Dyeing techniques of the Hallstatt-Textiles

Analysis, experiments and inspiration for contemporary application

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Tablet woven ribbon from Hallstatt, Iron Age (foto: © NHM)

Making a combed top (foto: G. Rösel)

Woad ball, made of pounded leaves, to preserve the indigo dye (foto: M. Kohler-Schneider)

Machine spun wool dyed in possible colour variants of the Hallstatt-Textiles (foto: A. Hartl)

The Hallstatt-Textiles

Hallstatt in Upper Austria is famous for its 7000 years old history of salt production. The condition in the salt mine is ideal to preserve organic material from prehistoric times. Due to the impregnation by salt, the constant climate of the mine and the protection from light, coloured textile fragments survived up to 3500 years. Since 1849, more than 565 textile fragments have been excavated, most of them from the Hallstatt Period (800-400 BC, early Iron Age), some even from the Bronce Age. The fragments are pieces of fabrics with spinning and weaving patterns, but also fine ribbons made of woolen yarns only 0,2mm thin.

Research and inspiration

The interdisciplinary research project is funded by the Austrian Science Fund (FWF): L431-G02 (duration 2008-2011). The aim of the project is to gain knowledge about the prehistoric dyeing techniques and to apply this knowledge on reproductions. Furthermore, links shall be created between the unique cultural heritage of the Hallstatt-Textiles and reflection in textile arts and inspiration for today's commercial products. The main parts of the project are:

Analysis. 68 samples of threads were analysed by high performance liquid chromatography with photo diode array detection (HPLC-PDA), optical microscopy and scanning electron microscopy with energy-dispersive X-ray analysis (SEM-EDX). Several dyes respectively dye plants were identified, e.g. woad, weld, tannins, Rubiaceae. The use of dye insects and lichens is also possible, but could not be proven for sure. More than 400 dyes - especially red and yellow ones - remain unknown yet. Element analysis was performed because aluminium, iron and copper could have been used as mordants in the dyeing process. These elements, however, could also originate from the embedding material in the mine and therefore could have changed the original colour shades of the textiles.

Experiments. Wool of four old sheep breeds with fleece comparable to the Iron Age sheep was tested during experimental archaeology experiments. Different wool preparation and hand-spinning methods were successfully applied to produce yarns as thin as the prehistoric ones. Dyeing experiments were carried out to reconstruct the colour shades of the original textiles as well as to give an input to dyestuff analysis: based on a literature review, 42 domestic dye plant species were collected and used to dye reference material. Further different fermentation vat dyeing techniques were performed with woad (*Isatis tinctoria*) and indigo (*Indigofera sp.*). These dyed yarns were analysed to be compared with the unknown reds and yellows found in the prehistoric textile samples. The analysis of the reference material aims to improve the understanding of the dyestuff analysis results from the Hallstatt-Textiles.

Reproductions. Three ribbons made of hand-spun wool and dyed with natural dyes are reproduced to show how the ribbons once may have looked like. Each ribbon is made in two possible colour variants, based on the analytical results and a colour comparison of dyed samples with the original Hallstatt ribbons. A short part of each reconstructed ribbon is put into copper solution to demonstrate the colour modifying effect.

Inspiration. Students of the University of Applied Art are working on objects of textile art and textile design, inspired by the Hallstatt-Textiles, the weaving and dyeing techniques, and the prehistoric context. They exclusively use natural dyes and natural fibre materials for their works.

Exhibition & Symposium. A special exhibition at the Natural History Museum Vienna will show the prehistoric textiles, the reproductions and the contemporary art and design objects (17.01.-29.06.2012). The symposium "3000 Years of Colour - from Tradition to Art and Innovation" will take place at the Natural History Museum Vienna (21.-23.03.2012). For details please look: http://3000YearsOfColour.nhm-wien.ac.at/

Project team and external cooperations

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