

A-3580 Horn, Wiener Straße 2, Kunsthaus

Further education course held by *Dr. Jan Wouters*

The Understanding and Analysis of Organic Materials in Art

Capita selecta: proteins; natural organic dyes and pigments

3rd – 7th September 2012, Horn, Austria

Short description of the course

Introduction

A short introduction will be given to understand why the analysis of organic materials in art requires an approach different from the analysis of inorganics. It will explain that the key features of organic analysis are analytical and spatial resolution. It will lead to suggesting logical sequences of hyphenated analytical approaches.

Proteins

The course on proteins aims at improving the understanding of the diversity of proteins present in materials used for the creation of objects of art and culture as well as for their conservation. The trajectory of understanding starts from the elementary building blocks, amino acids, and ends with the smallest observable morphology. The clarification of the scanning electron microscopic morphology of a collagen microfibril and of its properties is taken as an example. The multi-level spatial configuration of proteins will be explained and will be at the basis for understanding protein degradation and enzyme activities.

The potential of calibrated amino acid analysis with high-performance liquid chromatography will be illustrated with a series of examples within a heritage context.

Practicals include the making of models of amino acids and small peptides to illustrate optical and position isomerism and to understand spatial configurations; the calculation of the isoelectric point of some amino acids will improve the understanding of this important parameter.

Natural organic dyes and pigments

The course on natural organic dyes and pigments aims at explaining why the enormous diversity of these materials should be considered an advantage for contributing to the understanding of heritage, rather than a disadvantage.

Nowadays, the analysis of organic dyes and pigments should stretch beyond the mere reporting that such a material is present, without any further specification. The course will give a detailed overview of organic colourant chemical classes. It will report on the structure of a relevant research project. It will show the potential of high-performance liquid chromatography coupled to a diode-array and a mass detector for identifying up to seven biological sources, used to perform one single colouration in the past. Several other examples will show how detailed organic colourant analysis may contribute to the understanding of heritage.

Practicals include dyeing experiments with natural organic colourants to illustrate the main dyeing processes.

Elaborate description of the course content

Proteins

- A short history
- Correlations between perception and composition
- Classification of proteins
- Amino acids: basic structure; isomerism; amphoteric character; isoelectric point; all structures; isoelectric point calculations
- Peptides
- Conformation of proteins: primary, secondary, tertiary and quaternary structures
- Bonds and interactions in and between polypeptide chains
- The conformation of collagen, leading to the construction of a collagen fibril
- Proteins in use in art and in art conservation practice: gelatin; ovalbumin; casein
- Alteration/degradation phenomena in proteins: denaturation; oxidation; hydrolysis
- Enzymes: history; importance; catalytic action; important parameters to observe; hints for purchase; important enzyme classes (proteases, amylases, lipases)
- Practicals
- Calibrated amino acid analysis by high-performance liquid chromatography and fluorescence detection at the sub-microgram of protein level
- Sources of error in amino acid analysis
- Examples of contributions of calibrated amino acid analysis to improving the understanding of heritage: paint binding medium; archaeological textile pseudomorphs; leather degradation; parchment degradation; baroque artificial marble; wool degradation; yarns in colonial Andean tapestries

Natural organic dyes and pigments

- The definition of a dyestuff
- The history of dyeing
- Nomenclature of colouring matters, biological sources and individual components
- Reading botanical information
- Chemical structures of main dye classes (quinonoid, flavonoid; indigoid; tannin; other)
- Important parameters in analytical protocols
- Analytical resolution and identification potential
- The high-performance analytical protocol
- Examples of contributions of organic colourant analysis to the understanding of heritage: a project on early Chinese organic pigments; identification of scale insect red dyes; analysis of faded colourants; technologies for dyeing purple and red in Roman and Coptic Egypt; precolumbian dyes in Colombia and Peru; theory and practice in dyeing Florentine borders; distinguishing between East and West
- Practicals: dyeing with cochineal, indigo and safflower; pigment preparation with brazilwood

The course language will be English. The course fee plus accommodation (4 nights) is 830.00 € plus 10% VAT. The number of participants is restricted. [Registration](http://www.buchstadt.at/?id=161&L=3): <http://www.buchstadt.at/?id=161&L=3>

Accommodation during the course is either within the building (guesthouse) or in a close hotel (hotel conditions) and **is included in the price**. The guesthouse offers a kitchen where participants can prepare own meals and the close connection to the venue is of advantage, but there is no TV and no telephone in the rooms. The hotel is 5 minutes walk from the venue, but provides all facilities a hotel normally got.