

## PHOTONICS SEMINAR

# On the use of photonic and laser technologies for the conservation and restoration of cultural heritage artworks

Insights on selected optical and terahertz-based technologies  
with imaging capabilities

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### Abstract

Over the past 40 years, scientific research activities in support of knowledge, conservation and restoration of objects and monuments belonging to the world's cultural heritage, have grown in number and quality. A large number of disciplines of science and engineering started to be exploited for the understanding of composition of the cultural objects, providing important answers and interpretative tools about: the original technologies used to create works of art, which contributes to the scholarly interpretation of art and artefacts (technical art history); the understanding of deterioration mechanisms and the principal factors influencing damage mechanisms of objects of art; the evaluation and the development of restoration materials and approaches.

The introduction of analytical methods in the heritage field strongly relies on the transfer of know-how initially developed for industrial and biomedical applications, adapted to the specific needs associated with the preservation of cultural heritage, with few exceptions. Established in 1930, the Centre de Recherche et Restauration des Musées de France (C2RMF) in Paris, is one of the oldest laboratories in the world specifically dedicated to the analytical examination of the artworks stored in the national museums, and its current activities will be briefly introduced.

Within the new technologies adopted for artworks inspection and analysis, the photonic and laser ones are gaining a prominent position for determining the composition and for their restoration as well.

The development of LIBS, LIF and Raman spectroscopies to analyze materials from cultural heritage and the improvement of laser cleaning methods are among the goals of the laser laboratory of the C2RMF, and its current research lines will be briefly presented.

The overall advances in laser technology have led to the emergence of a range of new sophisticated and powerful techniques with 3D imaging, depth profiling and cross-sectional view capabilities. Among them, optical coherence tomography (OCT), terahertz time-domain imaging (THz-TDI) and terahertz radar will be fully treated and explained in relationship to their use for visualizing the internal structure of cultural heritage objects.

**Corinna Ludovica Koch Dandolo** was born in Switzerland.

She received the B.Sc. and M.Sc. degrees in Heritage Science from the University of Perugia (Italy) respectively in 2007 and 2008, a M.A degrees in Conservation and Restoration from the University of Applied Sciences and Arts of Southern Switzerland (SUPSI) in 2012 and a Ph.D. degree from Technical University of Denmark – Department of Photonics Engineering (DTU Photonics) in 2016.

From August 1st 2015 to July 31st 2016 she has been teaching assistant for the degree course in Conservation and Restoration of the University of Applied Sciences and Arts of Southern Switzerland (SUPSI).

She has been post-doctoral research fellow granted by the Swiss National Science Foundation (SNSF) from August 1st 2016 to January 31st 2018, conducting her research at the Applied terahertz science group of the Centro de Investigaciones en Óptica (CIO, León, Guanajuato – Mexico), at the Laser & Terahertz test Team of Laboratoire de l'Intégration du Matériau au Système (IMS, Bordeaux - France) and at the Centre de Recherche et Restauration des Musées de France (C2RMF, Paris - France). Her postdoctoral research focused on terahertz time-domain, frequency modulated continuous waves and optical coherence tomography systems for inspecting the internal structure of cultural heritage objects.

She is currently a postdoctoral researcher at C2RMF. Her main areas of research interest continue to be on laser-based technologies for imaging cultural heritage objects.