Materials research in conservation and heritology

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Abstract: This article is based on the dissertation by the author. It creates a connection between materials research and conservation and heritology. Materials research is a part of multidisciplinary heritology and it has an important role in preserving cultural heritage. If reliable information for the documentation is needed about the materials in an object, on the origin of the object, on the authenticity of the object or on whether any restoration has been carried out previously, analyses that reveal chemical compositions must be performed. On the other hand, the materials research can be focused on examining the ageing properties of materials to find out the chemical and physical changes caused by different environmental conditions. This kind of research benefits the preservation of cultural heritage objects, because results can be applied to both preventive and active conservation. Furthermore, materials research is needed for testing and examining the conservation and restoration methods.

Key words: Materials research, conservation, restoration, documentation, authenticity.

INTRODUCTION

Even though both material and immaterial cultural heritage exist, materials research in conservation is restricted to only investigating the material cultural heritage (Maroević 1998: 136), since the research literally focuses on substance and the formed materials.1 Scientific methods are applied in research so that information on cultural-historical material compositions, work techniques and the ageing properties of the materials is acquired. In addition, research on materials in conservation work aims to find out both the properties of the material used in active and preventive restoration treatments as well as their effect on the materials of the conserved object. The present article, which is based on a doctoral thesis, discusses the museological functions that provide the context for materials research in conservation (Knuutinen 2009).2

SEARCHING FOR THE CONTEXT

The context for both materials research and early museology, i.e. museography dates back to 1914, when Uuno Taavi Sirelius defined museology as research that aims at finding out the best possible ways of cleaning, preserving, cataloguing and exhibiting the objects in the
museum, as well as investigating what constitutes the most practical exhibition stands. According to Sirelius, museography aims at finding out how work at museums should be conducted so that the objects are preserved for the future generations (Vilkuna 2003: 80–81).

Even though the definition is related to the museum artefacts and how to preserve them, it lacks the foundation related to the materials of the objects. Before knowing how to best preserve, clean and exhibit the product, one must know the materials as well as their properties and reactions in different environments.

The context between materials research and museology, which is closely intertwined with preserving the material cultural heritage, began to form and clarify as late as in the 1980s and 1990s, as Peter van Mensch presents Lasko and Lodewijk’s definition of conservation science (van Mensch 1992: Research 5/13). Conservation science has been suggested to entail the following three main orientations:

1) The study of the history and technology of the object
2) The improvement of conservation techniques
3) The search for the best conditions under which to preserve the collection.

Interestingly, even though the definition is viewed as related to object-oriented research, it simultaneously lacks the proper basis and foundation of the materials study in conservation. The history and technology of the object can to a certain extent be studied without knowing the material composition of the object. However, evaluating and testing conservation techniques, whether preventive or active by nature, requires accurate information concerning the chemical composition of the material(s) as well as the chemical and physical properties. The aforementioned definition is interpreted to include also materials study related to documentation. However, it remains unclear what exactly the materials study is, who conducts it, and which steps are taken. Maroevic’s thoughts are along the line with van Mensch. In addition, Maroevic also brings up the role that scientific research plays in conservation (Maroevic 1998: 248–254). Both van Mensch and Maroevic classify research in the field of conservation in the context of museological research as so-called applied research (van Mensch 1992: Museological research 1–4/11).

APPLIED MUSEOLOGY OR APPLIED NATURAL SCIENCES?

In his doctoral thesis, van Mensch discusses the thoughts presented by e.g. Sofka, Teather and Stránský concerning museological research as well as what is classified as basic research and what is a part of applied research. Provided that museological basic and applied research should be shortly defined, van Mensch provides a sensible definition in his doctoral theses as follows: “Basic research thus refers to the levels of theoretical and philosophical knowledge, while applied research is related to the level of empirical knowledge and the field of applied museology” (van Mensch 1992: Museological research 1–4/11). Dividing research into two fields of research, namely basic and applied research, has become so established that the distinction is used in the research conducted in museums (Kinanen 2007: 239). Basic study in the field of museology is viewed to consist of investigating cultural information, whereas the applied research has been suggested as a synonym for museographical research. Conservation is viewed as one field among the multiple museological functions of museography. If applied
museology is nowadays still called museography, then it is worth noting that the definition of museography has gone through remarkable changes since the years of Uuni Taavi Sirelius. (Vilkuna 2007: 53–54; Stránský 1995: 20–21). Nevertheless, Maroevic includes the term applied science in conserving, restoring and exhibiting the object. As fields of research, Maroevic brings up chemistry, physics, material technology, biology and statistics, which are used for studying materials, structures and preserving the cultural-historical objects. Maroevic also suggests the following two basic fields of study in applied sciences:

1. research on the materials and structures of heritage objects
2. the heritage objects that can be physically preserved.

Maroevic clarifies that by knowing the materials and structures, one can obtain accurate information concerning what has caused the damage (Maroevic 1998: 252 and 253). In other words, the better the objects are known, the more effective the contribution that can be made to their preservation. Furthermore, Maroevic suggests that knowing the materials and their properties requires scientific research. If scientific study on materials is needed and it will be included as a part of applied museology, a clear context is formed for the primary function of museology, namely preservation. Moreover, when contemplated from the point of view of materials study in conservation, the following questions arise: which study and which applications are at hand? The questions are valid, as materials study in conservation is also viewed as being a part of applied natural scientific research. Materials study cannot be conducted without basic sciences such as chemistry, physics and mathematics. The foundation of the research lies, therefore, in natural sciences but the objects of research and the investigated materials, however, belong to the sphere of cultural heritage and thus heritology.

**Multidisciplinary heritology**

It is evident that in order to preserve cultural heritage, a wide variety of specialized information and knowledge is required in the fields of both humanities and natural sciences. Therefore it would be important for various professions to conduct research together, share information, discuss and solve professional problems, and co-operate in a multidisciplinary environment. Being multidisciplinary does not alone guarantee sufficient scientific expertise, since genuine multidisciplinary work involves participants who are specialists in different fields. However, executing multidisciplinary research in practice would call for more intensive co-operation between various fields of research. This would consequently offer new insights and spheres of influence for research. Tomislav Šola’s (2005) graph on memory organization (files, libraries and museums) and relations of information sciences can be held as an important foundation for realizing multidisciplined heritological research and distributing information between different professionals (see fig. 1).

The graph entails practical sciences linked to the memory organizations, such as archival research, library science and applied museology, i.e. museography (Vilkuna 2007: 44–65, Šola 2005: 3–16). Even though Šola does not define which various functions of heritology can be classified into conservation or materials research in conservation, both conservation and materials study can be a part of applied museology in the graph and thus form a part of heritology defined by Šola, provided that
the foundation of the study is multidisciplinary. Materials study in conservation cannot be classified as information science but rather as already mentioned, as applied natural sciences. After all, it produces significant information concerning cultural-historical material objects for the memory organizations presented in Šola’s graph.

Fig. 1 portrays Šola’s graph, which depicts the basic functions of materials research in conservation below museography. Materials research in conservation can be divided into various functions, out of which two basic functions stand out: firstly investigating material(s) of the cultural historical object as a part of documentation and secondly the function related to conservation and preserving the cultural-historical object.

**THE FUNCTIONS OF MATERIALS RESEARCH IN CONSERVATION**

Materials research in conservation and the closely connected chemical analyses play an important role in documentation (Appelbaum 2007: 42–64), since it is evident that only a carefully documented museum object will form an important source of information. In a similar way, the attached information concerning documentation will become reliable and useful. Documentation that is of high quality also increases the museum value of the artefact, as museum value is viewed to consist of both the material and the informative whole (Valtonen 2006: 18; Štránský 1995: 48.). Therefore, when documenting the items in the process of diarying, cataloguing and indexing,
information about the objects should be collected in as much detail as possible.

Basic research is viewed as a part of cataloguing, which includes such things as defining the material and the timing. When card indexing, too, the collected information can be organized according to the material. (Heinonen and Lahti 2001: 89–98).

Study on authentification can be classified as a sub-function of materials study, since it creates an opportunity to state and to ensure the authenticity of the artefact or alternatively to indicate previously conducted restorations and their timing. Authentification studies on artwork and artefacts serve as examples (Laitinen-Laiho 2004: 150–154). Materials study can also reveal significant cultural-historical information on the materials and the related work techniques. Material techniques can also be understood as a sub-function of the materials study. In addition, the third function of the materials study is to reveal the properties of the materials e.g. ageing, or chemical and physical changes due to certain circumstances (ENVIART http://www.echn.net/enviart/).

Fig. 2 defines the sub function of the cultural-historical research on materials.

Fig. 3 depicts preservation and conservation, which are further basic functions of conservation. They both entail preventive and active material-based research. Before making decisions on objects, their materials and how to preserve them, regardless whether active or preventive conservation takes place, the decision-making should be based on scientifically researched data. In other words, information should be available on how different preservation circumstances and conserving or restoration treatments affect materials and combinations of materials. The study is needed for fine-tuning and optimizing the conservation processes. This is because a successful outcome of the conservation treatment is created only by knowing all the details of the process and carrying out the treatments carefully.

Since new material might be added to the original object in a procedure of conserving or restoring, one of the goals of conserving is to research the materials used, the properties of ageing and the effect they have on the original materials. In addition, problems caused by earlier conservation or restoration processes are occasionally encountered. In such cases, information based on scientific research is
needed to conclude whether a solution can be found to the problem.

The previously portrayed figures aim to clarify all that is related to the materials research of conserving (fig. 1, 2 and 3) and to illustrate various functions present in material studies.

Even though fig. 1 separates the basic functions of materials study, the research related to conserving and preserving does not remain isolated from the materials study in documentation since the materials study in conservation cannot be separated from the study of chemical composition of the materials and analytics. Furthermore, as the chemical composition of the object is studied, one also learns the fundamentals of the material properties. This information can also be applied immediately to preserving the object and thus to preventive conservation.

However, it is not always necessary to focus on certifying the authenticity or carefully research the techniques of material use. This can also be applied to active conservation. Not every cultural-historically significant object is automatically conserved or restored, and thus there is no need to actively research or consider the methods of active conservation. However, when it is necessary to study the authenticity of the object, the techniques related to the materials, or active conserving, the study should be closely linked to defining the chemical composition and the properties of the researched material. A more detailed definition of the parts and the sub-functions of the graphs may therefore not be plausible, as overlapping connections are formed. For example, a study can be conducted and executed from the point of view of conservation and yet the end result can produce information concerning the basic characteristics of the researched material. In short, materials study of conservation shares multiple functions and is, therefore, polyfunctional.

**BACKGROUND FUNCTIONS**

Materials research in conservation comprises background functions, which are not directly related to heritology. These background functions are closely related to scientific research. One of the important functions involves constantly developing research methods, both when analyzing the material of the objects and investigating the conservation processes. First
and foremost, the new methods – which are precise, non-invasive and non-destructive by nature and also comprise micro- and even nano-analysis – have set constantly improving prerequisites for the research and preservation conducted on cultural-historical objects (Adriaens 2005: 1503–1516, Knuutinen 2006 and Stuart 2007). However, before the research results can be held as reliable, the method analyses and equipment require research on the comparable materials as well as calibration, standards and possible validations.

**MATERIALS RESEARCH, CONSERVATION AND CONSERVATION SCIENCE**

Why is it necessary to discuss conservation science and materials research in conservation separately? Both conservation science and the study of materials in conservation include partly similar spheres of operation. Moreover, materials research in conservation partly belongs to the field of conservation but as a discipline it also belongs to natural scientific research. Publications of material studies are therefore often presented in natural scientific series of publications in addition to the public forums of conservation. On the other hand, however, conservation science is not only research based on natural sciences but it also consists of other fields of research (Townsend 2007: 3–5). For example, documentation related to conservation includes other functions in addition to materials studies. Kecskeméti includes estimating the damages, evaluating the cultural-historical object as well as the information content in the documentation (Kecskeméti 2007: 202). Conservation has been described as a fairly young field and it has not yet been acknowledged as an independent discipline (Auer 2000: 260). It is evident, however, that there is no established and unambiguous concept of what conservation or materials research in conservation can entail. Instead, this is all being debated between scholars. This fresh, ongoing debate is probably one of the main reasons why museologists have not been provided with a clear definition of material studies. However, this is also the case in museological functions. Scholars have presented different models and insights on how to classify various museological functions. Both Peter van Mensch and Ivo Maroevic extensively discuss museological functions and models for classification (van Mensch 1992: Museological functions 1: 7/9, Maroevic 1998: 222–247). This means it is not realistic to think that there would be one correct way to classify heritology or any other functions in the field of materials study.

**CONCLUSION**

Materials research in conservation plays an important role in heritology. Materials study not only produces added value for research conducted in the humanities but in many ways also constitutes a necessity. Even though conservation and the related research is classified as applied museology, however, materials research in conservation is first and foremost concerned with applying natural scientific research methods to cultural-historical objects and their materials. Materials study in conservation is thus not information science in a way similar to heritology, by its very definition. However, it produces significant information for the memory organizations presented in Šola’s graph (2005). This means that materials research in conservation can thus be characterized as a part of multidisciplined heritology, in which co-operation should be in-
creasingly carried out between scholars in the humanities and the sciences. All the information provided by materials study could thus be utilized in the best possible way. High-quality multidisciplinary co-operation can in my view guarantee reliable documentation and thus create a solid foundation for preserving and conserving cultural-historical objects and materials. The better one knows the material properties of the culturally valuable objects, the better are the possibilities for planning and executing their preservation.

NOTES:

1. Maroevic 1998: 136. "Cultural heritage can be material and non-material", "Material cultural heritage is divided, in addition, according to fundamental features into immovable and movable".

2. The present article is based on a doctoral thesis by Ulla Knuutinen (2009). The thesis creates a link between the functions of the materials research in conservation and heritology via international publications in the field of conservation. The publications are as follows:
   - Report of the Pompeii Project/ Project Report of Pigment Analyses of the Fourth Style Wall Paintings In the Casa Di Marco Lucrezio (IX 3, 5.24) in Pompeii
   - Colours and Inorganic Pigments of the House of Marcus Lucretius (Insula IX 3, 5/24)
   - Cadmium Colours: Composition and Properties
   - Two Case Studies of Unsaturated Polyester Composite Art Objects
   - Leather Spue: A Problem with Lubricants
   - Wax Analyses in Conservation Objects by Solubility Studies, FTIR and DSC
   - Control of Aqueous Paper Treatments with Ion Chromatography.


4. Appelbaum 2007: 42-64. “In The role of science in object characterization … Many scientific fields, including chemistry, physics and material science, provide information that conservators use to help in interpreting observations. Scientific tests and analyses also enhance the interpretation of findings from the physical examination.”…: “Science provides not only information, but also tools that help in the interpretation of physical findings and that can be used to explain conservation to non-conservators.”

Vilkuna 2003: 86; Stránský 1995. "The purpose of museology is to guide us to understand which objects contain and which do not contain museological value." Therefore, museum value cannot be defined merely on the basis of information acquired in materials studies. The materials study aims at investigating materials and their properties instead of defining museum value.

7. The aim of ENVIART / COST D 42 is to explore chemical interactions between cultural artefacts and typical indoor environmental conditions through field studies and laboratory experiments and transfer the results into preventive conservation practice. The Action focuses on the chemical impact of pollutants on materials, thus also considering physical and environmental aspects, materials technology, chemical analytics, emission and standardisation.

8. Post-graduate education on a doctoral level for the conservation scientists has been needed. EPISCON project, which was funded by the EU, started in 2006. The project provides post-graduate education for graduates holding a minimum of Master’s degree in the field of conservation. EPISCON project defines a scientist in conservation as follows: "Conservation Scientist is a professional working in the field of cultural heritage preservation, implementing a wide interdisciplinary approach. A technical background in natural science and engineering, necessary to carry out diagnostic studies and conservation therapies, is a supported and enriched by knowledge in history, archaeology, art history and museum management".

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Defining “museology” (also known as “heritology”) is as easy as describing any academic field – the minute you say something about it, someone sets out to prove you wrong. These fields are therefore most often defined by objects of scrutiny rather than methods of research. As the interests of museums vary from robotics and mathematics to music and sofas, the field of museology also covers all corners of human behaviour and doings, and does not need over-zealous surveillance of its boundaries.

Besides improving academic knowledge about human activities in and around museums, museology has a duty to improve museum professionalism. Being a meta-field – one uniting a large variety of more or less down-to-earth or up-to-the-heavens interests – museology offers a unique place to share opinions and knowledge of all sorts. We would argue that there is no reason to separate and grade museum professions or research done in the universities, museums or wherever under different fields, and fence them apart. That will only make everybody’s work more difficult.


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