WALL PAINTING CONSERVATION IN ARCHAEOLOGICAL SITES

Beki̇r ESKİÇİ*  
Berna ÇAĞLAR ERYURT**

ABSTRACT

During the in-situ conservation of wall paintings, which are regarded as immovable cultural property except necessary cases, challenging situations are encountered. The problems arising from carrier of wall paintings and constantly varying atmospheric conditions such as humidity-temperature increase destruction. Stopping and/or slowing these effects is possible with correct planning, conservation and restoring interventions which begin with exhuming these wall paintings.

It is a long process involving in-situ conservation and restoration applications (such as cleaning, consolidation of paint-mortar layers with injection mortar) and conservation needs (such as protective roof which is constructed on the structure it which the wall paintings belong) which necessitates cooperation between the excavation team and conservation specialists. In this study, active and passive conservation methods oriented towards in-situ conservation of wall paintings in an archaeological site will be addressed.

1.0. INTRODUCTION

Wall paintings, which are the primary ones among the most ancient artistic productions appear to us with their different techniques, colours and depictions and enable us to have information about the lifestyle, art and aesthetic understandings of the period in which they were made. Like all artefacts which are excavated, wall paintings too bring along different problems. For the in situ conservation of the wall paintings which are found in archaeological sites a need for urgent intervention arises and it becomes highly important to carry out these conservation procedures fast. Producing reversible solutions to all the problems that can be encountered meanwhile can be possible with a correct planning and a specialist team. A contrary situation causes the deterioration process of the wall paintings to continue and the destruction to increase.

Conservation, in the modern sense, is a composite term applied to a set of scientific procedures aimed at stabilizing an object and prolonging its life to the maximum extent possible. Broadly speaking, it involves (i) the elimination of the causes of deterioration, (ii) reversing the adverse alterations in the object (caused by the deterioration process) as much as possible and, (iii) steps to prevent future deterioration (Subbaraman 1993: p. 736).

* Prof. Dr., Ankara Hacı Bayram Veli University, Department of Conservation and Restoration of Cultural Properties, b.eskici@hbv.edu.tr
** Res. Asst. Dr., Ankara Hacı Bayram Veli University, Department of Conservation and Restoration of Cultural Properties, b.caglar@hbv.edu.tr
2.0. WALL PAINTING TECHNIQUES

Plaster, stucco, secco and fresco painting from archaeological sites represent a rich source of information for archaeologists and for those conducting research in fields such as building materials and techniques, painting media, and the history of art.

**Fresco**, a painting technique in which dry pigments ground with water are brushed onto a thin layer of wet plaster (*intonaco*). As the plaster dries, there is a chemical reaction between the calcium hydroxide (CaOH) and the air, and it stabilizes as calcium carbonate (CaCO3) to become durable (Mora, Mora and Philippot 1984: p. 10-16; Neguer and Alef 2014: p. 5, Weyer 2015: p. 70). Fresco paintings are known to have survived from the Minoan period in Crete (1700 BCE) and also from the Roman period at Pompeii (79 AD). Fresco paintings were used to decorate interior walls in Italy, particularly in churches, from the thirteenth century AD onward (Neguer and Alef 2014: p. 5).

**Secco**, a wall painting technique where pigments mixed with an organic binder and/or lime are applied onto a dry plaster (Weyer 2015: p. 84; Neguer and Alef 2014: p. 5; Subbaraman 1993: p. 739). Secco was often used over the fresco painting to correct mistakes, and to add details in shades that were impossible to achieve in fresco because of the alkaline nature of the fresh plaster. Blue presented a particular problem; for example, blue robes were usually added using the secco technique, since neither of the two minerals commonly used to produce blue in ancient times, lapis lazuli and azurite, are chemically compatible for working on wet plaster (Neguer and Alef 2014: p. 5).

**Stucco (molded plaster)**, a type of malleable plaster, made from slaked lime mixed with powdered marble (*stucco romano*), or with gypsum and stone powder. The stucco sets more slowly than “regular” plaster, and therefore lends itself to sculpting and the decoration of external and internal architectural elements (Neguer and Alef 2014: p. 5, Weyer 2015: p. 114).

**Plaster**, a soft, plastic material that can be spread on a wall, ceiling, or other surface, where it subsequently hardens. In the context of art and architecture, plaster is a mixture of water, lime and sand, often combined with other materials, such as animal hair, to give the resulting material the required strength, texture and porosity (Neguer and Alef 2014: p. 5).

3.0. DETERIORATION OF WALL PAINTING

Deterioration is a product of physical, chemical and biological agents which enter into contact with the object from the moment of its burial and thereafter exert their effects and which will accelerate as soon as remains are exposed. (Ed. Price (Mora) 1995: p. 92; Acton and Holt 2012: p. 3).

One of the main problems faced in conserving the wall paintings is the exposure of the building or building remains, to which they belong, to the external factors (rain, humidity, wind, sun etc.) and decomposition between wall-mortar-plaster-paint layers. In the buildings without sufficient drainage and roof isolation, powdering between the layers has occurred in time due to the destroying effect of the water (liquid and/or vapour) seeping through the
ground, wall, and roof, and if the necessary measures are not taken this results in excessive

As a result of vaporization of the water seeping through the ground and the roof with changes
of climate and heat, the carried salts crystallized on the surface and formed a hard and a thick
layer depositing in time. Evaporation and crystallization sometimes occurred in the pores. The
pressure of the salts formed in the pores weakened the plaster and paint layers in time. (Mora,

One of the factors of the deterioration of the wall paintings is biologic factors. Undeveloped
plants (algae, fungi, and lichen) that find a convenient environment to reproduce with the
existence of humidity, heat, and light sources form a shell on the surfaces in time and the acid
secreted through their deep penetrating roots causes physical and chemical damages (Caneva,

4.0. DOCUMENTATION

The recording of information is therefore a process which is inseparable from the examination
and treatment, which it must follow step by step. Everything judged to be essential or even
significant with regard to the historical, archaeological and technological features of the work
must be noted, as must data relative to the diagnosis of the causes of deterioration and the
methods used in treatment (Mora, Mora and Philippot 1984: p. 25).

5.0. RESTORATION AND CONSERVATION PROCESS

The conservation and restoration process must progress according to the needs of the wall
painting. From the moment the wall painting is excavated the intervention need may vary. If
there are problems arising from its carrier, if there is water presence from the wall or the
ground these should have the priority. The wall painting should be intervened later on. Determining
the order of priority is possible with a good planning and good definitions. If
building a protective roof is at stake, the restoration treatments should be postponed to a time
after the roof is completed. The structure in which the wall painting is found, historical
development of the structure, the technique of the wall painting, its conservation condition
and the deteriorations must be detected and specified. The sources of deterioration must be
noted as much as they are observed and the application order must be roughly determined
after the observation. Compatibility with the original material, reversibility and minimum
intervention principles must be observed in all the treatment that will be made.

5.1. INITIAL ON-SITE CONSOLIDATION

In many cases, the physical condition of fragments in debris or of panels to be lifted is fragile
and crumbling. Therefore, pre-consolidation with reversible materials and methods is needed
to stabilize them before collection and transportation to the laboratory. Pre-consolidation of
the painting in situ will usually be combined with treatment. The conservator is responsible
for in situ pre-consolidation:
1. Pre-consolidation of the paint layers with reversible materials be carried out in exceptional cases before treating the foundation of the painting or before removing the wall paintings.

2. Applying support using “facing” with gauze and reversible consolidates, such as Paraloid B72 diluted in an organic-based agent, enabling future treatment (Photo 1-2). In certain cases, non-reversible materials may be used, such as lime water or lime-based mortar or nanolime, which will not interfere with future treatment.

3. Protection of the painting before removal from the site and transportation, by building wooden or plastic mesh supports and boxes filled with polyurethane foam or gypsum, matching the size of the panel or fragments.

4. When a wall painting is exposed in situ, preventive conservation measures must be provided, including temporary drainage, shelter and cover, as well as pre-consolidation of the walls and plaster (strengthening edges, consolidating lacunae, and micro-grouting) (Neguer and Alef 2014: p. 14).

5.2. CONSOLIDATION

One of the important conservation problems in the structure, which is open to all kinds of external factors before the restoration, is the risk of spillage of largely degraded plaster-painting remains. At most points, due to the loss of binding function of lime in the mortar due to the moisture coming from the wall, decomposition / gaps occur between the carrier, mortar and / or plaster layers.

It may be necessary to apply the consolidation procedure both between the mortar/plaster layers and the surface of the wall painting. The cleavages between the mortar layers are generally filled with lime-based hydraulic injection mortars and the ratio (fluidity) of this mortar is determined according to the sizes of the cracks and holes. This mortar is poured with a wide tip syringe through the sides, cracks or cleavages (Photo 3). In the spaces where there are neither cracks nor cleavages the injection mortar is sent through the small holes opened on the surface (Eskici 2005: p. 30-31).
Fixing is required when the paint layer is flaking or tending to become powdery. A good fixative must have sufficient adhesive power to consolidate the paint. It must be colourless, must penetrate thoroughly, must be resistant to abrasion and, above all, must not modify the colours of the picture or change the general tonality (Philippot and Mora 1968: p. 172).

![Photo 3. Consolidation with injection mortar, Iznik Elbeyli Village, Byzantine Hypogeum, 1997](image)

For re-establishing cohesion the consolidant should be able to penetrate in depth; therefore it should be applied in solution with adequate solvents so that, having a good power of penetration, it can reach even the deeper layers. The solvent or mixture of solvents must have the right evaporation rate, not too high or else it would evaporate before its action takes effect, not too low or else it would make the surface sticky for some time and would favour the deposit of atmospheric dust upon it.

The consolidant can be applied with a spray, by brush or through percolation. In all cases, given the toxicity of solvents, the operators should observe the necessary precautions for use. The concentration of the solution can vary from 2-10%, according to the state of deterioration; the more the material has deteriorated, the more concentrated the solution should be (Ed. Price (Mora) 1995: p. 94).

5.3. CLEANING

The initial cleaning involves the removal of earth, light concretions and plant growth. This should be done with plastic spatulas, with brushes selected according to the resistance of the original surface, and with scalpels for the more resistant areas, taking great care not to cause the slightest damage to the surface, which often is more delicate than the material to be removed. If the condition of the object allows, the cleaning should be carried out by washing with water using nebulization, so as to wash away superficial salts, taking care to direct the water runoff well away from the structure (Ed. Price (Mora) 1995: p. 93).
The purpose of preliminary cleaning of the painting at this stage is to allow a rudimentary understanding of its physical condition and to assess its significance, as a basis for decision making as regards the continued excavation and method of treatment. The rest of the cleaning will take place at a later stage in the laboratory, or on site prior to exhibiting the wall painting. Preliminary *in situ* cleaning will be the responsibility of the conservator, following these stages:

1. Mechanical cleaning of dry soil residue with brushes and a scalpel.
2. Chemical cleaning of carbonates and other deposits.

The methods employed for cleaning mural paintings vary, naturally, according to the substances that have to be removed and the materials that are to be preserved (Philippot and Mora 1968: p. 170). The choice of cleaning materials and methods will depend upon the nature of the substance to be removed and fundamentally upon the resistance of the wall painting (Photo 4). Cleaning operations are invariably begun on less important areas of the painting, leaving the more important areas and those that are the most delicate for the final stages (Mora, Mora and Philippot 1984: p. 285).

Consequently, the removal by cleaning of all non-original materials does not restore the work to its original state, i.e. the state in which it was left by the artist on completing the original work. It simply reveals the present state of the original materials (Mora, Mora and Philippot 1984: p. 282).

**5.4. INFILLING**

To re-establish continuity between layers reinstating their structural and aesthetic properties. A lacuna can be infilled with a mixture consisting of a filler and a binder.
Generally, one uses materials with characteristics compatible with and/or similar to the original, including the nature, colour and grain size of the components for a fresco; the mixture is usually composed of a lime and sand mortar (Photo 5). If the lacuna is to be reintegrated in form and colour, it is brought within the same plane as the pictorial layer. The surface can have a similar texture to the original. If the lacuna is not to be reintegrated into the pictorial context, it is usually brought within the same plane as the underlying preparatory layers or the support. Finally, the grain-condition of the surface must be made to match, as far as possible, the original, in the interests of continuity (Philippot and Mora 1968: p. 175; Weyer 2015: p. 318).

Photo 5. Infilling the lacuna with mortar, Terrace House 2, Ephesus, 2019

It must never be forgotten, however, that the aim is always to restore to the original its presence and its lost authority and never to attempt to compete with it. In this respect the quantitative factor is crucial: if there touched area is too noticeable it will outweigh the original instead of restoring it (Philippot and Mora 1968: p. 175).

5.5. RETOUCHING

It reduces the visual impact of damage and lacunae on a work of art, thus increasing its artistic and iconographic legibility. Two and even three-dimensional reintegrations can be carried out using different methods and techniques (Photo 6-7).

Every reintegration is related to a specific historical and cultural perception of the work of art and to prevailing taste. Therefore it should be strictly limited to damage and lacunae and should be clearly distinguishable when viewed at close proximity (Weyer 2015: p. 328).
When, as is commonly the case, a mural painting is imperfect and certain isolated portions are missing, these areas must be dealt with in such a manner as to satisfy two fundamental requirements, namely: (a) respect for the work as a piece of historical evidence, which precludes any kind of faking; and (b) as far as possible, recovery of the aesthetic unity of the work so that it can be fully appreciated. The retouching of such missing areas calls for special qualifications in the operator in addition to studio training—an understanding of the significance of the work as an artistic and historical document and an appreciation of its particular qualities. The responsibility, therefore, of authorizing any retouching is not inconsiderable and the extent of such retouching must be related very definitely to the qualifications of the personnel available for the work. Retouching, after all, is not an essential part of conservation and it must be emphasized that responsible authorities do not authorize such work unless an experienced technician is available (Philippot and Mora 1968: p. 174-175).

### 5.6. MAINTENANCE AND CARE

Any active or passive act, carried out on a routine basis that aims to preserve a wall painting, but not including direct treatment or other interventions.

It concerns physical actions performed on the surrounding environment (including the building itself) and the monitoring of conservation conditions. It combines an administrative protocol as well as the management of monitoring and technical actions which ensure the appropriate conservation of the wall painting as it would have been previously defined within a preventive conservation study (Weyer 2015: p. 302).

Long-range conservation planning and treatment may take months or even years. One good option for temporary protection of archaeological wall paintings is reburial. Non-woven geotextiles can often be placed directly against the painted surface, permitting passage of moisture, while protecting the surface from abrasion and minimizing damage during reexcavation (Severson 2002: p. 3).
A protective shelter is directly affected by the management environment in which it is created and, in turn, impacts on the heritage and other values of the context into which it is inserted. Funding availability, intellectual and human resources for its planning and construction, maintenance and other issues are all dependent on the management system that exists for the protection and conservation of the heritage being sheltered (Ed. Aslan, Court, Teutonico and Thompson 2018: p. 4).

6.0. CONCLUSION

The conservation methods which we describe above with their essentials should be qualified as urgent conservation interventions rather for archaeological sites. The essential purpose here is to prevent the further deterioration of in-situ wall painting remnants and conserving them by consolidating their existing conditions. After the consolidation-oriented works which are performed in accordance with this purpose, it is highly important to cover the wall paintings/spaces with a large roof structure as a precaution against external factors (i.e. rain, wind, sun). The difficulties of “in-situ conservation” especially in protected areas is a widely known reality. Unless the isolation of the spaces and the walls are fully provided, the deterioration risk in mortar-plaster layers due to the water which will come from the walls and plant roots will not go away. For this reason, it is necessary to operate the mechanisms of maintenance and control in certain intervals and to repeat and/or renew the procedures according to the needs. Nevertheless, it is often seen in many archaeological sites that these kinds of interventions lose their functions in time and some conservative interventions on the same wall paintings are needed. In order for the conservation works in these kinds of sites to be more permanent and sound, a comprehensive restoration project which will solve the drainage and isolation problems together with the structure and the structure remnants needs to be carried out.

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