

Research for Conservation and Restoration of Movable Cultural Heritage: Advanced Techniques and Training on Assessment and Diagnosis of Historical Leather and Parchment: The Romanian Case

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Abstract

Cultural heritage is the memory of our society and is thus essential to a national and shared European identification based on common history and cultural roots. Since cultural heritage (CH) protection is a highly complex task, it can only be successfully undertaken by using the synergies established through joint efforts from different disciplines, with chemistry and physics being by far the most important among the hard sciences. Fostering relationship between national programmes and closer cooperation in the field of research, harmonisation and applicability of the best existing technologies and methodologies applicable to a sustainable cultural heritage and joint and reciprocal activities will enhance European excellence and will give visibility on heritage at the European level. Romanian research and education for conservation and restoration of movable cultural heritage as well as research and advanced training on assessment and diagnosis of historical leather and parchment is presented.

Keywords: hard sciences, cultural heritage protection, organic material, collagen-based materials

Research centres within Romanian museums

In Romanian museums, the first scientific approaches to analysing cultural artefacts appeared at the end of the XIXth century. The first scholar who promoted chemistry for study and conservation purposes was C. I. Istrati (1850-1918), the discoverer of les francéines (new class of colorants)- At the beginning of the XXth century scientific knowledge of the cultural objects' materials was encouraged by the newly established Restoration Workshop of the Historical Monuments Commission (1922). In the post-war period, restoration laboratories were established at the National Art Museum, Village Museum and Natural History Museum. At the Natural History Museum, Grigore Antipa developed a taxidermy laboratory. A sudden change in the relation between science and cultural heritage was brought about by chemists after 1960. Among them, we should mention Mihai Mihalcu and Ion Istudor, as promoters of applied investigations as part of archaeological, historical and art research. At the end of the 70s/beginning of the 80s, the material features of cultural heritage began to be regarded as a part of national intellectual history and no less important than their contents. Since then many points of view have changed: museums are no longer regarded as merely repositories of artefacts but as the main actors in the preservation and transmission of cultural heritage. The care, preservation and restoration of CH is no longer a matter of simple common sense and craftsmanship, but the meeting point of highly qualified disciplines, a creative encounter of different study traditions. Inter- and multi-disciplinary cooperation can provide new sustainable and preventive strategies, concepts, methods and techniques to integrate the safeguarding and management of our heritage. A number of research laboratories and centres have therefore been established within the major Romanian museums and are now involved in key national strategies and research programmes applied to the protection of tangible CH. Currently, the Romanian research landscape is governed by the national strategy for research, approved by the Government at the beginning of 2007 which however does not include any strategy focused only on tangible CH. The second national plan was developed for research, technological development and innovation (PN II) for the period 2007-2013 run by the Executive Unit for

Financing Higher Education, Research, Development and Innovation (UEFISCDI). Its implementation period overlaps with two other important European Programs: a) 7th Framework Programme of the European Union; b) Structural funds.

The Sectorial Operational Program - Increase of Economic Competitiveness through research (axis 2) allows researchers to apply for R&D funds, including technologies related to CH. CH research is also embedded in socio-economic research. The Romanian Ministry of Culture, Cults and National Patrimony developed the National Cultural Patrimony Strategy (2008-2013) which aims to provide maximum efficiency and consistency of actions by the Ministry in the field of CH. This strategy implies both government investment and significant contributions by local councils, religious bodies, voluntary organizations and private sector. The research strategy (which includes R&D domains related to CH) is coordinated and implemented by the National Authority for Scientific Research (ANCS) while the National Cultural Patrimony Strategy is coordinated and implemented by the above-mentioned Ministry of Culture, Cults and National Patrimony. CH domain is included in priority no 9 – Socio economic research. The previous national R&D program (1999-2006) had a sub-program (CERES) devoted to safeguarding our patrimony, one of its specific objectives being: development, protection and enhancement of cultural patrimony in the perspective of integration in a multicultural and multinational Europe.

Romanian educational programmes for cultural heritage conservation

The century of nations, as the XIXth century is now being called, culturally substantiated museology. At that time, in Romania, Prince Alexandru Ghica founded the National Museum of Natural History and Antiquities of Bucharest (1834), Prince Alexander I. Cuza organised the first Commission of Historic Monuments (1859) and the National Museum of Antiquities (1864) and Governor Gheorghe Asachi established a Gallery of Art in Iassy. The strategic policies on preservation, enriching and growing collections were sustained by the Regulations for National Museum of Antiquities (1864) and Law for Preservation and Conservation of Public Monuments (1892). Later, Law No. 63 of 1974 established new laboratories for restoration of metals, ceramics, textiles, rare books, documents, paleo-fauna, as well as laboratories to analyse works of art and new museums. At that time professional training was centralised for all the professional figures, e.g. conservators, restorers, archivists, librarians, curators, etc., which then became the trainers of the next generation of conservators and restorers. Training activities and management of CH has been centralised in Bucharest, while regional laboratories for conservation and restoration grew throughout the country and carried out inventory and evidence, preservation and conservation, and investigation. Some universities had museology as specialization and the faculties of art and architecture had specific courses (for one or two semesters) on preservation and conservation of paintings, wall paintings and monuments. Only in the last decade of the XXth century was the first Conservation Department at the Fine Arts University of Bucharest (1991) founded, specialised in wall painting conservation, and the first Department of Cultural Heritage at the “Alexandru I. Cuza” University of Iasi (1993), specialised in conservation of polychrome wood and icon as well as documents and books. The laws adopted in 1996 and in 2000 offered new opportunities in advanced education in conservation-restoration and science for conservation in Romania (Table 1) with the objective of training professionals for scientific research, preservation, documentation and enhancement of CH as well as its conservation and restoration. Many courses do not end with clear, legally recognised qualifications but they meet various educational needs by dealing with a wide range of issues related to conservation-restoration and science for conservation, building on the professional backgrounds of the participants. Two interdisciplinary master courses have been recently set up at the University of Bucharest to enrol Romania in the European circuit of specialist training in the field of science conservation: (i) Science of conservation and restoration of heritage items through advanced physical and chemical methods and (ii) Geo-biology applied to natural and cultural heritage. At present there are no doctoral programmes in science for conservation in Romania, but a number of doctoral theses on this topic have been successfully completed in recent years and few examples are given in Table 2.

Training programmes in Romania for conservators and restorers: Current training courses for conservators and restorers cover three levels of competence: (i) post-secondary level, (ii) graduate level and (iii) postgraduate (master) level. There are

also doctoral programs on restoration and conservation topics run by the faculties that organise graduate and postgraduate courses dedicated to conservation and restoration of CH.

Post-secondary level courses are organised by the Ministry of Culture, Cults and National Patrimony, through the Centre for Professional Training in Culture. Within this system of education, theoretical and practical training is organised in multiple stages and practical training is conducted in one of the museum laboratories or private workshops specialised in the specific topic and technique the student is training for. Specialisations covered are metal, ceramic, paper, book binding, textiles, wood. Expert certificates are issued by the national committees of the Ministry of Culture, Cults and National Patrimony, namely the National Commission for Historical Monuments, for mural and historical monuments conservators, and the National Commission for Museums and Collections, for restorers of objects from the movable heritage.

The training curricula for “conservator” profession covers three annual modules of 80 hours each and includes: degradation factors, measures to prevent degradation of goods displayed, stored, packaged, transported, itinerated, general museology, ethiopathology of materials (paper, paint, textile, wood), general chemistry. Inasmuch as the participants may have different levels of education, secondary or higher, the programme is developed according to the curriculum of each category.

The training curricula for “restorer” professions covers two annual modules of 80 hours each. The first presents theory of restoration issues and includes practical training in restoration laboratories of cultural institutions as well as in private workshops. The second module, depending on the restoration techniques, takes place in different periods and venues. This programme includes: legislation, general museology, ethiopathology of cultural goods (causes, effects), preventive conservation measures, general chemistry (i.e. properties of substances and materials used in restoration - solvents, adhesives, consolidants), toxicity of substances used in restoration, technology of restoring objects made of metals, ceramics, porcelain, stone, wood, textiles, graphic works, paper and book binding, painting.

Research and advanced training on assessment and diagnosis of historical leather and parchment

Since 2001, the national R&D program has funded scientific and technological research applied to the protection, conservation and enhancement of collagen-based materials as reported in Table 3.

The National Agency of Scientific Research (ANCS) promoted bilateral cooperation as the fastest and most efficient “gateway” for regional European and international cooperation. It is an opportunity that can be capitalised on in the short- and mid- term through building up and strengthening partnerships. In addition, bilateral cooperation activities bring “added value” to the national funded projects. Table 4 reports the bilateral research projects on collagen-based heritage coordinated by the National Research and Development Institute for Textile and Leather–Leather and Footwear Division (INCDTP-ICPI), Bucharest.

Specific cooperation agreements have also been signed between Romanian and foreign research and academia institutions to establish and maintain scientific research relationships between institutions, agreements for an exchange programme and scientific research activities focused on collagen-based heritage materials and documents (Table 5).

Under the umbrella of EUREKA Projects aimed to assisting the development of new industrial and other kinds of applications and market-oriented products and technologies, as well as matching best practices for conservation and restoration work based on and supported by scholarly-scientific knowledge, a project entitled “Automatic Damage Assessment System for Cultural Heritage Leathers and Parchments” (ADAS) was launched this year. The consortium is formed by INCDTP-ICPI, Mira-Telecom, Bucharest, Applied Informatics and Artificial Intelligence Laboratory (LIA) of Politehnica University of Bucharest, and Curtits AQUALATA. S.A, Spain. ADAS intends to develop new non-destructive or micro-destructive techniques for automatic damage assessment of historical collagen-based materials.

A number of national and international seminars and workshops on damage assessment and diagnosis of historical leather and parchment have been organised with the specific aim of effectively transferring knowledge at the European level for the benefit of both scholars and CH professionals. The most important was the International Seminar & Workshop “Conservation and Restoration of Parchment and Leather” within the 1st International Conference “Matter and Materials in/for Heritage

Conservation" (MATCONS 2009), held in Craiova, Romania, jointly organised by the School of Conservation, Royal Danish Academy of Fine Arts, Copenhagen, Denmark, University of Turin, Italy, The State Archives of Turin, Italy and INCDTP-ICPI, Bucharest, Romania.

It is worth noting that since 2004 research on historical parchment and leather has contributed towards the external dissemination of the results by means of more than 30 scientific publications in ISI and reference journals as well as three books published by national publishing houses certified by the National Council for Scientific Research in Higher Education (Annex 1).

We wish to conclude by stressing that the information given is not exhaustive and that the material presented in these pages, extracted from the national information system, is only partial, even though it provides a representative overview of the existing research, education and training for conservation and restoration of movable cultural heritage in Romania.

Table 1. Education programmes specifically dedicated to education and research in the field of conservation-restoration or science for conservation

City	Institution	Specialisation	Duration/years
Iași	□ "Al.I.Cuza" University Faculty of Orthodox Theology	Conservation and Restoration	4 + Master 2
	□ "George Enescu" University of Arts, Faculty of Arts	(icons, books; wall paintings and tempera on wood)	since 2008 3+2+3
Bucharest	□ University Of Bucharest Faculty of Orthodox Theology	Conservation and Restoration	4 + Master 2
	□ National University Of Arts Faculty of Theory and History of Arts		
	□ "Al.I.Cuza" Police Academy Faculty of Archives	Archives and History	3+2+3
Pitesti	□ University Of Pitesti Fac. of History, Philosophy, Journalism	History–archives and museology	4 + Master 2 3+2+3
Suceava	□ "Stefan Cel Mare" University Faculty of History and Geography	Museology	3
Cluj-Napoca	□ "Babes-Bolyai" University Faculty of Orthodox Theology		4 + Master 2
	□ University Of Arts And Design Faculty of Fine Arts	Conservation and Restoration	3+2+3
Sibiu	▪ "Lucian Blaga" University Faculty of History and Cultural Heritage	Conservation and Restoration	5 3+2+3
Alba Iulia	□ "1 Decembrie 1918" University Faculty of History and Philology	Conservation and Restoration	4 + Master 2 3+2+3
Oradea	□ University Of Oradea Faculty of Arts	Conservation and Restoration	4 + Master 2
	Faculty of Orthodox Theology		3+2+3
Târgoviste	□ "Valahia" University Faculty of Humanistic Sciences	Conservation of archaeological heritage and collections	3
Timișoara	□ University Of Timișoara Faculty of Arts	Paintings, textiles, stones, ceramics	3+2

Table 2. A few examples of the topics of doctoral theses on conservation science subjects completed in recent years

Institution	PhD research project
National R&D Institute for Textile and Leather, Bucharest	Physical-chemical processes involved in the conservation of heritage parchment and leather objects
National Museum of Romanian History	Liquid chromatography as analytical technique in the protocol for the characterization of natural dyes and organic pigments in patrimony objects
National Institute of R&D for Optoelectronics	Contributions to the improvement of laser techniques and methodologies used for the treatment of surfaces of scientific artwork objects
University Politehnica of Bucharest, Faculty of Physics	Non-contact optical methods for monitoring monuments conservation status

Table 3. Research projects funded by the Romanian national R&D program through the National Agency of Scientific Research (ANCS)

Project title and acronym	Programme	Period	Partners
Laboratory services for museums intended for patrimony leather objects and parchment identification and diagnosis	Relansin	2001 - 2004	INCDTP-ICPI–coordinator, National Museum of Romanian History, City Museum of Bucharest, National Military Museum of Bucharest
Manufacture of specific leather intended for substitution, supporting, strengthening, completion and restoration in patrimony leather objects	Ceres	2001 - 2004	INCDTP-ICPI–coordinator, National Library of Bucharest, National Museum of Romanian History, City Museum of Bucharest, National Military Museum of Bucharest
Multidisciplinary studies to establish deterioration mechanisms in historical and cultural parchment documents (PERGAMO)	CEEX	2006 - 2008	INCDTP-ICPI–coordinator, INCDIE ICPE-CA, National Museum of Romanian History, University Politehnica of Bucharest, Museum Complex of Iasi, National Military Museum of Bucharest
Durable materials and technologies for leather cultural heritage objects conservation and restoration, to ensure viable cultural inheritance at Community level (PEL-RESTAURO)	PNCDI II	2007 - 2010	INCDTP-ICPI–coordinator, INCDIE ICPE-CA, National Museum of Romanian History, University Politehnica of Bucharest, PIELOREX S.A.
Techniques for investigation, assessment, conservation and restoration of ethnographic collagenous materials (ETNO-PEL)	PNCDI II	2008 - 2011	INCDTP-ICPI–coordinator, INCDIE ICPE-CA, University Politehnica of Bucharest, Bucovina Museum of Suceava, ASTRA Museum of Sibiu, Village Museum of Bucharest

Table 4. Bilateral research projects on historical collagen-based materials coordinated by INCOTP-ICPI

Project Title	Period	Foreign partner
New durable materials for the conservation and restoration of leather and parchment patrimony objects	2008-2009	National University of Technologies and Design, Kiev, Ukraine
The influence of environmental factors in the conservation of collagen-based museum objects	2009-2010	Institute of Natural Sciences, Academy of Fine Arts, Vienna, Austria
Study of the environmental impact on leather and parchment in Byzantine and post-Byzantine manuscripts in relation to their preservation and conservation	2010-2012	“Ivan Duichev” Centre for Slavo-Byzantine Studies, Sofia, Bulgaria
Environmental influence on collagen-based cultural objects in museums	2011-2012	Sichuan University, Chengdu, China

Table 5. Specific cooperation agreements between Romanian and foreign research and academia institutions

Title	Period	Partners
Meso- and Nanoscale Processes in Environmental Deterioration of Collagen Based Historical Materials	2006-2009	INCOTP-ICPI, Bucharest, Romania and University of Turin, Italy
Mapping, Imaging and Digitisation of Cultural Heritage Materials	2011-2015	University of Craiova, Romania and National Institute of Metrological Research, Turin, Italy

Annex 1. A few examples of scientific papers in high impact ISI journals on historical collagen-based materials

1. Badea E., Della Gatta G., Usacheva T., Effects of temperature and relative humidity on fibrillar collagen within parchment: a micro DSC study, Polym. Degrad. Stab., 97, 346-353 (2012).
2. Badea E., Della Gatta G., Budrugaec P. Characterisation and evaluation of the environmental impact on historical parchments by DSC, J. Therm. Anal. Calorim., Cultural Heritage Special Chapter, 104/2, 495-506 (2011).
3. Cucos A, Budrugaec P, Miu L, Mitrea S, Sbarcea S. Dynamic mechanical analysis (DMA) of new and historical parchments and leathers: correlations with DSC and XRD. Thermochim. Acta 516 19-28 (2011).
4. Budrugaec P., Badea E., Della Gatta G., Miu L., Comănescu A. dsc study of deterioration caused by environmental chemical pollutants to parchment, a collagen based material, Thermochim. Acta, 500, 51-62 (2010).
5. Badea E., Miu L., Budrugaec P., Giurginca M., Mašić A., Badea N., Della Gatta G. Study of deterioration of historical parchments by various thermal analysis techniques, complemented by SEM, FTIR, UV-Vis-NIR and unilateral NMR investigations, J. Therm. Anal. Calorim. 91, 17-27 (2008).
6. Budrugaec P, Miu L. Effect of accelerated thermal ageing on the thermal behaviour of recently made parchments. J. Therm. Anal. Calorim. 94 342-355 (2008).
7. Budrugaec P, Miu L. The suitability of DSC method for damage assessment and certification of historical leathers and parchments. J. Cult. Heritage, 9, 146-153 (2008).
8. Della Gatta G., Badea E., Ceccarelli R., Usacheva T., Mašić A. Assessment of damage in old parchment by DSC and SEM, J. Therm. Anal. Cal. 82, 637-649 (2005).