

‘BLACK BOX’ MEETING AT SÁROSPATAK EDITORIAL PREFACE TO AM 2008/1

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Abstract

In the framework of the Ancient Charm Project (Analysis by Neutron resonant Capture Imaging and other Emerging Neutron Techniques: new Cultural Heritage and Archaeological Research Methods, <http://ancient-charm.neutron-eu.net/ach>), imaging potentials of non-destructive neutron analytical methods are evaluated for archaeological applications. Prior to working on real archaeological specimens, so-called 'black boxes' were constructed (and characterised) for tests of the various methods. This issue of Archaeometry Workshop is dedicated to the study of these experimental test objects on the basis of a workshop held in November 2007 at Sárospatak.

Kivonat

Az Ancient Charm Program keretében (Analysis by Neutron resonant Capture Imaging and other Emerging Neutron Techniques: new Cultural Heritage and Archaeological Research Methods, <http://ancient-charm.neutron-eu.net/ach>), különféle neutron analitikai vizsgálatok képalkotási lehetőségeit vizsgáljuk a kulturális örökség körébe tartozó tárgyakon. Mielőtt a régészeti műtárgyakat vizsgálnánk, a különféle vizsgálatok lehetőségeinek felmérésére kísérleti tárgyakat, úgynevezett "fekete dobozokat" készítettünk, amelyeken a módszereket kipróbálhattuk. Az Archeometriai Műhely / Archaeometry Workshop jelen számát ezeknek a próbatestek a vizsgálatáról állítottuk össze, egy 2007. novemberében tartott kisebb konferencia (Sárospatak) anyagára alapozva.

Introduction

Ancient Charm (Analysis by Neutron resonant Capture Imaging and other Emerging Neutron Techniques: new Cultural Heritage and Archaeological Research Methods) is a multi-national project launched among the EU-FP 6 NEST (New and Emerging Science and Technology) programmes. It addresses problems and challenges related to neutron-based imaging techniques and their possible use in the study of cultural heritage materials (Gorini 2007).

In order to present the aims of the projects precisely, let us quote from the project central webpage:

'The idea of developing an imaging technique based on epithermal neutron absorption is totally new and presents a number of scientific and technical challenges which are best addressed by the joint development of two related 3D imaging methods:

- Prompt Gamma Activation Imaging combined with cold Neutron Tomography (PGAI/NT) and
- Neutron Diffraction Tomography (NDT).

Developing the 'Neutron Resonant Capture Imaging' combined with 'Neutron Resonance Transmission' (NRCI/NRT) as a non-invasive technique for 3D tomographic imaging and its use in cultural heritage research is the ultimate aim of the ANCIENT CHARM project.

The three new imaging methods will provide a new, comprehensive neutron-based imaging approach, which will be applied here for the 3D imaging of elemental and phase composition of objects selected as a result of a broad scope archaeological research.'

Hungary is represented in this project by a team from the Hungarian National Museum, working in charge of WP-1 ('Cultural heritage foundations of neutron-based imaging'), and a team from the Isotope Institute of the HAS working on PGAI and technical problems concerning measurements such as sample support construction.

Black boxes

Prior to the useful application of these leading edge technologies to archaeological objects, it seemed imperative to test potentials of the methods on objects of controlled geometries and materials, known to the constructors but unknown to the analysts.

Archaeologists taking part in the project planned a test series of possible complex materials likely to occur together in an archaeological context (Hajnal 2008). A series of 40*40*40 mm metal cubes were made, of iron plates (Hungarian boxes, Dúzs 2008) and another series of cubes, 50x50x50 mm large, made of aluminium sheets (German boxes, Kirfel 2008). The contents and the construction of these boxes were carefully documented, the raw materials used analysed by standard material testing procedures.

The boxes were sealed, and circulated among the Ancient Charm participants. A 3D coordinate system (x,y,z) was attached to the external parts of the cubes for clear orientation and reproducibility.

The analysts had no clue as to the contents of the closed boxes. However, the analysts could exchange information among themselves. For instance, neutron radiographies and X-ray radiographies were available at the time of the diffraction and PGAA measurements. The first time, the analysts had information on the actual planning, construction and the results of the other teams was at a small workshop held at Sárospatak, Hungary.

In this way we could test the potentials of the methodologies applied and define an optimal sequence of proper analysis for the archaeological objects to be analysed in the framework of the project.

The present issue of *Archeometriai Műhely / Archaeometry Workshop / Archaeometry Workshop* is dedicated to the results of this experimental work.

References

DÚZS K. (2008): Realisation of the planned 'Black Boxes' in the Hungarian National Museum. *Archeometriai Műhely / Archaeometry Workshop* **2008/1**. 7-20

FESTA et al. (2008): Festa, G., Kockelmann, W., Kirfel, A., Neutron Diffraction Analysis of 'Black Boxes'. *Archeometriai Műhely / Archaeometry Workshop* **2008/1** 61-72.

GORINI, G. and the Ancient Charm Collaboration (2007): Ancient Charm: A research project for neutron-based investigation of cultural-heritage objects. In: Mando et al. eds., Workshop on RICH 2005 IINC. *Il Nuovo Cimento Bologna Societa Italiana di Fisica* **30/1** 47-58

HAJNAL Zs. (2008): Test objects for developing 3D material analysis on Cultural Heritage objects: Plans for the 'Black Boxes' to be analysed in the Ancient Charm Project. *Archeometriai Műhely / Archaeometry Workshop* **2008/1** 3-6

KASZTOVSZKY Zs. & BELGYA T. (2006): 'Non-Destructive Investigations of Cultural Heritage objects with Guided Neutrons: The Ancient Charm Collaboration', *Archeometriai Műhely / Archaeometry Workshop* **2006/1** 12-17

KIRFEL, A. (2008): Construction and description of the UNIBONN 'Black Boxes'. *Archeometriai Műhely / Archaeometry Workshop* **2008/1** 21-34.

KIS et al. (2008): Kis, Z., Belgya, T., Szentmiklósi, L., Kasztovszky, Zs., Kudejova, P. & Schulze, R., Prompt Gamma Activation Imaging on 'Black Boxes' in the 'Ancient Charm' Project. *Archeometriai Műhely / Archaeometry Workshop* **2008/1** 41-60.

KUDEJOVA, P. (2008): Neutron and X-Ray imaging of the 'Black Boxes' for the Ancient Charm project. *Archeometriai Műhely / Archaeometry Workshop* **2008/1** 35-40.

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