# SYCH 2: Cultural Heritage in the Light of Physical Methods II

Time: Thursday 16:30–18:30 Location: HSZ 02

**Invited Talk** SYCH 2.1 Thu 16:30 HSZ 02

**Looking below the surface of paintings by help of neutrons** — •Claudia Laurenze-Landsberg[1] and Carl Otto Fischer[2] — [1]Gemäldegalerie, Staatliche Museen zu Berlin — [2]Helmholtz-Zentrum für Materialien und Energie

The research using the Neutron-Autoradiography method is in collaboration with the Helmholtzzentrum für Materialien und Energie, Berlin and the Gemäldegalerie of the Staatliche Museen Berlin. The Gemäldegalerie Berlin is the only institute world wide, which systematically employs the method of Neutron-Activation-Autoradiography to analyse paintings. Today we have investigated about 70 mainly 17th century works.

The paintings to be investigated are scanned by means of neutron activation. The isotopes arising during this process have specific half-lives and emit gamma and beta energies. For a period of up to six weeks after activation x-ray films are placed on the painting exposing them to the radiation. Hereby, paint layers, which vary in colour, can be separated on different films and supply valuable additional data to x-radiographs.

Deeper paint layers are made visible. In this way, it is possible to gain insight into the work process and the artistic approach of the painter. A hidden composition might reveal another artist's influence on the painter, which might be important for the dating. The elucidation of the brushstroke can be read as the handwriting of the artist responsible for the painting. Examples for these various findings by using non-destructive autoradiography will be shown.

**Invited Talk** SYCH 2.2 Thu 17:00 HSZ 02

**X-ray fluorescence analysis using synchrotron radiation excitation** — •Martin Radtke, Günter Buzanich, Uwe Reinholz, and Heinrich Riesemeier — BAM Bundesanstalt für Materialforschung und -prüfung

Archaeology and Archaeometry are two emergent fields in materials science with an increasing demand of access to synchrotron radiation (SR) based techniques such as X-ray imaging, X-ray Diffraction, X-ray fluorescence and IR spectroscopy. These methods allow the characterization of specific features or fingerprints of the materials that are often comprised of trace element compositions or the presence of particular minor phases that can be for instance, used as a marker of the provenance of a material or a distinct fabrication technique.

In this contribution especially the use of SR for the analysis of ancient gold objects using X-ray fluorescence (SRXRF) is presented. After an introduction to the properties of SR the results for measurements at the Sky Disc of Nebra, the Berlin Gold hat and the Hiddensee treasure are discussed.

All examples of this presentation have been measured with the SR-XRF setup at the BAMline at BESSY II. A superconducting wavelength shifter with a maximum field of 7 Tesla is the X-ray source. The useable energy ranges from 5 up to 80 keV. Thus nearly all elements can be detected by measurement of their K-shell flourescence. With compound refractive lenses a beam diameter of 1 micron can be achieved.

**Invited Talk** SYCH 2.3 Thu 17:30 HSZ 02

**Metabolic tools to study wine body** — •Oliver Fiehn, Kirsten Skogerson, and Gert Wohlgemuth — UC Davis, Genome Center, U.S.A.

Are wine tasting panels really objective? Can physical measurements mimic human reception of wines? Our senses perceive a wide variety of compounds, from volatiles (odor) to polyphenolics (tannins), acids, and numerous other metabolites. Quantitative analysis of 'all compounds', called metabolomics, might therefore replace or complement human wine tasters. However, no single technical platform can analyze all metabolites present in a biological sample. When several platforms are combined, 500-3,000 metabolites can be assessed per biological study using chromatography (GC, LC) coupled to mass spectrometry (TOF, ion trap, QTOF, FT-ICR MS) in combination with standardized spectral libraries and databases.

An exemplary study is presented for predicting wine body of 20 white wines, using the results of categorization of mouthfeel viscosity from trained wine panelists. By applying metabolomic results and multivariate statistics, mouthfeel viscosity was predicted at 80% confidence. Interestingly, the human sensation of wine body is not perceived by compounds that might otherwise be accounted for 'high viscosity' (such as sugar alcohols, glycerol or lactate) but amino acids. We also confirmed that no single biomarker could accurately predict wine body, whereas a panel of few compounds was found to be pretty close to the average scores of the wine tasting panel.

**Invited Talk** SYCH 2.4 Thu 18:00 HSZ 02

**Identification of Ancient Plant Textiles** — •Bodil Holst[1] and Bridget Murphy[2] — [1]University of Bergen, Department of Physics and Technology, Bergen, Norway — [2]University of Kiel, Institute of Experimental and Applied Physics, Kiel, Germany

Archaeological textiles are made of natural fibers, which can be divided into two subgroups according to their origin. The two subgroups are animal fibers (wool, hair and silk) and plant fibers (flax, nettle, hemp etc.). Based on archaeological finds, it is believed that the first textiles were made of wild plant fibres. Up till now it has been the general assumption that the development of textile production was closely linked to the development of agricultural society through the use of cultivated textile plants (primarily flax and hemp). In this paper we challenge this assumption: Using new analysis methods which we have recently developed, we present conclusive evidence for high quality textile production based on the collection of wild plants in a Bronze Age agricultural society. Specifically, we show that the 2800 year old Bronze Age textile found in Voldtofte, Denmark is made of nettle.

Our investigation suggests that plant textile production in Bronze Age central Europe was based not only on agriculture, but also on the targeted exploitation of wild plants. It highlights the importance of nettle as a textile plant and suggests that a re-examination of many existing plant textile finds with new analysis techniques is called for.