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ORIGINAL PAPER

Scientific and traditional methods used in the process of conservation-restoration of works of art after the post-communist period in Romania

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Abstract:
The transition from communism to democracy produced major changes both in the situation of monuments in Romania and in the methodological process of conservation-restoration of cultural heritage assets. It was thus observed that, in addition to the traditional methods of conservation-restoration, modern investigative materials and techniques were introduced in this methodological process, as well as scientific methods for researching works of art. The purpose of these methods was to preserve the authenticity of cultural assets and to transmit heritage values in full integrity to future generations.

Keywords: *conservation; restoration; works of art; scientific methods; communism.*

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The national cultural heritage must be seen as a set of testimonies based on which can be known and supported the socio-economic history, political history, technical-scientific development and cultural-artistic activity in Romania, from ancient times up to the present.

The goods having historical, documentary and artistic value, created and restored, represent the material and reference source, regarding the interpretation of events and the understanding of various aspects of existence and evolution of the Romanian people, in the various planes of human activity.

In Romania, communism had a special role in shaping religious life, and in order to regain religious freedom, a fierce struggle against oppression and official atheism inflicted by the state was imposed. The persecutions were directed against the church and religion because they encouraged beliefs, but also limited the role and authority of the state, thus affecting the liturgical cult, cult monuments and all cultural goods of religious art. (Gheorghiță, 2015: 9). During the communist period, many religious heritage monuments were destroyed, and restoration sites and specialized institutions were suppressed by the authorities.

Many of Romania's valuable masonry and wood churches disappeared in the last half of the 20th century. Some perished due to people's negligence, being burned by flames, others were demolished to make way for urban constructions or new churches, way more spacious. In some cases, some wooden churches, although preserved near the new buildings, have deteriorated irreparably due to lack of interest in conservation-restoration and lack of funds for structural repairs of monuments (Mardale, 2014: 96).

Also, the rapid development in the twentieth century of the paint industry and that of building materials, made available to painters and restorers, ranges of complex products often used anarchically, without respecting the principles of scientific intervention. In the effort to recover the 19th century heritage, the research and knowledge of these materials is a major component without which any approach to the work of art can only be empirical. The ensembles of artistic components have undergone over time interventions from the most diverse, many monuments or paintings being often retouched or repainted in full.

In contemporary society, the protection of the national cultural heritage has involved numerous scientific researches, studies, as well as various actions of conservation-restoration and capitalization of cultural assets with historical and artistic value.

Saving heritage objects affected by the passing of time and various degradations, increasing their resistance, bringing them to a condition, shape, color and appearance as close as possible to the original one can be done through restoration actions on a scientific basis.

The restoration operation is an activity dominated by artistic and technical problems, and it must be carried out in a unitary framework, in the light of scientific principles and technologies, generally accepted and rigorously controlled to prevent interference and undesirable accidents.

By the conservation-restoration intervention we understand the restoration in its efficiency of a product of human activity. If the product is considered a work of art, the functionality of the object is only a secondary aspect. Restoration is the methodological moment of recognizing the work of art, in its physical consistency and in its double aesthetic and historical polarity, in order to transmit it in the future (Brandi, 1996: 18).

The term conservation refers to a complex of actions designed to care for and treat valuable cultural artefacts, both movable and immovable. Conservation must be transformed into a series of concrete actions and multiple achievements, and the restoration represents the continuation of the conservation process, the purpose of the restoration being to restore the potential unity of the object. (Ionescu, 2010: 8)

The degradation of the work of art is an effect of some processes with uncontrolled evolution, which have various causes. There is an interdependence between these causes, one creating favourable conditions for the action of the other, but in some cases, the effect may appear later after the action of the cause and sometimes may last a long time after its elimination (Bădescu, 2018: 444). For this reason, it is necessary to carry out a technological analysis and at the same time a history of the chain of causes and effects over time that have generated the current degradations. The analysis of the changes suffered, in time, by the art work is necessary in order to be able to decide the treatment and then to act effectively on the causes, and by reducing them, the long-term protection of the monument or object is also ensured.

In order to be able to make a correct diagnosis of any type of object involved in the conservation-restoration process, such as monuments and cultural heritage assets, several types of analyses and laboratory tests are needed, all these being decisive in knowing the basic material of the support as well as the main issues of the work of art.

For this reason, the first, but also the most important action performed in order to treat the work of art, is the scientific documentation, containing analyses, tests, written, photographic and drawn documentation. In general, all types of documentation are needed to highlight the technological aspects, the state of conservation of the objects under study, as well as evidence of the evolution of the interventions performed (Ionescu, 2010: 8).

Each intervention must be the optimal and achievable according to the principles of conservation - restoration and it must be based, first of all, on the most extensive and substantiated scientific argumentation considered, as the first activity.

Restoration must aim at restoring the potential unity of the work of art, as far as possible, without committing an artistic forgery or a false history and without removing the traces of the work of art passing through time (Brandi, 1996: 39). Thus, the respect of the physical integrity of the object, of all the elements that confer the particularity of the work, such as the documentary, artistic, scientific, cultural and historical value, must be taken into account.

Another principle that must be taken into account in the conservation-restoration process is that of the reversibility of materials. Any material used in the restoration process must be able to be removed at the time of its aging without producing negative effects on the work, and the materials used, with relative mechanical and chemical resistance, can be easily removed by non-destructive means for the work of art.

By knowing closely the structure of materials and the techniques of execution of heritage objects, compatible materials will be used in the restoration process, which form a common body with the original materials. Therefore, the materials introduced in the original works must be sufficiently well known, tested in the laboratory, researched, and the research results, correctly interpreted. In the restoration process, the intervention materials must be easily traceable, so that what was introduced in the work can be clearly distinguished from what existed when the work entered the restoration laboratory.

Each work of art is unique and has particularities that must be identified in order for the intervention on it to be beneficial and not harmful. The indissoluble link between restoration and the work of art must be recognized by the fact that the work of art conditions the restoration and not the other way around (Brandi, 1996: 36). Lack of knowledge in this area will lead to erroneous treatments that may jeopardize the integrity of the work. The use of insufficient solutions or treatment methods based on scientific analysis can often lead to new degradations in addition to the already existing ones.

Of particular importance in the final aesthetic presentation of the restored objects is the cleaning operation. This operation raises many problems, due to the diversity of deposits and accumulations on the surface of cultural assets. Cleaning is an irreversible operation in a restoration, which is guided by the principle of reversibility, and the purposes of cleaning are to remove: layers of adherent deposits, aged varnishes and total or partial repainting.

After the communist period, in Romania there were major changes in the methodological process of conservation-restoration of cultural heritage assets, as there were introduced modern materials and techniques of investigation, as well as new scientific methods for researching works of art.

Scientific research in the field of restoration and conservation of heritage assets, whether they are monuments, objects from museums or private collections, requires interdisciplinary collaboration. These investigations have as objectives the knowledge and determination of the technique and manner of work, in the realization of the cultural good, the discovery of the interventions subsequent to the creation, the detection of the false reality, the characterization of the behaviour of the constitutive materials of the cultural goods, depending on the problems it raises (Marincaș, 2003: 7).

Scientific research is a set of methods and procedures of a physical, chemical or biological nature applied to a cultural asset in order to obtain information on: physical-chemical and biological parameters (characterization of conservation status), structure of the cultural asset, history of its realization (painting, repainting, subsequent conservation-restoration interventions with materials identical to the original or different ones) as well as its antiquity (Marincaș, 2003: 9).

Cultural assets are irreplaceable, they are important from an artistic, historical, economic point of view and also have a social function. Therefore, before carrying out the conservation-restoration operations of such an object, specialized scientific investigations must be carried out. Thus, with the development of society and openness to the West, many diagnostic techniques began to be used in Romania in the field of conservation and restoration of monuments and cultural assets. From the category of non-destructive diagnostic techniques, visual and image analysis techniques, X-ray radiography and X-ray fluorescence spectrometry (XRF) were used.

Destructive scientific investigations represent the set of techniques and methods in which it is necessary to take and destroy a fragment of the cultural good or which modifies this fragment irreversibly. The main techniques are classified in physical, physical-chemical and chemical analyses, and the most used one was the FTIR technique - Fourier Transform Infrared Spectroscopy (Marincaș, 2003: 61).

Currently, in the field of restoration and conservation of heritage assets, in addition to conventional restoration methods, many non-contact, non-invasive or micro-invasive research methods are used, without the need for sampling, with real-time response to investigation and diagnose. Thus, in addition to the non-destructive scientific investigation methods used in restoration, 3D scanning for sculptures and monuments,

UV and IR reflectography, optical microscopy, electron microscopy (SEM-EDAX), radiography, X-ray fluorescence spectrometry (XRF), Fourier transform IR spectroscopy (FTIR), gas chromatography, thin layer chromatography (TLC) and X-ray diffraction (XRD) have also started to be used.

In addition to the methods of scientific investigation, the traditional method of removing old deposits from the surfaces of cultural assets, began to use alternative methods such as gels, enzymes and more recently the method of laser cleaning. Although laser cleaning applications have been used on stone objects for over 30 years on the surface of polychrome artwork, the use of laser is relatively recent, being a non-contact method and having some advantages over other alternative methods of cleaning. (Bădescu, 2014: 124).

The most used restoration methods in the communist period, the post-communist period, as well as today, are the traditional methods, methods that do not involve many scientific tests and analyses, because they are based on cleaning deposits / repainting with different pure solvents or mixtures with different concentrations and mechanical cleaning with a scalpel. The operation of cleaning works of art involves removing adherent deposits from the surface of works of art without altering the painted layer, this operation being irreversible (Cremonesi, 1999: 7).

The restorer uses solvents to solubilize the resins and repaintings, to dilute and remove the varnishes and with them the layer of dirt deposited over time on the surface of cultural goods. Conservation-restoration interventions on works of art require the use of solvents (for the removal of adherent deposits, repainting and improper interventions, for the regeneration of varnishes, etc.), a chemical compound in a volatile liquid state (with a high fluidity) that has the ability to dissolve reversibly other substances, without causing chemical changes to the constituent materials of the objects (Leahu, 2006: 3). Solvents have affinities for some substances and thus act as diluents. It is the principle of chemical affinity - when the interaction forces of the solvent molecules are the same or similar to those of the solid, the solubilization will be better.

Some types of deposits existing on the surface of cultural goods cannot be completely solubilized, but only swollen, after which they are mechanically removed with a scalpel, in the form of a pellicle. The solubilizing agent infiltrates between the molecules of the deposition layer, solidly bound together, and separates them, and the saturated fatty acids, which were a type of plasticizer in the oil layer, are completely removed with deposits.

Other traditional methods used in the restoration process are pastes and pickling gels, which are composed of one or more solvents whose viscosity is increased by a gelling agent. These pastes and gels do not solubilize old varnishes or repaintings, but they only swell the surface on which they are applied, and the removal will be done by mechanical means, by rubbing or using a scalpel. Gelling agents are dangerous precisely because they prevent the rapid evaporation of solvents, and at the end of the operation the mechanical removal is aggressive. For this last reason, emulsions with wax, paraffin and cellulose ethers (CMC) are used that are easier to handle (with a brush) and easy to remove. Gels and pastes can be replaced with different types of compresses in the methodological process of conservation-restoration.

Due to the high degree of toxicity and sometimes the too strong and difficult to control effect of solvents, in the post-communist period some substitutes were sought, new and alternative methods of cleaning deposits. Thus, laser cleaning and enzyme cleaning began to be used much more often. Instead, these types of non-invasive

cleanings have involved tests and analyzes of the most varied and complex ones, because without the information they bring, both laser and enzymes, cannot be used in the operation of cleaning deposits / repaintings in a safe and efficient way for the restored object.

Romania was the fourth country in the world where lasers were made, following research undertaken by Ion I. Agârbiceanu, physicist, researcher and inventor in the technique of laser and polarized light. Under his leadership, on the line of research initiated in the field of quantum light amplification, was made, in 1962, the first gas laser (helium-neon) with infrared radiation.

The foundations of laser cleaning were laid by John Asmus and his colleagues (1972), who recorded holograms of Venetian statues using a ruby laser, observed that when the laser beam touched the stone the impurities were removed without affecting the substrate. Asmus has continued his research into laser artwork cleaning, laying the groundwork for the development of a range of cleaning techniques, in particular the use of ruby and Nd: YAG pulsed lasers. He concludes that laser removal is based on two physical principles: washing and ablation. During cleaning, a selective vaporization of the deposits takes place and the absorption coefficient must be followed, both of the deposits and of the substrate, in order to achieve a safe cleaning for the works of art (Warkins, 1997: 8).

Although research in this area stagnated until the 1990s, laser cleaning developed rapidly, becoming a reliable technique that gave the conservator and restorer a high level of precision and control. The use of lasers in conservation and restoration increases with the dissemination and awareness of the benefits of photonic techniques (Rava, 2007: 101).

Laser techniques have proven to be promising diagnostic and restorative applications for artifact preservation. In the last decade, Romania's growing interest has made it possible to test and validate this unique approach for various purposes: laser cleaning of stone, metal, painting, paper; structural laser diagnoses on frescoes, art objects, as well as environmental monitoring (Bonsanti, 2007: 122).

Laser beam cleaning has been used to remove adherent layers such as: sulfurous black layers deposited on marble, lime and terracotta, silver deposits in textile fabrics, calcareous deposits on vessels, corrosion on bronze and aluminum objects, deposits from stained glass, graffiti, polluting deposits from old buildings, decorative objects from ivory or bone, from paper, leather and parchment (Zendri, 2007: 128).

In Romania, INOE promoted the laser cleaning technique and performed the first stone cleaning of a historic building (Biserica Doamnei - Lady's Church in Bucharest, 1675) with the approval and supervision of the Directorate of Historical Monuments and Museums of the Romanian Ministry of Culture and Cults. Climate parameter monitoring systems, designed within this department, were established at Bran Castle and the National Museum of History in Bucharest (INOE, 2002).

Currently, in our country, research from INOE involves the application of advanced techniques in restoration. The activity developed in the field refers to: laser systems and methods for cleaning the surfaces of art objects; investigation and diagnosis, by optoelectronic means, in order to restore the artifacts (LIBS, LIF techniques, thermography, high resolution multispectral analysis); monitoring microclimate conditions and air quality in museum premises, archives, galleries and storage spaces for works of art (Salimbeni, 2004: 53)

Research in recent years has increased interest in unconventional cleaning methods used on sculpture and sculptural elements of various historic buildings, on metal, paper and paint layers. Thus, the YAG: Nd laser is one of the most used lasers in the conservation and restoration of works of art.

Another non-invasive method applied in the restoration of cultural property for the removal of superficial and dirty deposits, since the communist period, and which is still used today, is the method of cleaning with enzymes.

Since 1970, enzymes that could be isolated in a stable form and easily purified have also been applied in restoration, consolidation operations and cleaning works of art. The positive experiments that have taken place in these years, demonstrate that these methodologies have positive results and can be used in the practice of restoring polychrome works of art. The first applications with enzymes in restoration were made in the restoration of books, and later on polychrome works, on canvas and wood. This method has been and is still used in cultural assets within the movable heritage (Knut, 1998: 96).

In Europe, Italian restoration laboratories have for many years used enzymes in the operation of cleaning adherent deposits of various kinds on the surfaces of works of art, but this was preceded by a slow transfer of knowledge, acquired mainly from the United States, where as early as the 1970s these systems were experimented with and introduced into common use. Numerous toxicity studies have been performed over time on amylases, lipases and proteases, being classified as non-toxic.

The enzymes were used in the field of paper restoration, where the main objective was to decompose old adhesives to peel off the paper mounted on the supports. Recently, enzymes have been isolated to be used in the bleaching process, in the production phase, enzymes that are very selective, attacking only lignin in a fairly short time. Regarding the wood and canvas painting restoration sector, the development of the enzymatic cleaning process has been slow and tiring, as the enzymes are difficult to use due to the difficulty of controlling the pH, temperature and repeated removal interventions. Despite these disadvantages, the use of enzymes to remove polymeric substances present in the paint layer is a real alternative to the use of organic solvents (Cremonesi, 1999: 40).

From the category of enzymes, in the operations of restoration of cultural goods that have a pictorial layer, artificial saliva is also used. It contains organic compounds, albumin, globulins, mucins, acids, phenols, as well as inorganic compounds such as sodium, potassium, magnesium, calcium salts (chlorides, phosphates), whose heavy cleaning action can remove superficial deposits from the surface of the objects of art.

In an age of speed, it is hard to imagine that the cleaning time of a work of art would be doubled, tripled or even more in the case of enzymes and artificial saliva, compared to the almost immediate action of solvents and lasers. However, the use of enzymes in the restoration of a work of art also needs to be considered. Properly applied, the enzymes can successfully remove some deposits, and the time of exposure to the action of solvents in the human body would be reduced.

The optimal method of removing deposits from the surface of a monument or a work of art will be proposed on a case-by-case basis, following tests, analyses and scientific investigations, taking into account the principles of restoration and the need not to bring damages to patrimonial goods.

Cultural assets are important and irreplaceable from the perspective of art and history. They also fulfil a social function and therefore when it comes to preserving or

restoring such an asset, it is important to take all precautions and act critically and carefully so as not to destroy or further damage the asset. Taking into account all this, scientific and innovative methods must be correlated and used together with traditional methods of conservation-restoration, in order to ensure the permanence of the values of the national cultural heritage.

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