



Foreword

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Foreign people usually say that Italians are best known in the world as experts and lovers of music and arts. Actually, our country has given birth to several musicians and artists, and also to very famous engineers and architects that imposed their works all over the world. This is one of the reasons why most of the worldwide cultural heritage is in Italy, giving us the duty to preserve this heritage in the frame of a sustainable development.

The safeguard of cultural heritage must be ensured for future generations not only in reason of the cultural identity of the population it represents, but also because cultural heritage is a driving force of the economy, especially in a period of economic global crisis.

This challenge is not easy. Both in the past and recently, cultural heritage was seriously damaged due to different causes. The natural aging process is worsened by the combined effects of air pollution and the 'normal' impact of visitors and tourists, as well as by the absence of adequate maintenance. In addition, natural disasters such as earthquakes, landslides and floods may cause terrific losses or heavy damage to historical centres that (at least in Italy) host the most important part of cultural heritage. The recent earthquakes that struck Abruzzo in 2009, Emilia-Romagna in 2012, and Pollino in 2012, are only the last of a long chain of natural disasters.

A careful prevention policy is strongly recommended for conservation of the cultural heritage survived up to date to be definitely guaranteed, which demands a huge effort by Governments. Such an effort should concern the preservation of cultural objects, the safety of a large number of people and the ability to "propose" and implement appropriate measures for a low-impact enjoyment of artworks and cultural assets.

Fortunately, nowadays new technologies offer effective tools for a wide range of analyses related to the knowledge and diagnosis, modelling, evaluation on the one hand, and those related to restoring and improving interventions on the other. The knowledge of materials, execution techniques, restoration products, the environment with its chemical, physical, biological and mechanical actions, is mandatory to preserve the overall cultural heritage. Over and above that, the natural aging, the environmental deterioration agents, the seismic risk and the risks associated to human activities are factors that must be studied and controlled. With this aim and with the contribution of different scientific disciplines, the modern conservation science was born: Chemists, Physicists, Biologists, Engineers, Geologists, Architects cooperating with Archaeologists, Art Historians and Restorers have developed diagnostic techniques, technological instruments, monitoring systems, synthetic restorations products, software programs to carry out studies, research and interventions on cultural heritage.



The great contribution of scientific research to conservation started in the decade 1950 - 1960, although some examples of application of nuclear technologies were previously demonstrated. Nowadays the conservation science involves knowledge and techniques often developed for other applications: analytical, optical, organic, spectroscopic, photonic, biological, imaging, mechanical, structural, anti-seismic, nuclear methodologies are now applied to determine the composition and the state of conservation of different works of art, from the excavation samples to historical structures, monuments and archaeological sites, passing through paintings, statues, pottery, mosaics, bones, textiles.

The multidisciplinary approach is the basis of the ENEA intervention in the cultural heritage. Since the pioneering studies in the '80s by a small group who began to analyze materials and structures of works of art using technologies developed for the nuclear sector, the range of applications enlarged greatly, both in terms of works of art studied and of technologies and methodologies –now including new anti-seismic technologies, in situ and on shake table seismic tests, geomorphologic survey, environment monitoring, biotechnologies, laser technologies, photonics, information and communication technology. More than 1500 diagnostic interventions on historical structures and objects of art in collaboration with Restorers, Art Historian, Archaeologists and officials of the Italian Ministry of Culture have been carried out in the past few years. Research projects with national and international funds have been performed, education and training programs in collaboration with different universities have been carried out.

This special issue of the ENEA Magazine gives a brief overview of some activities performed by ENEA in the knowledge, diagnosis and preservation of cultural heritage. It is organized in three sections. The first one is dedicated to the safeguard against natural risks, such as earthquakes and landslides, the second to several interdisciplinary approaches to conservation and the third to diagnostics and imaging by lasers, optics and photonics.

The works reported in this special issue point out the collaborations of ENEA with national and international institutions such as universities, Superintendence and others, represented in the two introductory papers by L. Marchetti and G. Bandini.

Have a nice reading!

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