

- Marubon (circular lacquer tray), Okinawan, Acc.# 4818: Treatment involved stabilizing areas of lifting lacquer, cleaning, and filling in the largest areas of loss using reversible acrylic putty (Figs. 1, 2). Original materials were identified using cross-section microscopy and scanning electron microscopy.



Figure 1. Marubon before treatment



Figure 2. Marubon after treatment

- Kakubon (rectangular lacquer tray), Okinawan, Acc.# 21298: Treatment involved stabilizing lifting lacquer, removing discolored overpaint, cleaning, and filling large gaps.

### Kitagama Pottery Analysis and Exhibition

- The Art Conservation Program made significant contributions to the *Kitagama x OIST* exhibition, which was held on OIST campus from May 18-July 31, 2015. The Kitagama Pottery Collective from the Yomitan Pottery Village had long-standing questions regarding their clay and glaze compositions as well as firing temperatures inside their kiln. Their questions were urgent due to the loss of some clay sources and the potters' desire to preserve their techniques for the future. Therefore, Ms. Dani analyzed their clays/glazes using X-ray Diffraction and X-ray Fluorescence Spectroscopy. The composition of the clays/glazes were identified and differences in clay firing resistance were explained by variations in the amount of silica as well as variations in potassium- and iron-containing fluxes. Ms. Dani also contributed to the planning of the overall exhibition and experiments done in conjunction with the potters. Scientific contributions made by Ms. Dani and those of OIST researcher Dr. Sajiki were presented in the exhibition alongside the artists' works.

### Ceramic Research

- Research was done into the composition and origin of Okinawan blue glazes. An unusual blue-glazed Wakuta bowl was brought to the attention of the Tsuboya Museum. Our analysis discovered a high level of arsenic mixed with cobalt blue. This is unusual as most Co blue used in Okinawa comes from China and does not contain significant As. Blue glazed bowls from Okinawa, China, Japan, Vietnam, and Thailand were analyzed and compared to the Wakuta bowl. The Wakuta bowl as proven to be an

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anomaly thus far and may be the result of the Ryukyu Kingdom's extensive trade routes. It is known that high-As blue was used in other areas of the world such as Germany and India.

- Research continued into the composition and provenance study of 17<sup>th</sup>-18<sup>th</sup> century archaeological ceramics from the Okinawan Main Island and Ishigaki Island.

## 3 Collaborations & Visitors to the Art Conservation Program

- **Junko Furihata**, Senior Conservator at the Conservation Science Laboratory, Nara National Research Institute for Cultural Properties. February, 2016. OIST seminar on 2/25/16 - *Commencing the domestic production of lead glazed bricks- Analytical studies of excavated ceramics from the 7-8th century*
- **Stephanie Spence**, Visiting Conservation Research Student from SUNY Buffalo State College. June-August, 2015 & January 2016. In addition to her contributions in artifact treatment and ceramic blue glaze analysis, Ms. Spence was critical to the **Laser Cross-Section Project**. This project investigated the efficacy of using femtosecond lasers to cut paint cross-section samples. This was a collaboration between the OIST Art Conservation Program, OIST Femtosecond Spectroscopy Unit, and Buffalo State College's Art Conservation Program. In special cases, it is necessary to remove small samples from paintings for analysis. The normal practice of removing samples using a scalpel has limitations, especially when paint surfaces are quite delicate. Therefore, experiments were performed using femtosecond lasers to make extremely precise cuts with no heat build-up (Fig.3). Tests were successful and our work was published in *Materials* and *MRS Advances*

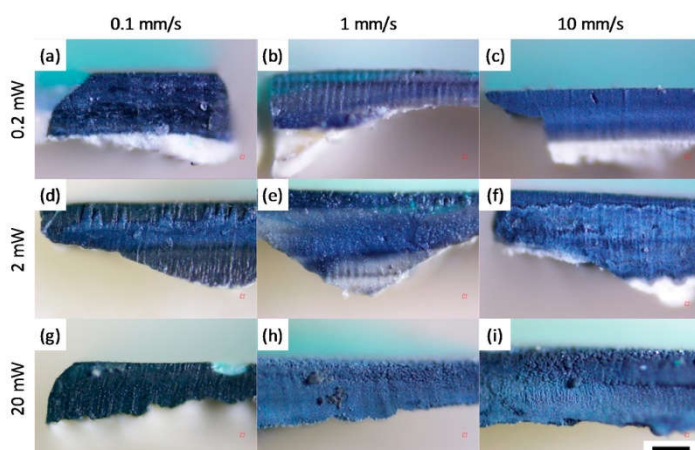


Fig. 3. Optical images of sample 2 cross-sections showing effects of translational speed and input power after the femtosecond laser cutting.

(Harada, T., Spence, S., Margiolakis, A., Deckoff-Jones, S., Ploeger, R., Shugar, A., Hamm, J., Dani, K., and Dani, A. *Obtaining Cross-Sections of Paint Layers in Cultural Artifacts Using Femtosecond Pulsed Lasers*. *Materials*, 2017, 10, 107).

## 4 Publications and other output

- Anya Dani. *Okinawan Ceramics: Technical Study & Collaborations with Local Potters*. Presented at the New Mexico Dept of Cultural Affairs, Conservation Dept, Santa Fe, NM (May 2015).
- *Kitagama x OIST* exhibition, OIST campus, Onna-son, May 18-July 31, 2015
- Dani, A., Kuranari, T., Toots, M., Margiolakis, A., and Mass, J. *Investigation into the Composition and Provenance of 17<sup>th</sup>-18<sup>th</sup> Century Okinawan Ceramics*. Presented at the 2015 International Symposium on Ancient Ceramics, Shanghai (October 2015).

### Art Conservation Treatment Proposals & Final Reports

- Spence, S. "Marubon: Artifact Exam & Trmt Proposal", Acc.# 4818, Yomitan Museum, 2015.
- Spence, S. "Marubon: Final Trmt Report", Acc.# 4818, Yomitan Museum 2015.
- Dani, A. "Kakubon: Final Trmt Report", Acc.# 21298, Yomitan Museum, 2016