Introduction to the Acta IMEKO special issue on the ‘IMEKO TC4 international conference on Metrology for Archaeology and Cultural heritage’

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Dear Readers,

This special issue of Acta IMEKO is the result of the 5th International Conference on Metrology for Archaeology and Cultural Heritage.

The conference was originally planned to be held in Trento (Italy) hosted by the Department of Humanities of Trento University, on October 22-24, 2020, but due to the sanitary emergency caused by the Covid-19, the organisers decided to hold the conference online. Despite the unexpected situation the conference has been a great success with 158 initial submissions, 126 accepted papers, 431 authors from 19 countries, 4 invited plenary speakers, 13 special sessions, 3 tutorial sessions and 11 patronage. Out of the numerous presented papers a selection has been made by the scientific committee to realize this issue. Particular attention has been paid to the papers which inspire the exchange of knowledge and expertise between “human sciences” and “hard sciences”. After the review process sixteen papers have been accepted for publication encompassing several research fields and methodological approaches.

More in detail, several papers are devoted to the material characterization by means of different analytical techniques. Six of them are focused on the analysis of archaeological artefacts. Particularly, Zerai et al. analysed the pottery assemblage from the site of Adulis (Eritrea): colorimetric measurements show new technological and manufacturing insights used for ceramic production during Roman age.

An Egyptian wooden statuette stored in the Museo Egizio di Torino has been analysed by Vigorelli at al., who compared the results of a multi-analytical strategy based on both non-invasive and micro-invasive procedures to investigate the original artistic techniques and the ancient restorations of the artefact.

The paper by Stagno and Capuano compares micro-MRI, diffusion-NMR and portable NMR data to highlight the diagnostic features of Roman archaeological woods.

Es Sebar et al. analysed different metal tools used during the construction of the Santa Maria del Fiore Cupola in Florence, PCA analysis performed on XRF data allow to determine different alloys depicting new details about the Renaissance technology.

Tavella et al. used a graphic elaboration software to calculate the capacity of several prehistoric vessels from north eastern Italy, suggesting possible functions and/or cultural traditions related to the potteries.

The article by Mazzoccatà et al. show the significance of laser scanning microprofilometry for surface analysis and 3D printing in the study of archaeological pottery.

Passing by the archaeology to the artworks, Sottoli et al. present an interesting contribution based on the combination of MA-XRF and DR to study painting layers and colours composition.

A second group of eight paper is more related to the study and also to the management and valorisation of architectural heritage. Baiocchi et al. proposed an approach to realize a geomatic survey by smartphones useful to create digital twins and virtual models. This approach has been tested on the Intihuatana stone in Machu Picchu (Peru) providing intriguing results and possibilities.

Brienza and Fornaciari combined GIS and photogrammetry to study the masonry of the Bagni di Eliogabalo (Rome). Their detailed data offer a wide reconstructive hypothesis allowing to point out roman construction techniques and expedients.

Doria et al. present the result of multi-steps program related to the study and the conservation of the Castiglioni Chapel in

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Pavia, focusing on the digital survey and the creation of an immersive 3D model with different levels of analysis and visualization.

The paper by Antolini focuses on the development of a wide approach for the reconstruction of the ephemeral apparatuses, the latter has been applied to the case study of the funeral apparatus realized in Rome for Cardinal Mazarin.

Several banded vaults systems in Turin Baroque atria have been analysed by Natta. The author proposes an integrated approach involving metric survey by laser scanning and digital drawing in order to investigate the original constructive methodologies and the changes due to the time.

Moving to more recent structures, the paper by Gabellone shows an interesting 3D reconstruction of an underground oil-mill in the town of Gallipoli, which has been used to develop shared virtual visits during the COVID-19 emergency.

Pirinu et al. present the results of an extended survey activity related to the military architectures built in Sardinia during the Second World War. The collected data allow to analyse the historical construction techniques as well as to recover a peculiar heritage which is part of the contemporary landscape.

Bertola discusses a methodology which starting from archival documentation and using BIM allow to reproduce a 3D model of Druce Case a Capri by Aldo Morbelli.

Eventually, the article by Weththimuni et al. deals with the preservation of cultural heritage building by using ZrO2-doped ZnO-PDMS nanocomposites as protective coatings for the stone materials, providing interesting future perspectives.

The contributions of this special issue provide an overview on the significant impact achieved by a more intense synergy between metrology and human sciences. Moreover, following the constraint given by the international situation occurred since the 2020, this issue stressed the importance to promote a diffuse accessibility of cultural heritage thanks to virtualization and digitalization of archaeological artefacts, human landscapes, historical documents and so on.

To conclude we hope that this special issue catches the attention of the readers thanks to its interdisciplinarity. Actually, we strongly believe that the intermingling of competencies is the way to look beyond the contemporary research and to sketch both the opportunities and the path of the cultural heritage in the future.

Hope you will have an exciting reading!

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Guest Editors