



ITALIAN NATIONAL AGENCY FOR NEW TECHNOLOGIES,
ENERGY AND SUSTAINABLE ECONOMIC DEVELOPMENT

Since the Eighties ENEA has developed innovative technologies and solutions for the protection, valorisation and conservation of Cultural Heritage, at both national and international levels.

The typical ENEA approach is the availability of highly-qualified research centres, expert staff, excellence instruments, expertise consolidated by the constant interchange of skills acquired in the laboratories and the requests by specialists, which have allowed to get specific knowledge, optimize processes and diversify the equipment.

Some successful interventions are: antiseismic basements of the Bronzes of Riace; 3D reconstruction of the Sistine Chapel's vault; study of the seismic vulnerability of Orvieto Cathedral; biorestitution of the statues in the Vatican's Gardens and biocleaning of Palazzo Farnese's plasters in Rome; monitoring of traffic-induced vibrations of the Colosseum and the Coclidi columns; study of dynamic characterization of Villa dei Misteri in Pompeii also by way of teledetection techniques; diagnostics for the study of paintings such as Raphael's Deposition or optical studies on the Sacred Sindone in Turin.

Plans for the near future envisage museum paths for blind people with real or reduced scale statues through rapid prototyping; application of laser technologies for 3D hyper-photographs or of ICT for the creation of digital databases with different levels of access allowing data sharing for scientific, cataloguing and dissemination purposes.

As National Agency for Energy Efficiency, ENEA has developed the Energy Optimization in cultural heritage conservation and restoration, that is activities of study, diagnosis, assessment and definition of guidelines for higher energy efficiency in valuable buildings and efficient management of the building-facility system, energy saving and the introduction of renewable sources, such as those for Palazzo Montecitorio and Palazzo del Seminario in Rome, and Villa Reale in Monza. These subjects are the object of a specific Memorandum of Understanding signed with the Italian Ministry for Cultural Heritage in June 2016.

ENEA owns expertise and infrastructures for the creation of professional paths of updating and high training on cultural heritage energy efficiency, innovation, prevention and security for public and private subjects.

At the European level, the Agency is engaged in the definition and qualification of Italian Nodes of DARIAH, the research platform on digital technologies applied to Arts and humanistic studies, and participates in E-RIHS.it - European Research Infrastructure for Heritage Science. ENEA is co-chair of the International Cooperative Programme on effects of air Pollution on Materials, including Historic and Cultural Monuments (UNECE Convention on long-range transboundary air-pollution) and is one of the promoters of the network school in Digital Cultural Heritage Arts and Humanities (DiCultHer), that will allow researchers to propose their activities on the national territory through Training Poles.

ENEA, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development, carries out activities targeted to research, innovation technology and provides enterprises, public administrations and citizens with advanced services in sectors such as: energy efficiency; renewable energy sources; climate and the environment; safety, security and health; seismic protection; agrifood; cultural heritage; new materials; and green chemistry.

ENEA is endowed with a wide range of expertise and consolidated experience in the management of complex national and international projects; to date 850 patents have been registered and 11 spin-offs have been created.

Thanks to its experimental facilities, specialized laboratories and excellence equipment, ENEA provides: high-tech services; studies; measurements; tests and assessments; training, technology transfer and information dissemination of the results obtained, so that they might be valorised for production purposes.



The Agency is organized into Departments for Sustainability, Energy Technologies and Fusion and the Technical Unit for Energy Efficiency. The latter acts as National Agency for Energy Efficiency.

ENEA hosts over 2500 researchers and technologists in 14 Research Centres and Laboratories, and a network of 19 territorial offices providing local realities with support and consulting. In Brussels, an ENEA-EU liaison office is present, reinforcing ENEA participation in European and international research programmes and networks.

ENEA, researching innovation

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RESEARCH AND INNOVATION
FOR CULTURAL HERITAGE

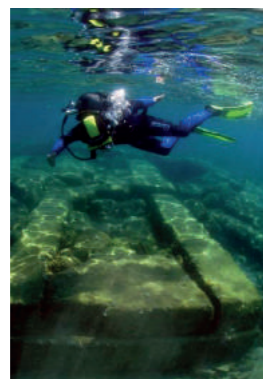




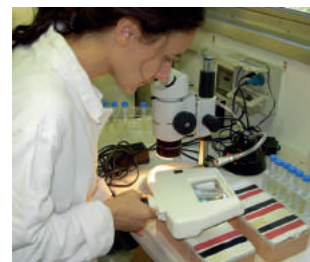
Diagnostics and conservation



Raphael, *The Deposition*.
In-situ XRF measurement campaign



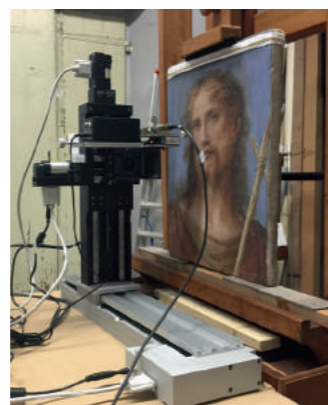
Underwater survey
in archaeological sites



Development of microbial biotechnology
for conservation



Restoration interventions in San
Costanzo Church in Ronciglione (VT)



Alessandro Gherardini, Museo degli Uffizi
in Florence. THz imaging techniques



Madonna of Mercy by Piero della Francesca,
diagnostic analyses



Defect analysis and crack mapping of warrior "A"

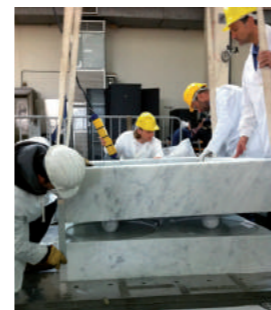


Scipione Pulzone's Crucifixion in Santa Maria
in Vallicella. Reflection surveys.

Coordinating the diagnostic campaign
in Pompeii's Villa de Misteri



Prevention and protection



The Bronzes of Riace, antiseismic
basement test on shaking table



Structural Dynamics and Vibration Control
Laboratory at the ENEA Casaccia Research Centre



Monitoring by fiber optic sensors.
Equestrian Statue by Bartolomeo Colleoni



Structural tests of the Egyptian obelisk
in Piazza San Giovanni in Laterano



Crack analysis of Orvieto Cathedral by
ITR laser technology



Movement and transport of the statue of Augustus
of Prima Porta to the Scuderie del Quirinale



Monitoring of traffic-induced vibrations of the Colosseum



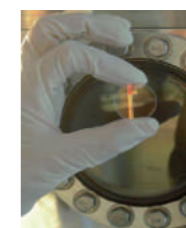
Repositioning of the Maestà on the façade of Orvieto Cathedral



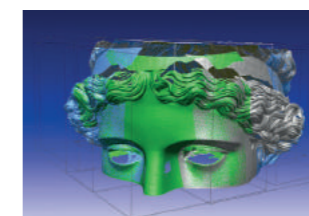
Valorisation and fruition



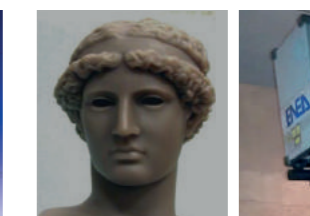
Study of optical fibers for the protection and fruition of works of art in museums



Projects for sustainable and energy-aware recovery of cultural heritage



Rapid prototyping and Reverse Engineering for the development of 3D models with cad/cam technologies



Acquisition by imaging topologic radar:
Holy Trinity Church, Hrastovlje, Slovenia



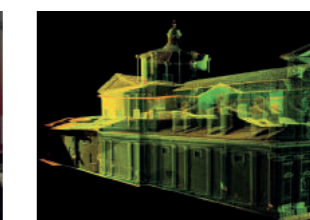
Oratory of S. Peter Martyr, Rieti



Carafa Chapel, S. Maria Sopra Minerva, Rome



Reconstruction of past buildings, artifacts, and landscapes through 3D modeling and multi-media solutions



ENEA has developed several research lines for the diagnostics and restoration of mobile and immobile goods, monumental structures and archaeological sites making use of physical, chemical, biological and nuclear techniques. By implementing innovative technologies, its equipment has been targeted to material characterization and the possible detection and characterization of their degradation.

ENEA is engaged in cultural heritage prevention and protection by: planning interventions of seismic adjustment and enhancement, monitoring; developing innovative antiseismic systems and devices; knowledge of conventional construction techniques and materials; performing experimental in-situ and lab campaigns, geometrical survey and damage detection; studying seismic evidence in antique monuments; designing and providing safe movement and transport of innovative antiseismic basements of highly-vulnerable statues.

By now, the concept of cultural heritage fruition has changed thanks to ICT: virtual reconstruction and new diffusion channels have made cultural heritage objects remotely available to the public with no impact. Contributing to the diffusion and dissemination of culture through the application of innovative technologies is one of the main ENEA commitments. Cataloguing and 3D virtual reconstruction activities have been performed for the valorisation, protection and diffusion of cultural heritage objects contained in museums, institutions and collections.