

Architectural Decoration of Christian Churches in Some Regions of Caucasus between 10th and 11th Centuries: An Attempt to Reconstruct the Decorative System*

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Abstract: *In course of the long-term research on the architectural decoration of Christian churches in Abkhazia and Southern Ossetia, there has been gathered a great number of important materials (that help to correct the date of some groups of artefacts and to identify some new subjects, as well as to put them in the artistic context of the life of the Byzantine Empire and its periphery in the period between the 10th and the beginning of the 11th centuries). However, lapidary collections that originate from these regions have not been studied from the point of view of function and its reliefs. It is necessary to separate the fragments of the altar barriers from the ones of the facades of the Christian churches.*

Studying of the analogies from the neighboring regions (modern territory of Georgia, Armenia, Asia Minor, other parts of the Byzantine Empire) and using the modern methods of research (3D reconstructions) could permit to visualize many principal monuments (small forms and monumental decoration) that originate from the above-mentioned regions.

Such research is important for the studying of the artistic culture of these regions in the period of the genesis of the self-consciousness of their tribes (end of the 9th cent. – beginning of the 11th cent.) and their separation from the political and cultural influence of the hegemon, that is the Byzantine Empire. Reconstruction of some monuments (altar barriers, decorative system of the facades) and drafting of the typological lines could afford us to demonstrate the meaning of the two regions for the Christian culture of the Southern Caucasus in the period concerned. It is also important to show their interrelations with the neighboring territories.

Actuality of the problem is proved by the active research led, for example, in Georgia, Russian Federation, France, etc.

Originality of research is proved by the fact that small forms and facade decoration of the Christian churches in Abkhazia and Southern Ossetia in the period in question have not been systematically studied yet. The previous studies

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focused on the paleo Christian period and the dates supposed for some key monuments have been essentially corrected by recent research.

Meanwhile, this territory (Western Georgia, passes between Karachay-Cherkessia, Kabardino-Balkaria, Abkhazia, Southern Ossetia and Racha) played a decisive role in the formation of the original type of medieval artistic Christian conscience.

Keywords: *architectural decoration, reliefs, 3D reconstruction, Byzantium, periphery, altar barrier, facade decoration, decorative scheme, Christian Orient, Black Sea region.*

Introduction

As a result of long-term research (as part of numerous international projects of scientific cooperation between Russian – Abkhazian and Russian – Ossetian specialists) of architectural decorations (in Abkhazia – beginning from 2006, in the Southern Ossetia – from 2020), many different witnesses have been brought to date and attribute some monuments of Christian architecture. Main monuments of the 10th – 11th centuries in the above-mentioned regions are ruined. Some lapidary collections of architectural decorations and small forms are dispersed (being left in the fresh air or kept in different museum collections).

Considering the opportunities of the modern methods of visualization of the material (virtual 3d reconstruction), it would be suitable for scientific and educational purposes to use them in the work with the ruins of Christian medieval churches and their decoration.

Purposes and objectives

Reconstruction and creation of 3d models of altar barriers and architectural decoration of some churches that can be dated back to the 10th – beginning of the 11th centuries from the territories of modern Abkhazia and Southern Ossetia are seminal to this research. The program of the research includes the ruined monuments that will be inscribed in the cultural context of the art of the 10th century in the Christian Orient. The abundance of decorative details and several unique iconographic subjects (for example, rear variant of the scene “Prophet Jonas in the womb of the whale”) would permit to reconstruct important typological series.

Methods and materials

In the course of field and desk research, many materials were gathered. As to the bibliography on the subject, it is very vast. Concerning Abkhazian monuments, there are many publications on single monuments and several generalizing works. During recent decades medieval churches of Abkhazia have been intensively studied by Russian and Abkhazian scholars including via numerous projects of scientific cooperation between these two countries.

A detailed review of the bibliography on the subject (up to the 2020) is published in the monography of E. Endoltseva [1, 5 - 24]. For example, single churches were actively studied by S. Sakania [2-5]. As for scientific synthesis, it was partly made by L. Khroushkova (even if sometimes her suppositions concerning the date of some monuments need to be essentially corrected) [6-7].

Architectural decoration of Christian churches in Southern Ossetia is not studied as minutely as in Abkhazia. The most reputed research on the subject was conducted by Georgian scholars more than forty years ago [8]. It contains descriptions and many precious observations on key monuments of Christian architecture on the territory of modern Southern Ossetia in the period between the 5th and 18th centuries. But actually, there is possibility and even necessity to study the Christian churches of the region dating from the middle Byzantine period in a more detailed manner. Several recent publications on the topic are not enough even if the generalizing work of a group of Georgian specialists is perfect as for quality of polygraphy and richness in rear photo materials [9].

Some interesting observations on zoomorphic images in the decoration of Christian churches of the 10th – 11th centuries were made as a result of a project of scientific collaboration between Russian and Ossetian scholars (i.e., “Bestiary of the period of the early Iron age – Middle Ages from the territory of the modern Southern Ossetia (monuments of archaeology, sculpture, mythology)” (2020 – 2022) [11, c. 167-177; 12, c. 9-28; 13, c. 161 - 173]. Research on the architectural decoration of 9th – 11th centuries on the territory of the Southern Ossetia should be continued.

Thus, the accumulated information on the topic allows us to make preliminary reconstructions of the architectural decoration of some churches. We should analyze the available information and resulting possibilities one more time.

A lot of necessary information for the hypothetical reconstruction of the architectural decoration is gathered for the Abkhazian monuments (field research, as well as extensive bibliography). Besides, the state of some of them is preferable for such experiments. For example, there are several large lapidary collections in Abkhazia whose reliefs can be assuredly associated to certain church buildings in different states of preservation. The largest collection (more than 90 artefacts) was kept (up to 2016) in the citadel of Anacopia fortress (on top of Anacopia mountain in Novij Afon). These reliefs were analyzed in a very detailed manner (measurements, analysis of figurative and ornamental compositions, etc.) in course of long-term collaboration between Russian and Abkhazian research groups. The results of the research were published in a collective monography dedicated to the complex study of the Christian monuments of Anacopia fortress (epigraphy, archaeology,

iconography) [14]. Some of the results were later corrected and the data was completed [15, c. 103-104, 110-124].

The reliefs from the church of Saint Theodore on Anacopia mountain were measured, their function was studied, their iconographic and stylistic context was defined. But there are still some questions which could only be resolved with the help of the virtual reconstruction of the decorative system of churches from Anacopia fortress. It is particularly important to understand how many churches were decorated by the reliefs gathered in the altar of St. Theodore church in Anacopia and how could they look like. What were their exterior decoration and altar barriers like?

Scholars from the Laboratory of Digital Technologies of Institute of Oriental Studies RAS are planning to suggest solutions for the questions.

A lapidary collection from Anacopia mountain is studied in detail (moreover, the fortress on Anacopia mountain occupies a central place in the history of the Abkhazian kingdom) that is why it is the principal point in the research program concerning the virtual reconstruction of the architectural decoration of medieval churches in the above-mentioned regions. There are also some other lapidary collections in Abkhazia that can be included in this program. Among them, there are the fragments of the reliefs from Dranda church. This collection is divided between several locations. Part of it is kept in the funds of the Abkhazian State Museum. The others two parts – in the collection of the Church Archaeological Museum of the metropole of Abkhazia and in the narthex of the cathedral of Dormition in Dranda village, respectively. Several fragments are lost but they were published more than a hundred years ago by countess P. Uvarova [16, c. 30]. Some other rear fragments of its altar barrier were recently discovered and attributed [17, c. 196-210]. As the preserved fragments are measured, other information is published. So, the virtual reconstruction of the altar barrier is possible. It could enrich the scientific vision of the evolution of small forms in the architectural decoration of Christian churches in Caucasus during the medieval period.

One more interesting and well-studied monument is the church in Veseloje village [18, c. 34-61]. In the course of archaeological excavations of 2010 – 2011 seasons, there were found several carved stone reliefs with figurative and ornamental representations. Available information about it also permits to make a virtual reconstruction of the altar barrier of the church.

As shown above, architectural decorations of Christian churches in the Southern Ossetia of the 10th – 11th centuries are less studied than in Abkhazia. But there are also a lot of interesting examples of stone reliefs. On the territory there are several rich lapidary collections (that can be dated back to the 10th century) which are accessible to be measured and analyzed in order to produce a virtual reconstruction of the decoration of the churches they originate from.

During a recent study trip (which took place in the autumn of 2020) as part of the Russian – Ossetian scientific program, a series of lapidary

collections were inspected and analyzed. Some of them are situated in Tskhinval region (Dodot village) and in Djav region (Sokhta, Kasadjin, Nadarbaz, Kvaisa regions). Some fragments of carved stone blocks (from the outer decoration or altar barrier) are inserted in the wall of the ruined hospital in Tskhinval city. It is known that they originate from the church in Tbet village of the Tskhinval region (its ruins are also preserved).

The most interesting (presence of rear iconographical subjects) are the fragments from the altar barriers and architectural decoration which were found in the ruins of churches from Sokhta, Kasadjin, Nadarbaz and Kvaisa villages. However, it is necessary to make some additional research work (measurements of the reliefs and of the ruins) before we reconstruct their virtual appearance.

In recent years, thanks to the growing research potential, the number of projects for the virtual reconstruction of monuments of cultural and historical heritage has increased. Virtual reconstruction is a modern digital method of scientific visualization that uses information and communication technologies (ICT) to recreate the historical appearance of individual art objects and architectural monuments (lost or partially destroyed) [19, p. 9]. It allows to visualize the appearance of both individual elements of buildings, and architectural ensembles or quarters as a whole, by developing a three-dimensional model of the object. The creation of a 3D model of an architectural monument is based on the collected historical sources, and the reliability of the reconstructed image depends on the work of the researcher and is based not only on traditional knowledge, but also on computer skills.

The accelerated development of digital technologies over the past decades has significantly enriched the research potential of humanities and has made it possible to use all forms of information modeling. Following the development of methods for mathematical modeling of historical processes in the mid-1990s, an advanced type of modeling appeared – visual modeling of objects [20]. In addition to the traditional approaches to creating graphic models – from drawings to sketches and layouts – digital technologies have provided researchers with the ability to a quicker and much less labor-intensive expansion and modification of models: edit material parameters, change the size and shape of the monument, adjust lighting conditions and environmental parameters, etc. One of the promising areas of visual modeling is considered to be digital volumetric (3D) modeling [21]. According to researchers, the emergence of 3D modeling technologies has become “a real discovery in the field of computer technology” [22, p. 146]. The importance of introducing 3D modeling technologies in art studies was pointed out by Bernard Smith, Head of Unit, Cultural Heritage Applications DG Information Society, European Commission [23]. Existing approaches to 3D modeling can be divided into 4 forms: 1) designing – the creation of new objects, 2) conservation (digitization) – the preservation of the forms and characteristics of existing objects, 3)

industrial renovation – the refinement and modernization of existing objects, and 4) virtual reconstruction – modeling of existing and lost forms and characteristics of the objects.

The virtual reconstruction of historical and cultural heritage objects is a complex research process: search and study of sources and analogues, painstaking analysis of heterogeneous information, creation of a detailed verified reconstruction algorithm that is unique for each object [24, p. 64]. Given the complexity, the activity of creating virtual reconstructions can be considered not only an auxiliary tool for art history and historical research, but also independent scientific research.

The first sporadic attempts to use 3D modeling technologies in art history research have been made since the mid-1990s. Let us mention some projects of historical and architectural reconstruction: Petra Great Temple (late 1st century BCE, Jordan) under the guidance of professor Martha Sharp Joukowsky (Brown University, https://www.brown.edu/Departments/Joukowsky_Institute/Petra/), temples of the 4th c. in Rome – under the auspices of Philippe Fleury (Research Center for Antiquity and Myths University of Caen Normandy, <https://rome.unicaen.fr/>), «Rome Reborn», supervised by Bernard Frischer (The Institute for Advanced Technology in the Humanities (IATH), research unit of the University of Virginia, <https://www.romereborn.org/>), Renaissance Vatican Palace, headed by Manfred Koob (Department of Information and Communication Technologies in Architecture, Technical University of Darmstadt, http://www.cad.architektur.tu-darmstadt.de/d_projects/vatikan.html).

By the mid-2000s, software and modeling methodology were being improved, and interest in virtual reconstructions of cultural heritage objects was growing in the scientific community. Thus, interdisciplinary research groups and laboratories are formed in the leading educational and scientific centers. These groups included, in addition to computer specialists, professional art historians, architects, archaeologists, historians, artists and humanitarians from other fields. Large-scale reconstruction projects were launched, characterized by the cooperation of specialists in various fields of knowledge, often from different institutions. This applies to: “Byzantium 1200” (Tayfun Öner, Albrecht Berger, <https://www.byzantium1200.com/>), Khmer temples (Technical University of Darmstadt, National Museum of Cambodia, http://www.cad.architektur.tu-darmstadt.de/d_projects/angkor.html), Digital Karnak Project (University of California at Los Angeles Experiential Technologies Center, <http://dlib.etc.ucla.edu/projects/Karnak/>), Teotihuacan (National Autonomous University of Mexico, National Institute of Anthropology and History), Temple and Sanctuaries of the Ancient Bosphorus (Saint Petersburg State University, Institute of the History of Material Culture RAS, <http://bosportemple.ru/>) [25], “850 years of Moscow Kremlin architecture,

1157-2000 гг.” (Technical University of Darmstadt, Russian State University for the Humanities, Moscow Kremlin Museums, http://www.cad.architektur.tu-darmstadt.de/d_projects/kreml.html), “Rome Reborn 2.0” (University of Virginia, UCLA, Polytechnic University of Milan, Université Michel de Montaigne Bordeaux 3, University of Caen Normandy).

From year to year, visualization tools, complexity and quality of ongoing projects have been improved. For a high-quality reconstruction, it was no longer enough to model only the main architectural elements; the emphasis was shifted to the reproduction of small forms, plastic details, and decorative elements. The same trends can be seen in the transformation of the already mentioned projects: Petra Great Temple, Rome Reborn, Byzantium 1200. In addition, it is worth mentioning other projects where special attention is paid to the virtual reconstruction of plastics and small forms: Imperial mausoleum of Xi'an (Technical University of Darmstadt, Shaanxi Provincial Institute of Archaeology, Emperor Qinshihuang's Mausoleum Site Museum, http://www.cad.architektur.tu-darmstadt.de/d_projects/xian.html), Tell Halaf (Syria) and Dresden residential palace 1678 (Technical University of Darmstadt, Architectura Virtualis GmbH, https://www.dg.architektur.tu-darmstadt.de/forschung_ddu/digitale_rekonstruktion_ddu/abenteuer_orient__tell_halaf/index.en.jsp, https://www.dg.architektur.tudarmstadt.de/forschung_ddu/digitale_rekonstruktion_ddu/dresdner_residenzschloss/index.en.jsp), Imperial Cathedral (Kaiserdom) of Königsutter (Hafen City University Hamburg), Gienos Temple (Laboratory of Integrated Digital Technologies IOS RAS, Tkuarchal archaeological expedition IA RAS and Abkhaz Institute for Humanitarian Research AAS, <https://digital.ivran.ru/proekty/gienos>), The Digital Sculpture Project (Virtual World Heritage Laboratory of University of Virginia, <http://www.digitalsculpture.org/>), attractions of Prague Old Town Square, Angkor Wat (Cambodia), Machu Picchu (Peru) (Vizerra SA), “Painted crypts of the Bosphorus” (Saint Petersburg State University, <http://www.bosporuscrypt.ru/>)

Specialist from the Institute of Archeology RAS V.V. Moor believes that virtual reconstruction contains a rich research potential and can serve as a unique tool for the creation and verification of art criticism hypotheses (clarification, verification, development of new ideas) regarding the form, location, manufacturing principles, materials used of historical and cultural heritage objects [26, p. 67]. Along with this, digital methods of virtual reconstruction are often used in the restoration of monuments of painting and monumental art, where they allow restoring images/figures from disparate fragments with great accuracy. The labor-intensive and time-consuming manual checking of the joining of many fragments is now replaced by a computer compatibility analysis of their digital models. High-speed processing of large volumes of data makes it possible to use for fragments joining not only the characteristics of the quality of contour joining, but also the characteristic

of the color gradient on the surface, the direction of the stroke/cutter, etc. It is an ostentatious project for the restoration of the destroyed fresco cycle by Andrea Mantegna in the Ovetari Chapel of the Church of the Eremitani (Padua). Thanks to the method developed by the University of Padua (Department of Physics and Astronomy “Galileo Galilei”), a high efficiency of fragment localization has been achieved [27]. Another project for the restoration of the broken frescoes of the 14th century Church of the Assumption on Volotovo pole, carried out by the “Freska” Research and Restoration Studio, also demonstrated the benefits of digital reconstruction technologies. After extracting the remains of frescoes from the ruins of the temple, more than 1.7 million fragments ranging in size from 1 to 6 cm² were collected. The software developed for the restoration of frescoes made it possible to select pairs from many small fragments that are highly likely to join each other, while operations with digital images make it possible to join the fragments without contact, without destroying the edges of the side faces of the fragments [28]. Similar methods can be applied to the restoration of architectural plastics. Consider the project “Reconstruction of the Lost Stone Reliefs of the 13th century St. George’s Cathedral” (Yuryev-Polsky Museum of History, Architecture and Art, Department of Historical Informatics LMSU), in which virtual reconstruction was used to restore the appearance of a number of lost mythical and biblical scenes on stone reliefs that previously adorned the walls of the cathedral [29]. During the collapse and in the course of further rebuilding, the cathedral lost some of the reliefs, and some were embedded in hard-to-reach places. Digital technologies have made it possible to digitize reliefs and work with their models without violating the current integrity of the object itself. During the project, a software tool was used, which made it possible to systematize the fragments and restore some of the stone reliefs. Recent successful examples include projects for obtaining and analyzing virtual images of rock art monuments. (HSE University, RSSDA) [30], making a high-quality copy of the ornate bronze doors for the Baptistery of the Florence Cathedral (Prototek, Ciglia&Carrai) [31], and creation of 3D models of medieval stone crosses (The State Hermitage Museum) [32].

The project presented in this article involves the integrated use of the previous experience of diverse projects for the virtual reconstruction of the cultural and historical heritage of the Eastern Black Sea region, carried out by various research teams. It is worth noting that the proposed scientific virtual reconstruction would be based on the results of many years of archaeological research. The project is carried out according to a single plan and on a proven methodological basis. Activities on the study and reconstruction of each monument include the following main stages:

1. Selection of sources.
2. Digitization, analysis and structuring of information from narrative and graphic sources.

3. The study of archaeological research data.
4. Selection and study of analogues, architectural and aesthetic-utilitarian analyses of the object.
5. Preliminary modeling with the construction of a sketch model.
6. Main modeling.
7. Visualization creation.
8. Verification and preparation of scientific and design documentation.

Thus, at the first stage of the project, a source base is formed using historical, archival, bibliographic and heuristic methods for detecting narrative and graphic sources. Further, the initial data of the sources are digitized, the analysis of the links between their messages and the comparative analysis of the sources are carried out. An important stage will be the study of data from archaeological reports containing information on the monument typology, its properties and the history of study. Here, if necessary, an additional archaeological survey of the object is carried out, along with its photographic fixation, 3D laser scan and photogrammetric measurements and their processing in specialized software (Agisoft Photoscan, Autodesk Remake, Micmac). Based on archaeological and source data, an architectural and aesthetic-utilitarian analysis of the object is carried out, the study of semantic and constructive changes in shaping throughout its history. Furthermore, the selection of analogues according to the constructive and architectural solution and the development of scientific hypotheses on the characteristics of the lost parts of the monument are being carried out. At the stage of preliminary modeling, the necessary design calculations are performed, preliminary conceptual art history and architectural solutions developed, and a simplified draft model of the monument is created. Based on the design solutions of the draft model, the main modeling is performed. Its results are fundamental for architectural, art and constructive solutions, as well as a detailed recreation of monumental art, plastic items and interior decoration. The result of the modeling should be a 3D BIM model – the so-called “digital twin” of the object, developed on the basis of scientific research, taking into account the authenticity of the monument. These two steps use information modeling and computer-aided design (CAD) software tools such as Graphisoft ArchiCAD, Autodesk AutoCAD, Autodesk 3Ds Max. These tools are used to synthesize graphic information (photographs, drawings, excavation plans, orthophoto maps, laser tacheometric survey data and photogrammetric 3D models) and subsequent design work on the reconstruction of the monument. The visualization stage includes the creation of a final illustrative reconstruction report using high-quality photorealistic graphics based on the monument model received, displaying an authentic landscape and site phenomenology. In accordance with the objectives of the project, this stage may include the creation of posters and video materials, virtual and augmented reality

applications (Lumion, Unity3D software). An indispensable milestone of the project will be the stage of verification and scientific criticism of the model. Verifiable reconstruction of the external appearance of monuments should be based on the data of available sources to the maximum extent. It is clear that the models have certain accuracy, a reliable reproduction of plastic and decorative compositions can be combined with reasonable borrowings from analogues. Completion of work on the study and reconstruction of the monument is accompanied by the release of documentation: drawings, diagrams, plans, explanatory notes and web reports. It should be noted that reconstruction work is an iterative process, when the results obtained at one of the stages can serve to correct the data of previous stages, to clarify research hypotheses and design solutions.

We can say with confidence that the implementation of the project carefully prepared by us for the virtual reconstruction of the architectural decorative system of Christian churches will allow us to shed light on traditional issues in a different way and expand research horizons.

Conclusion

To conclude, the project of virtual reconstruction of architectural decoration of Christian churches of 10th – 11th centuries seems to be important for the scientific study of the sculpture of the middle Byzantine period in Caucasus. It fits good to the increasing interest to the subject from some European scholars (for example, significant studies of C. Vanderheyde[33] and N. Iamanidze[34]).

Besides, virtual reconstruction would help a lot in conservation and popularization of cultural heritage. The results of the research would also stimulate writing of informative guides and creation of virtual tours. Virtual reconstructions of architectural decoration of Christian churches of 10th – 11th centuries in Abkhazia and Southern Ossetia could be actively used in creating modern museum exhibits (in Sukhum, New Afon and Tskhinval).

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