

AGEING AND CONSERVATION OF SILK

Evaluation of Three Support Methods Using Artificially Aged Silk

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Academic dissertation in Conservation, to be publicly defended, by due permission of the Faculty of Science at the University of Gothenburg, on November 6 2015 1 P.M. at the Department of Conservation, the Auditorium, Geovetarcentrum, Guldhedsgatan 5c, Gothenburg.

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ABSTRACT

The general aim of this thesis is to evaluate common remedial conservation support methods used in the conservation treatments of fragile silk costumes that have experienced physical damage. It is based on five papers. Paper I surveyed the methods textile conservators use to conserve historic textile costumes and their criteria for a successful intervention. It also investigated artificial ageing of modern silk and wool fabrics with exposure to ultraviolet radiation to create material for laboratory-based experimental research. Furthermore, it evaluated mechanical methods to imitate natural wear in silk and wool fabrics, to simulate the handling of conserved costumes, and to find a method to evaluate the effect of the conservation methods. The most common conservation method conservators reported using was to insert a support fabric between the outer fabric and the lining of a costume, which was then sewn on by the couching method over the outer fabric. The most important criterion for a successful conservation was aesthetical appeal. Abrasion by Nu-Martindale and tensile testing were found promising to use to achieve natural accelerated wear and to evaluate conservation methods.

Paper II aimed at finding an optimal accelerated ageing protocol to simulate the nature and degree of degradation found in naturally aged seventeenth century silk fabric in order to produce surrogates for experimental research. Tensile tests, Attenuated Total Reflection - Fourier Transform Infrared spectroscopy (ATR-FTIR) and Size Exclusion Chromatography (SEC), were investigated as methods for evaluating the results. Four environmental parameters were tested: relative humidity (RH), acidity (pH), ultraviolet irradiation (UV) and thermo-oxidation. For Paper III, further investigations were carried out to establish analytical markers for aged silk by additional analytical methods. The investigations were successfully complemented and verified using amino acid analysis, and measurement of pH and brightness. In both Papers II and III it was established that thermo-oxidation at 125°C was the most suitable ageing method.

In Paper IV two types of experimental damage on silk surrogates were conserved with three different methods: brick couching, laid couching, and crepeline. The conserved surrogates were further subjected to accelerated wear by using a combination of washing and tumbling, followed by tensile testing. The three interventions increased the surrogates' strength from three to more than five times. Surrogates with a tear conserved with laid or brick couching were the least affected by wear; and, after the conservation was removed, the abraded surrogates conserved with crepeline were stronger than those conserved with the other two methods. Paper V explored the factors that determine aesthetic quality of conservation interventions. The study, based upon examinations performed by Swedish textile conservators, resulted in two factors coherence and completeness, that describe aesthetic quality.

This doctoral thesis is based on the following articles:

- I Johanna Nilsson. "A survey of the most common support methods used on historical costumes and a preliminary investigation of tests assessing the quality of conserved fabrics." Post print at the conference *Scientific Analysis of Ancient and Historic Textiles*, 2005, University of Southampton, eds. R. Janaway & P. Wyeth, p. 79-85.
- II Johanna Nilsson, Francisco Vilaplana, Sigbritt Karlsson, Jonny Bjurman, and Tommy Iversen. "The validation of artificial ageing methods for silk textiles using markers for chemical and physical properties of seventeenth century silk." *Studies in Conservation*, 2010, 55 (1) p. 55-65.
- III Francisco Vilaplana, Johanna Nilsson, Dorte Vestergaard Poulsen Sommer, and Sigbritt Karlsson, "Analytical markers for the degradation of historic and artificially aged silk in different environments.", *Analytical and Bioanalytical Chemistry*, 2015, 407, (5) p. 1433-1449. DOI 10.1007/s00216-014-8361-z
- IV Johanna Nilsson. "Evaluation of stitched support methods for the remedial conservation of historic silk costumes." *e-conservation Journal*, 2015, 3. DOI 10.18236/econs3.201506
- V Johanna Nilsson and Östen Axelsson. "Attributes of aesthetic quality used by textile conservators, evaluating conservation interventions on museum costumes.", *Perceptual and Motor Skills*, 2015, 121, (1), p. 199-218. DOI 10.2466/27.24.PMS.121C10X7

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