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Editorial to selected papers from the 2022 IMEKO International Conference on 'Metrology for Archaeology and Cultural Heritage' – 2nd part

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Section: EDITORIAL

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Dear Readers,

This Special Issue collects the extended version of some of the contributions presented at the 2022 IMEKO International Conference on Metrology for Archaeology and Cultural Heritage, held in Cosenza (Italy) from the 19th to the 21st of October 2022. This international conference brought together experts with different expertise but united by the interest in the characterisation and conservation of Cultural Heritage. The topics of data acquisition, interpretation, and reliability have been addressed during the event.

The first part of this publication has been included in the third issue of the 12th volume of this Journal, already available online. The contributions published in this second part of the Special Issue will be presented individually below.

The paper by Marra et al. [1] presents the case study of the palaeontological heritage of the Capo Vaticano - Monte Poro area (Vibo Valentia, Italy). This site preserves palaeontological records particularly relevant for phylogenetic studies and paleogeographic reconstructions as well as for scientific divulgation and museology. The acquired data on the taphonomic constraints allowed the Authors to delineate the diagenetic history of the sedimentary succession of the Cessaniti site. Moreover, the actions implemented to protect and manage this important heritage are presented.

Somma and coauthors [2] report on the geological heritage of the main collections housed at the University of Messina (Messina, Italy), and the results of the activities and methods carried out for the characterisation of geological materials of uncertain classification or composition. The optical observations at the stereomicroscope and by Scanning Electron Microscopy-Energy Dispersive Spectroscopy (SEM-EDS), in tandem with μ-Raman analyses on geomaterials allowed them to ascertain the authenticity of suspect specimens, pointing out that such methodologies provide a useful and fast approach to properly discriminate between real and fake geomaterials.

Smeriglio et al. [3] present a numismatic study of Roman coins through X-ray fluorescence and X-ray computed μ-tomography analysis. The combined use of different techniques allowed the Authors to identify the alloys used to produce the archaeological objects and also to reveal the inscriptions on them, which were made partially unreadable by the corrosion layers. Thus, the study was able to date the analysed coins.

The paper by Carpino et al. [4] addresses the important topic of fungal formations in historic buildings. The Authors examine the conditions that favour the growth of different fungal species on building materials such as brick masonry, limestone, and plaster. The analysed climatic conditions refer to three locations, typical of Northern, Central, and Southern Europe, respectively. These conditions are obtained using the DesignBuilder software; then, a more detailed analysis of the walls is performed with the WUFI software. The paper suggests solutions to reduce the risk of fungal growth and, therefore, to avoid phenomena that can damage the historical heritage.

Moreno and coauthors [5] aim to set up an HBIM (Heritage Building Information Model) system to facilitate the planning of diagnostic and restoration activities by bringing all archive information into a unique digital reference platform, accompanied by three-dimensional models that can be consulted, examined, and updated. In the paper, the Authors present the case study of the Troia Cathedral rose window.

In the paper by Vietti et al. [6], the realisation and characterisation of Cu-based references for neutron imaging calibration is reported. The Authors produced some reference

samples with chemical composition and microstructure similar to ancient artefacts. Then, some of them were artificially patinated using different chemical treatments obtaining an artificial corrosion layer comparable to natural corrosion. X-Ray Diffraction, Scanning Electron Microscopy and Raman Spectroscopy have been used to characterise the corrosion patina. Finally, preliminary Neutron Imaging measurements were performed on a first set of coated and uncoated specimens to correlate the neutrons attenuation coefficients with the chemical compositions.

Pagano et al. [7] present an overview of ancient pigments used in wall paintings in the Campania region by comparing different case studies and archaeological contexts in which various pigmenting agents, dating from the 6th century BC to the 1st AD, were discovered. An in-depth analysis was performed on four case studies, both funeral and residential, to determine the raw materials used, the nature of the pigments, and the painting techniques of the ancient painters. Mineralogical and geochemical data showed the similarity in the ancient techniques, materials, and technological choices made by the artists over time, as well as highlighting the continuity of use of some compounds and mixtures in the Campania region.

The paper by Galvagno et al. [8] presents data obtained using Optically Stimulated Luminescence (OSL) signals from quartz for dating ancient objects and artefacts, within historical and archaeological sites. Specifically, the study showed the conditions for the applicability of subtraction dating on a sediment of known age, allowing an age determination that is independent of knowledge of the environmental dose rate. Absorbed dose measurements were obtained by OSL on pure fine-grain and coarse-grain quartz, while contributions to the annual dose were determined from natural radioactive isotope concentrations through high-resolution gamma spectrometry (HPGe) measurements. The results obtained highlighted the effectiveness of the method in dating procedures, even for objects excavated many years before and now present in museum collections.

Rossini et al [9] describe the experimentation conducted using 2D shape analysis to study Epigravettian lithic artefacts to evaluate an innovative approach for the characterisation of lithic assemblages. The study aimed to explore the use of shape analysis to help scientists answer questions about the production and modification of laminar artefacts, combining shape quantification with classical techno-typological assessments. The Authors tested the method on a lithic sample from Grotta Paglicci (Puglia, southern Italy) showing interesting prospects for the implementation of 2D shape analyses complementary to the classical technique. The data proved to be useful for defining a new methodological approach to establish different techno-economic groups within lithic assemblages.

The research carried out by Crezzini et al. [10] aimed at studying several ivory fragments from the Etruscan tumulus of Carmignano (Central Italy) using 3D digital microscopy. The non-invasive method allowed scientists to investigate micromorphological and micromorphometrical features of the archaeological specimens in a short time, preserving their integrity. The recognition of the "Schreger's lines" on the surfaces of many specimens, allowed the Authors to further hypothesize the presence of proboscidic dentin. The technique proved to be essential in the characterisation of the proboscidean taxa exploited in the past for ivory, thanks also to the comparison with the data present in the literature.

The research by Alessandri et al. [11] introduces a novel approach for data collection during archaeological surveys aimed at mapping surface ceramic density in excavations. A new protocol has been developed in the framework of the Salt and Power project of the University of Groningen, through the use of a low-cost GPS/GNSS RTK receiver able to build a grid during the intensive archaeological survey of the Piscina Torta site (Italy). The data collection method on ceramic samples proved to be useful and faster than traditional ones, highlighting how data collection procedures in archaeological sites can be done paperless by using open access and free software.

We hope you will enjoy your reading.

Michela Ricca, Leonardo Iannucci, Yuval Goren
Section Editors

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