

**Cultural Heritage and Archaeological
Issues in Materials Science**

**MATERIALS RESEARCH SOCIETY
SYMPOSIUM PROCEEDINGS VOLUME 1374**

Cultural Heritage and Archaeological Issues in Materials Science

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PREFACE

The aim of this book is the dissemination of interdisciplinary investigations that involve scientific analysis of materials related to problems of cultural heritage, ranging from studies on identification and use of materials, ancient technologies, dating, and deterioration to restoration and conservation.

In Mexico, during the past 15 years, scientific investigations focusing on questions concerning material culture have involved interdisciplinary approaches and included the work of art historians, museum curators, conservators, archaeologists, paleontologists, biologists and even contemporary artists, all interested in getting involved more and more in the study of cultural materials. In particular in developing countries, research teams engaged in new trends of archaeometric studies and science in conservation are working on several fronts; one is the constant struggle to achieve a fully interdisciplinary approach, which cannot be taken just as a routine analysis. Moreover, in order to complete successfully these kinds of studies and to achieve not only academic success but to create a social impact that directly contributes to the preservation and the enrichment of the culture of each country, ingenuity, commitment, teamwork, development of new methodologies and equipments, economic resources and critical thinking are required. On the other hand, the interaction of different disciplines generates a new language that facilitates communication between scientists and specialists that have no detailed knowledge of the material and natural sciences.

These trends led to the creation of the symposium “Electron Microscopy in Archaeology and Art” in the framework of the 14th International Congress on Electron Microscopy (14th ICEM 1998) held in Cancun, Quintana Roo, Mexico. In this first meeting, a variety of investigations were presented that focused on the scientific analysis of pre-Hispanic and XVI century pigments, deterioration of pre-Hispanic monuments, consolidating materials in Mayan masks and more. This event presented the opportunity to show how instrumental scientific analysis was the answer to questions generated from the archaeological data and materials.

By the year 2000, the 32th International Symposium on Archaeometry was organized in Mexico City by the Universidad Nacional Autonoma de Mexico (UNAM), the Instituto Nacional de Investigaciones Nucleares (ININ) and the Instituto Nacional de Antropologia e Historia (INAH). For the first time a Latin-American country hosted such an event, bringing together an important number of scholars from around the world, which presented their research in ten different symposia. This conference aimed at linking the international archaeometry scene with the archaeological heritage of the American continent. The experience gained through the above mentioned events and the efforts of scholars in Mexico, helped to create the symposium called “Archaeological and Arts Issues in Materials Science”, which was celebrated in the framework of the International Materials Research Congress of the Mexican Society of Materials from 2000 to 2010. This forum has enjoyed steady growth due to the continuous effort of the chairpersons, and the sustained interest of the participants that each year honored the symposium with their presence; today the event is a point of reference for materials science in archaeology, not only in Mexico but also internationally. The most relevant investigations

of the symposia of 2003 through 2006 were selected by an academic committee and published in a series of books called “La Ciencia de Materiales y su Impacto en la Arqueología” volumes I, II, III & IV. This was possible thanks the sponsorship of the Mexican Academy of Materials (now named Mexican Society of Materials), and the financial support of various Mexican universities.

Reflecting the increased importance of materials science and archaeometry in Mexico, in 2009 the joint meeting of the symposium “Archaeological and Arts Issues in Materials Science” and the “2nd Latin-American Symposium on Physical and Chemical Methods in Archaeology, Art and Cultural Heritage Conservation” (LASMAC2009) was included in the XVIII International Material Research Congress. The objective of this symposium was to present and discuss the most recent Latin-American research on cultural heritage and the historical past, using a wide spectrum of techniques and scientific methodologies available in this geographic area. In this forum scientists and specialists in cultural heritage and archaeology from countries including Argentina, Brazil, Colombia, Chile, Cuba, Mexico, Spain, France and United States presented “the state of the art” in this subject.

The development of archaeometric research in Mexico during the past decade has closed the gap that separated it from the high standards of research performed in developed countries with more resources. Due to the constant evolution of this research and the increase of scientific topics included in the “Archaeological and Arts Issues in Materials Science” symposium, in 2011 it changed its name to “Cultural Heritage and Archaeological Issues in Materials Science (CHARIMSc)”. Under this new name the symposium drew physicists, chemists, engineers, conservators, archaeologists, art historians, architects, restorers and other specialists involved in the scientific study of cultural heritage and archaeological and historical collections, and together they showed the impressive results of their scientific and interdisciplinary research.

Over 90 papers were presented during this symposium, including invited lectures from France, Italy, Israel, Thailand and Mexico, as well as oral and poster sessions of participants from Spain, Mexico, Italy, Russia, Poland, United States and Australia. This represents a substantial increment in the quality and the amount of papers and the number of participants compared to previous symposia and is a clear sign of the intensive work carried out over the last few years.

This book of proceedings is published by the Materials Research Society and Cambridge University Press, and it is the first one to bear the title “Cultural Heritage and Archaeological Issues in Materials Science (CHARIMSc)”. This publication presents selected contributions of the symposium in its 2011 edition, evaluated by an academic committee. Main topics such as Non-destructive Characterization of Cultural Heritage, Technical Studies in Art History, Archaeological Science, Conservation Studies, Biomaterials Research and Methodologies & Instrumentation show the new trends and directions being taken worldwide in the analysis of cultural and archaeological materials.

The most diverse techniques and scientific methodologies were presented including non-destructive methods, spectroscopic techniques, ion beam accelerator techniques, electron and optical microscopy, imaging techniques, experimental archaeology, all kinds of chemical methods, dating, biological methodologies, deterioration studies and conservation procedures.

The techniques mentioned above were applied to the study of European paintings by hyperspectral near-infrared imaging, inks in manuscripts, dyes and pigments from Europe, Israel and pre-Columbian Mexico, glass in pictorial European techniques, pre-Hispanic manufacturing technologies of stone and shells in Mesoamerica, technological studies of metals from the Maya area, as well as modern mural painting on cement and modern materials such as latex sculptures from contemporary art.

Papers on science in conservation are related to bio-degradation of monuments, evaluation of conservation of shells in pre-Hispanic collections, modified clays for restoration purposes and environmental studies, among others subjects.

Some new methodologies for the identification of dyes, the study of biological remains such as bone and plants (maize), as well as satellite radar prospection are also included in this book.

Finally the readers will realize that the application of scientific methods on cultural heritage and archaeological materials is making an important impact on society worldwide.

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