

News Release

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Cultural heritage and archaeological artefacts to benefit from a two million Euro non-destructive research project

Priceless artefacts of cultural heritage will benefit from a European-funded project worth two million Euros. The Ancient Charm project, which will enable scientists to develop and combine new and existing scientific research techniques to investigate objects of cultural heritage, will officially start on 1st January 2006. The main aim of this project, which will be presented at the conference 'Research Infrastructures for Cultural Heritage' in Trieste on 12th - 13th December 2005, is to develop non-invasive techniques for 3D tomographic imaging for use with cultural heritage and archaeological objects.

"There is growing interest in using the appliance of modern science to cultural heritage projects" explains Dr Paolo Radaelli, top UK project scientist from the ISIS pulsed neutron source at the CCLRC Rutherford Appleton Laboratory in Oxfordshire, UK. "Conventional X-rays give us some basic information about the construction of artefacts, but using new techniques like neutrons or lasers can give us much more information, helping us to understand how they were made, see where they have been restored and help us determine the best way to preserve them. It may even be able to determine fakes."

Scientists currently involved in the research of cultural heritage are already showing the potential these new non-destructive testing opportunities can offer. Dr Dirk Visser, a Netherlands Science Foundation (NWO) scientist working on the ISIS pulsed neutron source at the Rutherford Appleton Laboratory, has generated in collaboration with the Rijksmuseum, Amsterdam several 3D computer graphics animations of ancient bronze statues using neutron tomography. Many of these statues are on show at the 'From Vulcan's Forge' exhibition of bronzes from the

Rijksmuseum in Amsterdam which is being held in London until Friday 16 December 2005. See the internet link in the Notes for Editors for more details of this exhibition.

“These 3D graphics are very exciting – we can rotate the images, see where damage has been restored, look inside the bronzes, and even take a virtual reality trip into the heart of the bronze”, explains Dr Visser.

One of the challenging tasks of the project is the development of a new 3D neutron imaging technique combining neutron resonance capture imaging with neutron resonance transmission measurements. This technique will be used to determine the 3D elemental composition of an object. “The development will build primarily on the experience gained at the GELINA facility of the European Commission’s Joint Research Centre (JRC) by Prof. Hans Postma from the Technical University of Delft and the staff of the JRC Institute for Reference Materials and Measurements (IRMM) in Geel (B)” explains Dr. Peter Schillebeeckx from the IRMM.

Professor Carla Andreani, Italian project scientist from Università degli Studi di Tor Vergata is also involved in the project and explains the need to involve those working with cultural heritage artefacts. “We will work in close collaboration with operators from the world cultural heritage and operators and scientists from museum such as those in Villa Adriana (Rome-Tivoli). We want to address issues such as how the materials in an artefact were produced and how the artefact was manufactured using those materials. We want to know the methods used to produce objects like marbles and archaeological bronzes, and find out the components in the gold or silver alloys of coins and medals without destroying them.”

Professor Giuseppe Gorini from the Università degli Studi di Milano-Bicocca, Italy, is the project leader. “This project is not just about looking at individual techniques, as powerful as they are,” he explained, “We are interested in the synergies – found at the multi-disciplinary research institutions like the CCLRC Rutherford Appleton Laboratory in the UK, and the Polygone Scientifique in Grenoble, France.”

A key part of the project is to bring together the different research techniques, which all offer complementary opportunities. As well as being able to 'see' inside cultural artefacts using the 3D tomography and see where repairs have been made, neutrons would also be able to investigate particular spots on an artefact – perhaps a weld that has been detected with tomography.

“We could then investigate, non-destructively, the elements used in the welding material”, explained Professor Gorini. “Knowing the component metals used in the weld can provide valuable information about how and when the repair was made. The neutron tomography will determine very accurately how thick the walls of the bronze are and, in combination with laser scanning techniques, we will be able to direct the non-destructive neutron investigation with a micron scale accuracy.”

Editors Notes

Ancient Charm (Analysis by Neutron resonant Capture Imaging and other Emerging Neutron Techniques: new Cultural Heritage and Archaeological Research Methods) is a project funded through the NEST (New and Emerging Science and Technology) programme of the European Commission's Specific Targeted Research Project (STREP). The project will last 36 months from its start date (1 January 2006) and will cost 2 million Euros.

A range of scientific techniques, including X-rays, are currently used to investigate objects of cultural interest – but each has limitations. For example some cannot penetrate very deeply into the material of the object. Neutrons can penetrate thick layers and have many other advantages, but although the areas of materials science research using neutrons has steadily grown from physics to include chemistry, biology and engineering, the potential for using neutrons for archaeological artefacts is still being developed. The Ancient Charm project aims to develop the potential that neutron science research offers, including the ability to produce complex 3D images of objects and determine their atomic content non-destructively – a vital tool when determining the technology used in producing an artefact and deciding if the object is genuine or fake.

For details of the London exhibition of bronzes, follow the link:

<http://www.rijksmuseum.nl/tentoonstellingen/werkplaats-van-vulcanus>

This project (Ancient Charm) will be presented at the conference 'Research Infrastructures for Cultural Heritage' in Trieste on 12th to 13th December 2005.

http://neutron.neutron-eu.net/n_nmi3/n_networking_activities/rich

Professor Giuseppe Gorini from the Università degli Studi di Milano-Bicocca, Italy, is the project leader.

There are ten partner organisations in the Ancient Charm project:

- Università degli Studi di Milano-Bicocca, Italy
- Università degli Studi di Roma Tor Vergata, Italy
- Hungarian National Museum
- Institute of Isotopes – Chemical Research Center, Hungarian Academy of Sciences, Hungary
- Rheinische Friedrich-Wilhelms Universität zu Köln, Germany
- Universität zu Köln, Germany
- European Commission – Joint Research Centre – Institute for Reference Materials and Measurements, Belgium
- Archaeology, Leiden University, Netherlands and the Museum of Antiquities (ROM), Leiden, the Netherlands
- Reactor Institut Delft, Technical University Delft, Netherlands
- Council for the Central Laboratory of the Research Councils, UK

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