

SURVENIR PROJECT- A DEDICATED INSTRUMENT FOR COLLECTION SURVEYS

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Collection surveys are necessary in order to reveal the condition of a collection, the general conservation needs and in order to plan preservation activities. For such a task, a simple instrument is necessary, which allows us to survey a collection in a non-destructive, non-invasive and chemical-free manner.

In the frame of the SurveNIR project, co-funded by the European Commission 6th Framework Programme (2005-2008), a consortium of research institutions and end-users built a dedicated NIR spectroscopic instrument, which enables the user to determine a variety of chemical and mechanical properties of paper, including naturally aged paper. The approach has been validated in several European collections in the British Library (London), Victoria and Albert Museum (London), National Archives (The Hague), National Archives (Stockholm), National Museum of Denmark (Copenhagen), National and University Library (Ljubljana), and State Archives of Dubrovnik.

Traditionally, the condition of a paper-based object or a whole collection is assessed visually, and simple physical and chemical tests are performed, such as the folding test¹ or determination of pH of paper using pH-indicator pens. The folding test is performed in such a way that a paper corner is actually torn away; the pens leave some of the dye used as a pH indicator on the object. Neither of the two tests can be described as non- or micro-destructive. Even determination of paper pH using flat surface electrode, which is probably the most often used methodology in paper conservation workshops, is destructive as an area of paper has to be wetted in order that the measurement can take place at all. In addition, traditional surveying methods are also highly subjective.²

Based on the chemical and spectroscopic analysis of more than 1500 historical samples from AD 1650 onward, we developed a non-destructive method, which enables us to characterize historical paper by gelatine content, mechanical properties, lignin content, pH, degree of polymerization of cellulose and other properties.^{3,4} A lightweight and portable instrument has been developed and designed in cooperation with conservators and curators (Figure 1).⁴ The approach provides museums, libraries and archives with a non-destructive chemical-free low-cost surveying tool that provides more in-depth information than the traditional methods and is at the same time also user-friendly and does not require extensive technical knowledge by the surveyor.⁵



Figure 1: The SurveNIR instrument for non-destructive evaluation of paper chemical and mechanical properties for collection surveying, based on chemometric evaluation of NIR spectra.

Additionally, software has been developed, which allows the surveyor to work in three different modes:

- Single item assessment: for condition assessment of an individual item, where chemical and physical data are needed for several locations on the same object,
- Random collection survey: for surveys of large collections, where a subset of a collection is first pre-selected and on the basis of condition assessment of the subset, the condition of the whole collection is deduced (with a pre-calculated confidence interval and a level of significance),
- Total collection survey: for smaller collections, where all objects in a collection can be surveyed.

The software provides methods for assessment of chemical and physical properties of paper both for single sheets (graphical or archival documents) as well as for books. In addition to providing the data on the paper, the software also enables the user to build a survey questionnaire based on a set of descriptive criteria, which can be freely defined, e.g. binding condition, evidence of mechanical damage etc., however, these need to be evaluated visually.

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Literature

1. S. Buchanan, S. Coleman: "Deterioration survey on the Stanford University Libraries Green Library stack collection", *College and Research Libraries* 48 (1987) 102-147.

2. J. Taylor, S. Stevenson: "Investigating subjectivity within collection condition surveys", *Museum Management and Curatorship*, 18 (1999) 19-42.
3. T. Trafela, M. Strlič, J. Kolar, D.A. Lichtblau, M. Anders, D. Pucko Mencigar, B. Pihlar: "Nondestructive analysis and dating of historical paper based on IR spectroscopy and chemometric data evaluation", *Anal. Chem.* 79 (2007) 6319-6363.
4. D. Lichtblau, M. Strlič, T. Trafela, J. Kolar, M. Anders: "Determination of mechanical properties of historical paper based on NIR spectroscopy and chemometrics – a new instrument", *Appl. Phys. A* 92 (2008) 191-195.
5. SurveNIR webpage, <http://www.science4heritage.org/survenir/>