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Mineralogical Sciences and Archaeology
Preface

During the last decade, the archaeometric community has matured, both in quantity and in quality. This is evidenced by the high impact-factor values reached by the most important archaeometric journals, comparable to those of some outstanding mineralogical and petrographical journals.

In this community, the number of geoscientists, mostly mineralogists, has also increased, because they are intrinsically dealing with complex systems such as the natural geological materials utilized to produce artifacts. Ceramics, glassy materials, metal objects, and lithic tools have stored during their production a lot of information about the history they underwent. Geoscientists, probably more than chemists and physicists, are able to decipher this information in the same way they reconstruct the geological history of rocks through the study of chemical and physical properties of minerals.

The reconstruction of the ''history'' of artifacts (in the field of art and archaeology) implies the identification and provenance of raw materials and the definition of various aspects of production technology. Mineralogy is well equipped to face the methodological and experimental challenges involved in the analysis of complex materials and the interpretation of the processes they underwent. Together with basic optical and electron microscopy, diffraction, spectroscopic, spectrometric, and imaging data allow the interpretation of polyphase and composite materials through the integration of bulk and detailed information at different space scales.

The high success of the Cultural heritage session in IMA-2010 in Budapest, which had about 50 contributions, further evidenced the wide and deep interest for archaeological materials. Consequently, the editors of the European Journal of Mineralogy decided to publish a special issue dedicated to ''Mineralogical Sciences and Archaeology.'' This volume includes twelve papers comprising different aspects of the scientific bonds between mineralogy and archaeometry and a wide variety of methods used to decipher archaeological mysteries.

In a first contribution by G. Artioli and I. Angelini, this scientific bond, i.e. *the general value of mineralogy in archaeometric research is discussed. One of the most important questions in archaeology and archaeometry is the provenance of archaeological finds and of raw materials used for their production. In this way, ancient relationships and trade connections between different cultural domains can be enlightened.*

The provenance of marbles used by Romans in the western Mediterranean is discussed by F. Origlia et al.*, whereas J. Elsen* et al. *focused on raw materials utilized to produce Late Roman and Early Medieval mortars as well as in their provenance. For both investigations, various methods specific to rock analysis are applied.*

An important aspect in archaeometry is the necessity of non-destructive analytical methods, such as the prompt gamma activation analysis utilized by G. Szakmány et al. *for provenancing of Neolithic stone tools.*

In archaeometallurgy, the provenance of ores also plays an important role. Gold from Cornwall, for example, was used for the production of the Early Bronze Age Nebra Sky Disc, as shown by A. Ehser et al.*, based on almost non-destructive laser-ablation-ICP-mass-spectrometry.*

For provenance analysis of raw materials, a knowledge about different compositions of potential natural deposits is absolutely necessary. D. Pop et al. *fathomed the possibility to identify and discriminate Transylvanian gold as the source material of ancient gold jewelry by using electron microprobe analysis.*

Based on a very similar intention, Krismer et al. *applied electron microprobe analysis combined with micro-Raman spectroscopy to characterize ore minerals of the Schwaz and Brixlegg copper deposits in Tyrol, mined in prehistoric and historic times. They confirmed the use and local distribution of Brixlegg ores during the Early Bronze Age.*

Beside provenance, the techniques of ancient cultures for production of the present-day archaeological finds are of special interest. This aspect is highlighted by five contributions. Firing-induced mineral transformation in Copper Age ceramics, as seen under the electron microscope and analyzed by electron microprobe, are described by C. Ionescu & V. Hoeck.

In a further article, Arletti et al. *inform about the recipes in glass production during the Villanovian Culture at the transition between Late Bronze and Early Iron Age, using electron microprobe analysis and laser-ablation-ICP-mass-spectrometry.*

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During the investigation of glass, particular attention is drawn to the question of colouring agents. De Ferri et al. *determine the oxidation state of the chromophores Fe and Mn by XANES, UV-VIS and luminescence spectroscopy to explain the anomalous colours of some Late Roman glass samples.*

Details of metal smelting in the 3rd–4th century AD at Aksum, Ethiopia, are investigated by Severin et al. *to determine whether copper or iron was produced. They use established chemical and mineralogical methods for archaeometallurgical analysis of slags, hereby focusing on the compositional zonation of spinels to get information about the evolution of the melt phase.*

Finally, M. Maggetti introduces us into the world of Late Baroque porcelain production, investigated by secondary electron microscopy, electron backscatter diffraction, and open porosity measurements.

With this special issue, we hope to give readers more insight into the field of archaeometric research and generate additional interest in this fascinating interdisciplinary research at the interface between the natural sciences and the archaeology/art sciences.

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