

FRESCO WALL PAINTING AND ITS REGIONAL MODIFICATIONS

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Abstract

The article analyses the regional specific features of fresco mural painting. Comparison of ancient Chinese and Kyivan Rus frescoes and shows their differences; proves that the borrowed art (introduced Buddhist in China and Byzantine in Kyivan Rus) undergoes modifications in the technique of execution and plot-image concept on the local ground. The study aims to analyse the source base and, based on its processing, field surveys and existing practical restoration experience, to determine the characteristics of production technologies and restoration techniques of Kyivan Rus mural painting. The scientific novelty of the research lies in the introduction into a wide scientific circulation of narrow-profile restoration documentation of the historical and architectural monuments of the pre-Mongol era in Ukraine, which are included in the UNESCO World Heritage List.

Keywords: *Kyivan Rus frescoes; Regional features; Production technology; UNESCO the World Heritage List; Cultural heritage; Preservation and restoration*

Introduction

The issues of the study of fresco mural paintings are directly related to the need of their conservation and museification, as well as preservation of the original appearance of the object, their location points, which is reflected in the publications of *P. Spiridon and I. Sandu* [1], *P. Spiridon et al.* [2], *L. Pujia* [3] and *V. Petruşonis* [4]. This aspect should be considered according to the concept of art in the restoration industry and the general principles of preservation and restoration of works of art, highlighted in the publications of *M. Orlenko and Yu. Ivashko* [5], *Yu. Ivashko et al.* [6], *I.C.A. Sandu et al.* [7] and *O. Florescu et al.* [8].

The objective of the presented research was to highlight the process of regional modifications of fresco murals. The phenomenon of the modification of borrowed fresco techniques, both in terms of the figurative concept and the technology of making murals, is the defining attribute of various civilizations. Each country has certain features of fresco murals. And not only do the murals of different countries differ, but the murals of different periods of one country vary a lot. It can be clearly seen in the mural paintings of Ancient China, which were assembled from fragments as stationary; and their figurative concept changed many times depending on the religious and political doctrine, and in the murals of Kyivan Rus, starting from Byzantine models to further modified paintings on the local ground.

This aspect of the specificity of Chinese mural painting, the correspondence of the decor to the architectural forms, and the forms to the constructive schemes was noted in the publications by *M. Orlenko et al.* [9], *M. Krupa et al.* [10]. At the same time, their research

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focused mainly on the origins and morphology of architectural forms, constructive schemes, and only certain types of ancient Chinese murals.

The mural painting of Ancient China and Kyivan Rus, in our opinion, should not be compared (although there are quite a lot of such scientific studies) [11], since they were formed on different grounds, which influenced both the figurative concept and the technique of execution, but the common thing is the fact that the mural painting felt the changes in external factors and reacted to them with changes in the figurative doctrine and could have both national roots (mural painting of the Han day in China), and borrowed, subsequently changed on the local background (Buddhist mural painting, modified in the conditions of China, and modified Byzantine mural painting of Kyivan Rus). In the case of borrowing a figurative concept or technologies for performing mural painting from the outside, it is more similar to archetypes in the early stages, but there is an increasing gap between them in the future (it is inherent in both China and Kyivan Rus), as established by *D. Ainalov and Ye. Redin* [12]. There are common features of the figurative concept of mural painting in both Kyivan Rus and China: gradual shifting from rigid canonicity, laconicism, restrained polychromy, purely religious subjects towards more liberal compositional construction, rich polychromy, realistic plots, as indicated in the scientific publications of *Yu. Asieiev* [13], *Yu. Asieiev et al.* [14] and *S. Vysotskyi* [15].

The works concerning the analysis of plots and techniques of the execution of fresco mural painting can be divided into works of the nineteenth and first half of the twentieth century, in which interest in fresco mural painting was raised [16-18]); monumental studies of Soviet and post-Soviet times, dedicated to Kyivan Rus art, including murals [19-22]).

A separate group is made up of works concerning the technologies of Kyivan Rus frescoes technique at different periods with the analysis of the changes that have occurred [23-28].

The possibilities of modern methods for studying historical artefacts are described in the publications by *D. Giaccone et al.* [29] and in different scientific reports [30].

It is worth noting that, unlike, for example, the mural painting of Kyivan Rus, with its religious or secular subjects exclusively in the interiors of the chief cathedrals, mural painting in China was most often performed in religious buildings and tombs. It had an effect not only on the further development of Chinese art but also on design and even on landscape design: there was a prevalent mystical-and-religious basis of the fresco plot and particular elements of the landscape. If we consider the ancient Chinese mural painting along with other ancient murals, then it is much more similar to the ancient Egyptian mural painting than to the Christian one; it also refers to the subject-matters and figurative means. In Chinese murals, as, by the way, in ancient Egyptian ones, the influence of animistic religions deifying the forces of nature and natural beings is felt. Whereas, in ancient Russian murals, there is the pronounced theme of God in the Trinity and the pantheon of saints. In Christian wall paintings, God, the Mother of God, angels, saints are the bearers of the supernatural properties but not the forces of nature, animal or fantastic creatures with a combination of human and animal traits, which we observe in ancient Egyptian and ancient Chinese fresco murals.

If we analyse the techniques of performing the ancient Chinese mural painting of the Han era and ancient Kyivan Rus murals, it is worth noting such differences. The murals in the tombs of the Han era are actually prefabricated; the murals of Kyivan Rus are stationary. The murals of the Han era were made on hollow bricks or stone slabs: the image was applied on a white primer with outlines highlighted with lines. In the murals of Kyivan Rus, the painted element becomes the main one; in the Han murals – the line and the linear image.

Materials and methods

To solve the set tasks, we used general scientific methods of historical analysis, comparative analysis, and graphical-and-analytical methods. The method of the historical analysis made it possible to evaluate the role of external factors in the formation of the artistic-

figurative system of Chinese and Kyivan Rus murals, the technique of performing murals. The method of comparative analysis made it possible to trace the transformation of the figurative concept of murals of different periods and to compare the artistic-figurative concepts and techniques of execution of ancient Chinese and Kyivan Rus murals. The graphical-and-analytical method made it possible to confirm the conclusions with examples of specific analysed paintings. The method of field surveys of Kyivan Rus murals was also used.

Results and discussion

The figurative system of images of Kyivan Rus

It is worth noting that despite the gap in space and time, there is one similarity between the murals in China and Kyivan Rus – it is the gradual growth of genre scenes and portrait images of real faces into canonical subjects. In China, such images are scenes from the life of the emperor and courtiers, especially exquisite ladies, scenes of folk entertainment; in Kyivan Rus, in the Sophia Cathedral, there is an image of entertainment scenes, and in the central nave – the princely family [13]. Both in Chinese and Kyivan Rus murals, polychromy was widely used, however, it should be noted that in China, the colours had a particular symbolic sacred meaning, and in the church frescoes of Kyivan Rus, special canonical restrictions determined the colours of the outfits of the Mother of God, saints, martyrs, members of the princely family. The frescoes of the St. Sophia Cathedral are divided into two main groups – religious in the cathedral itself and secular on the walls of the northern and southern staircases (Fig. 1).

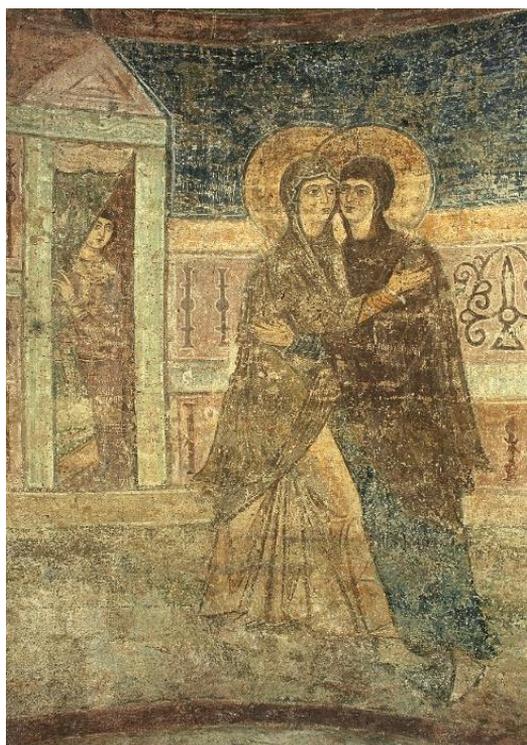


Fig. 1. Meeting of Mary with Elizabeth. Photo by I. Buzin, 2021

On the example of a comparison of Christian fresco mural painting borrowed from Byzantium on the territory of Kyivan Rus and Buddhist mural painting borrowed from India in

China, one can see how in both cases the borrowed techniques of religious images of the religions brought in from outside (Christianity and Buddhism), changed under the influence of regional factors. So, in Kyivan Rus, such a vivid example of the combination of the rigid Byzantine canonical and secular worldview is the fresco mural painting of the Sophia Cathedral – the main temple of Kyivan Rus since the time of Yaroslav the Wise.

The Byzantine figurative concept is embodied in the following:

- all the walls of the vault, apses, pillars and baths are covered with mosaics and frescoes to create an unearthly impression of the interior, the greatness of Christianity;
- each image is a carrier of certain sacred information and an exponent of Christian morality and virtue;
- there are images of the Heavenly Forces as the humanity guards from the dark forces;
- the dominance of the figurative doctrine of Byzantium in the depiction of higher powers and saints (equanimity of faces and postures, severity, lack of emotions, sustained canonical arrangement of images and their colouristic).

Kyivan Rus originality is expressed in the following:

- Slavic facial features of some of those depicted figures;
- the emergence of secular subjects of the Kyivan Rus character;
- the location of the family of ancient rulers of Kyivan Rus in the central nave of the church gallery.

The study of Kyivan Rus Byzantine murals proved its correspondence to the archetypes with the requirements of clear canonical images, in which the basis was not to convey the maximum realism of the plot by artistic means but to embody a particular ideological doctrine in laconic ways. In this case, it is possible to draw an analogy between the ancient Greek and ancient Chinese murals.

Such characteristic features of Byzantine religious art are the images of God, the Mother of God, evangelists and saints as in empty space, against a golden background, with expressions of calm on their faces and static poses. The same tradition was later transferred to the specific secular murals of Byzantium, wherein the ceremonial imperial images, although the background is drawn, however, the figures remain the same static and emotionless (the image of the Emperor Justinian with the courtiers and Empress Theodora with the court ladies).

The extensive use of frescoes and mosaics in the chief churches during the 1st–2nd periods of Kyivan Rus requires an understanding of mosaic and fresco techniques, and the restoration work is preceded by thorough archival and field surveys, especially taking into account the identity of each temple.

The peculiarity of the system of murals in St. Sophia Cathedral in comparison with the Byzantine interior design of churches lies in the combination of mosaics and frescoes, which was not in Byzantium. The secular subjects of the paintings are located in both staircase towers and even in the crossing – above the western triple arch, on three walls - southern, western and northern – in the form of patron portraits of all members of the princely family, which is unique for the art of the 11th century (Fig. 2). The ktitor wall painting covers an area of 35m². Unfortunately, the ktitor fresco survived because of "renovation" during the restoration works led by F. Solntsev, in a fragmentary damaged state; the authentic mural painting of the western wall has not survived, one figure and part of the second on the north wall, four figures on the south wall.

All the plots of mosaics and frescoes, supplemented with sacred texts – the image of the Mother of God Oranta, the Almighty, archangels, apostles, forty Sebastian martyrs, saints – express the idea of heavenly patronage to the sovereigns of Kyivan Rus. Two frescoes had symbolic meaning – "The Resurrection of Lazarus" and "The Entry of the Lord into Jerusalem":

"The entry into Jerusalem" was an illustration of Yaroslav's triumphant return to Kyiv after the victory over the Pechenegs in 1015, 1017 and 1019.

The altar of St. Joachim and Anna was painted on the themes of their lives. In the conch-apse, the fresco has not survived; on the southern wall from top to bottom, there are frescoes "Anna's Prayer for Barrenness", "The Nativity of Mary", "Mary's Introduction to the Temple", "The Annunciation at the Well", "Presentation of the Purple and the Crown", "Kisses of Elizabeth". On the north wall, there are frescoes "The Meeting of Joachim and Anna at the Golden Gate", "Betrothal" and "Mary with yarn – Annunciation". The Peter and Paul Altar has preserved the murals "Sermon of the Apostle Peter", "Baptism of the daughter of the centurion Cornelius", "Miracle in the house of the centurion Cornelius", a fragment of the fresco "The withdrawal of Peter from prison".



Fig. 2. The image of the daughters of Yaroslav the Wise. Photo by I. Buzin, 2021

The altar of St. George and the Archangel Michael was completed and decorated with thematic murals. In the St. George altar in the conch, there was a half-figure of George, under it – six figures of saints, on the vault of the presbytery (bema) – the plot "George before the emperor Diocletian", on the north slope of the vault is the plot of the scene from St. George. Four scenes on the vault opposite the main transverse nave have not survived. Separate fragments of frescoes depicting the torture of the saint have been preserved on the walls. In the Mykhailivskyi altar in the apse conch, there is a half-figure of Michael, there are six figures of saints under it; on the presbytery's (bema's) vault, there are the scenes "The struggle of the archangel Michael with Jacob" and "The overthrow of Satan". On the vault opposite the transverse nave, there are the scenes "Balaam's donkey", "The vision of the prophet Zechariah" and "The Miracle of the Archangel Michael".

Several thematic frescoes of the northern part of the choirs have survived – "Three Youths in Fiery Hell", "The Hospitality of Abraham", "The Last Supper" and "The Miracle of the Multiplication of Loaves", on the south branch of the choirs – "The Meeting of Three Wanderers by Abraham", "The Wedding Feast at Cana of Galilee", "The Miracle at Cana of Galilee with the Transformation of Water into Wine".

The secular iconography of the murals at the staircase tower to the choir is unique [15]. The south tower murals depict scenes of hunting for wild boars; the composition "Hippodrome" represents the bed of the emperor and the palace; then the plot of catching wild horses, scenes of play of buffoons, acrobats, dancers, hunting scenes and scenes of carolling. The northern tower is decorated with scenes of mummers' wrestling, bear hunting, the image of the empress with maids and ladies of the court, the emperor on horseback, the image of a musician, a deer hunt, a reception at the Byzantine emperor. There are two symbolic plots – "The Reception of Princess Olga by the Byzantine emperor" (in the northern tower) and "Hippodrome" (in the southern one) since both frescoes depict Princess Olga's stay in 957 in Constantinople and her reception by Emperor Constantine Porphyrogenitus (Fig. 3).

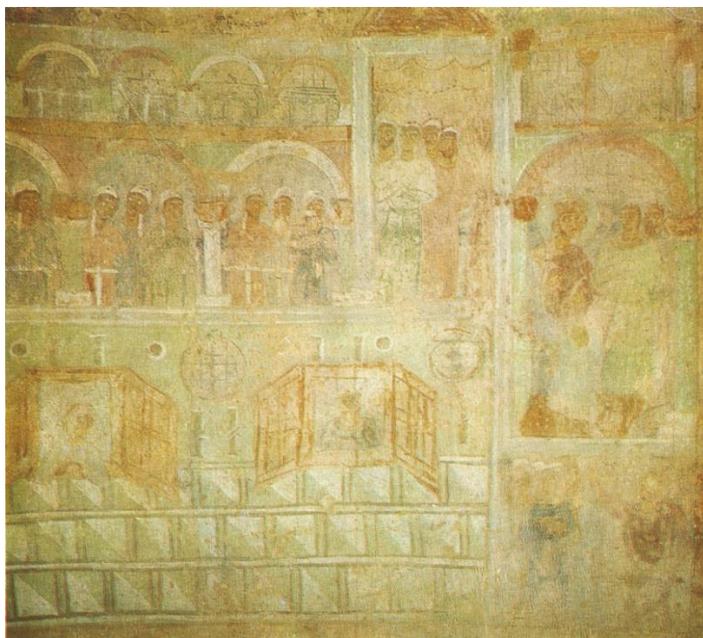


Fig. 3. Hippodrome. Fresco of the walls of the staircase of the South Tower of St. Sophia Cathedral in Kyiv. The archival photo of the Ukrestavratsiia Corporation

The graffiti inscriptions on wet plaster, containing information about the cathedral's history and historical figures, are also of great importance.

It is also worth mentioning that the Kyivan Rus mural painting in the Church of the Saviour on Berestovo in Kyiv, which dates from 1115 – 1125. In the 1970s, due to the swelling and flaking of the 17th-century murals, fresco murals "The Wonderful Fishing" of the 12th century were found. Sounding examination of the narthex with confirmation of the plots of the Christological cycle caused the transfer of the fresco of the 17th century on a new base with an area of 20m² (Figs. 4 and 5).



Fig. 4. Fresco "Wonderful Fishing" in the Church of the Saviour on Berestovo. Photo by I. Buzin, 2021



Fig. 5. Fresco "Wonderful Fishing". General view. Photo by I. Buzin, 2021

Production technologies of murals in Kyivan Rus

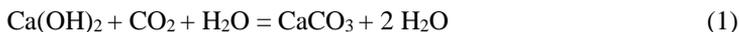
Thus, it should be noted that the main difference between the Han mural painting and the Kyivan Rus mural painting was that the mainline in the Han mural painting was cut through the stone, which expressed the silhouette, dynamism of the composition and ensured the play of light and shadow of the fresco, and in the Kyivan Rus mural painting – a colour spot (as a comparison – a mural painting in the city of Nanyang in Henan province with the image of a man and a bull and a mural painting of the Sophia Cathedral and the Church of the Saviour on Berestovo in Kyiv).

Mural painting of the pre-Mongol era has survived to this day mainly in a form damaged due to later redrawing and repairs.

As the artist-restorer I. Dorofienko noted that the work on the repair of the murals took place from the very beginning of the existence of Kyivan Rus, citing the example of ornamental paintings around the window of the Mykhailivskyi altar in the southern gallery of St. Sophia Cathedral, and emphasizing that such changes should be considered as repair work, and not a restoration. She gives examples of Kyivan Rus murals of the Church of the Savior on Berestovo (Figs. 4 and 5) and the Mykhailivska Church of the Vydubtskyi Monastery, which were covered by later murals and have been disclosed already in our time.

In the Mykhailivska Church, the ornamental fragments of frescoes were disclosed on the window reveals of the southern and northern walls with flower-leaf motifs and flexible stems. On the northern wall of the nave, at the level of the panel, an ornamental fragment of the 11th-century fresco has been preserved. Themed frescoes of the 11th century, with an area of 20.4 square meters, were opened on the southern wall under the later mural painting "The Last Judgment". On the staircase, under the layers of late plaster, fragments of ancient plaster with traces of pigments were found. In the upper part of the staircase pillar, graffiti with the image of cypress leaves and the cross, dated to the 11th century according to epigraphic studies, has been preserved.

As it was defined by *Yu. Kuks and T. Lukianova* [26], in the early period of Kievan Rus, the sandy, carbonate (crushed white stone), ceramic (powdered brick) fillers were added to levkas (lime-plaster ground); but, in the 16th–17th centuries, according to the chronicle sources of that time, there was no filler in the composition of the levkas (lime-plaster-ground), that is, it is already purely lime ground, in which the supplied flax plays the role of a reinforcing and heat-resistant component – admixture without the properties of a filler with anti-settling qualities. In the early period of Kyivan Rus, purely Byzantine technologies for preparing the ground for a fresco were borrowed. *Yu. Kuks and T. Lukianova* [26] analysed in detail the specificity of the work of such a ground, where the addition of a fine fraction of quartz sand to the lime mortar on the surface of the sand grains is a reaction of the interaction of lime and silica, which accelerates the reaction of lime hardening, relieving shrinkage stresses, provides greater strength and endurance of the ground. For the same purpose, the Romans added *Opus signinum* (young, slightly fired clay) instead of quartz sand; this technology was described by Vitruvius. In particular, the ancient Roman technology provided for mixing the slaked lime with sand (for one part of lime, three portions of mountain sand or two portions of the river or sea sand); it was added a third part of broken and sifted tiles to the river or sea sand. It is the way of production of the Roman-Byzantine lime-*opus signinum* ground, which was spread in the early period of Kyivan Rus. Kievan Rus also borrowed the Byzantine method of preparation of the lime ground with the addition of finely powdered carbonate filler, in particular, crushed white stone, which accelerated the hardening of lime [26]. In scientific publications devoted to later technologies of Kyivan Rus mural painting, it is shown that the method of preparing a lime ground for a fresco provided for repeated washing of lime, aged for up to 10 years, with its subsequent freezing, that is, artificial carbonization of lime took place, the transformation of calcium hydroxide into calcium carbonate.



For this purpose, special pits were used for lime slaking, which, in particular, were recalled by P.A. Rappoport [22], who defined the dimensions of the pits – 30–50 square meters, where, according to the above formula, a 1.0–1.2mm thick layer of lime was saturated with carbon dioxide for ten years. Then, this aged lime was washed with constant shovelling for seven weeks, further enhancing the carbonation reaction. According to the chronicles of the 16th century, in addition to this technology of using old lime for the lime ground-levkas, before applying it, some combed and finely chopped flax and a little cow bile were added to a thick lime and beat it to the consistency of a thick dough. Then the levkas was watered with a special strong boiled glue: spruce bark was made into powder, mixed with flour, sifted with a fine sieve, the same part of barley was added, water was added and the mixture was boiled in a

cauldron, then sifted again with a fine sieve and a strong glue was obtained for impregnating the levkas-ground. From above the glued surface was additionally sprinkled with pure oat flour [18].

Thus, a lime ground without filler is gradually formed. Old aged lime turns into almost pure calcium carbonate and is mixed with freshly slaked lime, the chemical composition of lime and carbonate filler is formed, where lime is both a binder and a filler at the same time. Sometimes broken iron nails were added to the levkas. The advantage of such levkas in comparison with the ground of the early period of Kyivan Rus is called the absence of coarse grains of stone, high density of the solution and the possibility of surface polishing [26]. It is believed that the origins of this technology with obtaining a pure white polished surface of the base of the fresco are still in the Cretan-Minoan civilization, while the use of fine sand as a filler in ancient Roman mortars gave a not so perfectly smoothed surface [28].

The admixtures in Byzantine ground mortars gave them a particular shade, so there was no smooth white base for the fresco. There is a version that such a ground was originally intended not for frescoes, but for mosaics; that is, in fact, the technology of so-called mosaic ground was introduced, however, with some changes. Therefore, in the St. Sophia Cathedral in Kyiv, based on Byzantine technologies mosaics and the frescoes themselves are combined. Not one, but two layers of ground were applied for the mosaic. It was made a significant conclusion that the Greek masters of the 10th–11th centuries, who were engaged in the interior decoration of the cathedral with mosaics and frescoes, used the ground of the same composition, which made it easy to combine mosaics with frescoes [27].

So, it was a two-layer ground: the bottom layer was made of lime dough without granular filler, with the addition of a dust-like fraction of limestone tuff and a small amount of straw filler, the top layer was also with the addition of ash from straw to achieve a contrast between smalt joints. She compares the ground composition of Sofia with the ground of frescoes in Bulgaria of the close periods and notes that the upper layer of the ground from Tyrnovo of the 11th–12th centuries is a long-cured lime layer with a significant amount of gelatinous glue and does not contain any fillers. Analysis of the ground for the mosaics and frescoes of the St. Sophia Cathedral, the remains of the frescoes of the St. Michael's Golden-Domed Cathedral allowed T. Lukianova to conclude that in the conditions of Kievan Rus, the Byzantine mosaic painting technique did not receive such widespread, however, the Byzantine technique of preparing lime-carbonate- Opus signinum the ground (grey, grey-pink and grey-beige shades), gradually transformed in the technique of the ground for fresco mural painting under the conditions of Kyivan Rus [27]. She explains the changes in the composition of the grounds by the absence of volcanic materials as fillers in Kievan Rus, so they were replaced with burnt clay. Gradually, as a result of the need to create a white smooth base for the fresco, the composition of the ground changed; it happened at the end of the 14th century, including under the direct influence of the St. Panteleimon Monastery on the Holy Mt. Athos [27].

As a result of restoration work carried out in St. Sophia Cathedral in 1843–1853 led by F. Solntsev, during the mechanical removal of soot and dust, the paint layer was damaged or removed. Then the frescoes were covered with oil and re-painted with oil murals, destroying the authentic frescoes. The frescoes were cleaned off with wooden and iron knives, alcohol, potash, lacquer oil were used; in fact, all ancient Russian frescoes were cleaned and redrawn with oil paints. Subsequently, under the leadership of A. Prakhov, the frescoes of the Church of St. Cyril in Kyiv were "restored". Only in 1928, prof. D. Kiplik supervised the works on fixing the fresco murals of the south tower of St. Sophia Cathedral and the southern apse of St. Cyril's Church. In 1934–1938, works were carried out to uncover the frescoes of St. Sophia Cathedral. In 1947, L. Kalenichenko began a cartographic method of fixing the state of preservation of murals. In 1952–1956, systematic works were started on the restoration of the murals of the entire interior of the St. Sophia Cathedral under the leadership of L. Kalenichenko, O. Pliushch and

E. Mamolat, and this period is considered to be the embedding of the methods and technologies for the restoration of monumental painting of the Kyiv Restoration School.

In 1946–1966 the restoration measures were carried out on mosaics and frescoes under the leadership of academician I. Grabar and prof. V. Lazarev. The team of restorers was headed by L. Kalenichenko, artist E. Mamolat and chemist-technologist O. Pliushch. The restoration and disclosure of the ancient frescoes were carried out. It was found that the original subject and ornamental frescoes occupied more than 10 thousand square meters of area, but only 3 thousand square meters of murals have survived. The height of the figures of the frescoes is 2.3m.

The nature of the destruction of plaster and paint layers put forward requirements for materials: chemical and physical resistance, not to affect the composition of the plaster and paint layer, mechanical strength and adhesion to plaster, water resistance, thermal and frost resistance, inertness to the composition of the plaster and the colour of the paint layer.

Under the frescoes, two-layer and three-layer plaster were used: *grafita* was applied on the wet plaster of the top layer, then crushed coal (*reft*) to isolate the paint layers of the mural from the lime plaster mortar. After applying the main painted fragments, they proceeded to the final finishing – retouching, showing the shape with spaces "in the light" and shadows in the folds of clothes or shading in faces. By the joints of the plaster (overlap of layers), it is possible to determine how much area was painted per day, which is due to the number of artists involved (scenes in the choir with an area of about 8 square meters were painted by two artists). The ideological significance of the chief cathedral of Kyivan Rus determined the choice of iconography and plots.

Maintaining optimal temperature and humidity conditions is crucial for the preservation of the unique fresco painting of the St. Sophia Cathedral with an area of 3 thousand square meters. The cathedral was built of stone and plinthiform bricks on the lime mortar with powdered bricks, the lower parts of the walls made up of granite and red quartzite, with an increase in the level from the ground, the amount of natural stone in the masonry decreases. Vaults, domes, arches made of plinthiform bricks on the lime mortar with powdered bricks, the thickness of the walls is from 1.2 to 1.5m. In the 19th century, the cathedral was not heated. In 1953, a new heating and humidity system was installed, which was subsequently modernized several times. The temperature is maintained at $+17\pm 1^{\circ}\text{C}$ in the cold season and humidity of 50 – 65%; $+22\pm 2^{\circ}\text{C}$ in the warm season, the difference between the temperature in cold and warm seasons has been reduced. As for most of the monuments of this period, the most unfavourable was the spring season – it was improved by the lengthening of the heating period.

The restoration work on the murals is performed according to a clearly defined and approved algorithm [31 – 37].

a. Carrying out restoration work without scientific research and justification, a restoration project, without consideration of the scientific and artistic council is not allowed.

The state of the painting is being studied, including:

- study of the history of the monument;
- study of the state of the building, its walls, ceiling, domes, on which painting was preserved;
- study of temperature and humidity conditions;
- the state of the painting is investigated and studied inside and outside;
- cartograms are made, photographs are taken and the state of the painting is described in detail;
- carry out scientific, archival, architectural, chemical-technological research;
- scientific and project documentation for the restoration of painting is being developed (Project);
- the project is being considered by the scientific and artistic council of the body for the protection of cultural heritage;

– project approval.

b. The main principle in carrying out restoration work on the restoration of wall paintings, frescoes, mosaics is conservation, that is, preservation in such a state that does not allow their further destruction.

As part of the scientific and design documentation, a methodology, technology, execution technique, a recipe for restoration work, recommendations for where and how it is necessary to carry out these works are developed.

c. The main priority of work:

– preliminary strengthening of the paint layer of painting or its temporary conservation;
– removal of mould and treatment of the surface of the painting with a disinfectant solution

- strengthening of the plaster ground;
- strengthening of the paint layer;
- removal of dirt from the surface of the painting;
- puttying of loss of the paint layer in cracks and on the sides of the painting;
- artistic toning (neutral colour)
- treatment of the surface of the painting with a coating layer.

At the end of the work, cartograms (executive) of restoration work are made with attachments of all documents in terms of volume, place, technology, recipes, inspection reports, minutes of the meeting of commissions, comments of experts, on the journals of work performance, diaries of restorers. It is made a scientific report on the work done.

It should be noted briefly that the problems of the unsatisfactory state of fresco murals under the influence of excessive moisture are international, typical, for example, for the murals of the famous Chinese caves of Dunhuang and the murals of the burial vault of Demeter in Kerch in the Crimea (the 1st – the 2nd centuries), where the project of emergency work even assumed the lowering of the groundwater level in order to drain the crypt, since at the time of the survey in 1982 the humidity inside the burial vault was 100%. The crypt is famous for the images on the walls and vault of Demeter, scenes of the abduction of Demeter's daughter Cora by the god Pluto and other ancient subjects.

The Demeter's Crypt in the form of a rectangular chamber is located on the slope of a hollow, in the thickness of loess-like loams, on the left slope of the ancient river valley, and since the 1940s, increased flooding led to a rise of groundwater above the floor of the crypt by 70–100 cm in 1984. The problems were primarily associated with the fact that the change in the groundwater level was a result of the filling of the hollow, especially in 1970, and the deprivation of its role as drainage. It led to the complication of surface runoff, the formation of closed swampy areas, an increase in the amount of groundwater through precipitation and part of the surface runoff, watering of vegetable gardens in private plots around, the emergence of high-surface buildings with developed engineering networks. A study of a fragment of plaster in 1950 resulted in a moisture level of 35%, the murals were covered with light grey mould, bacterial deformations were recorded on the plaster layer, and salt precipitation was visually recorded on the eastern wall.

The main image of Demeter had losses of the plaster base with murals, cracks with the detachment of the fresco layer, loss of plaster with damages, peeling of the paint layer, swelling of the plaster. At the time of the survey in the 1980s, the mural was in a stage of progressive destruction due to excessive moisture and required urgent emergency measures. The damage to the image of the abduction of Demeter' daughter Cora by Pluto was expressed in the fallout of the plaster ground, salinization of the paint layer, the appearance of cracks, and the peeling of the paint layer. Significant losses were revealed in the lower part of the eastern wall with the image of a bunch of grapes, where peeling of the paint layer, plaster potholes, cracks and salinization were found out.

Such surveys showed the inadequacy of measures before 1974 aimed at normalizing the temperature and humidity regime and proved the need for measures to lower the groundwater level, drainage, and later on, desalting the masonry and further strengthening the plaster and paint layers.

Conclusions

The preservation and restoration of Kyivan Rus murals is a significant task of modern restoration, designed to preserve these unique artefacts for future generations, especially, taking into account, the negative attitude towards church architecture at Soviet times [31, 32].

Specialists of the Ukrrestavratsiia Corporation have developed and introduced into practice the technology of restoration of Kyivan Rus fresco murals [33, 34].

In most cases, the destruction of the painting is a consequence of the unsatisfactory condition of the wall, its ground or the entire room, therefore, first of all, the general condition of the structure and the temperature and humidity conditions, the humidity of the walls and plaster at different depths from the surface are studied, since fluctuations in the temperature and humidity conditions are the main factor of destruction of the fresco wall painting.

A widespread problem is contamination with cement coatings, lids and synthetic paints, which erode the layers of mural underneath.

The separation of several layers of the mural happens according to the layering and transfer technique.

Fresco restoration works are very difficult if the walls are covered with cracks. In the pre-Mongolian murals of Ukraine, the main component that ensured the strength of the plaster and its connection with the wall was lime, obtained by burning limestone, in combination with water, it formed calcium oxide hydrate. All plaster studied in cathedrals of this period were made mainly according to the general technology. To prevent lime cracking during drying, inert filling and hardening agents of the solution were added to it, such as sand (15%), crushed limestone instead of marble chips in Greece and Rome (in the plaster of the Galicia-Volyn principality), powdered ceramics, charcoal, chopped straw, flax, sheep's wool, vegetable or animal glue was added to increase the strength of the plaster. The plaster mortar was applied in two stages. The first plaster coat was not smoothed, the second – from the same mortar, but well smoothed.

The example of Kyivan Rus and Ancient China vividly demonstrates the process of transformation of such a conservative artistic direction as religious mural painting, in which in the first place is obtained not by the artistic skills of transferring images, but expression by artistic means understandable to the general public. And in China, during the periods of various dynasties, and at different periods of the development of Kyivan Rus, the visual methods of transmitting these canons have repeatedly changed, experiencing local and external influences. So, for example, Buddhism borrowed from India on the territory of China gradually, along with its general canonicity, undergoes local figurative change; and a Christian fresco borrowed from Byzantium, despite the preservation of canonicity, undergoes the particular changes in the transmission of the depicted subject, thus, alongside the canonical plot, secondary secular ones appear, often not associated with it.

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