



Editorial

THE CONTRIBUTION OF GEOSCIENCES TO CULTURAL HERITAGE STUDY

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Historic - artistic and architectural - archaeological heritage is a great resource for the current societies, with a progressive broadening to include a variety of cultural items (i.e. minor buildings of historical towns, buildings of the industrial archaeology, etc.), which have significance in testifying the complex of aspects relating to the people civilizations, cultures and activities. Knowledge and preservation of the Cultural Heritage are considered fundamental issues in the life of modern communities and they may be effectively supported by the use of modern technologies and science.

Cultural Heritage studies typically involve interdisciplinary skills and integration of methodologies in order to investigate the variety of aspects relating to the artifacts. Within this integrated approach, geosciences may play an important role, with a broad range of applications effectively interfacing with the archaeometry and conservation science.

In particular, in archaeometric issues, mineralogical - petrographical and geochemical studies are the basis for the identification of geomaterials used in the Cultural Heritage. They may provide important knowledge on the exploitation of georesources over time for the supply of materials in stony artifacts, production of bricks, mortars, ceramics, pigments and other materials and handmade objects, and allow, as well, the determination of the provenance of both raw materials and artifacts, which contribute to highlight the trade routes in the past. Moreover, they may support the knowledge of the material manufacturing and execution technics of artistic decorations and finishings.

Preservation of Cultural Heritage items involves both surfaces and structures and the needs of interventions originates from a variety of factors promoting material degradation and structural instability. Moreover, in many cases they arise from new performance requirements, i.e. building safety against the seismic risk and improvement of performances in relation to modern energy efficiency criteria, as well. Applications of geosciences are significant in diagnostic assessment of materials and artifacts to determine their intervention needs, as well as for the selection of suitable technological solutions for rehabilitation, repair and conservation with reference to both products to be used and technical - operational procedures to be followed.

Chemical-mineralogical identification of decay products, assessment of the damage and its effect on the structure/microstructure and related physical - mechanical properties of materials within the artifacts allow determining their decay profiles and states of conservation. In addition, petrographic and mechanical studies of traditional materials, such as stones taken from the quarries of provenance, combined with suited artificial ageing processes, are effective to investigate durability performances of geomaterials once being placed in buildings or other structures. They contribute to understand the decay processes affecting the material's behavior in life service, and their mechanisms and effects, which are relevant not only to diagnostic issues but also to the selection of suited materials for replacement, when the original ones are highly compromised. In a similar vein, application

of petrophysics to the study of interactions between traditional materials and modern restoration products support the evaluation of optimal treatments to be adopted, in terms of compatibility with the substrate characteristics and effectiveness in preservation.

An important research topic in the field of Cultural Heritage concerns on site and laboratory standardized and non-standardized testing techniques for material and structure characterization, monitoring of weathering features/structural failures and checking of conservation works, aiming to reduce the invasive impact of the investigations, as an important requirement for the preservation of the integrity of the artifacts. In this regard, research of correlations between DT and NDT deserves particular attention, in order to promote a sustainable conservation and management of the Cultural Heritage. This should be based on preventive measures and periodical maintenance rather than one - off interventions and needs to rely on effective and sustainable methodologies, protocols and procedures of investigations, allowing a running activity of checking and monitoring of materials and structures. Non-destructive methods may be suitable tools at this purpose, in terms of no impact on the physical integrity of the artifacts, cost and time effectiveness. Also in the field of non-destructive investigations of Cultural Heritage, geosciences can provide significant contributions, thanks to the application of techniques of the geophysics domain, such as ground penetrating radar, sonic and ultrasonic techniques, electrical methods, etc. These may be used not only in groundwork and archaeological prospections, but also in indirect assessment of mechanical properties and detection of defects and anomalies at the scale of both structures and materials, as well as in their long run monitoring before and after repair works.

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Also recommended reading:

Proceedings of ASMOSIA (Association for the Study of Marbles and Other Stones In Antiquity) International Conference (biennial issues, since 1988).

Proceedings of International Congress on the Deterioration and Conservation of Stone (quadrennial issues, since 1972)



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