



NTUA University
Athens



CNR – Institute
of Chemical
Methodologies



Association
Investing
in Culture

6th International Congress on

***“Science and Technology for the Safeguard of
Cultural Heritage in the Mediterranean Basin”***

ABSTRACTS



Athens, Greece

22 – 25 October 2013

© Editore VALMAR – Roma
Printed by Centro Copie l'Istantanea, Roma, 2013
ISBN 978-88-97987-01-7

Publishing coordination, revision and realization: Angelo Ferrari - CNR,
Inst. of Chemical Methodologies, Italy;

Digital Editing and Data Processing: Stefano Tardiola and Gianni Pingue;

Secretariat: Enza Sirugo - CNR, Inst. of Chemical Methodologies, Italy;
Manuela Manfredi, A.I.C. Secretariat, Italy.

INDEX

Foreword, III	
Organization, V	
Session A, Resources of the Territory,.....	1
Session B, Diagnostics, Restoration and Conservation,	63
Session C, Biological Diversity,.....	182
Session D, Museums Projects and Benefits,.....	202
Session E, Cultural Heritage Identity,.....	224
Session F, Cultural Assets as Resources and Sustainable Development,	280
Abstracts Index,	295
Keywords Index,	305
Authors Index,.....	309

ORGANIZATION

HONORARY COMMITTEE

Konstantinos Arvanitopoulos (*) - Minister of Education and Culture, Greece

Maria Chiara Carrozza (*) - Minister of University and Research, Italy

Massimo Bray (*) - Minister of Culture and Tourism, Italy

Nana Spyropoulou (*) - Deputy Mayor of Athens, Greece

George Broulias (*) - President Athens Development & Destination

Management Agency of Athens Municipality, Greece

Antonia Moropoulou - Vice Rector National Technical University of Athens,

NTUA, Greece

Sesto Viticoli, Director Flagship Project "Cultural Patrimony", CNR, Italy

Emanuele F. M. Emanuele, President Fondazione Roma Mediterraneo, Italy

Sergio Conti, President Italian Geographic Society, Italy,

Angelo Guarino, President A.I.C., and Ass. to CNR-IMC, Italy

(*) *Invited Authorities, waiting their acceptance*

SCIENTIFIC COMMITTEE

Abdel, Harith Mohamed, Cairo University, Egypt

Alvarez, Monica, CSIC, ICG, Madrid, Spain

Ancona, Massimo, University of Genova, Italy

Baluci, Claire Angéle, DSL Heritage, Malta

Bonsignorio, Fabio, Ceo Heron Robots s.r.l. Genova, Italy

Burri, Ezio, L'Aquila University, Italy

Caneva, Giulia, Rome Third University, Italy

Caron, Guillaume, Université de Picardie, Amiens, France

Carrozzino, Marcello, TeCIP Institute, Scuola Superiore S. Anna, Pisa, Italy

Chiaia, Bernardino, Turin Polytechnic, Italy

Colomban, Philippe, CNRS, LADIR Thiais, France
Dalamagkidis, Konstantinos, Technical University, Munich, Germany
Doulamis, Anastasios, Technical University of Crete, Greece
Ehlers, Frank, Research Dept. for Underwater Acoustics & Marine Geoph. Germany
Elif Özlem, Aydin, Gebze University, Turkey
Fantoni, Roberta, Enea, Rome, Italy
Ferrari, Angelo, CNR-IMC Rome, Italy
Frediani, Piero, CNR, Florence, Italy
Galluzzi, Paolo, Florence University, Italy
Garraffo Salvatore, CNR- ITABC, Rome, Italy
Gómez Bolea, Antonio, Barcelone University, Spain
Gregory, David, National Museum of Denmark, Copenhagen, Denmark
Guarino, Angelo, A.I.C., CNR-IMC, Italy
Hala, Afifi, Cairo University, Egypt
Hamdi Kuzucuoğlu, Alpaslan, Istanbul Yeni Yuzyil University, Turkey
Hatipoglu, Murat, Dokuz Eylul University, Turkey
Ioannidis, Charalambos, School of Rural & Surveying Engineering, NTUA, Greece
Jasienko, Jerzy, Wroclaw Technical University, Poland
Jon, Rodica – Mariana, ICECHIM, Bucarest, Romania
Kappos, Andreas, Aristotle University of Thessaloniki, Greece
Karagol, Sedat, Mimar Sinan University, Turkey
Kozlowski, Roman, Polish Academy of Sciences, Poland
Kurtz, Donna, Beazley Archive, Oxford, UK
Leissner, Johanna, Fraunhofer Institute, Germany
Ljaljevic, Grbic, Milica Belgrade University, Serbia
Maistrou, Eleni, Dean of the School of Architectural Engineering, NTUA, Greece
Mavridis, Nikolaos, New York University, USA
Mayorga, Rene, University of Regina, Canada
Moricone, Claudio, ENEA, Rome, Italy
Moropoulou, Antonia, School of Chemical Engineering, NTUA, Greece
Navrud, Stale, Norwegian University of Life Sciences (UMB), Norway
Nevra, Ertürk, Mimar Sinan Fine Arts University, Turkey
Nuechter, Andreas, Jacobs University, Bremen, Germany
Pipan, Michele, Trieste University, Italy

Pournou, Anastasia, Athens University, Greece
Rojas-Sola, José Ignacio, Jaén University, Spain
Romagnoli, Manuela, Tuscia University (VT), Italy
Romero, Noguera, Julio, Granada University, Spain
Roberts, Jonathan, CSIRO ICT Center, National Museum, Australia
Sabbatini, Luigia, Bari University, Italy
Sabbioni, Cristina, CNR-ISAC, Bologna, Italy
Sarris, Apostolos, Foundation for Research & Technology, Crete, Greece
Schilling, Klaus, Julius-Maximilians University, Wuerzburg, Germany
Sibley, Magda, Manchester School of Architecture, UK
Sorlini, Claudia, Milan University, Italy
Varvarigou, Theodora, NTUA, Greece
Vintzileou, Elissavet, School of Civil Engineering, NTUA, Greece
Zaki, Moushira, Cairo University, Egypt

ORGANIZING COMMITTEE

Di Ciano, Diomira, CNR, Dept. Medicine, Rome, Italy
Ferrari, Angelo, CNR-IMC Rome, Italy
Guarino, Angelo, A.I.C., CNR-IMC, Italy
Kuzucuoglu Alpaslan, Hamdi, Istanbul Yeni Yuzil University, Turkey
Manfredi, Manuela, A.I.C., Rome, Italy
Moropoulou, Antonia, NTUA, Greece
Pingue, Gianni, CNR-IMC, Rome, Italy
Possagno, Elvira, A.I.C., Rome, Italy
Sirugo, Enza, CNR-IMC Rome, Italy
Taha, Ali Omar, CIERA, Cairo, Egypt
Tardiola, Stefano, CNR-IMC, Rome, Italy

SCIENTIFIC PROGRAMME

SESSION A Resources of the Territory

- A.1– Identity and Globalization
- A.2 – Reuse of Historical Centres
- A.3 – a) Archaeological Sites
 - b) Robotic Systems in Underwater Archaeology
 - c) Remote Characterization of Surfaces: robotic platforms
 - d) Signal Processing Advances
- A.4 - Natural Environment
- A.5 - Naval Heritage
- A.4 – Unmanned Aerial Vehicles on Site Surveillance
- A.5– Artefacts Dating

SESSION B Diagnostics, Restoration and Conservation

- B.1 – a) Historical Buildings and Monuments
 - b) Non Destructive Techniques: In situ advanced diagnostics
 - c) Crack Mapping by Autonomous Flying Robots
 - d) Robotic Systems in Harsh Environmental Sites
 - e) Quad-rotor Helicopters in Monuments Diagnostics
 - f) Climbing Robots for Structure monitoring
- B.2 – a) Seismic Emergencies and Early Protection
 - b) Seismic Retrofitting of Historical Masonries
 - c) Climatic Change
 - d) Natural and Human Driven Hazards Endangering Cultural Heritage
- B.3 – Marbles, Stones and Lithic Materials
- B.4 – Mosaics, Frescos, Stuccos
- B.5 – Mural and Oil Paintings
- B.6 – Gems, Ceramic and Vitreous Materials
- B.7 – Paper Documents
- B.8 – Textiles
- B.9– Coins and Metallic Artefacts
- B.10 – Microbial Colonies Attack on Artefacts
- B.11 – Nanotechnologies in Cultural Heritage
- B.12 – Lab on Chip

SESSION C Biological Diversity

- C.1 – Analysis and Preservation of Biological Diversity

- C.2 – Ethno Anthropological Heritage
- C.3 – Plants and Historical Gardens
- C.4 – Virtual Environment for Art
- C.5 – a) Robots and Tele Participation
 - b) Verbal Human – Robot Interaction

SESSION D Museums Projects and Benefits

- D.1 – Museums Cultural Projects
- D.2 – Museums Monitoring and Microclimate Data Bases
- D.3 – Mobile Tele Presence for Museums
- D.4 – Multiple Embodiments for Robots in Heritage Applications
- D.5 – Tourism and Economic Outcome

SESSION E Cultural Heritage Identity

- E.1 - Documentation – Metadata description
 - a) Geometrical
 - b) Architectural
 - c) Structural
 - d) Materials
 - e) Integrated protocols
- E.2 - Interdisciplinary Knowledge Based Decision Making
- E.3. a) 3D reconstruction in Cultural Heritage
 - b) Image Processing Techniques in Cultural Heritage
- E.4 - a) ICT in Cultural Heritage Protection
 - b) Media production and Reuse
- E.5. - Collective Intelligence in Cultural Heritage
- E.6. - Education for Cultural Heritage Protection
- E.7. - Research policies for Cultural Heritage Protection

SESSION F Cultural Assets as Resources and Sustainable Development

- F.1 - Sustainable Tourism in Cultural Heritage
- F.2 - Integrated Environmental Management for the Protection of Cultural Heritage
 - a) in Historic Cities/Centers/Sites
 - b) in Rural and Isolated Areas (Mountains, Islands)
- F.4 - Monitoring Technologies
- F.5 - Strategical Planning of Sustainable Development

NANOSTRUCTURED MATERIALS FOR PROTECTION AND CONSOLIDATION OF ANCIENT STRUCTURES

Di Salvo Santina¹

Department of Architecture of University of Palermo, Italy - ¹santina.disalvo@unipa.it

Keywords: Protection, Consolidation, Nanomaterials, Cultural Heritage.

Abstract

The preservation and appreciation of the built cultural heritage is of particular interest, through researches and studies on innovative technologies. As evidenced by the good results obtained in some interventions both at national and international level, activities for the conservation of cultural heritage must be the result of synergies and collaboration of interdisciplinary groups, science and knowledge: architecture, engineering, technology, sociology, economics, urban planning, legislation must be managed and planned to work together. The theme of protection and consolidation of ancient structures, applying non-traditional technologies, requires a comprehensive overview of strategies for reliable interventions and a methodology to achieve goals that are consistent with the concept of sustainability. If sustainability ultimately means learning to think and act in terms of guaranteeing the prosperity of interdependent natural, social, and economic systems, then the built heritage, with its unique values and experiences must be contextualized and integrated with this view. In fact, conservation science is one of the most complex topics in the materials science as it requires expertise ranging from the history of art and archaeology to the advanced analytical and physical chemistry. However, the recent development has shown that the complex tasks of the conservation of the cultural heritage can be solved very effectively using novel nanomaterials and nanotechnology procedures. The aim of this study is to evaluate the effectiveness of inorganic compatible treatments, based on nanoparticles as consolidants for wood and stone materials affected by different kinds of decay. Scientific experiences of the Author of the present contribution were carried out, as shown by a new scientific and technological patent, regarding the implementation projects on nanomaterials, mainly on nanostructured inorganic oxides, and more particularly titanium sesquioxide (Ti₂O₃) and silicon (Si₂O₃). All the results converged in individuating these nanometric particles as an innovative, with a high level of biocompatibility, and efficient material for the consolidation of architectural wood and stone surfaces.

ISBN 978-88-97987-01-7