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THE PROBLEM OF PRESERVING EXTERIOR WALL PAINTINGS ON MONUMENTS: A COMPARATIVE STUDY OF LATE MEDIEVAL PAINTED CHURCHES IN BUCOVINA (ROMANIA) AND SLOVENIA*

Preface

Wall paintings on the exteriors of monuments and other outdoor cultural materials (sculptures, mosaics, stuccos, etc.) represent a notable segment of visual arts heritage. As part of public spaces, they are noticed and appreciated on a daily basis. They can be there for different reasons and have different functions or meanings. Medieval churches, for example, were painted both inside and outside with "images that were intended to instruct, to incite devotion and to remind their viewers of Christ's sacrifice and of the examples of the saints."[1]

One of the most characteristic images of the middle ages was that of St. Christopher, the patron saint of travelers. At the time (as later), this saint enjoyed considerable popularity in many regions of Europe. His image is often seen in interiors or on façades of religious buildings. In Slovenia, for example, nearly half of all remaining medieval images on church exteriors represent the scene of St. Christopher with the Christ-child on his shoulder. This scene is often accompanied by other images of saints, scenes of Christ's Passion or depictions of Mary.

The image of St. Christopher is usually large enough to be seen clearly from the road, the nearby churchyard, the town square, or the village. Besides his role of protecting travelers, there is also another reason for his frequent appearance on exposed exterior walls: it was believed that one glance a day at his image would also protect against sudden or violent death.

*All photographs and charts are the work of the author unless otherwise stated.

Today, a large part of the function of the image has faded. However, without a doubt, these paintings are still recognizable as works of art with an aesthetic and historical nature. And, as works of art, it is imperative that they are conserved for the future, as Cesare Brandi explains in detail in his Theory of Restoration (Brandi, 49). Awareness of the imperative of conservation is particularly important in terms of exterior wall paintings since these represent some of the most endangered examples of the cultural heritage. Fading and other changes occurring to exterior wall paintings are often a clear sign of their vulnerability.

Consequently, this is fitting moment to take a look at St. Christopher and a great many other exterior images and to reflect on the issue of protection, either from the sudden or the slow but sure process of "dying". This work does not set out to find the ultimate solution. Rather, it hopes to contemplate and gain a new understanding of the situation in order to help in the planning of conservation and restoration strategies.

Subject and purpose of the research

This work will take as its starting point the research made on medieval wall paintings in Slovenia. This research was used as a pilot model in the development and application of a model for systematic approaches to the conservation of wall paintings (or a wider segment of immovable cultural heritage) in Slovenia (Šeme 2005). This research resulted in a huge pile of information with a comprehensive digital database on the condition of more than 200 medieval wall paintings on the exteriors of more than 130 monuments in Slovenia.[2] Still, a lot of questions remained unanswered. Through experience from the broader geographic area, the problem of the decay and preservation of exterior wall paintings will become more transparent.

The reason for making a comparative analysis of the situation in Romanian with that of Slovenia is given by the many regions of Romania with a rich tradition in painted exteriors. From an iconographic and technological point of view, it would make most sense to make a comparison with Transylvanian wall paintings of the same period. However, the painted churches of Bucovina are more appropriate to the study of the decay and preservation of external wall paintings. Many of the churches of Bucovina are unique in being painted both inside and out, on all surfaces, from the plinth to the cornice of the tower. It therefore

becomes possible to compare the differences in preservation of interior and exterior painting (sometimes including the semi-open church porch), with surfaces of different orientations and heights.

Ten monuments in Bucovina were selected for a closer, *in situ* examination: the Church of the Beheading of Saint John the Baptist in Arbore; the Church of the Assumption of the Virgin in Baia; the Church of the Assumption of the Virgin in Humor (Humor Monastery); the Church of the Feast of the Annunciation in Vatra Moldoviței (Moldovița Monastery); the Church of the Holy Cross in Pătrăuți (Pătrăuți Monastery); the Church of Saint Nicholas in Probota (Probota Monastery); the Church of Saint Nicholas in Râșca (Râșca Monastery); the Church of Saint George in Suceava (Monastery of Saint John the New); the Church of the Lord's Resurrection in Sucevița (Sucevița Monastery);[3] the Church of Saint George in Voroneț (Voroneț Monastery). Besides these, there are many more exterior paintings from the 16th century in Bucovina and the wider region of northern Moldavia, but these were either not well preserved or on monuments too distant from the aforementioned list of churches for the *in situ* inspection (e.g. Bălinești, Bistrița Monastery, Dobrovăț Monastery, Pârhăuți). At some of the monuments nothing has been preserved (e.g. the church of St. George in Hârlău, which is considered to have the oldest exterior paintings in Moldavia). Though not made a subject of closer study, fragments of wall painting on the entrance tower to the Probota Monastery and a part of the wall paintings in interior of the churches were also documented.

Taken as a whole, there are surely certain technical, technological and climatic differences that serve to differentiate between the late medieval wall paintings of Bucovina and Slovenia. What they have in common is their extreme vulnerability. Though in the course of time all materials are subject to deterioration and decay, the exterior wall paintings, sculptures and decorations of monuments are far more vulnerable in comparison with artifacts in museums with controlled climate and the protection this affords. Regrettably, the approach to outdoor artworks is often far less systematic in terms of the monitoring of condition and risk, as well as the consequences of conservation.[4]

The speed and the nature of deterioration of wall paintings depend on many factors, from location of the monument and the painting, the painting technique and technology used to later interventions, environmental effects and the nature of protection and maintenance. In contrast with museums with controlled climates, the exterior of monuments should be

evaluated on a timescale in which visible decay is measured in decades, years or even shorter periods. This makes feedback on conservation and restoration decisions fast enough to be able to learn from experience. Decision-making can thus follow a preservation- and risk- based approach in which knowledge about current conditions is combined with estimates of future damaging events. Proper maintenance and preventative conservation supported by the data acquired from regular monitoring and decay analyses can thus minimize needless loss.

Of all the natural factors of decay, weathering causes much faster deterioration of external painting than is seen inside monuments or in museums. It provokes harmful effects on the surface or beneath the surface of the paintings. This is particularly the case for precipitation and direct exposure to the sun and wind. The effects of capillary action on moisture and temperature changes also play a role, as do, according to research (Šeme 2002), the freeze-thaw cycle in the case of moisture-laden walls. And there are many other, sometimes less obvious factors, e.g. air pollution, water soluble salts, micro-organisms, etc. As a rule, the problem of deterioration with wall paintings is a complex issue, since the various different factors each have an affect on the other and cause varying degrees of damage.

To show that wall exterior wall painting is far more at risk than interior painting it suffices to select just one monument with both interior and exterior wall paintings painted in the same period and by the same artists or workshop. Some examples of comparisons at the churches of Humor in Bucovina and of Zanigrad in Slovenia are shown in Figure 6 and Figure 7, respectively.

At the church in Humor we also see how the state of preservation of external wall paintings depends to a large extent on protection from precipitation (i.e. paintings are better preserved under the covered porch than on the façade protected only by the cornice). This is particularly true for upper sections of wall paintings.

The purpose of this research is to assess the condition of external wall paintings in terms of different geographical locations, the different positions of paintings on monuments, different methods of protection and the varying states of preservation. This will be followed by a more general assessment of the major threats posed to external wall paintings as well as the rate of decay. This will be concluded by some reflections on the results of conservation and restoration performed in recent decades and thoughts on future techniques of preservation. This research is based on

solely visual examinations of monuments *in situ*, the comparison of old photographs and the study of written documentation and different sorts of literature.

My main focus in this study is the future of historic exterior wall paintings. Is there a way to predict, if only approximately, the fate of exterior wall paintings over the coming decades? Some preliminary analysis (Šeme 2005) revealed a rather gloomy picture in which, with the current rate of decay, the majority of overexposed medieval exterior wall paintings in Slovenia will cease to exist *in situ* within a few decades. So, despite the many solutions proposed in the past, the question still remains: What is the best strategy to preserve this segment of cultural heritage for future generations?

Technique and technology of wall paintings

Knowledge of the technique and technology of painting is important to the study of factors of decay. Overall, the technique and technology used in Slovenian and Bucovinian late medieval exterior wall paintings does not differ significantly. The support is always made of stone bound together by mortar. Then at least two layers of lime plaster are applied: the first is thicker and coarser to aid adhesion of next layer (it. *arricio*), which is thinner and smoother (it. *intonaco*). The painting technique is usually mixed, beginning on freshly made *intonaco* (it. *affresco*) and ending on fresh lime wash (lime technique) or dry plaster (it. *secco* painting). The most commonly used pigments are also the most durable, e.g. earth pigments like yellow ochre, red oxide, green earth. Still, there are some differences and peculiarities, mostly typical of the more "Italian" or "Alpine" style of painting in Slovenia and the "Byzantine" style in Bucovina. More information on the technique end technology can be found in the works of I. Istudor and I. Bals (e.g. Bals and Istudor 1968, 1980) in Romania and A. Krinar (Krinar 2005) in Slovenia.

The stone used in the masonry of churches usually comes from close-by sources. Limestone and dolomite were usually used in the construction of medieval churches in Slovenia. In some areas sandstone (e.g. parts of Primorska, some regions of central Slovenia) and conglomerate (parts of Gorenjska) are typical. On some churches the masonry is not homogenous but made of different types of stone (e.g. Brunk, Tlake). The quality of workmanship may also vary. The masonry can be made from regular

blocks of ashlars (mostly for cornerstones) or from poorly dressed or undressed stonework (e.g. Brunk). The method of the composing of stone can also differ, from irregular to stratified (as classified in Koch, 498).

In Bucovina, a sort of sandstone was often used in masonry (e.g. Arbore, Moldovița, Sucevița). The stone material also appears to be more dressed and composed in a more stratified way (Figure 11). According to some sources (Buchenrieder 1971), the masonry in Humor is made of stone and brick. The high quality of the masonry comes as no surprise since the churches were built by Moldavian rulers (Stephen the Great and his descendants) or other nobleman (e.g. Luca Arbore in Arbore and Teodor Bubuiog in Humor) in contrast to the mostly smaller and remoter village churches in Slovenia.

The rendering normally involves two layers of plaster (*arriccio* and *intonaco*). If the surface of the masonry is not sufficiently level, an additional preliminary layer makes the surface more even for the application of the next two layers. In drier climates, the use of an extra layer of plaster can help keep in the moisture for longer, which is especially important in fresco painting (Krinar, 44).

The exterior figural paintings of the churches in Bucovina were often painted years or decades after the churches were built. Paintings made at the time the buildings were erected usually show imitations of the brick or stone masonry. This primary painted plaster was later used as *arriccio* for the figural paintings (e.g. Probota, Moldovița, Suceava, Humor).

Examples of many layers of figurative painting are not uncommon on the exteriors of medieval monuments in Slovenia. There are even three layers of medieval painting of St. Christopher, one on top of the other, on the south façade of the Church of St. John in Bohinj.

The particular difference between plasters of the monuments in Bucovina and Slovenia is seen in their composition. In Bucovina, the cut straw typical of Byzantine plasters can be found. This was used to make the plaster stronger and retain the moisture for longer. For similar reasons crushed brick (or other organic or inorganic supplements) was added but its use is seen less frequently and sparser in Bucovina. By contrast, the medieval plasters in Slovenia very often contain greater amounts of crushed brick and the usage of organic compounds like cut straw is very rare. This type of plaster in Slovenia is more typical of ancient Roman plaster and later periods. Another special type of plaster also found in

Slovenia is characterized by its content of particles of unslaked lime. According to one theory (Fister, 156) this may be due to the application of the type of plaster named *quicklime plaster*. In both kinds of plaster (in Romania and Slovenia) particles of charcoal can be seen sporadically. In moisture-laden walls, the existence of these various hygroscopic particles can be dangerous in the long-term because it can contribute to different forms of damage (e.g. eruptive phenomena).

Some parts of paintings in Slovenia have remained with only the *sinopia* on *arriccio* (e.g. Pijava Gorica, Dobrina). However, underdrawing (e.g. Bodešče) or engraving on *intonaco* is more common. This can also be observed on paintings in Bucovina, but no further research has been made. Underpainting made on fresh mortar is common for paintings in Slovenia as well as Bucovina. A greater difference is seen in the selection of colors. For the paintings in Slovenia, the majority used earth pigments, with more expensive pigments like azurite, malachite and lead white or lead yellow being used only rarely. It is also impossible to find traces of gold on exteriors in Slovenia.

By contrast, in Bucovina it is clear that the persons who commissioned paintings were in no way poor. Large areas are often painted in more expensive blue azurite or green malachite. Prior to application of the blue color with azurite (or some other color) an underpainting with earth pigment or organic black was normally made. Painting on already dried plaster was made either using the lime technique or some *secco* technique; lime caseinate was most probably used as a binder.

Different uses of stencils and imprints are seen on paintings in Slovenia, with applications being more frequent in Bucovina. Applications were used especially for the nimbi which were plated with gold. Gilding was also used on some plain nimbi.

Condition assessment

The first step in assessing condition is a general visual examination of the wall paintings together with documentation acquired by on site examination. For the monuments in Slovenia, measurements of the dimensions and orientation of wall paintings were also performed. A solely visual examination may prove insufficient, in particular when studying the effects of moisture and related phenomena like the growth of salts and biological forms of attack. Similarly, for the monuments in Slovenia

it was often hard to establish when or in what way a monument has been protected from rising of capillary moisture. Therefore the data acquired must be interpreted carefully.

Due to various restrictions, additional instrumental analysis was made only for the painted exteriors of the Church at Vrzdenec in Slovenia in 2004 and 2005. At this time, sampling and analyses of painting material, moisture, salts and microorganisms on the painted surfaces were carried out in cooperation with Slovenian experts from the Slovenian Restoration Centre and many other institutions. The purpose of the Vrzdenec pilot project was primarily to make a study of the applicability of different methods of investigation and to link together experts from various fields for possible future interdisciplinary cooperation.

The general visual inspection of the monuments with exterior wall paintings in Slovenia and Bucovina included the following: an assessment of technique and technology of painting, assessment of damage and other changes, assessment of interventions and maintenance, and risk assessment. For that purpose a form for general in situ examination was created. With this it is harder to overlook important data while observing the condition of the paintings, and it also makes the final data analysis much easier.

The form is similar to many other pro formas already in existence: for example, as early as the 1970s similar forms were made for the investigation of wall painting in Slovenia (Bogovčič 1975 [1976], Bogovčič 1977) and Romania (Lăzărescu 1977, Mohanu 1977). On an international level, the pro forma published in the frequently quoted book on the restoration of wall paintings might be better known (Mora, Mora, Phillippot, 1984, originally published in French in 1977).

General state of preservation

A view of the monument with the wall painting as a whole can give the first estimation of the general state of preservation of a particular wall painting. For this purpose it is necessary to see the situation in reality (on site) and from all sides.

Looking at photographs of painted monuments in Bucovina on postcards or published in diverse printed materials, we get the impression that in general late medieval exterior wall paintings in Bucovina are much better preserved than those in Slovenia or anywhere else.[5] But this can be far

from the truth, since the churches of Bucovina are normally photographed from the south, southeast or southwest sides – the sides that are more picturesque due to being where the paintings are best preserved. When observing the same monuments from other sides, our impression of the state of preservation may be somewhat gloomier. Therefore, for a more objective estimate of the state of preservation it is necessary to treat the paintings as a whole, from all sides of the monument.

It is interesting that the medieval paintings in Slovenia do not show similar correlations between the orientation of a painting and its state of preservation. It is also hard to make a more objective analysis of the state of preservation because no one church has preserved paintings on all sides, and it is not even possible to establish with certainty that there were such churches in the middle ages.[6] Possibly the only painter that we know for certain painted more than two sides of a façade was Bartholomew of Škofja Loka (Jernej iz Loke) in the first half of the 16th century. He painted the church in Brode near Škofja Loka (paintings on the west, north and south of the façade are preserved) and the Church of St. John (Ribčev Laz) in Bohinj (paintings on the west, east and south of the façade are preserved). The sole example of a monument with medieval wall paintings on all sides, and from top to bottom, is a shrine (Rdece znamenje) in the forest (Smrečje) near Crngrob at Škofja Loka, painted by the Master of the Kranj altar. The paintings of the shrine near Crngrob show no distinct correlation between the orientation of the painting and its state of preservation.[7]

Medieval wall paintings in Slovenia are most frequently still preserved on south-facing façades (48% of all paintings) and far less on eastern façades (5% or only 10 paintings) (Figure 21). The presbytery is normally situated on the east side of the churches.

The exterior wall paintings of Bucovina in the study were originally painted on all sides (with the possible exception of the church in Pătrăuți).

As already mentioned in the example of the church at Humor (Figure 6), the state of preservation of exterior wall painting can depend considerably on the level of protection from precipitation. Clearly, exterior wall paintings entirely under the roof or with an additional overhang are more protected than those under a short cornice or with no overhang.

In Slovenia, the majority of the paintings are protected merely by ordinary cornices and with no additional extensions (Figure 23). In Bucovina, the majority of monuments with exterior wall paintings have

cornices that have been additionally extended. The church in Voroneț has a particularly long cornice in terms of the height of the wall. Additionally, the paintings on western façades of churches with partially opened porches in Moldovița, Humor, and Baia, and those in the vast western niche in Arbore, are still well protected.

Another important observation in terms of the monuments in Bucovina and Slovenia is that the state of preservation of external paintings (and mostly of the paint layer) generally changes in a vertical sense over the surface of the wall, i.e. the upper parts are usually much better preserved than the lower parts, whatever the orientation. As a rule, the paint layer of the paintings is very badly preserved at heights up to at least 1.5-2 m from the ground (rough estimation). This is mainly due to precipitation in terms of wind,[8] however the capillary action of rising damp is an equally important factor. Exceptions to this rule, showing extensive damage to plaster and paint layers also on other parts, occur for different reasons: infiltrating moisture due to defects in the roof, different kinds of accidents, direct human intervention, etc. The factors of decay will be discussed in more detail later.

For further analysis two basic aspects of the state of preservation of wall paintings were noted:

– The extent of preservation of the original plaster used for the painting (for different reasons parts of original plaster with a painting can be missing),
– The extent of preservation of the original paint layer (paint layer can be better or worse preserved depending on the degree of fading, powdering or flaking).

And:

– The extent to which a wall painting is uncovered.

The extent to which a wall painting is uncovered

When secondary depositions on the surfaces of original paintings (over plastering, whitewashing, overpainting, dust…) are present, the establishment of the extent of preservation of the original plaster and the paint layer can be very hard. This is especially true of exterior medieval wall paintings in Slovenia, since there more than three quarters of the exterior paintings were once covered by plaster, lime wash or overpainting.

Today, a still relatively high percentage (59%) of the paintings is covered to some extent. There is a very high percentage of paintings whose extent of uncovering is impossible to define due to the fact that the paintings are covered to such an extent that it is very difficult to know how much of the surface of the original painting still exists underneath (Figure 27).

In Bucovina, it is known that the wall paintings on the façades of the churches in Pătrăuți and Probota were whitewashed (or overplastered) in the past. At present these paintings are completely uncovered. A considerable section of the wall paintings on the apse and on the upper part of the west and south wall (the one not yet detached) of the church in Baia is still whitewashed (Figure 28). It seems that due to the very poor state of preservation of the original painting, the north façade of the church in Moldovița was also once whitewashed or covered by a thin layer of plaster (Figure 29). There are also some layers of plaster and overpainting preserved as samples on the left side of the south exterior of the church in Sucevița, but it appears that this ancient overpainting and overplastering reached only the border of the painting. In Râșca the apse was overpainted by decorative painting during a later period and underneath it is possible to notice the faint original painting.

The extent of preservation of the original plaster used for the painting

In Slovenia only about a quarter of paintings still have the majority of the original plaster intact. The reasons for this differ, the most important being the renovation of buildings, weathering (especially in lower segments) and insufficient maintenance. The main reason for the very high percentage of paintings whose extent of preservation of the plaster is impossible to define is secondary depositions (Figure 30).

In Bucovina the reasons for the decay of plaster are basically the same as in Slovenia, only that the situation seems somewhat better at first glance. Renovation and rebuilding was to a large extent responsible for the destruction of the painted plaster in Râșca (western side of the church) and probably also in Sucevița (addition of open porches to the south and north façade). Possibly the main reasons were insufficient maintenance (e.g. Arbore, Probota, Baia) and disasters like fire (e.g. Probota). Insufficient maintenance is usually closely connected with the decay caused by weathering.

The extent of preservation of the original paint layer

Visual assessment of the general condition of a painting depends a great deal on the assessment of the state of preservation of the original paint layer. However, some phenomena make this assessment more difficult:

- The paint layer can be highly irregularly preserved depending on the surface of the painting
- Various secondary depositions above the layer of the original painting can hinder its readability
- *Sinopia* or underdrawing under the layer of the original painting can be treated together or separately

Using a scale for numerical estimation makes the assessment easier:

- 0: nothing preserved; some engravings in plaster or very faint traces of color can give evidence of the former painting
- 1: very badly preserved, very low readability; only faint or unconnected traces of paint layer preserved; generally only assumptions can be made about the possible scene of the painting
- 2: badly preserved, low readability; very faded color or very poor cohesion and adhesion of the paint layer; very low readability of the painted scene
- 3: medium degree of preservation; medium degree of fading or poor cohesion and adhesion of the paint layer; readability of the painted scene may be low but satisfactory (with exception of details, *secco* parts, etc.)
- 4: high degree of preservation, only slight fading of color; good readability of the painted scene together with details
- 5: very high degree of preservation with no fading of color; the painting is as new

Almost half the paintings in Slovenia fall into the category of lost (grade 1 of preservation) and badly decayed wall paintings (grade 2 of preservation) (Figure 32). It should be noted here that only the best preserved part of the painting was considered in the analysis: for example, if 70% of the painting was assessed at grade 2, 20% with the grade 3 and 10% with grade 4, only the grade 4 was considered for that particular painting in the final analysis. Therefore the real situation is in fact worse than presented on the graph.

As mentioned at the start, the general estimation of the level of preservation of the paint layer for the whole monument, or even for a single wall, is very hard to establish in Bucovina. The most appropriate way may be to section the surface of a wall according to different degrees of preservation (Figure 33). At any rate, the general impression is that the paint layer for some sections of surfaces is very well preserved. The following can be awarded grade 4, or even 5:

- Arbore: segments of the painting on the upper and the middle part of the west and south façades
- Humor: upper segments of painting in the porch on the west (mostly on the vault) and the east side of the façade
- Moldovița: upper segment of painting in the open porch, especially on the vault, a large part of painting on the south side of the church, narrow segment of paintings almost all around the church
- Pătrăuți: very small segment of the upper part of the fragment on the west façade
- Râșca: some upper parts of the painting on the south side of the church
- Suceava: very small segments in the upper part of the south side of the church (less than 5% of the area of preserved paintings and mostly in niches)
- Sucevița: here the paint layer is the best preserved among all the churches of Bucovina (it was also painted some decades later!), the majority of the upper half of the area on the south, east and north side of the church, also the majority of the area on the lower part of the south and east side of the church
- Voroneț: most part of the west wall and upper parts of the south and east façade, to a lesser extent also the lower parts of the south and east façade and upper parts of the north façade.

One somewhat contradictory phenomena observed on exterior wall paintings on the churches in Arbore, Voroneț, Moldovița, Probota and elsewhere is that some parts painted in blue azurite or green malachite are much better preserved than other parts of the same painting painted with earth pigments (Figure 34).

State of preservation according to major forms of decay

Generally speaking, physical, chemical or biological damage (biophysical or biochemical) can occur to wall paintings. Usually the extent of chemical and biological decay is much harder to define from a solely visual inspection and can lead to misconceptions.

In terms of physical changes, on the paintings in Slovenia the biggest problem is poor cohesion and adhesion of the plaster and paint layer. Eruptive phenomena and large cracks that can be connected with crumbling, flaking or bulging of the plaster also occur relatively frequently. Much poor cohesion and adhesion (e.g. exfoliation) of the plaster was also noticed on exterior paintings in Râșca and Baia.

Some very interesting results were obtained from more in-depth study of the phenomena of biological attack, especially that of lichens that can frequently be clearly seen with the naked eye. More on this is contained in the risk assessment section. In Bucovina lichens were observed less frequently on paintings (maybe due to recent restoration) and more frequently on secondary depositions or the stone of plinths and buttresses.

Risk assessment

The field of risk management in cultural heritage has developed considerably in the last two decades (Waller 2003), especially in the field of risk management for museum collections. In the field of archeological and monumental heritage, a very strong concept of condition assessment and risk management, following Brandi's notion of preventive restoration, was designed as part of the Risk Map of the Cultural Heritage (La Carta del Rischio del Patrimonio Culturale) of the Istituto Centrale del Restauro (Castelli 1997). The Risk Map is applied to the whole territory of Italy and is still in development (Baldi, 1):

> "The central idea upon the 'Risk Map' is based on the development of systems and methods enabling maintenance and restoration programs for architectural, archaeological and historical-artistic items with regard to their respective conditions and the harshness of the environment where they are situated. The word 'programming' is used in its literal sense of obtaining useful information to predict, and thus to decide in advance, which measures have to be taken most urgently, with regard to both the time

necessary for execution and to inherent expenses, in order to avoid losses and damage. This requirement is all the more urgent when we consider the importance of Italian cultural heritage, as well as the lack of financial means available for its preservation and the resulting duty of using all available resources to their utmost and overcoming a constant state of emergency. By the time the project is finished, new tools of knowledge and new methods of analysis will be available to the central and local administrations of cultural heritage, which help control and monitor the condition of cultural heritage in order to manage and optimize conservation measures," Pio Baldi, ICR Project Director.

The Risk Map is an example of a good starting point for future more comprehensive analysis of risk, either as a whole or for more specific segments of cultural heritage such as exterior wall paintings.

Below are listed some observations regarding the dangerous predicament of exterior wall paintings in Bucovina and Slovenia. They are based on observations made *in situ* and on information accessed from literature and archive sources. There are three principle risk factors or dangers:

- natural disasters,
- environmental/air danger factors (weathering and air pollution),
- anthropic (human) risk.

Large natural disasters (like heavy earthquakes) and human destruction can leave a great mark on monuments and their wall paintings. Hardly perceivable alterations produced by weathering factors that act slower and are of lower but constant strength are also dangerous. It seems that the biggest damage to late medieval wall paintings still visible on exteriors in Slovenia and Bucovina was caused, over the course of their history, by weathering, poor maintenance and rebuilding and renovations (especially during the baroque period in Slovenia). For more comprehensive risk analyses it is important also to include monuments whose paintings were destroyed, overpainted, detached or are now situated in the interior. Still, in order to make predictions of future dangers, data about past events do not suffice and we need to include different kind of information acquired through interdisciplinary cooperation. Finally, the risk assessment can never be perfect in the sense of a final prediction of future damage since it always leaves room for some uncertainty. However, it can considerably help in planning a conservation strategy.

Natural disasters

At least five groups of natural disasters can be considered important for the monuments in Slovenia and Bucovina: seismic (ground shaking, lateral spreading, etc.), hydrologic (river flooding, drought, erosion, avalanches), atmospheric (hailstorm, lightning, strong winds, thunderstorm), other geologic (landslides and slips, rockfalls) and wildfire.

Both areas are close to areas with a high risk of seismic activity and in the past many earthquakes have affected monuments with exterior wall paintings. In Slovenia the majority of exterior medieval wall paintings are located in the central and northwestern part of the country, where the seismic risk is the greatest.[9]Floods in Slovenia do not normally directly endanger the monuments with exterior medieval wall paintings. In Bucovina some recent events (flood in June and July 2006) indicate that this could be a problem, at least for the monument in Arbore:

> Overall, 600 people had to abandon their homes after severe storms swept across the country. Hardest hit was northern Romania, where up to 100 liters of rain fell per square meter within hours. For example, it rained hard enough to turn a knee-deep stream in the village of Arbore, in Suceava, into a roaring river more than two meters deep.[10]

The droughts that occurred frequently in recent years in Slovenia can also result in damage to monuments. On some monuments (e.g. Brode) it was noticed that the drought produced cracks in the masonry.

For more comprehensive risk assessment various geographical data analysis is needed and more interdisciplinary cooperation.

Weathering and air pollution

In his book *Causes of deterioration of mural paintings* Mora wrote (Mora, 11):

> The most significant causes of change are due to high humidity, whether judged by its frequency of occurrence or by the secondary reactions that may follow in its train.

After studying the decay of exterior wall paintings in Bucovina it became even clearer that the most damaging agents on exteriors are precipitation in close connection with strong winds and the capillary action of moisture in close connection with water-soluble salts. The influence of condensation (also in connection with air pollution) and of direct exposure to sunlight (also in connection with temperature changes) is harder to access. In some respects, sunlight can be considered a salutary factor since on such exposed surfaces it is possible to find fewer microorganisms, as some analyses of the paintings in Slovenia have indicated. Thus the factors or agents of decay for wall paintings can be placed in three groups:

1. Humidity in different forms: precipitation in close connection with wind, capillary moisture, condensation moisture (especially fog and mist)
2. The decay agents closely connected with humidity factors: biological action, water-soluble salts, air pollution (acid rain, etc.)
3. Exposure to light (especially to direct sunlight), temperature changes (especially extreme changes, e.g. freeze-thaw cycle and fire), wind erosion, pollution (dust and deposits), vibrations.

Presentation and analysis of the effects of different risk factors for individual wall paintings can be made in visual form. Some attempts of this kind were made, e.g. on exterior wall paintings in Austria (Eschebach, 85), and more schematically for interior paintings of a certain type of church in Romania (Angelescu and Nagoe, 68-69). An example of a similar visual presentation of risk assessment for the north wall of the church in Moldoviţa is given below (Figure 35).

It is also possible to perform numerical analysis of the strength of the risk factors for a particular segment of wall painting (e.g. in a certain territory) (Table 1). Such assessments are always subjective to a certain degree since they are based on solely visual examination.

Table 1: An example of risk assessment according to precipitation and capillary moisture hazards; the data refer to ten wall paintings on eight churches in the coastal region of Slovenia.

	low	moderate	high
Precipitation + wind	20%	20%	60%
Capillary moisture + salts	10%	30%	60%

However, more comprehensive analyses can be made in close cooperation with experts of different fields. A good example of this approach was a project to study local climatic parameters so as to determine the condition of restorations and conservations of wall paintings for the churches in Voroneț, Humor, Arbore, Moldovița and Sucevița. The project was conducted by the Institute for Meteorology and Hydrology in Bucharest during the winter and summer of 1970.[11] It measured the temperature and humidity of the air and the direction and strength of the wind, and made visual observations of nebulosity and atmospheric phenomena (Ciovică and Tîștea, 1). In addition, some important studies were also performed in the period 1959-1969 (e.g. *Etude pour la determination des causes de l'humidification des murs de l'église de Voronetz – ISCAS 1959, Etude concernant les causes et les suites de l'humidification de l'église de Voronetz – INCERC 1968, Rapport géotechnique sur l'emplacement du monastère de Moldovitza – ISCAS 1969, Avis géotechnique sur le terrain de foundation de l'eglise d'Arbore – TTG 1959, ISCAS 1964, Protection des fresques exterieures par des panneaux – Archevèché de Moldavie 1958, ISCAS 1959,* Istudor and Balș, n.d.).

More indirect agents of decay, such as microorganisms, can also be analyzed. Analysis of visual observations of exterior wall paintings in Slovenia more clearly demonstrated to what extent the orientation and protection from direct sunlight influence the growth of lichens (Figure 36 and Figure 37).

Shady and unsheltered walls are doubtless the most likely target of lichen attack. In spite of this, on some such walls (e.g. Vrzdenec, Valterski Vrh) it was noticed that areas painted in blue were not attacked by lichens. Supplementary laboratory analyses confirm them to have been painted in blue copper based azurite pigment. Since it is known that copper hinders the growth of microorganisms considerably, it is obvious why blue or green (copper based pigment malachite) painted areas of paintings are much better preserved. The question, therefore, is to what extent the absence of microorganisms is the reason for the clearly much better preservation of some blue parts of paintings on the exteriors of the churches in Arbore, Voroneț, Moldovița, Probota and Suceava, or whether it is more a matter of a different painting technique or something else altogether.

Comparative statistical analyses of phenomena on exterior medieval wall paintings in Slovenia brought to light the fact that lichens are often

found on plaster with especially close nets of cracks. However, it is not yet sufficiently clear to what extent lichens contribute to shrinkage and corrosion of the paint layer. Some laboratory analyses of biological attack on painted exteriors in Bucovina were also made in the past (e.g. Lazăr and Dumitru 1973).

Risk assessment for weathering according to the rate of decay

It is impossible to rely on feelings when trying to estimate the extent of change of surface appearance over a period of years or decades.

As early as the 1970s, Garry Thomson proposed a well-conceived photographic method for periodic measurement of surface change on exterior wall paintings in Bucovina (Lemaire et al, 1970). Photographs repeated at intervals and from fixed points could register three kinds of visual changes:

- cracking and loss of surface,
- additions to surface such as efflorescence and dirt,
- change of color.

Regrettably, such systematic monitoring with an appropriate photographic method was not practiced in either Bucovina or Slovenia.

Various additions to surfaces and changes of color such as fading can be yet more accurately measured with spectrophotometer or high-resolution cameras. However, a special method needs to be devised for this particular purpose. Within the framework of the Vrzdenec project some test measurements of surfaces of exterior wall painting were made.

If no such instruments and recordings are available, comparison of older photographs of wall paintings with current situations can be of some use as well. There are of course some difficulties and for this reason the interpretation of the results must be made very carefully,[12] but for rough estimation of surface change this is sufficient.

In general, comparative analysis of photographs of wall paintings in Slovenia has revealed that over a time scale of two or three decades the change is usually not very visible. However, from the distance of five decades or more the alteration of the painted surface is more than obvious. It should be noted that at well-protected locations the change is smaller. Comparative analysis of photographic material from Bucovina does not

show such a high rate of decay. However, it was noticed that some new damage appeared on the surface of the west wall of the church in Humor, and it seems that the area of change of blue azurite to green malachite on the south wall of the church in Voroneț rose a few centimeters (Dumitrescu, 128-130 and 301).

An interesting way to study the rate of decay is by means of a close examination of dated graffiti, as in the painting in Moldovița (Angelescu, 61 and 64).

Anthropic risk

Today the major factors of anthropic risk are vandalism, destructive rebuilding, renovations or repainting, conservation and restoration errors and lack of maintenance. On wall paintings in Bucovina vandalism was a much greater threat in the past than today. The general impression is that the late medieval exterior paintings of Bucovina are less at risk from human intervention than those of Slovenia due to the higher level of attention they are paid.

There are some reasons for this: the (painted) monastery churches of Bucovina represent an important symbol of Moldavian history, they are architecturally and aesthetically unique in some respects, they represent the most important tourist attraction in the area, and seven of them are even on the UNESCO World Heritage list. In addition, as parts of monasteries (with the exception of the church in Baia) they are surrounded by walls with an entrance and are thus better protected from vandalism. On the other hand, for some of the churches not on the UNESCO list (Baia, Râșca) it appears to be harder to find sufficient funds for more regular maintenance and conservation-restoration treatments.

Table 2: Magnitudes of risk according to the type of anthropic risk faced by medieval wall paintings on exteriors in Slovenia and Bucovina.

Medieval wall paintings on exteriors in:	Slovenia			Bucovina		
Type of danger \ Magnitude of risk:	low	moderate	high	low	moderate	high
vandalism		+		+	+	
destructive rebuilding, renovation		+	+	+	+	
conservation and restoration errors	+	+		+	+	
lack of maintenance – important monuments	+			+		
lack of maintenance – less protected monuments		+	+		+	+

Churches in Slovenia are usually more freely approachable but the real threat of vandalism is more likely in areas that are attractive for tourists or school trips (Sv. Janez v Bohinju, Stara Fužina, Bodešče, Vrba). Lack of maintenance is more likely for monuments at more remote locations and is often due to lack of funds. The larger threat of destructive rebuilding and renovation is most likely among owners and caretakers with insufficient sensibility for cultural heritage. The possibility should not be excluded that the risk of damage from human intervention appears more acute for monuments in Slovenia since I am more familiar with conservation and restoration practice in Slovenia.

One deficiency is the lack of more systematic research on past restoration practice and its failures. This knowledge would certainly contribute to further improvements in practice and improve risk estimation.

In general, anthropic risk is harder to predict than the risk posed by natural factors.

Preservation concepts and approaches

The idea of preserving and renovating cultural heritage can be seen throughout history, with only the concepts sometimes changing. In Slovenia, for example, painters like Jernej of Loka or Master of Podpeč were renovating the wall paintings of older medieval masters as early as the end of the middle Ages. In this example the term renovation should be understood more in the sense of refreshing or repainting faded original paintings. In later centuries the renovation of wall paintings was again usually understood in the sense of a repainting while more or less faithfully following or respecting the original. Many examples of repainting can also be found of painted churches in Bucovina (e.g. on the exterior of the church in Râșca).

More organized protection of cultural heritage began in the middle of the 19th century with the creation of the *Central Commission for the Protection of Historical Monuments* in the Austro-Hungarian Empire in the year 1850. This fact is important since both Slovenia and Bucovina were part of the Empire until 1918 (n.b. Râșca, Baia and Probota were not part of *Herzogtum Bukowina* territory). The commission named honorary conservators for each duchy or kingdom of the Empire. But the Commission had no legal power or legislative body since no law on the protection of monuments had been accepted, as opposed to the Hungarian part of the Empire. The same is true of the later establishment of the *State Office for Monuments* in 1911. During this time we still see many examples of renovation of wall paintings in the sense of repainting but also approaches that are closer to the modern concept of conservation and restoration with more respect to the original. Today it is not hard to criticize some of the failures of these early restorations, but we should take into consideration that the knowledge and materials used in conservation and restoration at that time were less developed than they are today.

Most prominently at the turn of the century, debate centered on the idea of "to conserve not to restore" introduced by Georg Dehio (today this notion is understood more in the sense of "to conserve not to reconstruct"). The "Vienna School" with Alois Riegel and Max Dvořak also spoke out more in favor of conservation. This idea probably also contributed to a more cautious approach to wall painting conservation, as seen in the example of restoration of medieval wall paintings inside the church at St. Primus near Kamnik at the beginning of the 20th century (Stele, 20). One positive effect of this was a more preventive way of

thinking and acting, for instance in looking to achieve better protection from weathering by use of prolonged cornices, additional roofs, etc.

A lot has been written about the interwar and later establishment of the office for the protection of cultural heritage and its work either in Romania or Slovenia. Here I will mention only some of the more interesting facts:

In interwar Romania, the development of the conservation of cultural heritage owes a great deal to the role of the historian Nicolae Iorga, with the assistance of personalities like George Balș, Nicolae Ghica-Budești, Horia Teodoru, etc (Drăguț 1980, 7). After the Second World War, three important incidents affected the future approach to conservation of exterior wall paintings in Bucovina. One of these was the establishment of very close cooperation with the *International Centre for Conservation of Rome (ICCROM)* in 1970s. At the time there were many visits and missions by experts from the ICCROM including workshops held in cooperation with the ICCROM for the painted churches of Bucovina. This led to the exchange of views and the training of Romanian restorers, either in Romania or in Rome. This was accompanied by the adding to the UNESCO World Heritage List of seven monuments with interior and exterior wall paintings as examples of unique artistic achievement and outstanding examples of the historical period. In many ways this is important for the future conservation of the monuments. One negative event was the termination of the service for the protection of cultural heritage in Romania in 1977. This put an end to or interrupted some planned projects. (The service was reestablished at the beginning of the 1990s.)

In the interwar period, most of Slovenia was part of the newly formed state of Yugoslavia. The new office for the protection of monuments inherited the structure of the former one. Again, the law for protection of monuments was not accepted during this period. At the time the most important role was played by the art historian France Stele in his capacity as chief conservator. Though closely connected with the "Vienna School" his approach to cultural heritage conservation was less strict in the sense of the "to conserve not to restore" notion.[13] In the development of restoration, there were some important events soon after the Second World War when the Restoration Atelier of the *Institute for Protection of Monuments* and postgraduate study in restoration at the *Academy of fine Arts* were established. In terms of the preservation of exterior wall paintings, one important event was the round table meeting of Slovenian experts in 1989.

At this meeting it was agreed that wall paintings on exteriors were more endangered than other examples of cultural heritage and that there were different reasons for this situation. They also agreed on the need for:

- a systematic approach to asses the number of items (e.g. establishment of register of monuments),
- monitoring and evaluation of wall paintings according to the state of preservation (condition assessment),
- documentation of state of danger and decay (risk assessment),
- fundamental analysis using a methodological and interdisciplinary approach,
- analysis of possible conservation solutions (preservation in situ, detachment and dislocation, copistics),
- improvement in social attitudes to heritage.

Although the idea of a more systematic approach to the preservation of exterior wall paintings was quite well articulated, a lot of work is still needed in this area.

For example, the case of registers: when searching for locations and other information on medieval exterior wall paintings, the starting point might be the national databases of cultural heritage. This database in Slovenia represents the *Register of Immovable Cultural Heritage* and is freely accessible via the Internet. It currently provides only basic information about the monument: name, location, type and short description, etc.[14] There is a similar situation in Romania: there are two on-line databases that are clearly connected: *The Christian Architectural Heritage List* and *Historic Monuments Proposed for Restoration (1996-1998)*. The idea is for similar databases to become part of a much larger information system where data about current and past conditions of a monument and its components (e.g. wall paintings) can be accessed in the form of information retrieved from archive sources and permanent monitoring. In case of permanent or periodical on field monitoring, condition and risk assessment could be made each time.[15]

We should note the similarities and differences in conservation practice for wall paintings on exteriors in Bucovina and Slovenia, either in terms of more preventive conservation treatment or active conservation or restoration.

The most commonly observed actions taken to protect wall paintings from precipitation are the addition of roofs or extension of existing roofs and cornices. In most cases the cornices of monuments in Bucovina were

extended considerably following the Second World War. After realizing that the main reason for decay in Bucovina was precipitation in combination with strong winds that damage the surface of paintings, proposals were made as to how to minimize the destructive action of wind. First, more detailed proposals were made in the 1950s by Romanian experts and then again in 1970s by Paulo Mora from the ICCROM (Lemaire, 12-13). It was eventually realized that any action of this nature would affect the view of the monument considerably. It was then agreed that this should be the last solution chosen after careful study of the situation and exclusion of all other solutions.

Reduction of the capillary action of moisture is usually achieved by different types of drainage. Many churches in Slovenia still lack any kind of drainage system. Another solution often observed in Slovenia is to cut off the plaster to expose the inferior segment of the masonry. Less frequent is use of air vents placed at the base of the wall.

Certain differences were noted in terms of the restoration of wall paintings, for instance in the approach to the original painting. While in Slovenia more stable but also more difficult to remove or less reversible synthetic binders were normally used for retouching, the impression is that in Bucovina the aquarelle technique is more commonly used. Retouching is also more consistently used on non-original, newly plastered material. The less stable aquarelle technique poses certain problems on exteriors, and for this reason the plaster that filled the lacuna is sometimes already toned (e.g. in Sucevița), but this solution is only possible to limited degree.

While the detachment of wall paintings from famous monuments in Bucovina is hard to imagine, there are some examples of more recent detachments in both Bucovina (e.g. Baia) and Slovenia. Over the last 15 years, some 10 exterior medieval wall paintings in Slovenia were detached and transposed to other locations (Figure 40). Sometimes a copy replaces the original, as in the example of St Christopher on the south wall of the presbytery in Vrzdenec (Figure 16).

Conclusion

After our comparison of late exterior medieval wall paintings on churches in Bucovina and Slovenia, it is possible to draw some conclusions.

Most paintings in Bucovina were painted between the 1530s and 1550s (with the exception of the later paintings in Sucevița), with only a small number of paintings in Slovenia being from this period. The other paintings were painted earlier (from the beginning of the 14th century to the beginning of the 16th century).

In Slovenia medieval paintings on exteriors mostly still exist on small and remote village churches where the quality of the masonry can be inferior and the selection of pigments less rich when compared with the monuments in Bucovina. This is especially true when we compare the palette and gold leaves used on paintings in Bucovina. On the other hand, the paining technique used alone is not so different that it could be said that this for sure influenced the rate of decay.

It is clear that wall paintings in Bucovina are not considerably better preserved than those in Slovenia. From a rough estimate of the condition of the paint layer, it is normally clear that not much more than half of the whole painted area on the church is better preserved. However, the areas of preserved paintings are larger since the churches are usually bigger and higher and painted all over, from the plinth to the cornice. Interestingly, paintings on the southern side in particular, as well as some on the western and eastern sides, are also quite well preserved. This is all the more interesting given that the majority of these were never whitewashed, overpainted or overplastered. It is known, for example, that at least 80% of all medieval paintings still visible on exteriors in Slovenia were still covered at the beginning of the 20th century. Although paintings are in some way better protected under whitewash, uncovering them again can also put stress on the painting and cause new damage.

Exterior medieval wall paintings in Slovenia are spread over different types of construction (churches, chapels, shrines, houses) and different sides of the exterior, and this makes analysis of decay more difficult. On the other hand, this provides a very good opportunity to study late medieval churches in Bucovina, which are more unified, with paintings still preserved on all sides (at least for a majority), from top to bottom, exterior and interior. From this point of view, these churches are ideal for the visual study of the influences of different decay agents. There are of course some climatic differences between Bucovina and Slovenia, even within Slovenia itself. But the basic nature of decay is always the same.

It became clear that the capillary action of ground moisture and precipitation combined with wind are the biggest factors of decay. The extent of the effect of capillary moisture alone, which usually only reaches

a certain height on the wall, is harder to establish on exterior paintings due to the presence of many other mutually acting factors. For this it is better to look at the wall under the vault of the porch or, better still, inside the church, where the height of the capillary moisture and the water-soluble salts it carries within it is clearer. It should be noted that this height reached may be different on the south or north wall, the exterior or interior side of the wall.

In Bucovina, it seems that the destructive effect of precipitation is much stronger than the effect of capillarity. Any doubts as to its role vanish as soon as we look at the north lateral apse wall at Humor, where the shape of the edge of badly preserved painting depends precisely on the shape of the cornice of the roof.

There are however some questions that can not be solved purely by visual examination. The question remains open as to the extent to which salts have contributed to alteration primarily due to capillary moisture and to what extent microorganisms have contributed to damage primarily due to the effect of moisture in general. For examples in Slovenia (e.g. Vrzdenec) and Bucovina (e.g. Probota) it was noticed that paintings in blue were better preserved than those parts painted using earth pigments, which runs contrary to expectations. However, we come to understand this when we learn that azurite contains copper, which does not encourage the growth of microorganisms. It may be possible to find other reasons for the better durability of blue azurite on exteriors in Bucovina. And there are certainly other factors at play, implying the need for further research (e.g. air pollution).

At any rate, the strength of various agents of decay differs from monument to monument. It can vary considerably depending on different local conditions, such as the height of the water table, the spread of precipitation and number of foggy days per year, the strength and direction of the wind, etc.

In the past, various measures were taken to stop or at least slow the further decay and alteration of exterior wall paintings. The most commonly noticed preventative measure of this kind was additional protection from precipitation and the use of different systems of protection from capillary moisture. The most common form of direct intervention is consolidation of the plaster and paint layer. The effect of these and other measures would clearly be better if the approach adopted were more systematic in terms of the monitoring and analysis of condition and risk and the suitability of past interventions. This more prevention-oriented approach seems a

normal and more suited procedure for use on better-preserved paintings. However, the question arises as to how to deal with paintings that are in a pretty low state of preservation – namely, the group in which fall the majority of medieval exterior wall paintings in Slovenia and many segments of the wall paintings under study in Bucovina.

In these cases, three major aspects of the work of art should be taken into consideration before a decision about its future (if any) is taken: aesthetic, historical and symbolic. These free aspects can easily come into conflict in the case of badly preserved works.

From a historical point of view, the most important matter is to preserve the material witness of the past, with all its contents and changes. In this sense, from a strictly conservational point of view, the painting should be preserved as it is, in the same place, and with all later additions such as repainting and restorations, and with now further addition or interventions allowed. The painting should be carefully whitewashed or detached only if there is no other way to preserve it.

From an aesthetic point of view, the most important thing is to preserve or recreate the original visual appearance of the work of art. In this sense, the original image of the work of art should be reconstructed. If good photographic documentation of a one-time better-preserved original painting exists it is then possible to make a copy, otherwise reconstructions can be made from analogies. From an aesthetic point of view, it is also important, for example, for a reconstructed wall painting to remain in its original place on the monument, since the image forms an aesthetic unity of the monument. From a strictly aesthetic point of view, the original can be destroyed, whitewashed, overplastered or detached. The most important matter is original likeness.

From a symbolic point of view, the most important issue is not to preserve the material witness of the past, nor the original likeness, but to preserve what it symbolizes. For this reason many badly preserved paintings were destroyed or covered and in their place an image painted with the same religious or symbolic meaning (e.g. another image of St Christopher). The exact position of the new painting in comparison with the original one is not normally important. It is also not important if the painting is a copy, reconstruction or variation of the original. If values change, or for any other reason, the painting can be replaced by one with another meaning.

Figure 1: Spodnje Bitnje, Slovenia; church of St. Nicholas with an early 16th century wall painting of St. Christopher on the south façade (painted by Jernej of Škofja Loka).

Figure 2: Arbore, church of Decollation of St. John the Baptist, Bucovina; wall painting of St. Christopher on the east façade of the wall of the altar apse. This is the only preserved exterior depiction of St. Christopher in Bucovina from the late Middle Ages (painted by Dragoș Coman of Iasi, 1541).

Figure 3: The remaining medieval wall paintings in Slovenia are in most cases on the exteriors of sacred monuments (churches, chapels and shrines). To the side can be seen a wall painting from the façade of the castle, the civic house and the rural house. The state of preservation of these paintings differs considerably: from small fragments of only a few cm^2 to large areas covering the entire wall.

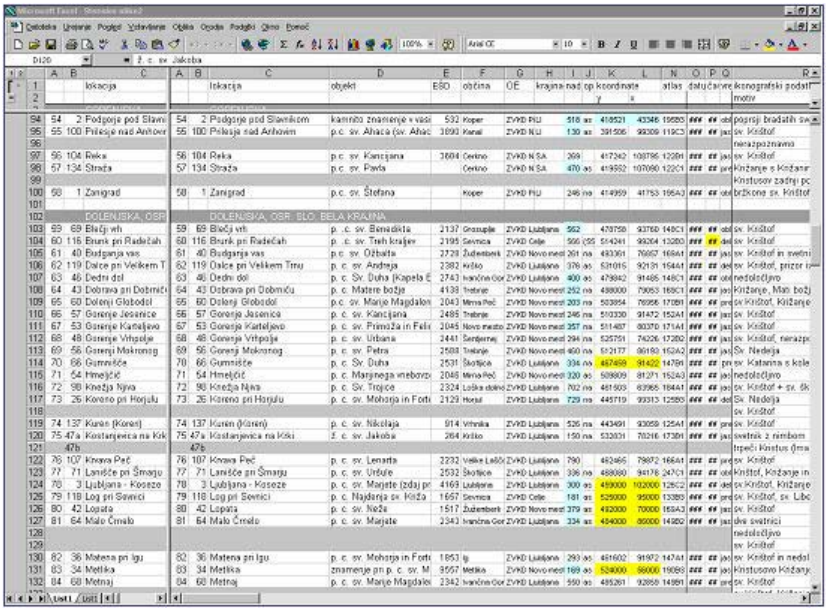


Figure 4: The database on medieval exterior wall paintings from the beginning of the 14th to the first half of the 16th century in Slovenia was taken as a starting point for further analysis.

Figure 5: Monuments in Bucovina with exterior wall paintings that were part of the research; Arbore, Baia, Humor, Moldovița, Pătrăuți (first row), Probota, Râșca, Suceava (St. John Monastery), Sucevița, Voroneț (second row).

Figure 6: Church of the Dormition of the Virgin at Humor; collage of three photographs – (left) segment of interior wall painting, (center) faint fragments of paintings on western façade, and (right) exterior paintings protected by the vault of the porch (all painted by Thomas of Suceava or his workshop between 1530 and 1535).

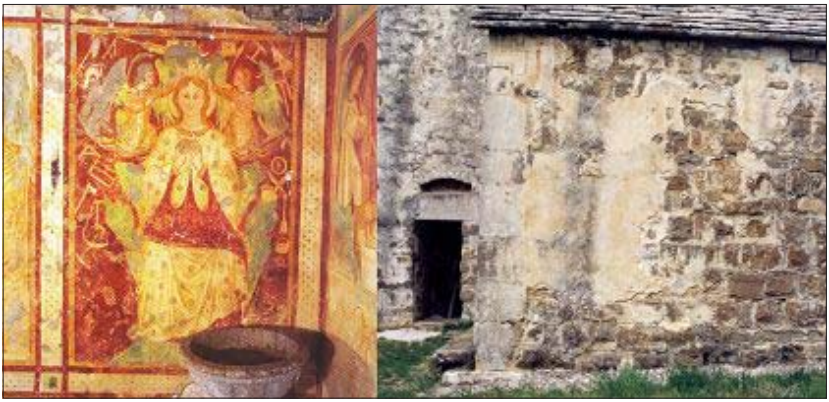


Figure 7: Church of St. Stephen at Zanigrad: this shows an extreme example of difference in preservation for wall paintings painted by the same author and on the same wall, inside (left) and outside (right).

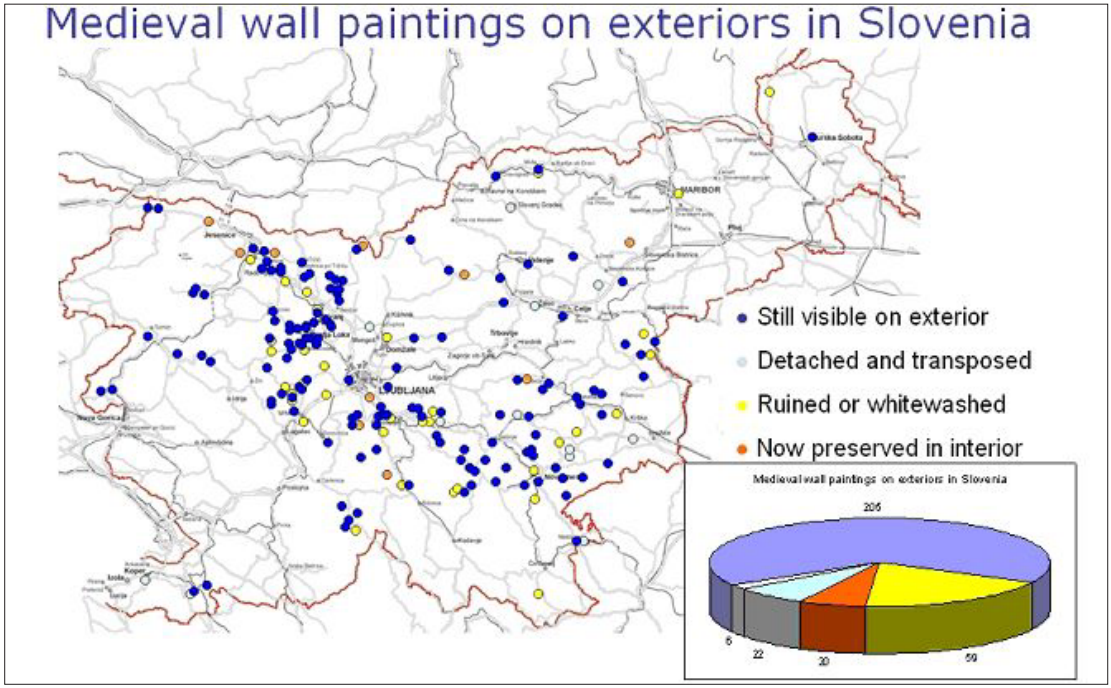


Figure 8: Map of Slovenia showing locations of medieval exterior wall paintings and their current condition (drawn using data collected from the literature, archival sources and field examination. N.b. monuments marked by a dark blue dot may also contain paintings that were whitewashed, destroyed, detached or are currently found in the interior.

Figure 9: Church of St. Urh at Vihre. South wall of the nave; example of irregular composing of stones.

Figure 10: Church of Sts Primus and Felicianus at Gorenje Karteljevo. South wall of the nave; example of stratified composing of stones.

Figure 11: Church of the Dormition of the Virgin at Baia, southern wall; clearly visible masonry where wall paintings were detached.

Figure 12: Church of St. Nicholas at Rasca, southern wall; cut straw in the plaster.

Figure 13: Church of St. Martin at Zalog, southern wall; particles of crushed brick in the plaster that caused damage in the form of eruptions.

Figure 14: Church of St. George at Voroneț, south façade; application of nimbus with some traces of surrounding gilding.

Figure 15: Church of St. Cross at Sv. Kri, west façade;
use of stencil on garment of St. Christopher.

Figure 16: Church of St. Kancian at Vrzdenec; samples taken from the south façade and from other sides for instrumental analysis in the laboratory.

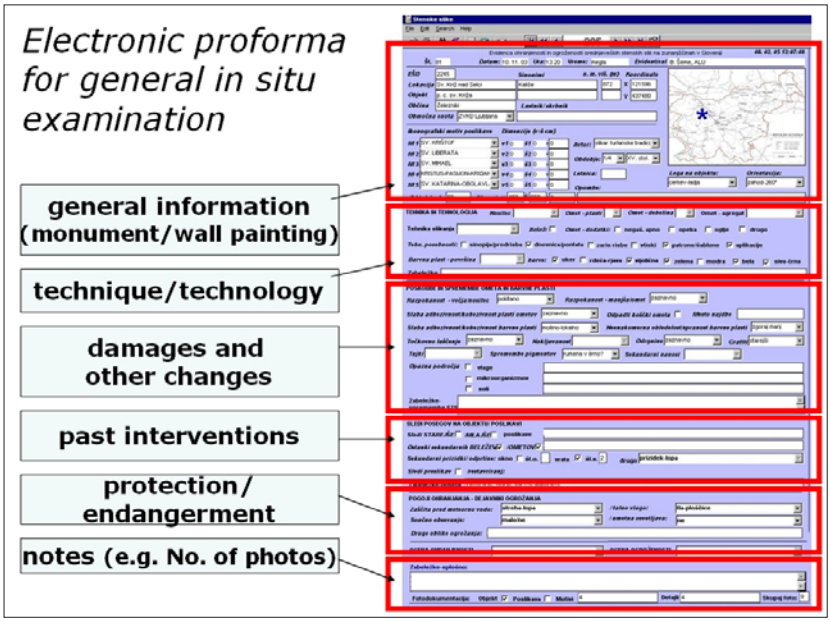


Figure 17: Electronic pro forma for general in situ examination of medieval wall paintings of Slovenia.

Figure 18: Postcards from Bucovina, showing the “brighter” sides of the monuments.

Figure 19: The painted monuments of Bucovina (Humor, Voroneț, Moldovița, Arbore, Suceava, Probota) showing sides with less well preserved exterior paintings.

Figure 20: Crngrob, “Red shrine”; the shrine together with the northern (left) and southern sides (right).

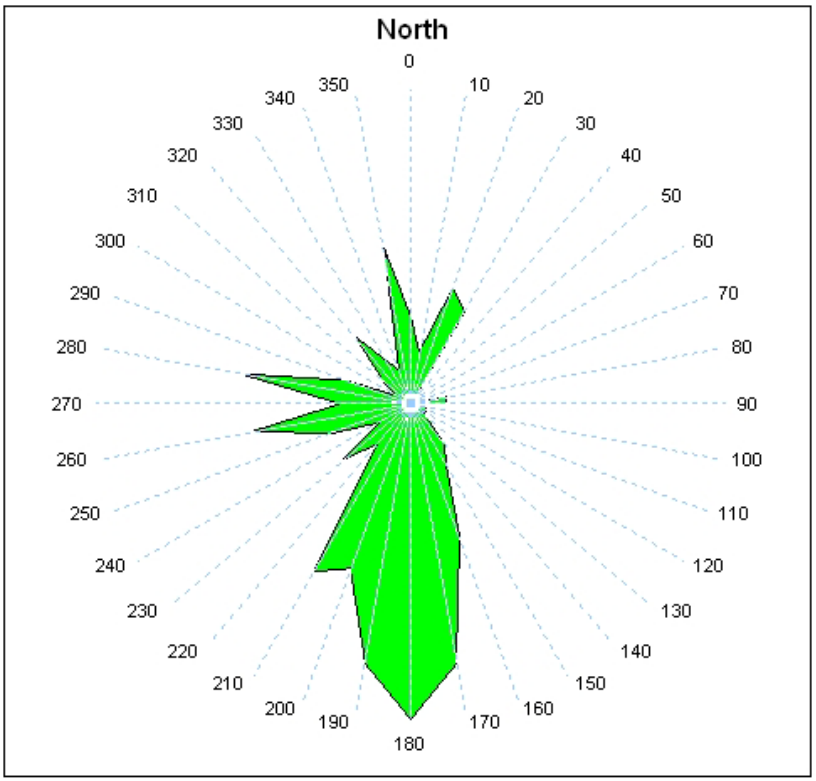


Figure 21: Orientation of walls with exterior medieval wall paintings in Slovenia.

Figure 22: Different degree of protection of exterior wall paintings from precipitation for medieval monuments in Slovenia.

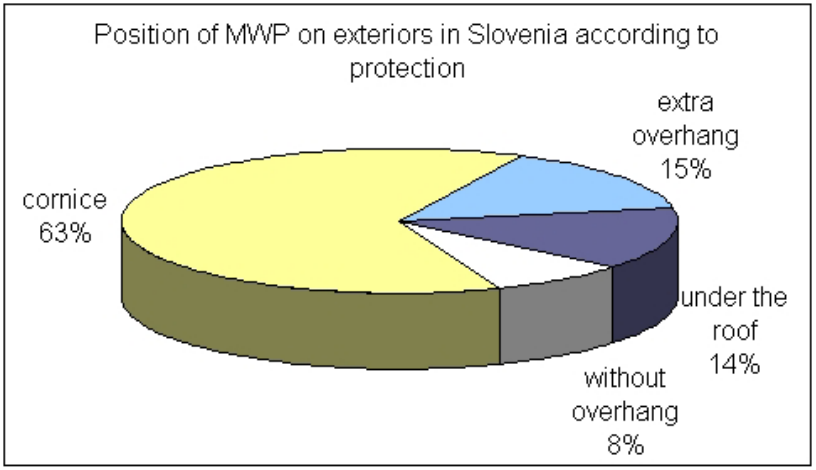


Figure 23: Position of medieval wall paintings in Slovenia according to the protection from precipitation and direct exposure to sunlight.

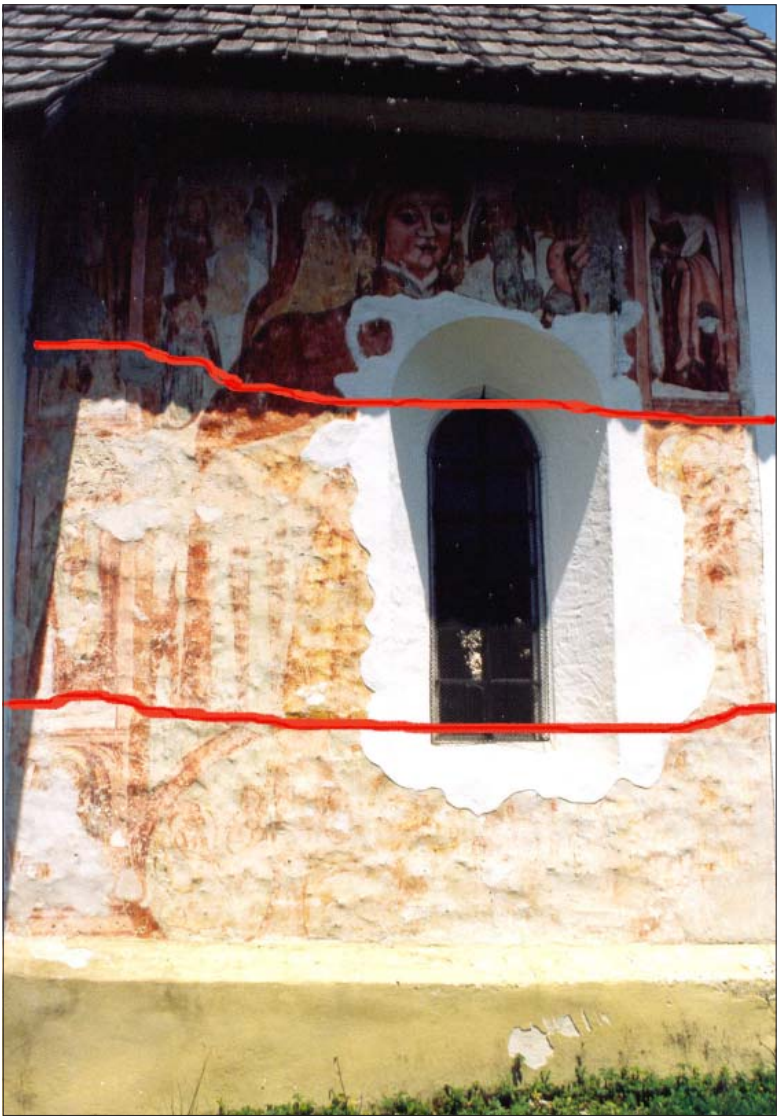


Figure 24: Church of Mary Magdalene at Brod in Bohinj, southern side of the presbytery; the lowest section of the painting is marked by combined influence of capillary action of ground moisture and precipitation.

Figure 25: Church of the Assumption of the Virgin at Humor, eastern side of the apse; the size and the shape of the highest and the best preserved section of the painting is also affected by the semicircular shape of the apse and consequently the shape of the cornice that protects the paintings from precipitation, stronger winds and direct sunlight.

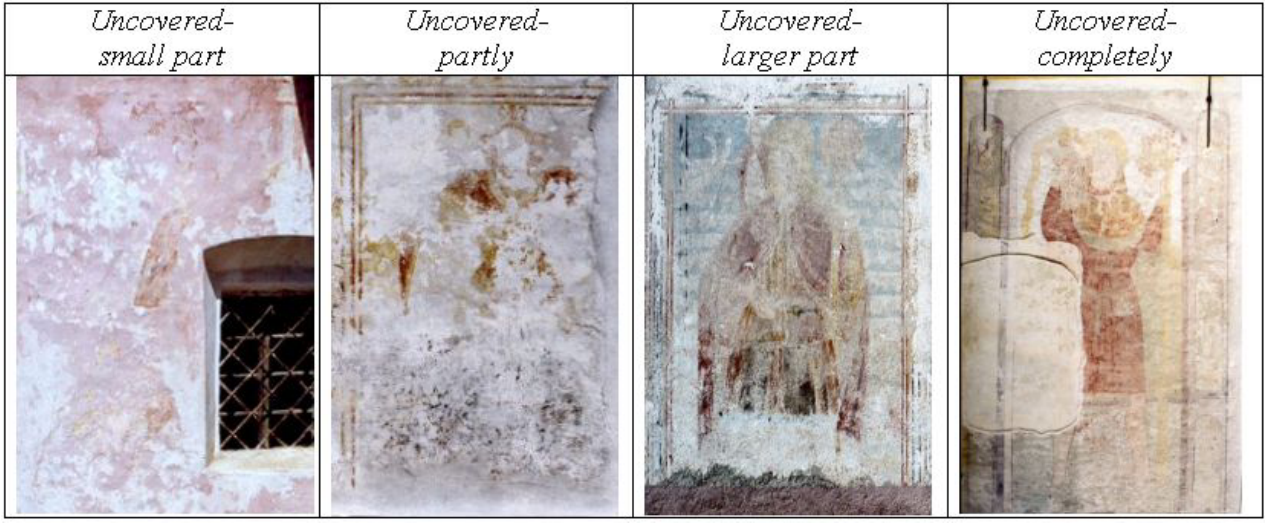


Figure 26: Different extents of uncovering from plaster, white wash, overpainting or other secondary depositions.

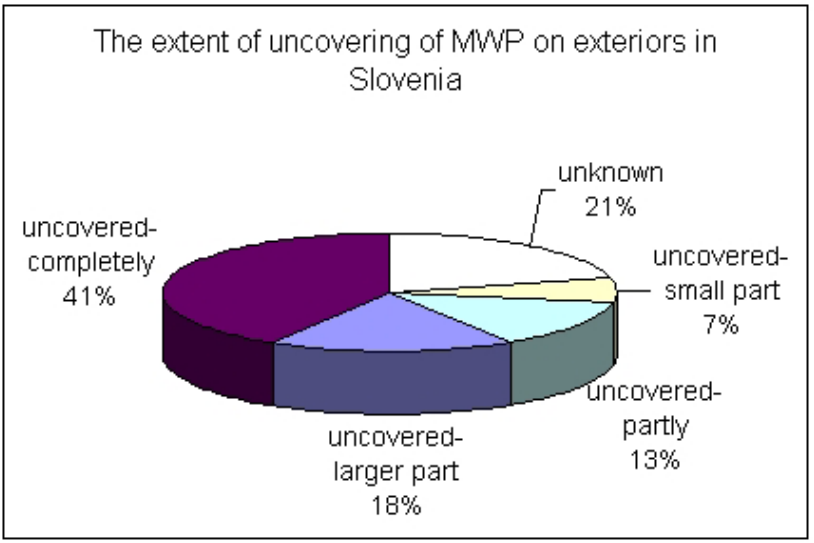


Figure 27: The extent of uncovering from plaster, white wash or overpainting of exterior medieval wall painting in Slovenia.

Figure 28: Church of the Assumption of the Virgin at Baia, southern wall;
some parts of undetached painting are still under the whitewash.

Figure 29: Church of the Feast of the Annunciation at Moldovița, northern wall; thick whitewash or very thin plaster that covered the remnants of original painting also flaking off the wall.

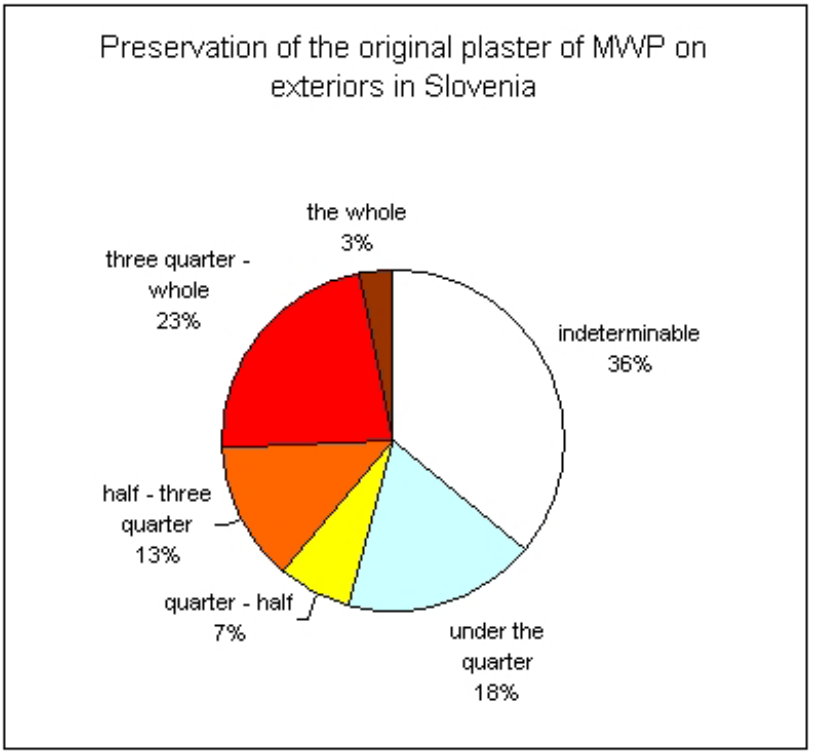


Figure 30: Distribution of medieval wall paintings on exteriors in Slovenia by the degree of preservation of the original plaster.

Figure 31: Visual presentation of the scale for different degrees of paint layer preservation. This can be used in condition assessment of wall paintings in the field.

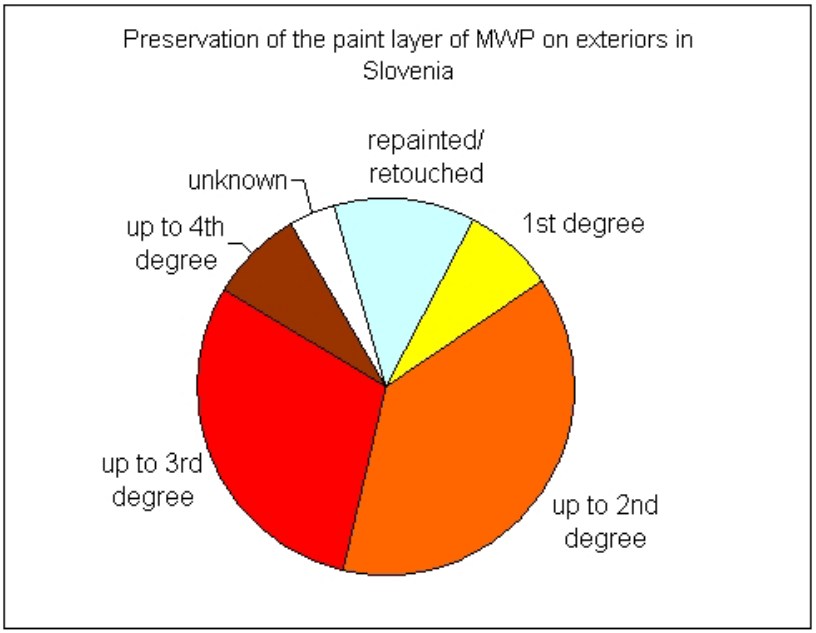


Figure 32: Distribution of medieval wall paintings on exteriors in Slovenia by the extent of preservation of the original paint layer.

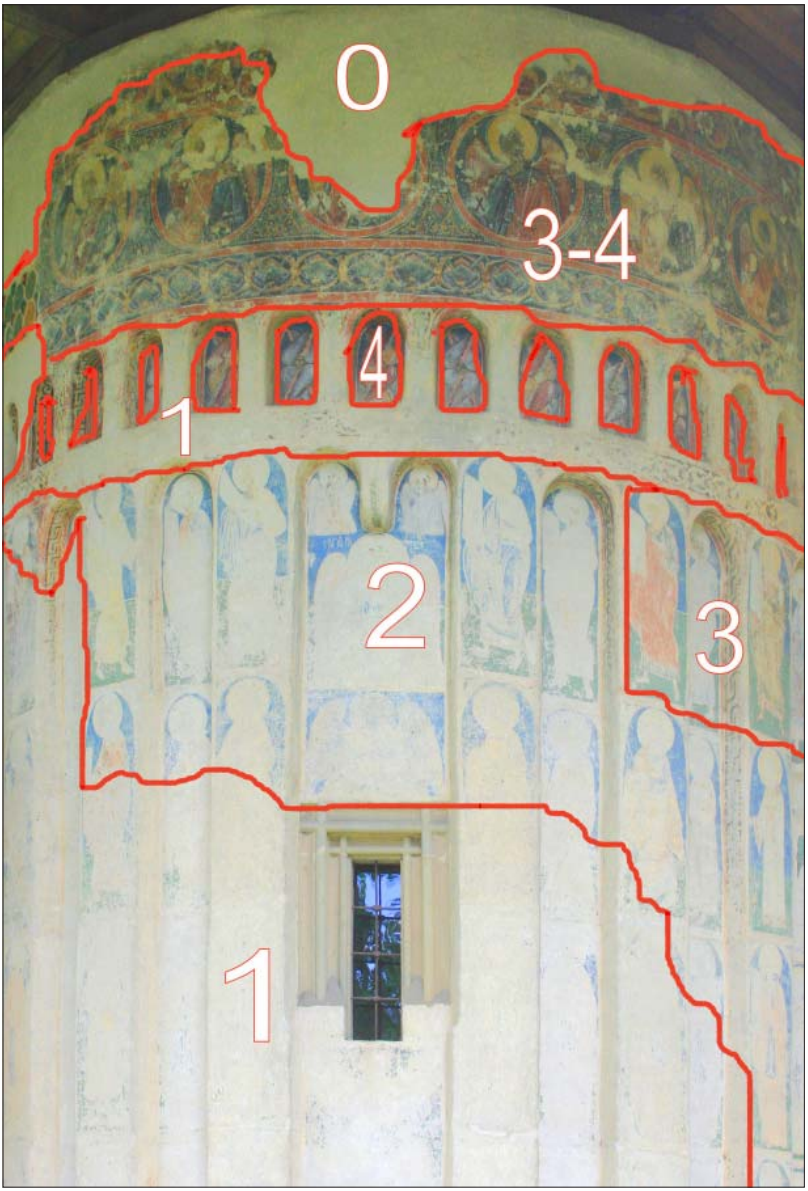


Figure 33: Assessment of condition of the paint layer on the north apse of the church in Voroneț.

Figure 34: Church of the Beheading of Saint John the Baptist Arbore; southern apse;
the surface painted with blue azurite is much better preserved than surfaces in other colors.

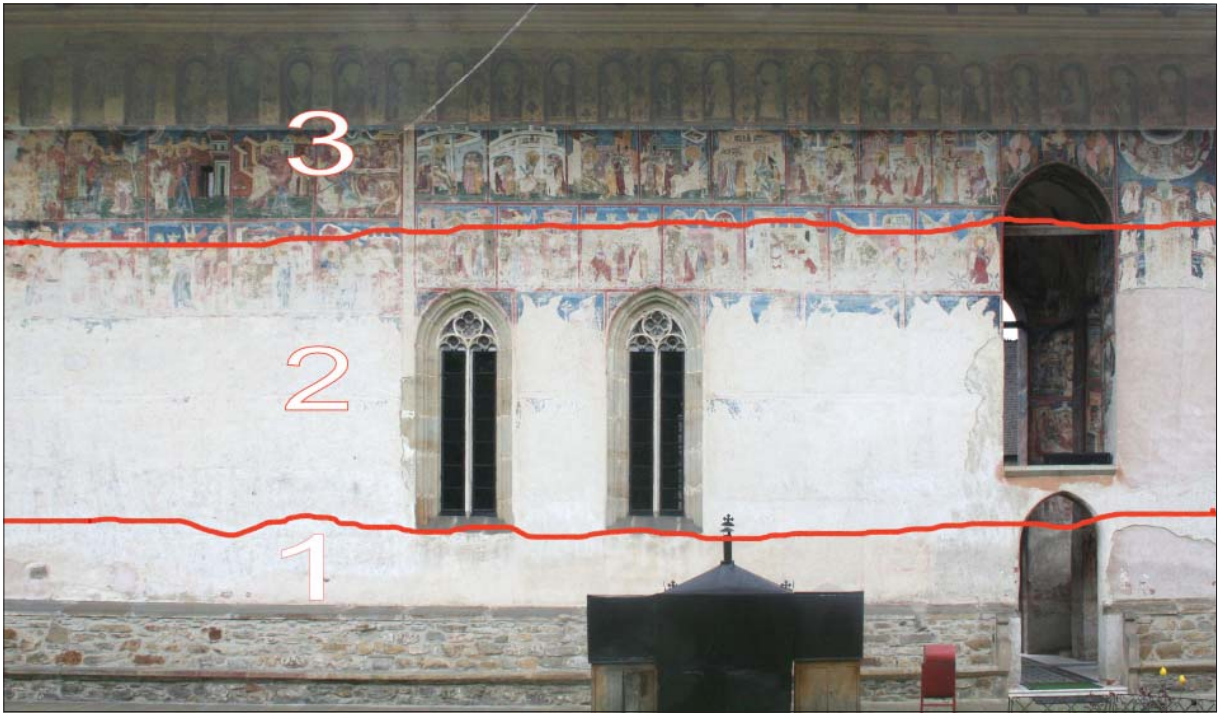


Figure 35: Church of the Feast of the Annunciation at Moldoviţa, north wall; more schematic risk assessment for different areas, (3): minor risk factors, (2): minor risk factors plus precipitation with strong wind and biological attack, (1): as for (3) and (2) plus capillary moisture with water soluble salts.

Figure 36: Phenomena of lichens with regard to orientation of wall paintings; from left to right: north (sever), east (vzhod), west (zahod), south (jug).

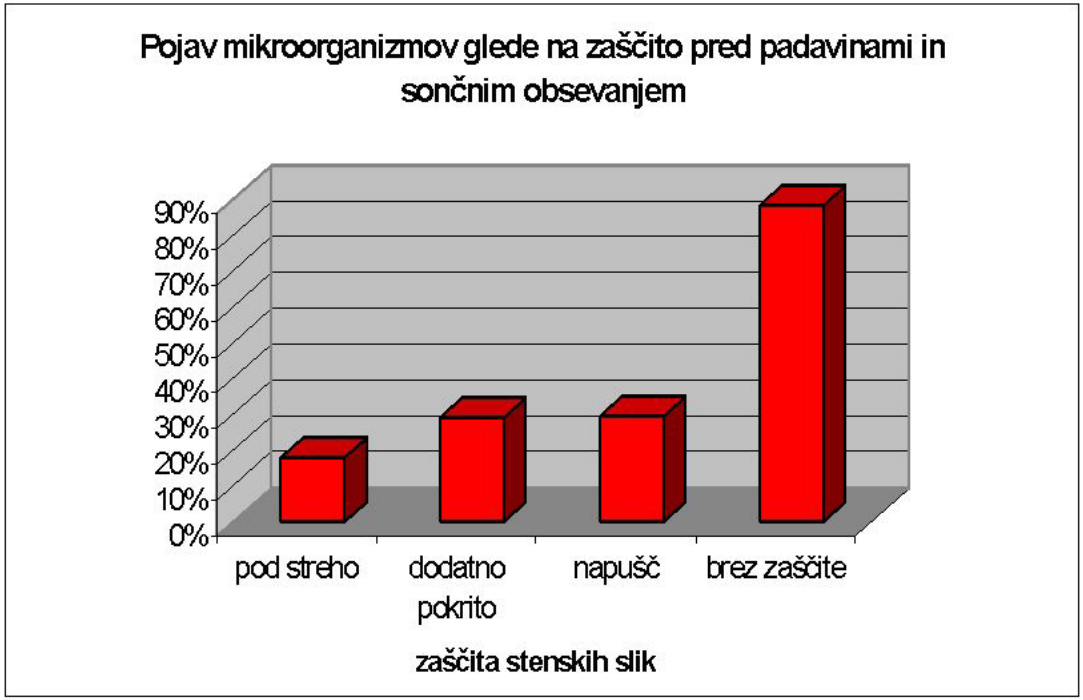


Figure 37: Phenomena of lichens with regard to protection from precipitation; from left to right: under the roof (pod sterho), extra overhang (dodatno pokrito), under the cornice (napušč), without overhang (brez zaščite).

Before 2nd world war

(Archive of Umetnostnozgod. Inšt. F. Steleta pri SAZU (F. Stele))

After 2nd world war

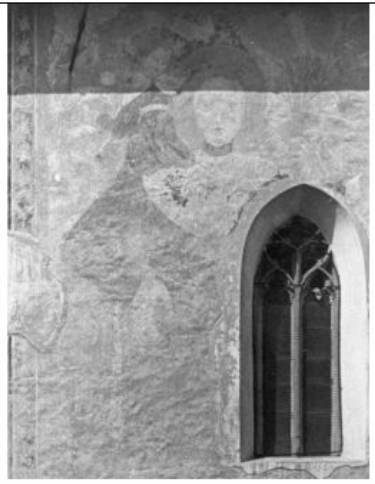
(Archive of Umetnostnozgod. Inšt. F. Steleta pri SAZU)

2003

(Photo: B. Š.)

Figure 38: Church of St. Leonard at Bodešče; the rate of change in surface appearance over a timescale of about eight decades.

Before 2nd world war
(Archive of Umetnostnozgod. Inšt. F. Steleta pri SAZU (F. Stele))



After 1959
(Photo archive of Dep. for Art History, Faculty of Philosophy, Univ. of Lj.)

2003
(Photo: B. Š.)

Figure 39: Church of Mary's Announcement at Crngob, the rate of change in surface appearance over a timescale of more than five decades.

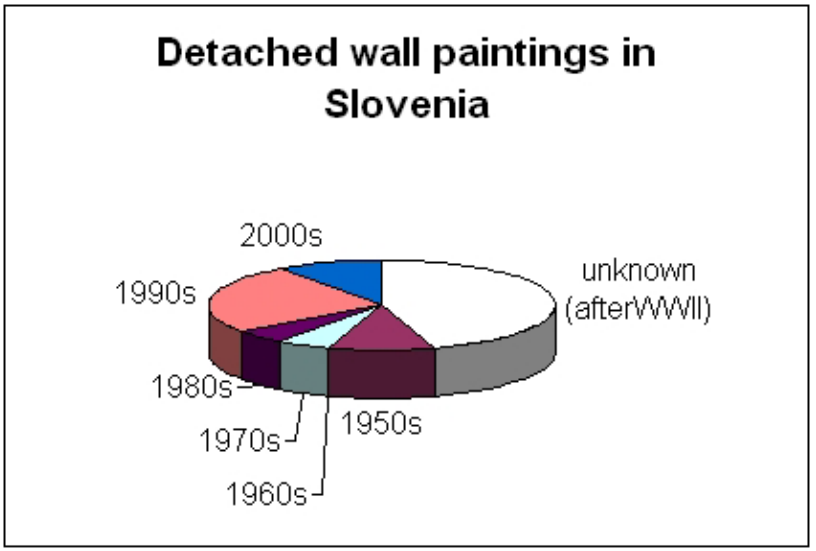


Figure 40: Detachment of exterior medieval wall paintings in Slovenia.

Figure 41: St. John in Bohinj (Ribčev Laz), south wall of the nave; four fragments of images of St. Christopher have been preserved – the first three paintings from the middle ages (on the left of the wall) were painted one over another, the last painting dates from the baroque period and was painted next to them on the right hand side.

NOTES

1 Bridget Heal, *Images and Religious Communication in a Sixteenth-Century German City*, paper presented at the New Europe College in Bucharest on 23 June 2006, p. 1.

2 The results of the research could be used to guide any possible future creation of an interdisciplinary database on wall paintings in Slovenia. This could be very useful to researchers dealing with cultural heritage in either the field of humanities or the natural sciences.

3 In terms of the age of the exterior wall paintings studied in Bucovina, the paintings in Sucevița are much later than the others. They were painted in the 1590s, while the exteriors of the other churches were painted between the 1530s and 1550s. From many points of view (e.g. iconographical), the painting in Sucevița is still very close to earlier painting and can be considered "the will of old Moldavian art" (Ogden 2001).

4 Sometimes this gives an impression that outdoor cultural material is a third-rate material with solely a temporal and more decorative function. This is of course not true for the exterior wall paintings of the seven Moldavian monuments (Probota, Pătrăuți, Voroneț, Arbore, Suceava, Humor, Moldovița) added to the UNESCO World Heritage List in 1993.

5 Similarly in Schmid, 1-3.

6 Fortunately some churches have preserved medieval paintings all over their interiors (e.g. the church in Hrastovlje).

7 There are many reasons for this: the shrine is in a forest and therefore partially shielded from direct sunlight and wind, the lower level of ground moisture can rise almost to the top of the painting, etc.

8 This was observed in the reports by the ICCROM experts (Mora, Philippot & Thomson) and (Schmid).

9 Following the earthquakes of the last two decades, the *Regional Office for the Protection of Cultural Heritage* in the northwestern region of Slovenia conducted more accurate monitoring and photographic documentation of the effects of earthquakes on immovable cultural heritage. At the time some structural damage on exteriors (mostly cracks in the masonry) were recorded.

10 http://www.reliefweb.int/rw/RWB.NSF/db900SID/VBOL-6RCGHD?OpenDocument&rc=4&cc=rou
Source: Deutsche Presse Agentur (DPA), Date: 03 Jul 2006.

11 The exact title of the work is "*Studiul parametrilor climatici locali pentru stabilirea condițiilor de restaurare și conservare a picturilor murale ale unor monumente istorice din Bucovina" (l'Etude des parameters climatiques locaux pour la determination des conditions de restauration et de conservation des peintures murales de certains monuments historiques du nord de la Moldavie*), 1970?, *MAS-DIFGA, Institut de meteorology et hydrologie*.

12 It should be noted that in the past wall paintings were often wetted before being photographed. In addition they were photographed from different angles, with different exposures to light, with different films used, etc. It is also only possible to perceive certain types of surface change.

13 For example, in respect of the original and removal of later additions or the faded original and its color additions with restoration, different decisions can be taken depending on each individual situation.

14 Source: http://fjz1.web.siol.com/Rkd_212/Zacetek.asp (15.7.2006). Unfortunately it is impossible to run a search according to type of artistic heritage (wall painting, mosaic, sculpture, etc.) or age of the monument.

15 A good example of such an information system for wall paintings is the database for medieval wall paintings (with possible future extension) in Lower Saxony in Germany.

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