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X-CT Reconstruction as a Tool for Monitoring the Conservation State and Decay Processes of Works of Art and in Support of Restoration and Conservation Strategies

Laura Guidorzi [1,*], Alessandro Re [1,*], Francesca Tansella [1], Luisa Vigorelli [1], Chiara Ricci [2], Joseph Ryan [3] and Alessandro Lo Giudice [1]

[1] Dipartimento di Fisica, Università di Torino & INFN—Sezione di Torino, Via Pietro Giuria 1, 10125 Torino, Italy; francesca.tansella@unito.it (F.T.); luisa.vigorelli@unito.it (L.V.); alessandro.logiudice@unito.it (A.L.G.)
[2] Centro per la Conservazione ed il Restauro dei Beni Culturali "La Venaria Reale", Via XX Settembre 18, Venaria Reale, 10078 Torino, Italy; chiara.ricci@ccrvenaria.it
[3] Research Institute for the Dynamics of Civilizations, Okayama University, 3-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530, Japan; josephryan@okayama-u.ac.jp
* Correspondence: laura.guidorzi@unito.it (L.G.); alessandro.re@unito.it (A.R.)

Abstract: X-ray Computed Tomography (X-CT) is now an established technique for the investigation and diagnostics of Cultural Heritage. Its advantages include non-invasiveness, non-destructiveness, and the possibility of exploring the inner parts of an object without any modification. X-CT is often employed to investigate the construction methods of complex artifacts made with different parts or materials, but it is also able to support the analysis, intervention, monitoring and enhancement processes of artworks, creating digital models that can aid in the conservation and restoration procedures. In this work, several case studies are presented in which the CT technique has been decisive in identifying the effects of time and the events that occurred during the object's life influencing its state of conservation. These range from large objects, such as an 18th century CE writing cabinet or an ancient Egyptian wooden coffin, to very small artifacts, like Mesopotamian lapis lazuli beads or fragments of Roman colored glass. Additionally, the results obtained by μ-CT investigations on the conservation state of a bronze arrowhead uncovered from the Urama-chausuyama mounded tomb (Japan, Kofun period, end of the 3rd century CE) are presented here for the first time. Lastly, the versatility of the technique when applied with different setups is highlighted.

Keywords: X-ray computed tomography; preventive conservation; damage; xylophagous insects; corrosion; bronze arrowheads; Urama-chausuyama mounded tomb

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1. Introduction

Many transformations can occur in a work of art, starting from its creation. Physical, chemical and biological changes can affect its structure, appearance, composition and integrity as time goes on. Sometimes changes are not visible from the outside, or conversely, an apparently destroyed object might actually hide inside a pristine part. In such cases, an analysis of the inner part of the object is needed to assess its actual conservation state. X-ray Computed Tomography (X-CT) has been borrowed from the medical field since the 1980s for the investigation and diagnostics of Cultural Heritage [1].