

Miško TUTKOVSKI

PAINTINGS IN THE OLD EPISCOPAL BASILICA IN STOBI ANALYSES OF THE TECHICAL-TECHNOLOGICAL CHARACTERISTICS

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National Institution Stobi
mishko.tutko@gmail.com

Abstract: *Our current knowledge on early Christian wall painting is mainly gained through studying catacombs and vaulted tombs, where the largest painted decorative arrangements have been discovered. Contrary to this, in early Christian churches and baptisteries it is the mosaic decoration that has survived better in general, while traces of any painted decoration are scarce. In this context, the Old episcopal basilica and baptistery in Stobi are of immense significance, since they own what is possibly the largest ensemble of paintings dating from the early Christian era. Notwithstanding, the basilica paintings have not been the subject of proper research and only short summaries focusing on some specific aspects have been published in the scientific literature. To address this issue, we considered as necessary to carry out an extensive research, by way of analysing the technical-technological characteristics of the paintings and performing comparative analyses of the materials used. The results of this research will be able to serve as dating indicators of the building and painting phases of the church, which will contribute toward chronological determination of all elements of the basilica. In addition, this study will serve as a basis for further research on early Christian paintings and its aspects of iconography, style and symbolism.*

Key words: Early Christian art, Stobi, basilica, baptistery, paintings

Introduction

Archaeological excavations have completely uncovered the nave and north aisle of the basilica, while only the central area of the south aisle measuring 18 meters in length has been excavated so far. All previous research concludes three main building phases and few smaller construction efforts and remodelling within the church interior. During the first phase, the length of the church including the apse amounted to 30 meters, while after the extension of the building toward east, its length grew to 35 meters and the width remained unchanged – 18.7 meters (Fig.1). The exterior faces of the basilica walls were coated with a thin layer of white lime mortar, while all interior facing walls, including the ceilings of both side aisles, were covered with wall paintings, applied in few successive phases.

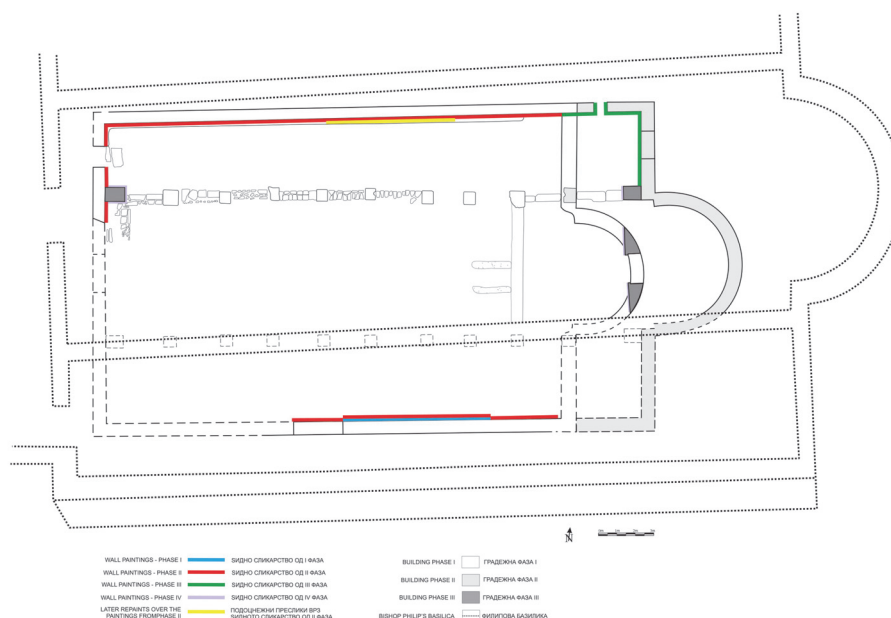


Fig. 1. Ground plan of the Episcopal complex with building and painting phases (drawing: T. Mitrova, M. Tutkovski)

Building phase I – painting phases I and II

The walls from the first phase of the basilica were built of roughly shaped stones bound by lime mortar, with upper portions made of mudbricks. When the church was first constructed only a small part of the south wall was decorated with murals using the fresco technique. This layer of fresco painting was discovered in an 8.5 meters long portion covering the area east of the main entrance, which leads to the baptistery of the church (Fig.2). The decoration is mainly preserved in the first zone and consists of six panels, with incrustations and painted simulation of marble plates in varied colours, separated by fluted pilasters with Corinthian capitals.¹

The foundation for setting the first phase frescoes consists of few layers: a layer of a grey-greenish clay reinforced with straw, 15-20 mm thick; upon which a

¹ The south wall paintings were partially discovered between 1973 and 1976. J. Wiseman and Dj. Georgievski, 1975, 176-180; J. Wiseman and Dj. Mano-Zisi, 1974, 142; Ibid, 1976, 283-291; J. Wiseman 1978, 395-413; B. Aleksova, 1982-83, 53, fig. 4. Excavations in the south aisle continued in 2010, when new painted surfaces were discovered, published for the first time in S. Blaževska and M. Tutkovski 2012, 12-13; E. Dimitrova 2012, 22-24.

thin layer of lime plaster was used (2-3 mm) to level the clay.² The layer for painting – *intonaco* was set over it, with depth totalling 8-10 mm (Fig.3). At a later point, the entrance in the south wall was blocked up with mudbricks, while, possibly around the same time, some reconstruction work was done to the west wall of the basilica, right next to the entryway leading to the north aisle. Namely, the north portion of the stone wall had been partially demolished and rebuilt using mudbricks (Fig.6).



Fig. 2. South wall - paintings from the first phase (photography - M. Tutkovski)

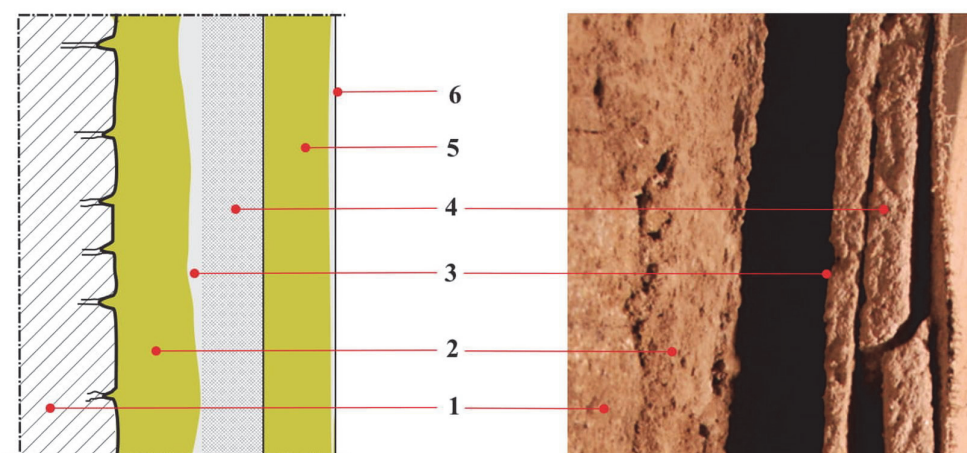


Fig. 3. South wall – cross section of the layers from the I and II painting phase. 1) Stone wall 2) Grey-greenish clay reinforced with straw 3) Lime mortar 4) Reinforced lime mortar – arriccio and intonaco of the I painting phase 5) Grey-greenish clay reinforced with straw 6) Intonaco of the II painting phase (drawing and photography - M. Tutkovski)

² During the conservation process of the fresco paintings in the south aisle, detachment of the fresco layers was carried out, where the layer of mortar used for levelling the surface was separated from the painted mortar. This part of the conservation process allowed for a more detailed examination of the layers underlying the frescoes, which resulted in discovering preparatory drawings and markings: underneath the painted panels No. 2 and No. 3 a rough sketch was found – three kantharos-shaped outlines in black colour (Fig.4), while beneath the panel No. 5 a red rectangular frame with indistinct signs (letters?) resembling a seal (Fig.5). These interventions were certainly made by the painters themselves, as a preparation and testing of the painting tools and materials.



Fig. 4. South wall – substrate of the I painting phase. Sketch of three kantharoses (photography - M. Tutkovski)



Fig. 5. South wall – substrate of the I painting phase. Several signs in rectangular frame. (photography - M. Tutkovski)



Fig. 6. Upgraded wall north of the entrance into the north aisle of the church
(photography - M. Tutkovski)

Following these remodelling works, the second painting phase took place, when all interior walls of the basilica were painted using *secco* technique.³ In this phase, the south wall frescoes were covered with a thin layer of grey-greenish clay 8-10 mm thick, with the 2-4 mm thick plaster used to paint on – the *intonaco* placed directly over it. In this way, the frescoes from the first painting phase in the church were used as a foundation layer for the new murals (Fig. 3). The area covering the blocked-up entryway was painted as well, with an underlying layer of red reinforced clay (18-20 mm) applied directly over the mudbrick wall. The clay was levelled with a layer of lime plaster (18-20 mm), upon which the base plaster for painting was set, measuring 2-4 mm thickness.

The second phase painting is best preserved on the north and west walls of the church (Fig. 7-8). The face of the wall is covered with a red reinforced clay (identical to the clay used for blocked-up doorway in the south aisle), with thickness that varies between 5 - 15 mm. Over the clay a thin lime plaster layer was spread (3 - 5 mm), with another layer of grey-greenish reinforced clay 5 - 10 mm thick over it. The last layer was levelled with a thin coating of plaster (1 - 2 mm), over which the *intonaco* was set, totalling 10 mm depth (Fig. 9). At few points on the north wall there were supporting layers made without use of the reddish clay and the plaster coating over it. Instead, grey-greenish reinforced clay was used, followed by the previously described subsequent layers, in the same manner as the rest of the walls (Fig. 10).

The second phase decoration is mostly preserved in the first zone, consisting of rectangular panels with painted imitation of marble plates and incrustations separated by fluted and spirally cabled columns. The south and west walls have paint preserved on the base of the wall (the socle), which is surface below the first painting zone. The wall base decoration is composed of a single motif in repetition throughout the entire length of the wall; eight-pointed crosses inscribed into rectangular frames (Fig. 11).⁴ It can be assumed that the north wall base was decorated in the same manner; however there have not been any fresco remains found on that level of the wall.

³ Part of the south wall paintings were discovered between 1973 and 1978, and at the same time two panels on the north wall were discovered as well as many fragments from the ceiling painting. J. Wiseman and Dj. Georgievski 1975, 176-180; J. Wiseman and Dj. Mano-Zisi 1974, 142; Ibid, 1976, 283-291; J. Wiseman 1978, 397-407, fig. 8. The wall and ceiling paintings which were discovered during this period were catalogued in C. Hemans 1987, 9-56. The paintings in the north aisle were completely uncovered by 1993. Short description on the iconographic characteristics of the wall painting (without illustrations) was published in B. Aleksova 1997, 116-123. The wall paintings from the entire church were published for the first time in the form of an exhibition catalogue accompanied by the basic data derived from the technical-technological, iconographic and stylistic characteristics. cf. S. Blaževska and M. Tutkovski 2012, 12-16; E. Dimitrova 2012, 21-32.

⁴ C. Hemans, 1987, fig. 195-196.



Fig. 7. Paintings on the north wall - II and III phase (drawing: T. Mitrova, photography and processing - M. Tutkovski)



Fig. 8. Paintings on the west wall of the basilica - II phase (drawing: T. Mitrova)

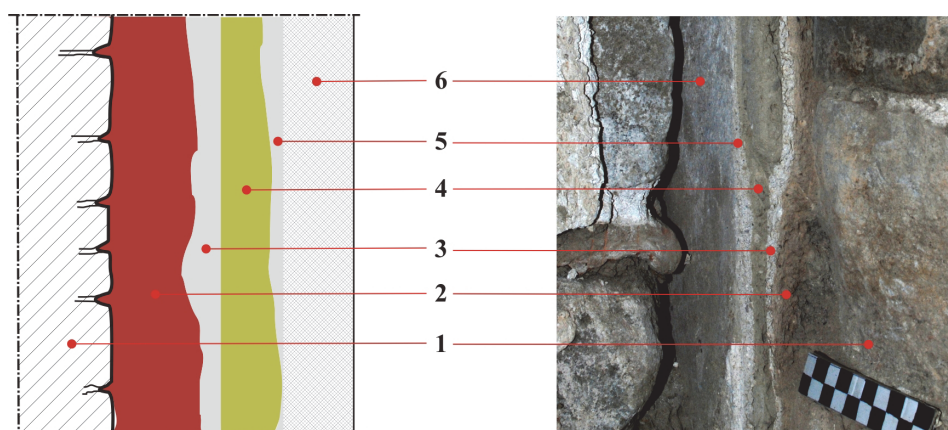


Fig. 9. West wall - cross section of the layers II painting phase. 1) Stone wall 2) Reddish clay reinforced with straw 3) Lime mortar 4) Grey-greenish clay reinforced with straw 5) Thin layer of lime mortar 6) Reinforced lime mortar - arriccio and intonaco of the II painting phase (drawing and photography - M. Tutkovski)

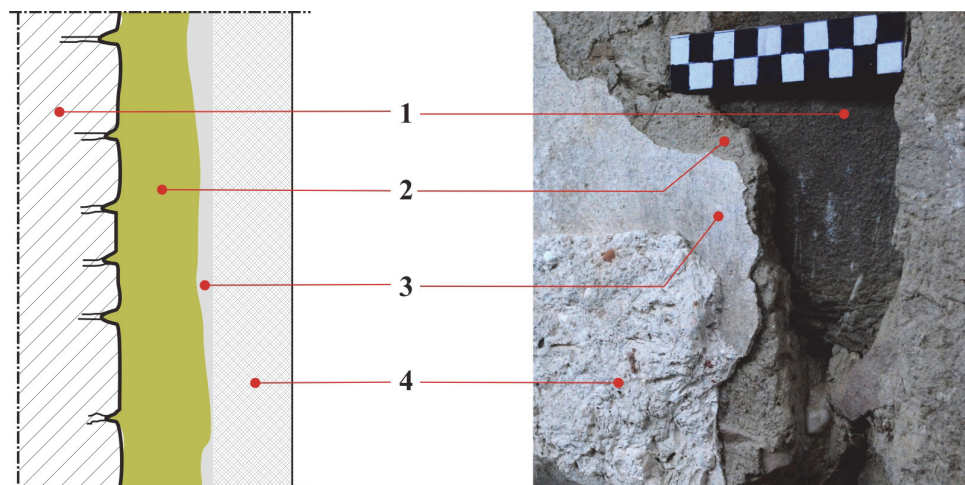


Fig. 10. North wall – cross section of the layers II painting phase. 1) Stone wall 2) Grey-greenish clay reinforced with straw 3) Thin layer of lime mortar 4) Reinforced lime mortar – arriccio and intonaco of the II painting phase (drawing and photography - M. Tutkovski)

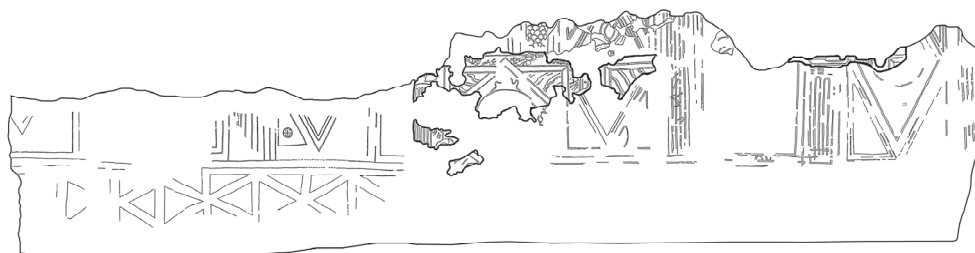


Fig. 11. South wall – paintings of the II phase with marked areas from the I phase. (drawing: M. Petrovski, B. Damjanovski, B. Kuzmanovski; processing - M. Tutkovski)

The west side of the north wall has remains of the second painting zone; however, it survives only in fragments. On the west end of this wall the lower half of a scene is preserved, depicting the Old Testament prophet Daniel in the lion's den.⁵ The two painting zones are separated by a wide band made up of horizontal lines in varied colours, complemented by graphically formed geometrical motifs, replicated throughout the entire band length (Fig.12).

The west wall has two zones of paintings preserved as well (Fig. 8), where aside from the usual depictions of pseudo-architectural plates and incrustations, the lower halves of two compositions survive in the second zone: north of the entrance

⁵ S. Blaževska and M. Tutkovski, 2012, 13-14; E. Dimitrova, 2012, 24-25.

zoomorphic and floral motifs were found, while the panel south of the entrance has a partially preserved depiction of a floral motif enclosed between two candelabras.

Later interventions carried out over the second phase, paintings were discovered in the central part of the north wall, where the lower portions of the frescoes were painted over; first by a layer of grey-greenish clay covered directly with the base plaster for the painting, 2 – 4 mm thick. The painting technique used here was *secco* which has barely survived, yet it is visible enough to attest that the painters followed the same decorative scheme (Fig.13).⁶



Fig. 12. Detail of the paintings of the north wall with the representation of the Prophet Daniel in the lions' den (photography and montage - M. Tutkovski)



Fig. 13. North wall - later interventions on the paintings from the II phase (photography - M. Tutkovski)

Building phase II – painting phase III

In the second building phase, the church was remodelled and extended toward east. During the construction work taking place in that period, the east walls of the side aisles as well as the presbytery and altar apse from the old church were all demolished in order to expand the building five meters eastward (Fig.1). In this way, new areas for painting were created, out of which only few wall paintings have survived in the northeast corner of the north aisle.

⁶ The reasons behind repainting of this section of the north wall are not clear, however, it is very likely that the painting was affected by the rising capillary moisture in the wall.

The walls in this phase were built of roughly shaped stones bound by lime mortar, and the same mortar was used to coat the interior face of the walls. The painting is preserved only in the first zone; the consistent motif of pseudo-marble plates between pilasters continues on the north wall (Fig.7), while in the central part of the east wall beneath the window, a symbolic scene is located depicting two lambs surrounding a spring of water.⁷ The portrayed lambs are flanked on both sides by painted imitation of marble plates and pilasters (Fig.14-15).



Fig. 14. Paintings on the east wall of the north aisle – III phase. (drawing: T. Mitrova)

The painting technique and technology used in this phase differs from those previously used in the church. Namely, the painting foundation consists of a single layer of reinforced lime plaster, 10 – 14 mm thick. Its surface was levelled out and finely smoothed to create the appropriate final layer - intonaco, where the painting would have been executed (Fig.16). Painting was done using the fresco technique,

⁷ S. Blaževska and M. Tutkovski, 2012, 15; E. Dimitrova, 2012, 28-29; B. Aleksova, 1997, 119-123, interpret this scene as a depiction of the Good Shepherd between lambs, and to support this claim offers a reconstructed image of the scene (Fig. 21), where a partially preserved figure of the Good Shepherd is standing between lambs. The colours of this scene are significantly faded, however, our investigation has shown that the reconstructed drawing and descriptions by B. Aleksova do not correspond to the fact of the matter and they do not reflect the real depiction in the fresco. Few facts that are in favour of this claim: the very location of the scene is beneath a window (or door) on the east wall, the exact place where, as according to B. Aleksova, the upper missing portion of the Good Shepherd fresco should be. In addition to this, the analysis of old photographs and drawings (made before the frescoes were detached) of this portion reveal no such scene. Our conclusions were confirmed by the evidence of infrared and ultraviolet photographs of the scene, after which we can safely say that the depiction of the Good Shepherd was falsified.

with the exception of few additional painting interventions, such as the medallions with the monogram of Christ, painted in secco. It is likely that during this building phase a bench was built next to the north wall of the church, and it covered the lower portions of the second phase painting (Fig.17).⁸



Fig. 15. Detail of the paintings of the east wall. Representation of lambs around the font (photography - M. Tutkovski)

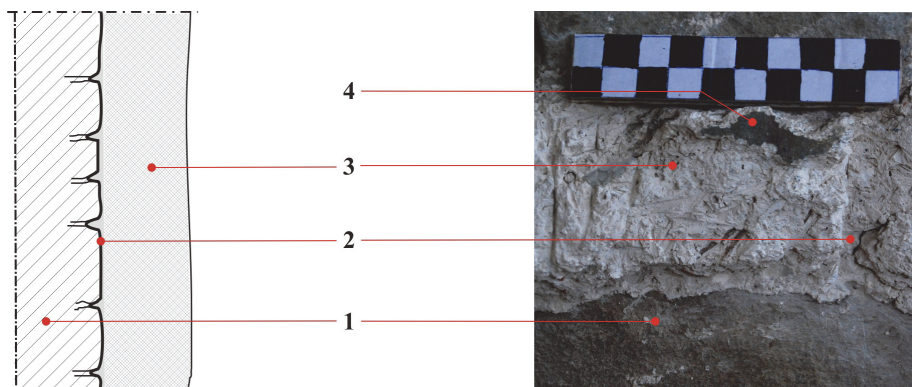


Fig. 16. East wall – cross section of the layers from the III painting phase. 1) Stone wall 2) Thin layer of lime mortar 3) Reinforced lime mortar – arriccio and intonaco (drawing and photography - M. Tutkovski)

⁸ The bench was constructed using amorphous stones and fragmented bricks and tegulae, which during the time of use were covered with red-toned clay. The length of the bench is 20.9 m, height is 0.5 m and width is 0.45 m.



Fig.17. West pilaster of the north aisle (photography - M. Tutkovski)

Building Phase III – Painting phase IV

After remodelling the church and its third phase of painting, the necessity occurred to structurally reinforce the building from its inner side, which was solved by placing two massive pilasters on both sides of the north stylobate (Fig.1).⁹ The west pilaster which is preserved measuring 3.45 meters was built of roughly shaped stones and horizontal bands of bricks bound with limestone (Fig.17), a unique construction technique for the entire building.¹⁰ The east pilaster is preserved in 0.6 m in height, coated in hydraulic mortar over its north and partially its west face.¹¹

Around the same time, a new altar screen was remodelled and founded over the apse foundations belonging to the first building stage of the church (Fig.1.18). Unconventionally, the altar screen was not made of marble columns and screens; it was constructed using stones and bricks bound with lime mortar instead. Only two fragments of fresco-paintings from the altar screen have survived, flanking the central entrance to the altar. The decoration is composed of simple floral motifs (Fig.19).

The west pilaster was decorated on all of its sides (Fig. 20), with painting applied in two zones; except on its east side where a fluted column was painted over the entire height of the pilaster. The south facing side of the pilaster has painted remains at the socle, an eight-pointed cross inscribed in a rectangular frame (identical to the socle decorations of the second phase), and above it, pseudo-marble plates painted in the first and second zones. The north facing side of the pilaster was decorated with a painted marble plate in the first zone, while the second zone contains a unique depiction of a ferocious rat with two small mice, painted against an abstract background (Fig. 21).¹²

The painters decorating the church in the last - fourth phase of its painting worked using the fresco technique, although unlike their predecessors, they had a different technical-technological approach. A foundation layer of lime mortar was

⁹ The south stylobate was destroyed when the foundation walls of the new Episcopal basilica were built; however, we can still assume that identical pilasters were constructed on the south side of the church as well.

¹⁰ Remains of the demolished pilaster were discovered in the nave of the basilica during the excavations in 1979, in trench No. 79-1. Researchers, at that point, did not have a full view of the building and assumed that the remains came from a later wall built inside the church, or perhaps brought from somewhere else and deposited when the church was buried. In the hydraulic mortar of the wall a coin was found dating from the period 383 – 395 AD, which is the terminus post quem for the last building phase of the church. J. Wiseman, 1986, 42; Ibid, 2006, 797; C. Hemans 1987, 12, 35-36.

¹¹ Identical hydraulic mortar with the same level of thickness (up to 2 mm) was applied on the wall base in the north and east face of the west pilaster. The lack of hydraulic mortar on the interior facing side of the pilaster (the east and west), points to the fact that plastering was done after the screen partitions were set.

¹² S. Blaževska and M. Tutkovski, 2012, 16; E. Dimitrova, 2012, 30-31.

applied (10 mm thick) over all sides of the pilaster, and the layer of plaster was spread over it, consisting of reinforced lime mortar with thickness of 10 – 14 mm. Plastering the north side of the pilaster was done in an unusual manner, a foundation layer consisting of reinforced lime mortar was first applied and a layer of hydraulic plaster with a small percentage of crushed brick was spread over it. The intonaco layer was formed by simply flattening out the last layer of hydraulic plaster (Fig. 22).



Fig. 18. Altar screen placed on the top of the apse of the first building phase (photography - M. Tutkovski)

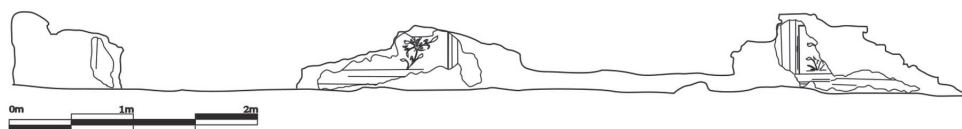


Fig. 19. Paintings on the altar screen – IV phase (drawing: T. Mitrova).

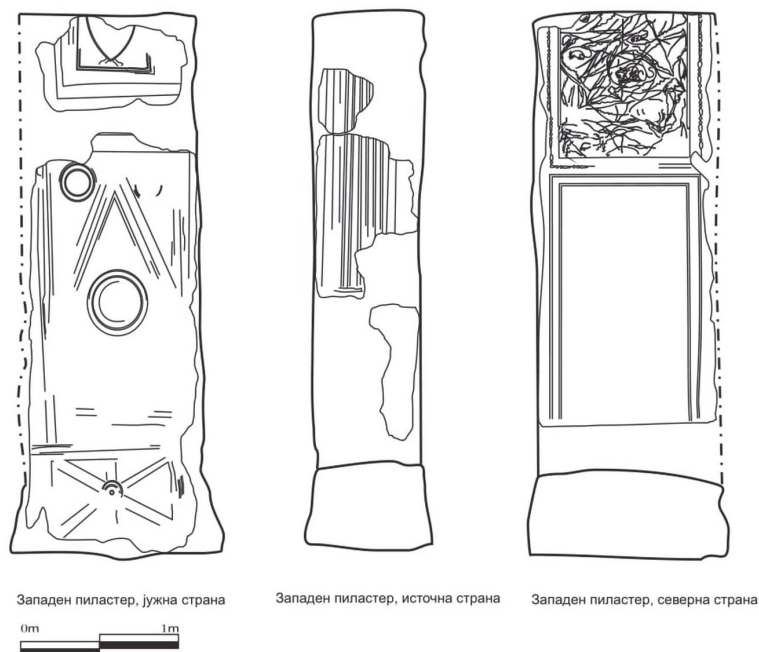


Fig. 20. Paintings on the west pilaster – IV phase (drawing: T. Mitrova).



Fig. 21. Detail of the paintings on the north side of the west pilaster with representations of rat and mice (photography - M. Tutkovski)

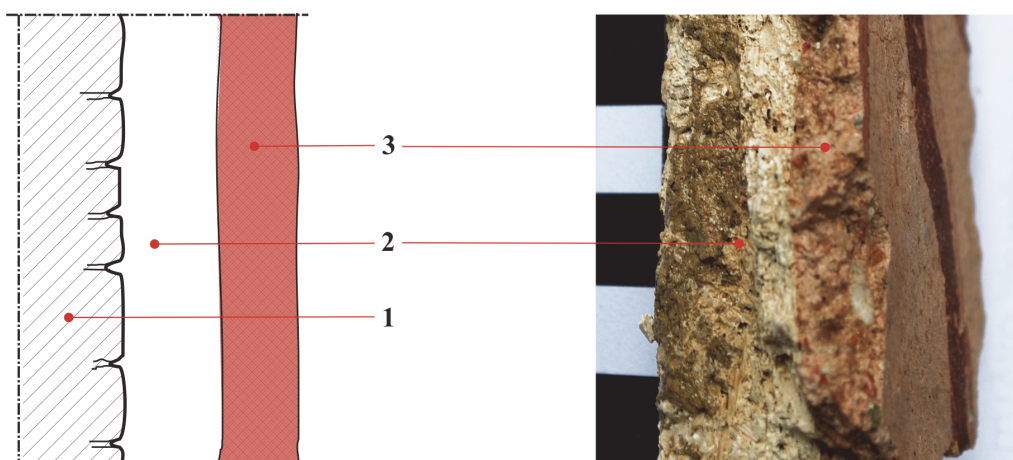


Fig. 22. West pilaster, north side - cross section of the layers from the IV painting phase
 1) Stone wall 2) Reinforced lime mortar 3) Hydraulic mortar - arriccio and intonaco
 (drawing and photography - M. Tutkovski)

Ceiling paintings

During the archaeological excavations many fresco fragments from the ceilings were found in the destruction layers covering the floors of the north and south aisles of the Old Episcopal basilica.¹³ The ceilings were built using wooden beams and reeds with an east-west orientation.¹⁴ Reeds were covered with a layer of reinforced lime plaster containing crushed brick and straw (40 – 50 mm), while the painting plaster measuring 5 – 10 mm thickness was applied over it (Fig. 23). According to the investigations on the fragments coming from the ceiling, the evidence points to a single phase of painting, executed in a combination of both fresco and secco techniques.¹⁵

The decorative arrangement on the church ceiling is composed of a wide border filled with stylized floral motifs. The decorative border follows the length of the side aisles and covers the central area of the ceiling, designed as a network of square fields filled with concentric rhombuses and squares, eight-pointed stars and cubes in pseudo-three-dimensional perspective (Fig. 24).¹⁶

¹³ For excavations in the side aisles and discovering the ceiling fragments see note No. 3.

¹⁴ J. Wiseman and Dj. Georgievski, 1975, 178-179.

¹⁵ C. Hemans, 1987, 28 - 30.

¹⁶ For a detailed study of the ceiling fragments discovered until 1979 see: Ibid, 28-55.

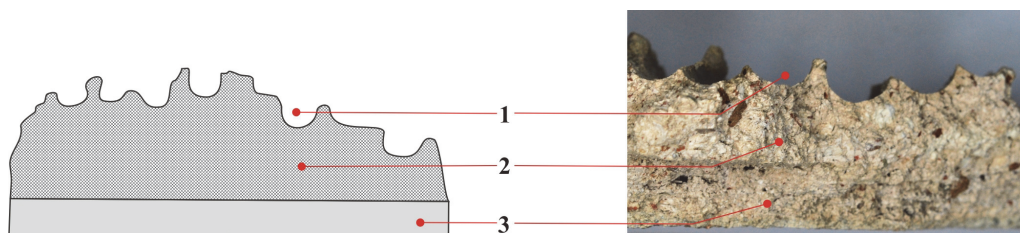


Fig. 23. Cross section of the layers from the ceiling paintings 1) Imprints of reed 2) Lime mortar with additions of crushed brick and straw 3) Arriccio and intonaco (drawing and photography - M. Tutkovski)



Fig. 24. North aisle - ceiling paintings (photography - K. Frangova)

Chemical analyses of the mortars

The results obtained by detailed examination of the architectural remains and studying the painting techniques are now complemented by chemical analyses of the wall and painting mortars. The analyses were carried out in the chemical laboratory of the National Conservation Centre in Skopje by Dr Lidija Robeva Čukovska using analytical methods;¹⁷ the results of which are presented in the following text.¹⁸

¹⁷ The analytical methods used are 1) Optical microscopy for analysing the texture of the building material; 2) Classical analytical techniques using gravimetry and complexometric method; 3) Infrared spectroscopy using IR Prestige 21 (Shimadzu) spectrometer, where the spectres of the samples were measured with DRS (Diffuse Reflectance Measurement) in a spectral range of 400 – 4000 cm⁻¹.

¹⁸ In addition to the analyses carried out by Dr Lidija R. Čukovska, this study takes into account the results obtained by chemical analyses of the painted mortars from the Old Episcopal basilica published in J. Wiseman and Dj. Georgievski, 1975, 177-180.

The data obtained by conducting quantitative analysis of mortar composition on the samples from the Old Episcopal basilica is shown in Table I, divided in two groups: wall mortars (M1-M7) and painting mortars (M8-M14).¹⁹

The analysed wall mortars can be classified into three groups according to the lime-sand ratio in their composition:

- 1) Mortars with lime to sand ratio of 1:1.5, with addition of crushed brick and organic filler – straw. These belong to the building mortars from building phase III, M6 – east pilaster and M7 – west pilaster.
- 2) Mortars with lime to sand ratio of 1:3-4 without organic filler. These are the mortars used in building phase I, M1 – west wall, M2 – north wall, M3 – apse (I phase).
- 3) Mortars with lime to sand ratio of 1:4-5 containing larger sand grains. These are the building mortars from building phase II: M4 – north wall (reconstruction) and M5 – apse (II phase).

The results of this analysis show clear distinction in the composition of mortars used in the different building stages. The data shown in table I suggests certain similarities in the quantitative composition of the mortars from the first and second building phase (M1-M5), however, the analysis of the texture of the building materials shows that the mortars from building phase II contain significantly larger sand grains. The mortars used in the third building phase (M6-M7), on the west and east pilaster, show complete distinction from the rest of all mortars used in the church, and are the only case with significant presence of crushed brick and organic additions – straw.

In addition to this, the levels of magnesium oxide (MgO) detected in the lime need to be taken into account. Mortars used in the second building phase (M4-M5), and the mortar extracted from the apse in building phase I (M3) show low percentages of MgO, which points to the assumption that the lime was derived from a calcitic source, whereas the rest of the mortars show relatively high percentages of MgO and a dolomitic origin; meaning they could originate from different lime quarries.

The painting mortars can be classified into four groups, according to the lime/sand proportions in their composition:

- 1) Mortars with lime to sand ratio of approximately 1:1-1.5 mixed with organic filler – straw, and in M10 presence of crushed brick is detected. These are the plasters from painting phase I and II: M8 – south wall (phase I), M9 – west wall (phase II) and M10 – north wall (phase II).

¹⁹ The data regarding the mortars from the south wall and the ceiling of the basilica (M8 and M14) follows J. Wiseman and Dj. Georgievski 1975, tab. 4.

- 2) Mortars with lime to sand ratio of 1:1.5, with addition of crushed brick and organic filler – straw. These are the plasters from phase IV: M12 – east pilaster and M13 – west pilaster.
- 3) Mortars with lime to sand ratio of 2:1 with organic filler and hemp. This is the plaster from phase III, M11 – north wall.
- 4) Mortars with lime to sand ratio of 3.5:1 with small amounts of added crushed brick and organic filler – straw. This is plaster from the ceiling, M14.

Table 1

Description		Chemical analyses of the mortars (mass percentage)					
		Sand %	CaO%	MgO %	R ₂ O ₃ %	Brick	OF
Mortar examples							
M1	West wall - building phase I	60.0	12.9	5.2	0.8	+-	-/-
M2	North wall - building phase I	64.0	12.3	3.6	0.7	+-	-/-
M3	Apse - building phase I	64.0	18.5	0.6	0.2	-	-/-
M4	North wall - building phase II	66.0	10.9	1.3	0.8	-	-/-
M5	Apse - building phase II	67.0	14.2	0.5	0.6	-	-/-
M6	East pilaster - building phase III	49.0	26.5	5.1	1.0	+	+/-
M7	West pilaster - building phase III	48.0	25.2	4.8	1.2	+	+/-
Mortar examples							
M8	South wall - painting phase I	36.7	24.1	0.9	3.1	-	+/-
M9	West wall - painting phase II (between two clay layers)	35.0	31.7	2.8	1.7	-	+/-
M10	North wall - painting phase II (between two clay layers)	37.0	30.9	2.7	1.4	+	+/-
M11	North wall - painting phase III	22.0	38.6	4.0	3.2	-	+/+
M12	East pilaster - painting phase IV	45.0	28.6	5.6	1.8	+	+/-
M13	West pilaster - painting phase IV	50.0	26.4	5.5	1.4	+	+/-
M14	Ceiling	11.9	41.7	1.6	2.6	+-	+/-

R₂O₃ - Total amount of iron and aluminium oxides (Fe₂O₃; Al₂O₃)

OF - Organic filler (straw/hemp)

This data points to the different composition of the painting mortars used in different phases; and in addition to this, a clear distinction can be seen in the mor-

tars from the wall painting (M8-M13) and the mortars used in the ceiling (M14) which contain a much higher level of lime. This is due to the specific technique used in preparing the painting foundation on the ceiling, where better adhesion is necessary to affix the mortar to the reeds.

Mortars from the first and second painting phase have certain similarities in terms of the relative quantities of lime and sand in their composition; however, levels of MgO show a clear difference in these mortars.

The mortar used in the third painting phase (M11) has a different lime to sand ratio from the rest of the mortars, and it is the only instance where organic filler is detected – both straw and organic fibres (hemp), while only straw was added to the rest of the mortars. It should be noted that the technique used in phase III differs than the rest since the foundation layer does not contain any clay.

The mortar coatings on the pilasters used for painting (M12-M13) have significantly higher percentages of sand in their composition, as well as higher levels of MgO in the lime than the rest of the mortars. If we compare the wall (M6-M7) and painting mortars (M12-M13) from the pilasters, it can be concluded that they have almost identical composition, which could indicate that right after they were built, the same materials were used to create the painting surface.

In addition to this data there are results obtained by chemical analysis of the painted mortars conducted in 1972.²⁰ The analysed samples show high levels of lime in the mortar composition, amounting to approximately 61%, which is a much greater quantity than in any of the other analysed mortars from the basilica. High levels of MgO in the lime composition were detected as well, in a percentage ratio of 11%. When the mortars for the baptistery were made, brick was not used in the mix at all, while organic fillers such as a combination of straw and hemp were detected in only two of the samples, with the rest containing only straw. This data shows that the technical-technological characteristics of the wall paintings from the baptistery are completely different than the rest of the painting phases in the basilica, while the high percentage of MgO content in the lime leads to the conclusion that the limes were extracted from different quarries.

Chemical analysis of the pigments

The pigments used in the wall paintings of the Old Episcopal basilica and the baptistery have been analysed a few times. Analyses were first carried out on seven samples from the baptistery in 1975²¹, followed by two more samples from the bap-

²⁰ 7 samples of the plasters were analysed from the baptistery. J. Wiseman and Dj. Georgievski 1975, 166, 180-182. tab. 5.

²¹ J. Wiseman and Dj. Georgievski, 1975, 182-184.

stery and the basilica in 1980 and 1982.²² The last analyses were made in 2010 by Dr Biljana Minčeva-Šukarova at the Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University in Skopje.²³ Ten fresco fragments with various colours were analysed, as well as eleven pigment samples were extracted from the walls using cotton swabs.

According to the analyses conducted by Minčeva-Šukarova, all pigments were made using natural – earth minerals. The results of the analysed paints and their mineral origin are shown in the list and Table II below:

Yellow:

Three types of yellow pigments derived from different minerals were found:

- Pigments made from yellow iron oxides, more specifically from the mineral goethite ($\text{FeO}(\text{OH})$). Sample No. 2 (ceiling)²⁴;
- Pigments made from orthorhombic lead oxide – the mineral massicot (PbO) and phyllosilicate mineral muscovite or mica. Sample No. 3 (ceiling);
- Pigments made from iron oxides, more specifically the mineral yellow ochre which has hematite in its base (Fe_2O_3) and contains clay and quartz. Sample No. 6 (ceiling).

Yellow – ochre:

This pigment contains few iron oxides such as: yellow iron oxide – goethite ($\text{FeO}(\text{OH})$), red iron oxide – hematite (Fe_2O_3) and small quantities of the black iron oxide – magnetite (Fe_3O_4). Sample No. 12 (south wall).

Red:

- Pigments deriving from Red earth, or a mixture of the minerals hematite (Fe_2O_3) and magnetite (Fe_3O_4). Samples No. 10 (pilaster), 14 (baptistry), 15-16 (ceiling) and 17 (west wall);
- Pigments made from the minerals hematite, magnetite and litharge-tetragonal lead oxide (Pb_3O_4). Samples No. 18 (west wall) and 6 (ceiling).

Dark red

²² C. Hemans, 1987, 38-40, 89-92.

²³ The analyses were done using micro-Raman spectroscopy (non-destructive method) in the archaeometry laboratory at the Institute of Chemistry, with a micro-Raman spectrometer Lab Ram 300, Horiba Jobin Yvon, with the following set parameters/conditions: laser – 632.8 nm, power – 13.7 mW (on the sample); grating – 1800 g/mm, hole 500 μm ; filter – D=0.3; D=0.6.1.0; objective magnification – x10, x50; exposure time – 5-15 sec; number of scans – 10-20.

²⁴ Numeration follows the order in Table II.

This colour was achieved by mixing hematite, magnetite and charcoal. Samples No. 2, 3 (ceiling) and 10 (pilaster).

Grey:

Two types of grey pigments were detected, made by combining different minerals:

- Pigments derived from the phyllosilicate mineral muscovite (mica), with additions of calcite and charcoal. Sample No. 2 (ceiling);
- Pigments made from a mixture of the minerals muscovite, glauconite, magnetite and calcite. Sample No. 3 (ceiling).

Green:

The green colour was derived from the natural pigment Green earth, which is a mixture of iron hydrosilicates, magnesium, aluminium and tin, i.e. the minerals glauconite and celadonite. From the analysed samples, glauconite was found in No. 1, 2, 4 and 6 (ceiling) and celadonite in sample No. 5 (ceiling).

Dark green:

Dark green tone was achieved by mixing Green earth and charcoal. Samples No. 4 and 8 (ceiling).

White:

The white pigments found in all of the analysed samples came from the mineral calcite (CaCO_3). Calcite was detected in the composition of other dyes as well, since its addition creates lighter versions of the colours.

Light brown (beige):

Created from a mixture of white and yellow pigments, i.e. the minerals calcite (CaCO_3) and goethite ($\text{FeO}(\text{OH})$). Sample No. 13 (baptistery).

White/light brown:

Derived from the minerals calcite (CaCO_3) and muscovite (mica). Sample No. 2 and 4 (ceiling).

Black:

The black dye in all analysed samples was made from charcoal. Charcoal was found in the composition of other dyes as well, since its addition creates darker colour shades.

In addition to the pigment analysis in this study, the following list presents results from previous research conducted on the pigments from the Old Episcopal basilica and the baptistery. Most of the earlier tested samples are identical to those presented in this study, however, few additional pigments were identified:

Pink:

Made from a mixture of iron oxides – magnetite (Fe_3O_4) and calcite. A sample from the baptistery.

Light brown:

The pigment was made from a mixture of natural Sienna ($\text{Fe}_2\text{O}_3\text{H}_2\text{O}$) and calcite. A sample from the baptistery.²⁵

Blue:

Two samples containing blue dye were analysed, extracted from painting phases I and II of the church baptistery.²⁶

- 1) Pigments derived from the mineral azurite;
- 2) Pigments made from crushed blue glass.

Table II

Examp. no.	Pigment origin	Colour	Pigment/material
Fresco fragm.			
1	Ceiling	White	Calcite
		Green	Green earth (glauconite)
2	Ceiling	Red/Bordeaux	Red earth (hematite, magnetite), coal
		Grey	Muscovite, coal
		Black	Coal
		White /light brown	Calcite, muscovite
		Green	Green earth (glauconite)
		Yellow	Massicot

²⁵ The results of the pink and light brown pigment analyses are published in: J. Wiseman and Dj. Georgievski, 1975, 182-184.

²⁶ For a detailed study on the baptistery wall paintings see C. Hemans 1987, 90-91; C.J. Downing, 1998, 259-280.

3	Ceiling	Red/Bordeaux	Red earth (hematite), coal
		Grey	Muscovite, glauconite, magnetite, calcite
		Yellow	Massicot, muscovite
		Black	Coal
4	Ceiling	Green	Green earth (glauconite)
		Dark green	Green earth (glauconite), coal
		White/light brown	Calcite, muscovite
5	Ceiling	Green	Green earth (celadonite)
		Black	Coal
6	Ceiling	Yellow	Yellow ochre (goethite, calcite, magnetite, anatase)
		Red	Litharge, hematite, magnetite
7	Ceiling	Yellow	Yellow ochre (Goethite, calcite, magnetite, anatase)
		Red	Hematite, magnetite
8	Ceiling	Dark green/black	Green earth (glauconite), coal
		Red	Red earth (hematite)
9	Ceiling	Green	Green earth (glauconite)
		Red	Red earth (hematite)
10	West pilaster	Dark red	Red earth (hematite, magnetite), Coal, quartz
		Light red	Red earth (hematite, magnetite)
Exempl. of colours			
11	South wall - phase I	Black	Coal with green earth
12	South wall - phase I	Yellow - ochre	Goethite, hematite, magnetite
13	Baptistery	Pale brown/beige	Calcite, goethite
14	Baptistery	Red/Bordeaux	Red earth (hematite, magnetite)
15	Ceiling	Red/Bordeaux	Red earth (hematite, magnetite)
16	Ceiling	Red/Bordeaux	Red earth (hematite, magnetite)
17	Central aisle - west wall	Red/Bordeaux	Red earth (hematite, magnetite)
18	Central aisle - west wall	Red/Bordeaux	Red earth (hematite), litharge

Overall, the wall paintings from all phases in the Old Episcopal basilica were created using a modest colour palette, dominated by white, black, grey, red and yellow/ochre tones, with rare instances of green. Analyses have shown that the dyes were made from earth pigments, mostly iron or lead oxides which are widespread in nature and easily obtained. The single exception is the green pigment, derived from the minerals glauconite and celadonite, which cannot be found in the nearby sur-

roundings of Stobi. These minerals are commonly formed along sea shores and the nearest deposits are around the Mediterranean or the Black Sea. The largest and most significant deposits of these minerals are found at Monte Baldo, a mountain range near Verona in Italy, known to be exploited for these minerals since antiquity. This suggests that the green pigments used in the Old Episcopal basilica were not easy to acquire nor cheap, which explains why their use in the wall paintings is limited.

Similarly, the blue paint is found only in few fragments coming from the basilica ceiling,²⁷ while in the baptistery it is used in both phases. The painters that worked on the first painting phase in the baptistery used high quality blue colour derived from the mineral azurite, which was certainly imported to Stobi; unlike their successors who turned to using glass waste in order to achieve a blue tone.²⁸

The limited use of green and almost complete absence of blue pigments reveals the weakened financial ability of donors to fund luxurious painted decoration of the temple, in contrast to the donors in the first phase of the baptistery who were affluent enough to afford the most expensive pigments, such as the azurite.

Final considerations

The analyses of the wall paintings from all phases of the church show that in the two buildings, which are in complete temporal, spatial and functional connection, few different painting ateliers worked using their own painting techniques and mixing different ratios in the materials when preparing mortars and dyes. There are four painting phases in the basilica and two in the baptistery that differ in the techniques and technologies used, as well as in the mortar composition, the ratios of organic and inorganic fillers in the mortars and the different percentages of MgO in the lime (their origin in different lime quarries). The results of all these studies clearly show that each painting phase was carried out by a different painting atelier, which was given the opportunity to paint only once, that is, not one of the ateliers was commissioned to paint for a second time in the Episcopal complex. This evidence is particularly valuable since it suggests that the period between two painting phases is quite long, as there are considerable changes in the painting technology, or perhaps the lack of consistency is due to travelling ateliers that were not settled in Stobi, resulting in a variety of technologies and traditions practiced by different travelling ateliers crossing paths in the Episcopal basilica and baptistery in Stobi.

²⁷ The preliminary microscopic analysis show that the pigments were made from crushed blue glass. The analysis was carried out by Dr Krassy Frangova in the laboratory at the Institute for Conservation in The Royal Danish Academy of Fine Arts in Copenhagen.

²⁸ C. Hemans, 1987, 89-92.

МИШКО ТУТКОВСКИ

СЛИКАРСТВОТО ОД СТАРАТА БАЗИЛИКА ВО СТОБИ: АНАЛИЗА НА ТЕХНИЧКО-ТЕХНОЛОШКИТЕ КАРАКТЕРИСТИКИ

Резиме

Анализите на сликарството од сите фази на црквата и од крстилницата покажуваат дека во двете градби кои се временски, просторно и функционално неразделни, работеле повеќе сликарски ателјеа кои применувале различни сликарски техники и се служеле со различни рецептури за подготовка на малтерите и на боите. Во базиликата се евидентирани четири, а во крстилницата две сликарски фази кои се разликуваат меѓусебно според применетата техника и технологија, како и според составот на малтерите, уделот на органските и неорганските полнила во малтерите и според различниот процент на MgO во составот на варта (потеклото на варовниците). По согледувањето на резултатите од овие проучувања, станува очигледно дека сите сликарски фази во црквата и во крстилницата се изработени од различни ателјеа кои имале прилика да сликаат само еднаш, односно, ниту едно ателје не добило повторен ангажман во епископскиот комплекс. Овој податок е мошне значаен затоа што може да сугерира дека периодот помеѓу сликарските фази е прилично долг, затоа што следиме крупни промени во сликарската технологија, или пак, станува збор за патувачки ателјеа кои немале постојано седиште во Стоби, и на тој начин во епископската базилика и во крстилницата се вкрстувале различните технологии и традиции кои ги практикувале патувачките ателјеа.

REFERENCES:

- ALEKSOVA B., *Loca Sanctorum Macedoniae: The Cult of Martyrs in Macedonia from the 4th to the 9th Centuries*, Skopje 1997.
- ALEKSOVA B., „The Old Episcopal Basilica at Stobi“, 1982-1983, *AI XII-XIII*, 50-62.
- BLAŽEVSKA S. AND TUTKOVSKI M., „The Episcopal Basilica in Stobi“, in *Early Christian Wall Paintings from the Episcopal Basilica in Stobi* (Exhibition catalogue, Stobi 2012).
- DIMITROVA E., „The Painterly Horizons of the Frescoes of the Episcopal Basilica: Iconographic Design, Symbolic Configuration, Stylistic Modularity“ in *Early Christian Wall Paintings from the Episcopal Basilica in Stobi* (Exhibition catalogue, Stobi 2012).
- DOWNING C. J., „Wall Paintings from the Baptistery at Stobi, Macedonia and Early Depictions of Christ and the Evangelists“, 1998, *DOP* 52, 259-280.
- HEMANS C., *Late Antique wall painting from Stobi, Yugoslavia* (Ph.D. diss. Indiana University, 1987).
- WISEMAN J., „Archaeology and history in Stobi, Macedonia“, in Charles B. McClendon (ed.), *Rome and the Provinces*, New Haven 1986, 37-50.
- WISEMAN J., „Stobi in Yugoslavian Macedonia: Archaeological Excavations and Research, 1977-1978“, 1978, *JFA* Vol. 5, No. 4, 391-429.
- WISEMAN J., „The early churches and the Christian community in Stobi“, in *Acta Congressus internationalis XIV Archaeologiae Christianae*, 2006, Citta del Vaticano & Wien, 395-803.
- WISEMAN J. - GEORGIEVSKI DJ., „Wall Decoration at Stobi“, 1975, *SAS* II, 163-189.
- WISEMAN J. - MANO-ZISI DJ., „Excavations at Stobi 1973- 1974“, 1974, *JFA* 1, 117-148.
- WISEMAN J. - MANO-ZISI DJ., „Stobi: A City in Ancient Macedonia“, 1976, *JFA* 3, 269-302.

AI - Archaeologia Iugoslavica

DOP - Dumbarton Oaks Papers

JFA - Journal of field archaeology

SAS - Studies of the antiquities in Stobi