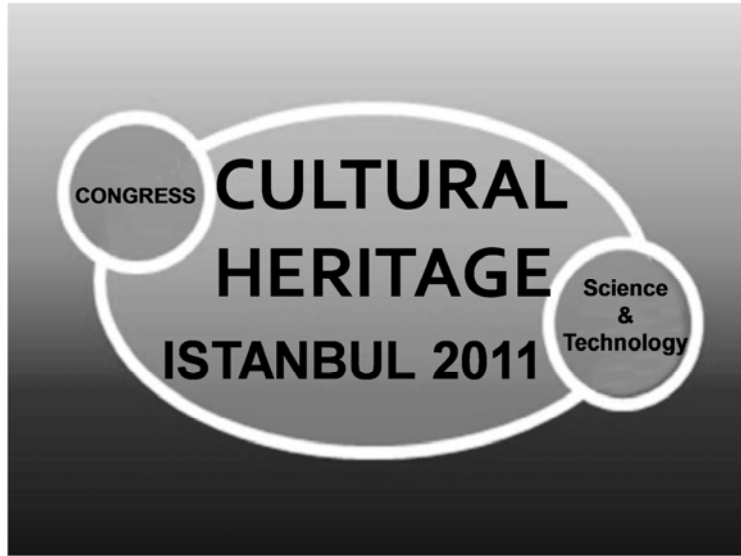




**5<sup>th</sup> International Congress on**

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



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# FOREWORD

This Congress which follows the December 2009 Congress of Cairo represents a significant step forward for the number of scientific activities, for the countries Participants belong to and for the number of presentations. These data show how large is the interest of scientists from all over the world for the preservation of our Cultural Heritage.

There are 750 registered scientists who belong to 52 countries: Albania, Algeria, Belgium, Bulgaria, China, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Finland, France, Georgia, Germany, Greece, Hungary, India, Iran, Iraq, Israel, Italy, Jordan, Luxembourg, Macedonia, Malta, Mongolia, Morocco, Nepal, Netherlands, Norway, Palestine, Poland, Portugal, Romania, Saudi Arabia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Syria, Tanzania, Tunisia, Turkey, Uganda, United Kingdom, United Arab Emirates, USA, Virgin Islands.

The total number of Abstracts is 400 presented by 1.030 Authors and Co-authors: 256 oral and 44 poster presentations.

Most participants belong to universities (60%), 24% belong to public scientific institutions and 16% to scientific enterprises.

This Congress will be also the right moment to define the final text of the EACH Project to be given to the European Commissioner for Research and Innovation, Mrs. Máire Geoghegan-Quinn in order to take it into account for the "Discussion Document" the Commissioner is preparing for the next 8<sup>th</sup> Framework Programme of the European Commission to be completed within the end of 2011.

Welcome to Istanbul, Istanbul'a hoş geldiniz,

prof. Angelo Guarino

prof. Ahmet Güleç



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## NANOTECHNOLOGY IN RESTORATION: CLEANING AND CONSOLIDATION OF STONework

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**Keywords:** Nanotechnology, Restoration, Stonework

Nanotechnology is a science that utilises methods and techniques to manipulate material on a size-scale smaller than a micrometre (normally between 1 and 100 nanometres) and has the aim of producing materials with particular chemical-physical characteristics. It constitutes a true multi-disciplinary sphere of investigation, involving numerous areas of research, ranging from molecular biology to chemistry, from the science of materials to (applied and basic) physics, to mechanical and electronic engineering. Nanotechnology's present and future applications render this an issue of great current interest, bearing in mind not only its innovative character, but also its possible impact on industrial applications and, therefore, our daily lives; it has a capacity to spark off a real 21<sup>st</sup> century industrial revolution. Its importance is confirmed by the interest shown by all the major world powers, including the USA, China, South Korea, India, not to mention Europe of course; these are devising long-term programmes devoted exclusively to development of nanotechnology.



Fig. 1 The altar in the archaeo-logical site of Morgantina

In the architectural sphere the use of nano-structured materials interests the building in its entirety, from the basic structure to the walling, from lighting to energy production. However the contribution of nanotechnology is not restricted to newly-built structures, but represents an opportunity for an overhaul of the whole cultural heritage. This sector includes experimentation on nano-structured materials for cleaning and reinforcement on stonework samples from the archaeological site of Morgantina. For this purpose, nano-structured systems have been devised and proved effective in the cleaning process, utilised as *cleaning agents* with the characteristics of a gel. As for the reinforcement of stonework, *hybrid nano-structured*

*polymers* have been synthesised and tested; the presence of the organic and inorganic components guaranteed a sound performance. Apart from issues of cleaning and the reinforcement of stonework, that of enhancing the performance of a traditional material such as earth was tackled, with its utilisation not only in the sphere of historical architectural restoration but also in new constructions. The research aims to create *nano-composite materials*, a new class of material characterised by an ultra-fine dispersion of elements, typically of the order of a few nano-metres; in virtue of this dispersion the nano-composites possess unique properties, not shared by conventional composites or micro-composites. In other terms, the research aims to bolster earth with nano-structured reinforcement, in order to improve the chemical-physical and mechanical performance of the final product. The research involves aspects of the cultural and material tradition, as well as innovation, as a criterion for renewing building methods.



Fig. 2 Test cleaning of the stone

To sum up, nanotechnology certainly represents an advance in the scientific field, its potential being enormous. The fact should not be neglected that this science requires investigation of the risks for human health, due to the utilisation of materials manipulated on the nano-metric scale; in this regard notes of caution have been voiced regarding the toxic nature of various nano-structured materials. The only path to take for the safeguard of health and environment, in our opinion, is to invest as much as possible in research and knowledge, especially with the involvement of public organisations.