

## Aiding the conservation of two wooden Buddhist sculptures with 3D imaging and spectroscopic techniques

Chiara Ricci<sup>(1)</sup>, Paola Buscaglia<sup>(1,2)</sup>, Debora Angelici<sup>(1)</sup>, Anna Piccirillo<sup>(1)</sup>, Federica Pozzi<sup>(1)</sup>, Paola Manchinu<sup>(1)</sup>, Leila Es Sebar<sup>(2)</sup>, Luca Lombardo<sup>(2)</sup>, Sabrina Grassini<sup>(2)</sup>, Federico Di Iorio<sup>(1,2)</sup>, Sara Croci<sup>(1,2)</sup>, Laura Vigo<sup>(3,4)</sup>, Davide Quadrio<sup>(3)</sup>

(1) Center for Conservation and Restoration of Cultural Heritage "La Venaria Reale", Via XX Settembre 18, 10078 Venaria Reale (Torino), Italy

(2) Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy

(3) Museo d'Arte Orientale (MAO), Via San Domenico 11, 10122 Torino, Italy

(4) Montreal Museum of Fine Arts, 1380 Sherbrooke Street West, Montreal, Quebec H3G 1J5, Canada

The conservation of Buddhist sculptures that were transferred to Europe at some point during their lifetime raises numerous questions: while these objects historically served a religious, devotional purpose, many of them currently belong to museums or private collections, where they are detached from their original context and often adapted to western taste.

This contribution focuses on a heterogeneous group of seven wooden polychrome sculptures from the Museo d'Arte Orientale (MAO) in Torino, Italy, which has recently undergone an in-depth study and conservation treatment at CCR "La Venaria Reale". The information contained in museum entries for these objects, never exhibited before, is generally rather scarce: they are all of Chinese provenance and likely dated from the 16<sup>th</sup> to the 18<sup>th</sup> century. Within this multidisciplinary project, special attention was paid to the study of two of the sculptures, which portrayed two Bodhisattvas and looked very similar to one another except for the symmetrical gesture of their hands. A scientific study was carried out to address questions from MAO curators in terms of whether these artifacts might be forgeries or replicas, and how they may have transformed over time. Several analytical techniques were used for materials identification and to study the production technique, ultimately aiming to discriminate the original materials from those added within later interventions. The analytical methodology involved non-invasive techniques, followed by sampling and micro-invasive investigations: in particular, XRF and FTIR analyses were performed to characterize pigments and binders, while optical microscopy and SEM/EDX were used to investigate the painting stratigraphy and to assess the possible occurrence of biodeterioration phenomena. In addition, one micro-sample was removed for wood identification.

Tridimensional imaging proved particularly useful to complement data from point analysis. X-ray computed tomography of one of the two Bodhisattva revealed precious details of its inner structure, based on the assembly of several wooden blocks. In an effort to fully document the object as well as the distribution of materials on the surface and outmost layers, a multispectral imaging campaign was then carried out for the creation of a multispectral 3D model within an ongoing partnership with the Politecnico di Torino. The approach used is based on the integration of photogrammetry and multispectral imaging, enabling the correlation of geometrical, morphological, and radiometric data in a single 3D model, which combines information that could support the design of suitable conservation treatments. The two sculptures are currently displayed within the MAO exhibition "Buddha<sup>10</sup>. A Fragmented Display on Buddhist Visual Evolution" (October 2022 - September 2023) [1].

[1] <https://www.maotorino.it/en/eventi-e-mostre/exhibition-buddha10>