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# Neutron imaging, a non destructive method for the study of mobile cultural heritage objects. Survey on 10 years of close collaboration with the NIAG team at PSI

*Tuesday, 17 April 2012 11:00 (30 minutes)*

The scientific staff at the Laboratory for Conservation Research at the Swiss National Museum performs non-destructive or minimally invasive analysis of cultural heritage by means of micro X-ray fluorescence spectrometry, atom-absorption spectrometry, and infra-red and Raman spectrometry, in order to determine the composition of metal alloys, adhesives, pigments, coloring, precious and semi-precious stones, products of corrosion and preservatives.
For specific studies, other methods are required to get knowledge about inner hidden structures or state of conservation. The common approach for this kind of investigations is to use X-rays, thermal and/or cold neutrons rays.
We performed in close collaboration with PSI studies within several projects.
Bronze sculptures from roman origin collected in Switzerland were studied with neutron tomography, in total about 200 pieces [1]. Because alloys in the Roman period were heavily loaded with lead, neutron imaging is preferred to all X-ray methods.
The process of wood conservation is strongly related to the penetration depth of the resin or other agents into the wood structure. With neutron imaging techniques we were able to visualize and to quantify the amounts over the full process of injection, distribution, solvent evaporation and solidification [2].
The flanged axe of Thun-Renzenbühl dated to the early bronze age axe decorated with numerous inlays of a golden metal was investigated by neutron tomography in order to obtain virtual cuts of the axe in all three dimensions. This allowed studying the casting and decoration technique.

[1] Deschler-Erb E, Lehmann EH, Pernet L, et al, The complementary use of neutrons and X-rays for the non-destructive investigation of archaeological objects from Swiss collections , in: ARCHAEOMETRY 46: 647-661 Part 4 NOV 2004
[2] E. Lehmann, S. Hartmann and P. Wyer, Neutron radiography as visualization and quantification method for conservation measures of wood firmness enhancement, in: Nuclear Instruments and Methods in Physics research section A- Accelerators spectrometers detectors and associated equipment, 542 (1-3): 87-94 APR 21 2005.
[3] K. Hunger, D. Berger, E. Lehmann, F. Müller, S. Hartmann and M. Wörle; Zerstörungsfreie Untersuchungen des frühbronzezeitlichen Randleistenbeils aus Thun-Renzenbühl (Kanton Bern) mittels Mikro-Röntgenfluroeszenzanalyse und Neutronentomographie, Beitrag zum Erwerbungsbericht „Die Sammlung“2008/2009, 124-127.

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