Teza de doctorat: „Aspecte moderne privind valorizarea artefactelor muzeale” – „Modern aspects regarding the valorisation of museum artefacts”

Îndrumător: prof. univ. dr. Ion SANDU

Doctorandă: Oana FLORESCU

Valorization of a movable or immovable cultural asset is a complex approach that takes into account optimal display for the public, capitalization through various modern editing-multiplication systems (films, photos, albums, brochures, catalogs, postcards etc.) and hoarding it through new archival and archaeological research.

Establishing the properties and characteristics related to a cultural heritage asset, with the aim of its hoarding and valorization, is obtained through research specific to the Science of Conservation that involves technical-scientific investigations (physical, chemical, biological, archaeological, geological, anthropological, art history, sociological, philosophical, statistical-mathematical), as well as artistic and sociological research

The Science of Conservation of Cultural Assets and Environment, along with Conservation of Biodiversity are lucrative (practical) branches of Environmental Science and Engineering, comprising both norms and measures for the unaltered preservation of tangible heritage, as well as processes and operations of preservation, restoration, display and protection, involving current physico-chemical systems (modern materials and technologies), compatible with the old-traditional ones, applied to cultural heritage goods, natural monuments and elements of biodiversity.

The purpose of the thesis considers the fundamental and applied research of the innovative aspects regarding the valorization of museum artifacts, analyzing the path taken by them from commissioning to museum display and valorization. This aims to identify new interdisciplinary, participative-collaborative experimental approaches that will be used in current practice through scientific investigation (authentication/dating/paternity, establishing the scholarship or catalog quota, determining the nature of the materials and their state of conservation, making the interventions compatible of preservation-restoration, monitoring the behavior of interventions and the evolution of the artefact during display and storage) preventive and prophylactic preservation, cleaning, restoration through structural reintegration

(completions/additions, grouting, etc.), chromatic and environmental, museum valorization and, not in lastly, maintenance and protection.

The objectives of the theme with their specific activities were:

(1) the scientific investigation of some museum artefacts by carrying out authentication and patrimonial assessment expertise, determining the state of conservation, knowing the normal structural materiality, aspects related to the aging of cellulosic supports and other components of the document structure (binders, inks and inks);

(2) participative-integrative conservation by analyzing the etiopathogenesis of the museum artefacts under study, highlighting the evolution of their state of conservation, carrying out the methodology of working on types of collections or restrictively on a single artefact, using the principles of integrative-participatory conservation by involving the public, under the guidance of museum specialists;

(3) the study of the impact of the environment on the heritage systems by identifying and analyzing the risks to which the cultural heritage goods in the museum are subjected.

The research methodology and the way in which the doctoral thesis was developed take into account the following aspects:

- regarding the fulfillment of the objectives of the thesis, scientific works were chosen from the specialized literature that refer to the valorization and preservation of cultural heritage assets from collections and museums;
- as a result of the documentation stage, in order to analyze and choose the work protocol necessary to establish the conservation status of a group of cultural goods on paper, little studied or newly discovered, with a great memorial and documentary value, a series of artifacts from which material samples were taken and processed and which were studied by non-destructive and non-invasive methods, such as: IR, VIS and UV reflectography, optical microscopy, scanning electron microscopy, coupled with X-ray spectrometry X (SEM-EDX), micro-FT-IR, FT-Raman and DRIFT spectrometry, all with implications in the study of the physical structure, chemical nature, as well as in the identification of some characteristics of the paper supports and component materials, all these steps being necessary to put in the value of the artefacts by establishing some heritage elements (authenticity; paternity; value share; classification level and classification group, age/time

patina uli) and the five patrimonial functions (aesthetic-artistic, historical-documentary, technical-scientific, administrative-building and spiritual);

- the application of various materials and methods of preservation of the artifacts, which were the object of the research, were analyzed by studying the risks of degradation and damage of the materials in the composition of some paper supports, caused or not by the conditions of different types of microclimate, specific to the historical monument taken into account study;
- in order to store museum artefacts, a series of methods of voluntary and active involvement of the public in specific activities of the museum were identified and studied, such as, for example, the preservation, restoration, display and valorization of cultural heritage assets, ending by corroborating the types of integrative-participatory conservation using case studies.
- the processing of experimental data through multivariable statistical-mathematical methods and their presentation through graphical and tabular presentations.

Chapter 1, *Bibliographic analysis and synthesis of the current state of knowledge regarding the role and functions of museums, the typology of museum cultural assets, integrative scientific conservation and their valorization*, deals with the current state of knowledge of the valorization of museum artefacts, the types of museums, the role and functions of museums, the life cycle of museum artefacts, their typology and classification, the characteristics of the museum climate in which cultural goods are preserved, the types of degradation and damage that affect the condition of preservation of movable cultural assets.

Chapter 2, *Investigation methods and techniques involved in determining the state of conservation of heritage goods on paper*, presents relevant information for the scientific investigation of museum artifacts by involving modern methods of analysis: optical microscopy with polarized light by reflection, scanning electron microscopy, coupled with X-ray diffraction, infrared spectroscopy, Raman spectroscopy, supplemented with statistical-mathematical methods to extract more information from data obtained from chemical and physical measurements.

In chapter 3, *The study of the cellulosic supports of some old documents from the heritage of the "Poni-Cernătescu" museum*, an assessment of the state of preservation of the documents is made and a series of archaeometric and chemometric characteristics are identified. The objectives were achieved through technical-scientific research that used optical microscopy

with polarized light by reflection, optical scanning microscopy associated with X-ray diffraction, infrared spectroscopy, Raman spectroscopy, supplemented with multivariable statistical-mathematical methods. The obtained results highlighted the chemical composition of the constituent materials, the state of preservation of the samples taken in the work and the archaeometric and chemometric characteristics.

Chapter 4, *Microclimate conditions for museum storage and display. Indoor climate monitoring as a basis for assessing the risk of decay and damage to museum artefacts*, focuses on the monitoring and analysis of the internal and external microclimate parameters necessary for the optimal preservation of museum artifacts, the identification and analysis of the risks of degradation and damage to documents.

When displaying a museum, it is necessary to know the elements that make up the microclimate (temperature, relative humidity, dew point), the constituent materials of the collections (organic, inorganic, composite), the deterioration processes (mechanical, chemical, biological) and the basic elements of degradation (heat and humidity).

The main cause underlying the destruction of museum heritage assets is represented by climatic factors, which act singly or cumulatively. Among them, the most active are atmospheric temperature and humidity, then precipitation, vapors, fogs, condensation, etc., which reproduce the hygrometric state of a microclimate.

The analysis of the collected data was used to identify the degradation risks of materials, to compare the preservation quality of one environmental space to another, and to analyze the museum's heating and ventilation systems.

Since the exhibited cultural assets were made of various, organic and inorganic materials, an estimation of degradation risks can be made based on knowledge of the biological, chemical and mechanical damaging mechanisms. Firstly, mildew development must be avoided as it causes museum buildings to be inadequate for the preservation of cultural assets and for living. Causes of mildew occurrence are related to specific conditions with respect to air temperature and relative humidity. Recommended temperatures to avoid mildew are up to 15 °C, but they must be controlled. Fluctuations are acceptable within a very low range (during summer months) and not outside extremes (±5% RH, ±2 K).

To assess the risk of degradation of heritage objects, we used Martens' methodology for the assessment of biological, mechanical, and chemical risks of degradation of collections according

to ASHRAE norms, which refer to the optimal intervals for the conservation of heritage objects as applied to the "Poni-Cernătescu "Museum in Iași.

We utilized climate evaluation charts obtained with climate analysis tools to develop a simplified interpretation of the temperature and humidity data.

The ASHRAE quality classes for conservation range from Class D (which prevents dampness) to Class AA (which is associated with no risk of mechanical damage to most artifacts). Class B is considered the reference standard for museums.

Temperature and relative humidity data were transformed into quantitative and qualitative numerical measures of the collection decay risk. These numerical values describe the space in which cultural artifacts are preserved and explain the type of deterioration of cultural artifacts. Thus, the authors referred to the following: the preservation index (PI) and the time-weighted preservation index (TWPI) to assess the risk for chemical decay for organic materials; the equilibrium moisture content (EMC) and dimensional change (DC) to assess the risk for physical/mechanical decay; and the mold risk factor (MRF) to assess the risk for biological decay for all types of materials. PI values were calculated in years, representing life expectancy values under the existing storage conditions. TWPI was calculated as an average value for PI values obtained at regular periods of time. MRF measures the risk for growth on objects of mold species. Lower values for MRF are preferable. EMC was measured as a percentage.

Based on temperature and relative humidity data, we utilized a dew point calculator which was utilized to obtain numerical values, as for PI, EMC, and MRF, which were input into the analysis of the indoor microclimate. These measurements were used to compare the environmental conditions in the museum spaces during the analyzed period, and then to compare the environmental conditions in the museum with those of the following year.

Chapter 5, *Participatory-integrative conservation of museum artifacts. Theoretical and practical aspects*, addresses methods of hoarding cultural assets by obtaining and interpreting new information about them and considers the identification and research of methods and tools for voluntary and active involvement of the public in museum-specific activities such as, for example, preservation, restoration, display and valorization of cultural heritage assets. At the end, the types of participatory conservation are corroborated through case studies.

In conclusion, the development of a complex scientific investigation methodology using magnifying optical instruments, vibrational spectroscopy, Raman, DRIFT and FT-IR

methods, assisted by data processing software, statistical multivariate data processing methods, surface analysis methods and in the depth of the materials to identify certain archaeometric and chemometric morpho-structural characteristics, allowed the establishment of certain historical contexts, as well as the evaluation of the state of conservation of the selected cultural assets. Also, the risks of degradation and damage to cultural assets displayed in different museum microclimate conditions were identified and analyzed, and the data obtained from the survey of the young public regarding the integrative-participatory conservation of museum cultural assets were multivariably analyzed.