CORBII DE PIATRĂ. CONCLUSIONS OF A RESEARCH

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Keywords: research, rock-hewn church, wall painting, conservation, preventive conservation, monitoring, urgent intervention, biodegradation.

Abstract: The aim of the research undertaken during 2008-2010 at Corbii de Piatră church in the rock was to provide the scientific background needed for an adequate approach of conserving the medieval site, especially the valuable mural painting ensemble. Starting from cross-disciplinary approach of conserving mural paintings inside the rock-hewn church, our project created a *research-monitoring-intervention model on a historical monument in the wider background of a historical and natural site at Corbii de Piatră.* Including the conservation of mural paintings as part of a site conservation strategy was aimed to go along the following major directions: a permanent monitoring of the historical and natural site where the rock-hewn church is placed; a permanent monitoring of the conservation of mural paintings, before, during and after the conservation; an emergency intervention at the natural site including the rock where the church was dug out together with its annexes; an emergency intervention for the interior mural paintings; elaborating a complex project for the conservation of Corbii de Piatră historical and natural site; implementing the complex project.

Rezumat: Scopul cercetării desfășurate în intervalul 2008-2010 la biserica săpată în stâncă de la Corbii de Piatră era acela de a oferi fundamentul științific necesar unei abordări adecvate a conservării sitului medieval și îndeosebi a valorosului ansamblu de pictură murală. Având ca premiză abordarea interdisciplinară a conservării picturilor murale din interiorul bisericii rupestre, proiectul nostru a creat *un model de cercetare – monitorizare - intervenție asupra monumentului istoric în contextul mai vast al sitului istoric și natural Corbii de Piatră.* Includerea conservării picturilor murale în interiorul unei strategii de conservare a sitului a fost propusă a se desfășura pe următoarele direcții majore: monitorizarea permanentă a sitului istoric și natural în care se află biserica rupestră; monitorizarea permanentă a stării de conservare a picturilor murale, înainte, pe parcursul și după intervenția de conservare; intervenția de urgență la nivelul sitului natural ce cuprinde stânca în care a fost săpată biserica împreună cu anexele sale; intervenția urgentă la nivelul picturilor murale interioare; realizarea unui proiect complex privind conservarea sitului istoric și natural Corbii de Piatră; punerea în practică a proiectului complex.

The initial aim of the research undertaken between 2008-2010 at the rock-hewn church of Corbii de Piatră (Fig. 1) was to provide the scientific foundation required for an adequate approach of the conservation of the medieval site, and particularly of the valuable mural painting ensemble. These mural paintings – with a problem range unprecedented in scope and complexity, especially concerning the biodegradation process – were the major objective leading to the development of the research project.[1]

Key issues for the SICBR project

An attempt to provide herein an abbreviated form of the entire course of the research seems useful to understand the source, the meaning and the significance of proposing the complex project emerging from the conclusions of this research.

The project carried out under the SICBR acronym went along a few major directions, able to allow an extension of the research to the same aim: the protection of a major monument of the Romanian Middle Ages in its own natural environment.

1. A first direction of research was placing the rock-hewn church at Corbii de Piatră in the history of arts.[2] Reassessing the identity of the place was so much more necessary as the conservation in extremely precarious conditions concerned a monastic ensemble of overwhelming importance, whose dating was oscillating between the early Romanian state formation – the 14th century – to the mature era of late Middle Ages – the 16th century. The iconographic and stylistic survey led to placing more firmly the monument together with its painting ensemble in the first decades of the 14th century. The undeniable value of the mural paintings stand for, along the uniqueness of the revered space – a single nave with geminate apses – the core

[1] *An integrated research strategy of the conservation of some rock-hewn churches, to restore and value them. Corbii de Piatră Study case*, under the SICBR acronym, a PC project, contract nr. 91-001, under programme 4, Partnerships in priority areas. The team included the following partners: National University of Arts, Bucharest, Conservation-Restoration Department, University of Bucharest, Faculty of Geology and Geophysics, National Technical University of Athens, S.C. CEPROCIM S.A., Bucharest Institute of Biology, Ecology, Taxonomy and Nature Conservation Department, National History Museum of Romania, Centre for Physical, Chemical and Biological Research and Investigations.

[2] Cincheza-Buculei 2010, pp. 11-56.

Caiete ARA, 3, 2012, p. 119-133, București.

Fig. 1. The historic and natural site Corbii de Piatră. Overall view of the rock where the carved church is.

reason along which the complex conservation project of the historical and natural site will have to go.

2. The geological definition of Corbii de Piatră site asked for a needed extension from the ecclesial space to the natural one, presenting us with the revelation of a unique place whose protection and conservation represent, in our view, a simultaneous concern along that of saving the rock-hewn church. The survey of tectonic blocks at Corbii de Piatră, close to Doamnei river, pointed out, along the geological structure of the site, the existence of a network of tectonic splits whose evolution stand for a progressive decay of the historical site. Here are a few essential remarks on the state and possible evolution of Corbii de Piatră site: "A side effect of faults emergence and the relative movement of blocks is the appearance of tectonic splits. They are inside the blocks, have a flat or relatively flat breaking surface and are grouped in sets of parallel splits with metric to decimetric equidistance […] Through the intersection of the four sets of splits, the tectonic block of the rock-hewn church is divided in polyhedral sub-blocks, relatively prismatic-shaped, with the long axis almost vertical and, therefore, potentially subject to collapse due to gravity."[3] At the same time, the mineralogical analysis of *Corbi sandstone* indicated a relevant image of the features of the material where the rock-hewn church was dug out, and which was the support for the mural paintings. The mineralogical outline informed both the analysis on the execution technique of the painting, as well as the elements concerning the conservation of the valuable iconographic ensemble, such as the porosity of the sandstone and its ability to absorb and retain humidity. The hydrogeology of the site[4] represented a chapter of major importance within the research which, together with the microclimate analysis, indicates the main degradation factor of the rock-hewn church: humidity.

3. For the site characterisation of Corbii de Piatră, one of the research directions was defining the influence of the vegetal layer on the conservation of the rock-hewn church.[5] Being a first approach of this kind, the characterisation of existing vegetation around the monastic ensemble represented a synergetic concern in the effort to diagnose and propose solutions for the site conservation.

4. Returning from the general survey of the natural site where the rock-hewn church is, back inside the monument, the analysis of the natural site where the rock-hewn church is located, the research focused on the technological study of the mural painting. "Executed, to the largest extent, in *fresco*, the iconographic ensemble inside Corbii de Piatră rock-hewn church displays the technological characteristics of a mural painting probably executed under difficult microclimate conditions, of a high relative humidity, with an increased humidity of the sandstone walls. That could be complemented by a considerably lower lighting compared to the current one."[6] The analysis of the constituent materials of the mural paintings led, for the first time, to a thorough understanding of the execution technique of mural paintings at Corbi.

5. The proposals for the conservation of the valuable iconographic ensemble implied a simultaneous analysis of the morphology of degradation and the causes which trigger it. In this respect, an important chapter of the research project was determining the features of the microclimate.[7] Performed continuously for two years, the microclimate survey was completed with HOBO RH & Temp Logger sensors, placed in various

[3] Şeclăman, Luca, Bărzoi, Roban 2010, pp. 59-60.
[4] *Ibidem*, pp. 66-68.
[5] Onete 2010, pp. 69-76.
[6] Mohanu 2010, p. 108.
[7] Mohanu 2010a, pp. 111-121.

points inside the church. In order to define the conservation conditions of the mural paintings, a graphical and data set representation was completed, of the following aspects: variations of air temperature and humidity; variations of wall humidity and temperature; the emergence of a dew point; the possibility of a frost-defrost phenomenon. Beyond the stunning values of relative humidity, reaching an average of 83,3%, what needs to be taken into consideration to define the degradation processes of mural paintings are the *microclimate variations*. Thus, for values of relative humidity of 50%, it was possible to reach values of over 90%. At the same time, temperature fluctuated from over 25°C to values under the frost limit. In such conditions, the mechanisms and the morphology of degradation are explicable, from a lack of cohesion of the support of mural paintings, to the complex process of biodeterioration.

6. Assessed in the specific environment of Corbii de Piatră site, the degradation of the rock-hewn church represented the subject of a first attempt to make a diagnosis in view of a conservation strategy. The study of efflorescences and cryptoflorescences, of hardly soluble crusts, indicated not only their source and nature – sulphates (gypsum), nitrates – but also the mechanism of degradations caused by the migration and the recrystallization of soluble salts.[8]

The process, however, whose complexity dominates the assembly of degradations of mural paintings inside the rock-hewn church, is that of biodeterioration.[9] The long term research to analyse the types of existing biodeterioration factors both on the mural surface, as well as on the objects part of the liturgical space, resulted in writing a genuine methodological toolkit not only for the treatment as such for the cleaning of the mural surface, but also the complex of necessary measures to prevent the extension of the biodeterioration.

Research conclusions. A conservation strategy for the natural and historical site

Through stating cross-disciplinarity as a key principle of this research we aimed to highlight not only the complex character[10] which each action requires in the modern area of art conservation and restoration in its widest sense, but also the extension of explorations in other areas, sometimes rather unpredictable. The effectiveness of an intervention over an architecture monument implies the extension of research-conservation-monitoring on the areas which protect it. Thus, starting from the initial topic, that of a medieval monument, one goes to the historical site, and even more, the natural site in which it appeared (Fig. 2). In our case, the rock-hewn church, together with the natural and historical site which is part of, asks for a similar scrupulous attention.

Therefore, the conservation of the valuable mural painting ensemble, as the key topic of our research, cannot be conceptualized outside the concentric "layers" which protect it, from the architecture in the rock, of the church, to the massive rock and natural site allowing the emergence of this monastic ensemble.

Based on a cross-disciplinary conservation approach of conserving the mural paintings inside the rock-hewn church, our project set a *research-monitoring-intervention model on a historical site in a wider context of Corbii de Piatră natural and historical site.*[11] The inclusion of the conservation of mural paintings in a site conservation strategy was proposed to go along the following major directions:

(a) a permanent monitoring of the historical and natural site where the rock-hewn church is placed;

(b) a permanent monitoring of the state of conservation of the mural paintings, before, during and after the conservation intervention;

(c) an emergency intervention in the natural site including the rock where the church was dug, together with its annexes

(d) an urgent intervention at the level of interior mural paintings;

(e) carrying out a complex project for the conservation of Corbii de Piatră historical and natural site;

(f) Implementing the complex project.

[8] I. Mohanu 2010, pp. 126-140.
[9] Gomoiu, Chatzitheodoridis 2010, pp. 141-168.
[10] Michael Petzet mentions a "pluralist approach" for monument conservation, to actually promote all values of a historical monument, Petzet 2010, p. 16.
[11] The results of the research were presented in the group volume *Corbii de Piatră.*

Fig. 2. The rock face where the carved church is comprises the west wall of the naos, reconstructed after the collapse of the initial wall in the 19th Cent., the entrance to the porch on the south side of the church and the elongated recess which holds the refectory.

(a) *A permanent monitoring of the historical and natural site* is required by the changes undertaken or coming changes at the site, and which our project first highlighted in a cross-disciplinary approach. At the same time, the monitoring of Corbii de Piatră historical monument provides the opportunity of improvable interventions. The model of monitoring, resulting from the structure of our research, covers the following chapters of investigation:

- the geological evolution of the site;
- the evolution of microclimate conditions;
- the evolution of structure of the vegetal layer;
- the evolution of biodeterioration;
- the migration and recrystallization of salts;
- the appearance of pigment alteration phenomena;
- the evolution of decohesion of the support and painting layers;
- the written record, diary-based, of the existence of the rock-hewn church and of the way the legal and the methodological site conservation frameworks are complied with, considering the two current functions: the ecclesiastical and the historical monument.

(b) *A permanent monitoring of the state of conservation of mural paintings,* part of the wider process of monitoring the historical and natural site, starts with the observations gathered during our research on the material structure of the mural paintings[12] (Fig. 3a-f), the processes and the causes of their degradation[13] (Fig. 4a-f). The permanent character of checking the microclimate conditions demands setting up a system of investigation and control to be part of the rock-hewn church. At the same time, a permanent conservation service will have to be provided through a cooperation agreement, probably between Corbii de Piatră Monastery and Argeș County Museum. The improvability of that measure and control system of the microclimate conditions is a must indicated by the research campaign carrying out for the duration of our project. We would like to point out, for a future improvement of the monitoring system, on the limits we had to accept during the research:

- the absence of sensors able to record the variations of wall temperature, in parallel with recording the temperature and air humidity;
- the absence of specialized equipment in recording the air movements inside the rock-hewn church;
- an insufficient number of sensors meant to provide a complete spatial view of the variations of Temperature and Relative Humidity inside and at the entrance of the rock-hewn church;
- the impossibility of a systematic recording of daily events in a diary, and, through this, to assess potential causes of certain variations appeared in the microclimate of the church and, in parallel to that, of the way biodeterioration was encouraged, or other type of degradation causing losses of the mural paintings.

(c) *An emergency intervention in the natural site including the rock where the church was dug, together with its annexes*. Considering a minimal intervention in such a short while, the operations undertaken as an emergency were meant to remove the risk of an imminent loss of certain lithic elements, some of them carrying valuable graffiti, or part of the church structure. The decision of such an intervention asks for caution, competence and cross-disciplinarity as well. These exigencies should lead to selecting mineral-based

[12] I. Mohanu, Chatzitheodoridis, Niculescu, Barbu, Georgescu, Şeclaman, Luca, S. Bărzoi, Roban 2010, pp.77-100; D. Mohanu 2010, pp. 101-110.
[13] D. Mohanu, Şeclăman, Luca, Bărzoi, Roban 2010, pp. 111-140.

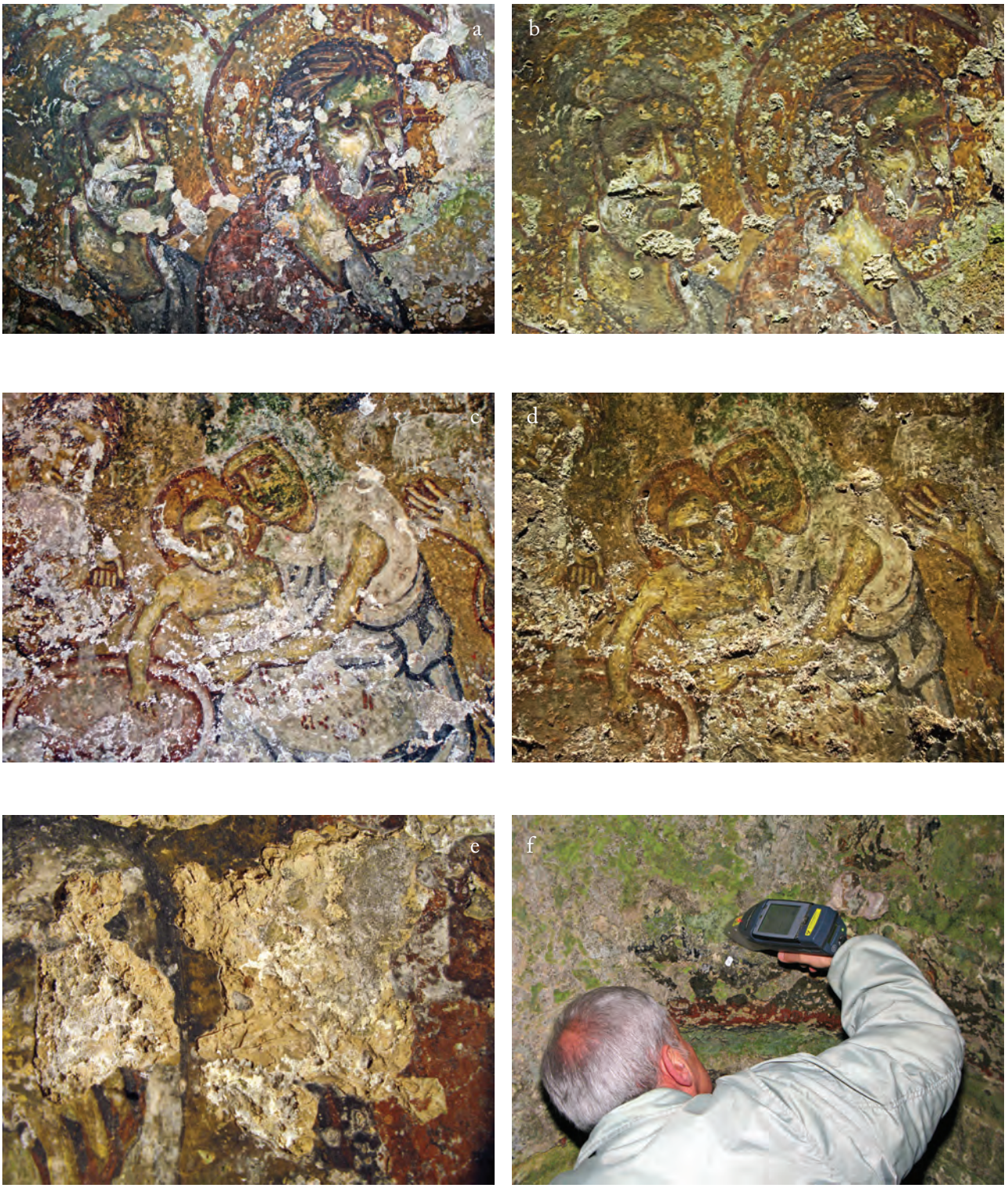

Fig. 3a-f. The analysis of painting technique based largely to the examination *in situ*, under direct (a, c) and raking (b, d) light and by means of macrophotography (e). Preceding the lab analyses, the investigation with the portable X-ray camera (f) contributed to the rapid extraction of information on the constitutive materials of the painting layer.

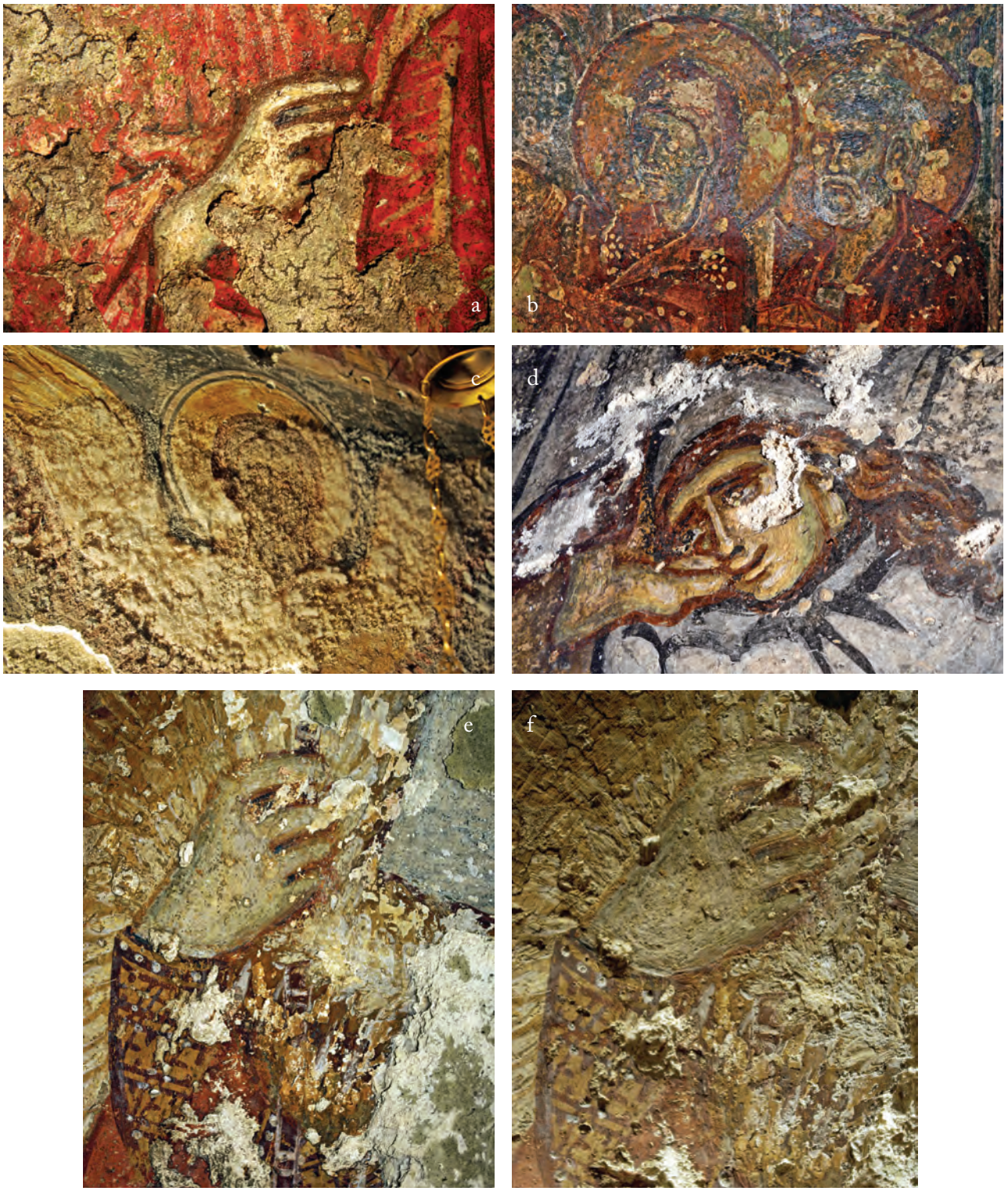

Fig. 4a-f. The description of the specific morphology of degradations at Corbii de Piatră was accompanied by the determination of causes which trigger them. The humidity of the walls, reaching in some times of the year maximum values (a-b) is responsible as well for the biodeterioration process and for the migration and recrystallization of soluble salts (c-d). The consequence is the progressive loss of painting layer and of its lime-straw support.

consolidation materials[14] (Fig. 5), compatible with the rocks part of the site we deal with, whose application methodology is non-destructive and whose introduction will be made on a minimum of material, as much as possible. At the same time, the emergency intervention includes an attempt to reduce the sources of humidity: infiltration, capillarity, or condensation.

(d) *An urgent intervention at the level of interior mural paintings*. Similarly to the intervention carried out at the site, the operations concerning the emergency treatment of mural paintings would aim to eliminate or reduce the major causes leading to the degradation and the loss of the painting layer together with its support. In other words, an activity of *preventive conservation*, directed to causes, without intervening on the painting material, should take place at the same time with the conservation operations focusing on the material structure of the mural paintings.

The improvement of microclimate conditions,[15] in parallel with following a strict regime of using the ecclesiastical area and the historical monument at the same time, could represent the side of indirect action on the painting ensemble. In this respect, the conservation plan should try to eliminate the high temperature variations and the relative humidity of air, and especially the critical moments of condensation. Controlled ventilation, avoiding, as much as possible, the sudden changes caused by the natural ventilation, should be accompanied by an improved lighting system and protection against UV.

At the same time, a direct intervention is targeted at three key issues: to stop the biodeterioration process, to extract soluble salts and to consolidate the dislocation of the support and the exfoliations of the painting layer.

In what concerns the major issue of biodeterioration[16] (Fig. 6a-d), an emergency intervention comes up with a series of operations aimed to stop and prevent the extension of the degradation process:

- removing and incinerating any contaminated cellulosic sub-layer; contaminated objects will be replaced with new ones, and they will be regularly inspected to allow an intervention at the first signs of contamination;
- extracting, packaging and burning the wood part of the wood sills or pews contaminated with Bazidyomicota *Coniophora puteana*;
- treating the wood used for the box with Holy Relics with Biotin R through a compress, protected by an impermeable foil, let to action for 24 h and then followed by a mechanical cleaning;
- treating the electric wire, once the power is off, following a similar procedure as for the wood;
- avoiding the storage of candles used for the religious service in the rooms of the church; their storage will be made in an uncontaminated space, close to the monument, where the relative humidity is not higher than 60%;

Fig. 5. Samples of different compositions of mortars destined to the consolidation intervention at the painting support have beet tested by CEPROCIM S.A. Not only was the compatibility with original materials examined, but the behaviour of new mortars in severe microclimate conditions, too.

[14] I. Mohanu, Năstac, Gomoiu, D. Mohanu 2010, pp. 104-112.
[15] *Il riscaldamento nelle chiese*, pp. 62-73. It refers to a set of operations under a *passive intervention*.
[16] Gomoiu, Chatzitheodoridis 2010, pp. 141-168; Gomoiu, D. Mohanu, I. Mohanu 2010, pp 87- 101.

- the treatment of drops made by candles, when one notices that they are contaminated; the operation will be done with a biocide solution applied through a compress, followed by a mechanical elimination of the wax drops and a repeated final treatment with biocide applied with a brush;

- avoiding keeping communion bread and Eucharist bread inside the church, eliminating thus the possibility, given the current microclimate conditions, of a swift biodeterioration process; also, avoiding the storage inside the church of offerings brought by believers, or of any other organic materials (paper, textiles, wood) which may be easily attacked biologically;

- to prevent the multiplication of mosquitoes inside the church, insecticides should be used and a regular examination of the walls and the vaults of the altar should take place; in the areas where the bodies of mosquitoes are in a putrefaction stage, compresses of cellulosic fabric soaked with biocide will be applied shortly, followed by the elimination of the bodies of insects and, finally, treating those surfaces with a biocide solution (Biotin R) applied with a brush;

- all surfaces in pronaos, naos and the altar on which there are microscopic fungi, will be treated with compresses with biocide R, and then cleaned mechanically; except the powdery mural paint surfaces; the final stage will consist of a biocide treatment, applied with a brush;

- the mortar and the bricks covered with biofilm will be treated with compresses bathed in a biocide R solution, followed by a mechanical cleaning; the final treatment will include the biocide applied with a brush.

This entire set of operations meant to eliminate and prevent the biodeteriorarion processes, added to the interventions of consolidation and improvement of microclimate factors, requires, besides a temporary presence of specialized teams, a permanent conservation service in which the new monastic community could play a vital role.

A special attention in this vast conservation process needs to be paid to the vegetal layer whose presence in the rock degradation needs to be assessed to its real proportion.[17]

(e) *Carrying out a complex project for the conservation of Corbii de Piatră historical and natural site*. Starting with the structure proposed in our project, the team to carry out the conservation of the natural and historical site needs, first of all, to pay attention to the following observations and recommendations resulting from the geological study[18] dedicated to the site:

Starting with the excavation in the rock of the stone walls of the church, they inevitably went through several processes of degradation, whose factors and mechanisms are relatively well known. Inside the church yard, the major cause of rock degradation is the infiltration of water through splits and the pores system. Although inevitable, the infiltration may be substantially reduced if a programme to obdurate the open splits in the Northern wall of the church will be applied, but not before selecting, via an *in situ* test, the best obturation material, compatible with the rock and the local climate.

The abrupt mountain side outside the church was and will continue to be under a regressive evolution[19] (Fig. 7a-c), which will certainly affect the stability of the site in the future. To assess the moment when the evolution of the mountain side turns critical for the church yard, it is also necessary to elaborate an *in situ* programme of observations, applying certain *markers* in the field and monitoring them over a long time.

The church is located in a special geological area, being excavated in the *Corbi sandtstone* stratotype, part of the major stratigraphic elements of the Oligocene deposits on the Romanian territory. Given this reason, as well as the show provided by the local lithogeomorphological background, the church environment should be treated with the respect due to a wonderful natural gift. Human intervention should be minimal. Brutal actions, such as those listed below, should be avoided:

- vast geotechnical works, meant to consolidate geotechnically the exterior mountain walls of the church;

- rock dislocations and buildings on the plateau above the church;

[17] Onete 2010, p. 74 -75.

[18] Șeclăman, Luca, Bărzoi, Roban 2010, pp. 57-68.

[19] One of the events on the rock regression was recorded in 1887 when the Western wall of the church collapsed. Ilinescu, Șerban, Gorunescu 2009, p. 106.

Fig. 6a-d. One of the major problems characteristic to the state of preservation of the rock-hewn church is the ample and complex biodeterioration process.

- rock dislocations and additional buildings close to the church mountain side;
- the treatment or plaquing the exterior walls with synthetic substances.

Following the directions of action at the level of the natural site, the long term intervention on the church dug in the rock and its iconographic ensemble aims to conserve the ecclesiastical monument along certain key principles:

- the respect for the authenticity of the monastic ensemble;
- the compatibility of the materials introduced in the works;
- the reversibility of applied materials during the conservation process, in non-traumatizing conditions;
- a dominant character of the preventive restoration in the general conservation-restoration process;
- the respect for the principle of minimum intervention.

The respect for the authenticity of Corbii de Piatră ecclesiastical monument is a vital condition for an unaltered preservation of the theological, historic and artistic message of a key-monument of the Romanian Middle Ages. The fact is so much the more needed as, on the one side, the monument still includes insufficiently clarified sides for its reading (Fig. 8), and on the other, it provided the opportunity of new support elements in assigning, dating and the iconographic journey of the church.[20] Besides an enriched reading of the iconographic programme and a deeper stylistic analysis of the mural paintings (Fig. 9a-d), a first-class discovery at the end of our research was the elucidation, in the mural painting fragments part of the central niche of the Southern

[20] Cincheza-Buculei 2010 , pp. 11-56.

Fig. 7a-c. Subject to infiltration, a microclimate with high variations of temperature and humidity and freeze-thaw phenomena, the fragile sandstone cliff which contains the church is in a process of regressive evolution which endangers the existence of the monument.

wall, of the votive picture. Even if the identification of the three characters blessed by Jesus Emanuel remains a hypothesis,[21] their representation, with the image of the character along the axis of the niche ampler than the others, and placed in front, is a certainty (Fig. 10).

To go beyond a mere declaration, the conservation of the monument in its authenticity requires a few rules to be followed strictly:

- an unaltered monument conservation through setting the interdiction of building in its protection area, and the prohibition of high buildings or any other technical or industrial type of buildings in the visibility area of the entire site;

- the protection of traditional architecture both by encouraging the preservation, consolidation and adaptation of old houses as well as the monitoring of taking over a traditional style for new constructions; the elimination of any strident and aggressive insertions both in the architectural shape and its chromatics, at Corbi historical setting;

- avoiding the introduction in the ecclesiastical area of inappropriate furniture and churchly objects, in contradiction with the medieval character, of a high artistic value of this monument;

[21] *Ibidem*, p. 49. The author launches the assumption of the representation of Basarab I and his sons.

- avoiding any type of aesthetic treatments – chromatic reinsertions, reconfigurations and additions – which could alter, falsify or be in contradiction with the original image of the architectural and iconographic ensemble;

- the insertion, with maximum discretion, of technical elements in the ecclesiastical area, meant for lighting and improvement of the microclimate.

The *compatibility* and *reversibility*[22] of materials, standing as old key principles and long debated upon in the area of art conservation and restoration, need to guide the intervention on the rock-hewn church at Corbii de Piatră. This concern was stated in this project along the entire research and *in situ* testing of the connecting mortars meant to consolidate the support of mural paintings (Fig. 11). The methodological model of preliminary testing, followed by the insertion in the work, and the monitoring of how the materials work, is to stand for the conservation-restoration complex project of this rock-hewn church.

Fig. 8. Generally considered illegible because of the biological attack and the lacunae which spread over the entire painting surface, the north wall of the naos offers nevertheless a possibility of an iconographical decryption in some periods of excessive humidification of the walls. This is how scenes such as the *Harrowing of Hell*, in the photograph, could be identified.

The preventive conservation,[23] considered leading in the complex project of conservation-restoration at Corbii de Piatră, requires a synergetic, complex and long term activity to suppress the causes resulting in the degradation processes of the ecclesiastical monument together with its mural paintings. Along this line, there are certain specific, long term measures to be taken for one of the major degradation processes inside the rock-hewn church, that is biodeterioration:

- a maximum restriction of the liturgical activity inside the church, to prevent the generation of new micro-organisms and the spread of existing ones on noncontaminated surfaces;

- redirecting church life to a new monastery built close to the rock-hewn one, and which would compensate the restrictions on the historical monument;

- tourism should follow similar restrictions for visits inside the rock-hewn church, and its expansion could be compensated by visual and illustrative materials provided by the monastery outside the historical monument;

- improving the microclimate conditions and the wall humidity given the "passive intervention" mentioned earlier;

- preventing natural light coming inside and a restrictive use of artificial lighting; using light filters which prevent the growth and multiplication of algae, respectively the cyanobacteria, along a reduced humidity;

- a permanent monitoring of the microclimate and the aspect of surfaces treated with biocide.

One needs to point out that the treatment is specific to each type of biodeterogens; it is set once they are identified, but it is applied only after the evaluation of the surface conservation status, respectively the emergency interventions.

[22] Rediscussed by M. Petzet, the reversibility gets, given a modern conservation and restoration, the status of a present principle, far from being an absolute one: *"Even where the principle of reversibility is legitimately brought in a discussion, it never refers to a total reversibility, but rather to options of reversibility or to a more or less real reversibility, namely if the intervention is not absolutely irreversible, but could be reversible to a certain extent. Thus, there is a clear gap between a theoretical reversibility and the practical one."* M. Petzet 2010, p. 53.

[23] A model could be the issue of conserving caves decorated with prehistorical mural paintings, (Brunet, Vouvé (eds.), 1996, pp. 43 – 48)

Fig. 9a-d. The most extensive iconographical reading can be done on the south side of the naos vault. Among the scenes which allow also a thorough stylistic analysis is the *Nativity of the Lord* (a), *Întâmpinare Domnului* (b), the *Transfiguration* (c), the *Ascension of the Lord* (d).

One also needs to consider that the biocide treatment is generally applied on a relatively dry surface, following the personal protection regulations, the requirements of conservation for the mobile and non-mobile heritage and the environment protection. For rock-hewn monuments, remanent biocides are used in specific concentrations, depending on the level of sensitivity of microbiodeteriogens. Treated surfaces need to be monitored, together with the entire monument, immediately after the treatment.

In what concerns the *bryophytes*, it is recommended to remove them mechanically and consolidate the rock with compatible materials.

The application at Corbii de Piatră of the *minimum intervention* principle implies a strategy for heritage conservation whose recovery and further use needs to take place on a strict condition of a minimum amount of new materials introduced in the genuine substance of the work. This caution, already declared for the geological site, and actually included in the above-mentioned principles, such as the compatibility, the reversibility of materials and the respect for authenticity, starts from the exceptional character of an ecclesiastical monument whose history and significance are not fully clarified so far. At the same time, the impossibility to provide radical solutions of conservations, but rather relieving ones and a permanent monitoring of the site, encourage us to adopt the principle of the minimum intervention as a guarantee of *further treatment opportunities*, while new discoveries of materials, technologies and nanotechnologies for conservation-restoration will allow it.

The tests completed *in situ* (Fig. 12a-d) were therefore limited to operations of strict conservation, imposed by the current major degradation and eliminating any attempt to treat the faults and aesthetic display.

Fig. 10a-c. The central recess of south wall holds the fragments of a votive picture. The figure in the scene axis (b), with frontalized visage, is larger than the other two characters which flank it.

Fig. 11. Application on sandstone fragments *in situ* of binding materials produced by CEPROCIM in view of testing their behaviour in the microclimatic conditions of the carved church.

We think that our aim is, on the one side, to free the mural paintings at Corbi from any parasite elements which may obstruct or turn ambiguous the reading of what subsists from the iconographic ensemble, and, on the other, to guarantee a conservability of the painting material under a permanent monitoring. The tests have consequently concerned three types of operations in terms of emergency intervention, as well as the long term conservation-restoration operations:

- a limited consolidation of the support with compatible mortars based on lime;
- cleaning the painting layer;
- a biocide treatment of mural surfaces.

(f) *The implementation of the complex project* for the conservation-restoration of the historical and natural site at Corbii de Piatră therefore relies on the results of a cross-disciplinary activity, on the introduction, at the same time with the urgent conservation intervention, of an ongoing monitoring process for the microclimate conditions, of the geological evolution of the site, on completed tests and the research on using mineral materials aimed to consolidate the rock and the support of the mural paintings. A part of the foundation of the vast conservation works at Corbii de Piatră was already set through the research completed in the SICBR project.

In what concerns the valuable ensemble of mural paintings, whose conservation was the core of our research, the long term intervention needs to stay between the borders of an archaeological restitution, implying certain limits in cleaning the painting surface, given the carbonation attachment, in conditions of

Fig. 12. The tests carried out *in situ* had a conservative character, based on the principle of *minimal intervention*: application of compatible lime mortars, with strictly consolidation role (a-b), cleaning of impurities deposits (c), cleaning and treating against biodeteriogenes (d).

high humidity, of superficial deposits of impurities and the biofilm. At least so far, it seems that any attempt of aesthetic treatment of faults or testing the intervention with new mortars on non-reintegrable surfaces seems unsuitable.

What should be the object of a first-hand concern though, along the monitoring of the site, is an overall photographic record (photo surveying) and in detail, in a direct and raking light, of the iconography of the rock-hewn church. A careful recording of what subsists in the mural paintings ensemble should be, along proper conservation actions, the object of an urgent mission, determined not only by the rhythm of the loss of the painting material, but also the opportunity of an unpredictable natural disaster, such as the one which provoked, in the relatively recent history of the monument, the collapse of the Western wall.

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Excerpt from ARA Reports 3, 2012.