

The typology of the scientific 3D-reconstructions of architectural monuments:

The research experience in the Moscow Institute of Architecture

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Abstract: The paper is devoted to the experience of scientific architectural 3D-reconstructions creation which was accumulated in the Moscow Institute of Architecture. The main aim is to demonstrate the reconstruction's typology on the examples of the works made by the authors or under their supervision. It connected with different methods and approaches due to the various tasks. The main method is the historical and architectural analysis of the survived data. This method has been playing the key role in such investigations at the Architecture and Urban History Department more than half a century. During the second half of XX century the traditional instruments for these reconstructions were hand graphics and models of paper. However last 15 years the role of digital technologies for this scientific area was considerably increased and now the making of 3D computer reconstructions is a part of students' yearly essays and theoretical and restoration works of the research fellows as well. The presented reconstructions were made for different scientific tasks. Thereupon the special attention is paid to the necessity of the explanation of the studying object selection. The definition of the criteria of such selection is also very important. The main types of the scientific reconstructions are defined: 1. reconstruction of the original look of a rebuilt edifice, 2. reconstruction of a lost or badly preserved architectural monument, 3. reconstruction of an unrealized project, 4. reconstruction of building stages of an edifice or an ensemble, 5. the reconstruction of architectural and constructional peculiarities of a building or building technology. All these types require the different methodology, approaches and visualization methods.

Keywords: 3D-reconstruction, architecture, methodology, visualization.

Introduction

This paper is dedicated to the analysis and presentation of the experience of Moscow Institute of Architecture (MARCHI) in making scientific 3D-reconstructions of historical monuments. The main aim of the paper is to suggest our variant of the typology for the scientific 3D-reconstructions of architectural monuments¹. As a rule they are created as a part of students' works or projects and mainly have educational purpose. In this context the key role is attributed to the historical and architectural analysis that has been carried out at the Architecture and Urban History department for more than 50 years. Historical scientific reconstructions often

¹ We should note that there are several studies on types and functions of reconstructions (D'FRANCESCO AND D'ANDREA, 2008).

became one of the means of this analysis. Traditional instruments for them were paper, plaster or wooden maquettes and hand drawings. For the last 15 years scientists all over the world, as well as in MARCHI, have been relying more and more on computer technology in their research. The authors of the article highlight the basic criteria for creating scientific reconstructions. The study of these questions is illustrated by a number of examples from architectural history made in MARCHI².

The reconstruction typology

In this article we have reviewed some examples of scientific architectural reconstructions of monuments of different periods – from the ancient times to the 19th century, made by the authors or under their guidance. These reconstructions, including those made with the help of computer technology, make an excellent illustration to the various aims of their creators. We should pay special attention to the fact that it is necessary to substantiate the choice of the object of the research and, thus, to formulate the criteria for making the said choice. In this article we are introducing basic types of scientific reconstructions according to the authors' classification:

- reconstruction of original architectural monuments that were remodeled later,
- reconstruction of partially or completely destroyed constructions, ensembles or complexes,
- reconstruction of architectural projects that were never actually built but are of scientific interest,
- reconstruction of building stages of an edifice or an ensemble,
- reconstruction of architectural and constructional peculiarities of the monuments or their building technology.

Summarizing the experience of creating scientific architectural 3D reconstructions, its approbation and comparing it with works of other scientists and organizations could contribute to the further development of this branch of historical and architectural research.

Reconstruction of original architectural monuments that were remodeled later

The most widely spread example of scientific reconstructions of this type involves examining those historical monuments that have survived up to our day in a modified form³. These remodeled constructions, unlike the extinct ones, have more potential for reconstruction. To recreate a building in its original form (or at least to show how it looked at different periods of time) the scientist should gather as much information as possible, in the course of fieldwork or through studying published materials on the topic as well as museum collections and archives.

² For example see: KLIMENKO AND KLIMENKO 2011, KARELIN 2011, KARELIN 2014, KARELIN ET AL. 2015a, KARELIN ET AL. 2015b, KLIMENKO ET AL. 2015.

³ It is possible to bring a lot of examples all over the world, for example see: Enane 974 project, which consist three objects: St. Saviour church, castle and St. Laurence church (WITTUR 2013, 79-138), parts of the *Forum Romanum* reconstruction (PACKER 2006, GORSKY AND PACKER 2015) and the others.

This practice came to be widespread in Russia during the post-war decade (1940-1950), when restoration works were in progress. Recreating the look the edifice had at different periods of its existence has become an essential part of the reconstruction project. Scientific reconstructions of this kind help to substantiate the restoration of the monument and they are also very important for historical and architectural research at the stage when scientific problems are solved. For example, this method was used when architects and archaeologists worked on fundamental research and restoration of the Old Katholikon of the Trinity Lavra (1422), which was undertaken in 1940-1950 under the supervision of professor V.I. Baldin. This work can be an excellent illustration to the aforementioned method which is still widely used today: studying bibliographical and archive materials, surveying the monument itself (measuring, photo-fixation, archaeological works etc.), examining other monuments (the analogous ones), creation of the scientific reconstruction.

Here we can review another good example – works conducted on the ancient monument of Vladimir and Suzdal architectural school – the Church of the Intercession on of the Holy Virgin built in white stone at the confluence of Nerl and Klyazma rivers, near Vladimir. The church was situated on a high artificial hill lined with white stone slabs. At the three sides of the church there used to be three adjacent open one-storey galleries which were demolished with time. The remains of these joints, a doorway and some other details discovered by archaeologists prove that this extension originally existed. Many scientists offered their variants of hypothetical scientific reconstruction of this element; the projects of N.N. Voronin are now considered to be classic. The analysis of numerous variants of the reconstruction, based on the data collected at archaeological and restoration surveys made it possible to create a digital model of the church that reconstructs its original look. Demonstrating this model during the course of lectures dedicated to ancient Russian architecture allows students to get a clear idea of the complicated and expressive design and construction peculiarities of this great monument of Vladimir-Suzdal principedom (Fig.1a)⁴.

Yet another good example of such work is the reconstruction of the mansion of Moscow residence of T. I. Tutolmin⁵, built at the turn of the 18th century. It is one of the most excellent specimens of Moscow classicism. The ensemble used to stand upon the Moskva River and consisted of a three-storey main central block and a cour d'honneur formed by numerous outbuildings. The edifice was crowned with a tall belvedere with a viewpoint. This building had a great meaning for urban planning, because it was seen from nearly everywhere and easily recognized. In 1905, according to the project of V.O. Sherwood, the ensemble was sufficiently remodeled. And after adding up some more floors to it in 1930-s the edifice changed so much it became actually a different building that had none of that well-known grandeur of the past. The scientific reconstruction was created on the basis of project and measuring drafts made by the team of M.F. Kazakov at the turn of 19th century and further restoration surveys (Fig.1b).

⁴ Made in 2007 by students Vasilieva S., Sorokhin S., Vereshkina E under the supervision of Klimenko S.V., published in: KLIMENKO AND KLIMENKO 2011.

⁵ Made in 2011 by students Poltorjitsky I.I., Cherkasov P.P. under the supervision of Klimenko Ju.G., not published.



Fig. 1 – Reconstruction of the original look of a rebuilt edifice. A. Church of the Intercession on the Nerl (Bigolyubovo, Vladimir region). The present look of the building and hypothetical reconstruction of the church's gallery (authors: Vasilieva S., Sorokin S., Vereshkina E. Supervisor: Klimenko S.V.). B. Mansion of T.I. Tutolmin (Moscow, Goncharnaya st., 12). Reconstruction of the original look of the building and state of preservation (authors: Poltorjitsky I.I., Cherkasov P.P. Supervisor: Klimenko Yu.G.).

The reconstruction of partially or completely destroyed constructions, ensembles or complexes

The first half of the 19th century became the time when scientists showed considerable interest in the extinct monuments of Russian architecture, which were very important for the history of the state. During that period there were made attempts to examine the most ancient of the monuments.

It is a rather difficult task because there is no information scientists could rely on – accurate measuring, designs, photo-fixation etc. – that is, any reliable evidence of how the monument originally looked. It is the reason why so many of the ancient Russian edifices and ensembles gone long ago, with only bits of information of how magnificent they were left of them, cannot be recreated even hypothetically. It is impossible to make a scientific architectural reconstruction of the demolished monuments of ancient Kiev, Novgorod, Pskov, Chernigov, Suzdal, Vladimir and other cities and towns. Although architects are very interested in this sort of monuments, the attempts to make their reconstructions mostly end with groundless fantasies and contradict scientific methods. It is very important to understand how dangerous for science the said hypothetical reconstructions are, not to mention building them in actual size (the so called remakes or modern replicas). And at the same time these attempts at reconstructions are necessary too, if we think about new data discovered and rely upon some newly acquired, more accurate information about lost monuments. We have quite a lot of examples of considerable achievements in studying demolished buildings, which involve, among other techniques, making a number of reconstructions that allow to interpret the whole body of information at a new stage. Nevertheless, reconstructing extinct monuments of the past even as a graphic design or a scale model makes sense and can be justified only if it has a great meaning for the history of architecture.

One of such invaluable for history buildings was The Church of the Tithes in Kiev (989–996), one of the early churches of Ancient Rus' built in Byzantine style. It was ruined in the 13th century and already at the beginning

of the 19th century there were made attempts to recreate it. The Church of the Tithes was the first stone church known to us, built after the Christianization of Kievan Rus', and of course it was always very special for people already in the 17th century - we should remember that Pyotr Mogila tried to erect a new church on the 10th century foundation, though certainly he didn't have a purpose to reconstruct it completely. V.P. Stasov was the first who thoroughly examined the foundation in 1820s and presented a project of the restoration of the church, which was carried out in 1828–1842. But of course the architecture of the new church bore absolutely no resemblance to the construction of the 10th century. Now our knowledge of the early periods of Russian architecture is much wider, so it might seem that such projects as V.P. Stasov's would never come to life. Nevertheless there are always enthusiasts who want to "remake" some lost monuments of great importance, and sadly they sometimes find support. Their designs are based only on hypothesis and the authors often see one and the same monument in such a different way that they look like completely different buildings; even the few remaining details are interpreted differently.

As an example we can take the Roman Imperial cult temple in Luxor⁶. This architectural masterpiece was founded inside the *principia* of the late Roman fortress⁷. This military complex was built around the ancient Egyptian temple at Luxor during the reign of Diocletian. The Roman temple inside the *principia* is of particular interest. On the one hand, the common principles of the Tetrarchic art and architecture were used. On the other hand, the architects had to include the *principia* with the Imperial cult temple into the ancient building. It is remarkable that they used its chambers with maximal efficiency and so inside the Egyptian temple a typical Roman *principia* appeared. Furthermore it is possible that in the Roman temple the architects used some principles of the ancient Egyptian architecture. Despite hypothetical character of some suppositions of the reconstruction it seems that generally it allows to imagine how the Roman Imperial cult temple could look like.

This type of scientific 3D-reconstructions seems most widely-distributed, and there are a great number of examples. They are reconstructions of prehistoric monuments⁸, ancient Egyptian architecture⁹; many reconstructions of Roman houses¹⁰, already mentioned reconstructions of *Forum Romanum* (PACKER 2006, GORSKY AND PACKER 2015) and many others, which are impossible to note in the article.

⁶ Made in 2013 by Karelin D.A. with participation of Karelina M.A. and published in: KARELIN 2014, KARELIN 2015.

⁷ About the temple of Roman imperial cult at Luxor see: MONNERET DE VILLARD 1953, KALAVREZOU-MAXEINER 1975, DECKERS 1979.

⁸ Avebury henge (WITTUR 2013, 139-204).

⁹ The Pyramid Complex of Senwosret III at Dahshur (ARNOLD 2002) and Senwosretankh mastaba complex (ARNOLD 2008) by David Johnson.

¹⁰ *Insula del Centenario* (IX, 8) (WITTUR 2013, 53-77), the house of Sallust in Pompeii (VI 2, 4) (LAIDLAW AND STELLA 2014, 255-268).

Reconstruction of unrealized projects

Nowadays scientists more and more often use yet another kind of scientific historical reconstruction in their historical and architectural research; that is, visualization of architectural conceptions which exist only on paper. We can come across projects like that at every stage of history of Russian architecture. Although they were never carried out, the ideas they express are sometimes more significant than buildings that already exist. Their presentation in 3D models allows to appreciate the peculiarities of the spatial layout of the designed construction, see the potential influence on the surrounding area etc.

The creation in 3D of an edifice or an ensemble that was never built seems the easiest types of historical scientific reconstruction. Availability of various information on the project - designs (plans, facades, sections, details), accompanying documents etc. makes it possible to recreate any chosen object in any graphic or maquette form. However it could be very difficult to work not only with clear architectural drawings, but with descriptions written in texts and sketches¹¹. From this point of view it is the most difficult type, furthermore it could be impossible to reconstruct some of such monuments¹². On the one hand, a great number of such projects opens a wide field of work for students. But on the other hand, the objects they choose for reconstruction must be those that are essential for comprehension stylistic features of a certain stage in the history of architecture.

Reconstructions of this type in Russia became widely spread in 1950s. Thus, while working on "The History of Russian Art" edited by I.E. Grabar, scientists began to see different periods of Russian architecture in a new light. It was then when the analysis of unrealized projects took on special significance because scientists understood their role in characterizing a historical epoch.

The aim of these reconstructions could be, for instance, to define the importance of a certain building, or more often an ensemble, for urban planning. The most vivid example is the graphic reconstruction of the magnificent palace of Catherine the Great in the Moscow Kremlin, designed by V.I. Bazhenov (Fig. 2a). The first attempt at reconstruction was made by the architect K.K. Lopyalo who presented the view of the ensemble from the Moskva River (1969). We can imagine the palace by Bazhenov thanks to the project model, which gives some idea about the spatial layout of the palatial complex. But the project was not always carried out. In this case weaving a designed construction into already existing urban fabric of the period when the project was created can also be a very interesting task.

¹¹ About the specific character of work with architectural drawings and sketches see: CARPO 2001.

¹² In this case the attempts to reconstruct the architectural objects from "Hypnerotomachia Poliphili" are very interesting, for example see: CRUZ 2006.

This task of building the author's project into the city environment can be illustrated by the 3D-reconstruction of Bazhenov's design in the Moscow Kremlin¹³ and by the project of his contemporary N. Legran, who was remodeling the old Savvino-Storozhevsky monastery¹⁴. We should point out that the epoch of classicism in Russia left a lot of unrealized projects, created by most famous architects of the day. So, gradually visualizing designs made by architects for the competition which are stored in archives, we can widen and enrich our knowledge of creative ideas of the architects of that time and their clients.

As an example we have taken the project of the new Saint Isaak's Cathedral in St. Petersburg (Fig. 2b)¹⁵ by A.N. Voronikhin, which was later erected by A. de Montferrand who used a different project.

This specific type of reconstruction is also presented in the visualization of the architectural ensemble at Resurrection Gate in Moscow. In 1755 D.V. Ukhtomsky suggested erecting a tall tower in baroque style on Red Square. The 3D reconstruction made in our day (Fig. 2c)¹⁶ allows us to learn more about style and works of this architect. The reconstruction is considered very significant as we still have not enough information about Moscow architecture of that period.

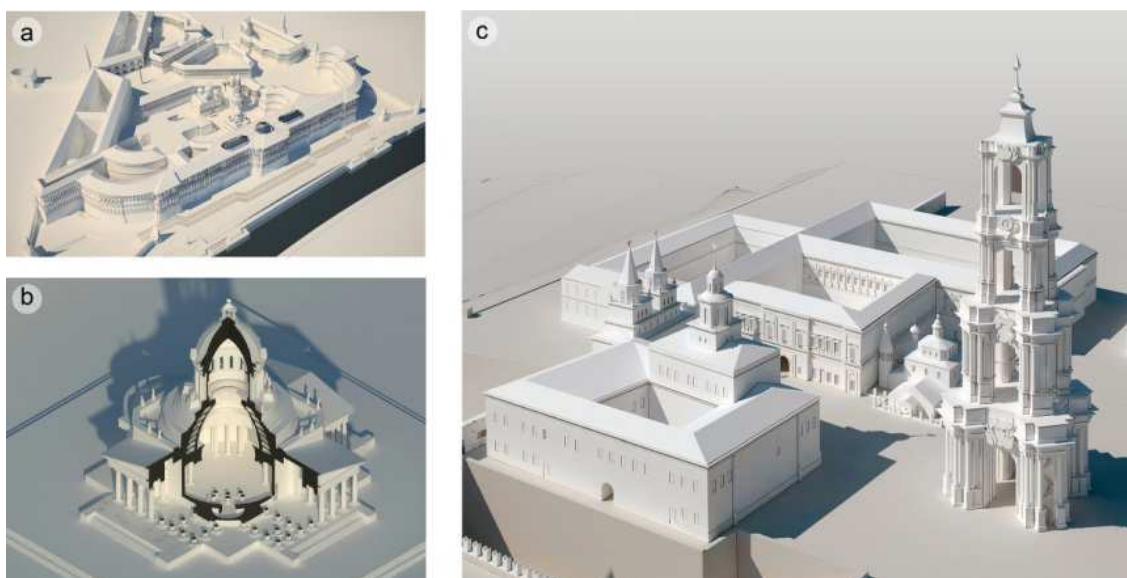


Fig. 2. – Reconstruction of an unrealized project. A. Reconstruction of project of Moscow Kremlin Palace by V.I. Bazhenov (authors: Ivanchenkov I.S., Kerimov Sh.K. et al. Supervisors: Klimenko S.V., Klimenko Yu.G.). B. Saint Isaac's Cathedral. The reconstruction of unrealized competitive project by A.N. Voronikhin (author: Kuznetsov A.A. Supervisor: Klimenko S.V.). C. The reconstruction of ensemble of Iberian Gate and Chapel in Moscow with the unrealized project of Resurrection Gate by D.V. Ukhtomsky (authors: Galaina M., Kurygina D., Popova E. Supervisor: Klimenko S.V.).

¹³ Made in 2009 by students Ivanchenkov I.S., Kerimov Sh.K. et al. under the supervision of Klimenko S.V. and Klimenko Ju.G., published in: KLIMENKO AND KLIMENKO 2011, KLIMENKO 2015a.

¹⁴ Published in: KLIMENKO AND KLIMENKO 2011; KLIMENKO 2015a, KLIMENKO 2015b.

¹⁵ Made in 2012 by student Kuznetsov A.A. under the supervision of Klimenko S.V., not published.

¹⁶ Made in 2012 by students Galaina M., Kurygina D., Popova E. under the supervision of Klimenko S.V., not published.

Reconstruction of building stages of an edifice or an ensemble

A fine example of this type of research is the reconstruction of a small Roman fortress Ain Lebekha in the oasis of Kharga¹⁷ (the end of 4th – the beginning of 5th centuries). Most probably this fortress acquired its final look after several remodeling phases (Fig. 3). Redde (REDDÉ 1999, 381) suggested the sequence of the stages of the constructing process, and his version is considered to be the main one. According to it, first the builders erected a watch tower in the north-eastern part (it resembles the surviving tower in Tahunet el-Hawa) (REDDÉ 1999, 381). Later, when the walls were added, the area of construction was enlarged. After this there might have been built the outer – that is, the second – contour of walls. In the end some shorter rounded towers were built. But after the field survey conducted in 2007 we can suggest the succession might be different¹⁸. We agree that the watch tower resembling the one in Tahunet el-Hawa was built first, but in our opinion it was situated in the south-eastern part of the fortress. Later on the walls were added up and the area of the fortress became larger. After that, in order to fortify the outer walls there were erected some inner walls. The height of the walls achieved the level of the fourth floor, and then inner constructions were built around them. Finally the rounded towers were added to the walls.

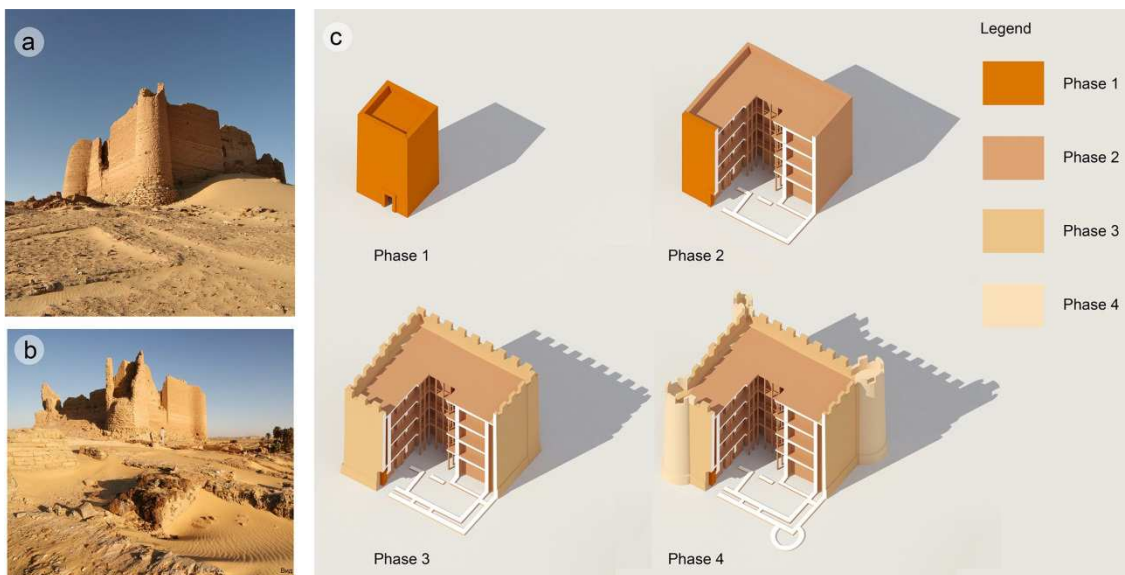


Fig. 3. – Reconstruction of building stages of an edifice or an ensemble. Roman fort Ain Lebekha in Kharga Oasis (end of IVth - beg. of Vth A.D.). A-B. State of preservation. C. Hypothetical reconstruction of building phases, based on REDDÉ 1999, 381 (authors: Karelin D.A., Karelina M.A., Zhitpeleva T.I.).

¹⁷ Made in 2015 by Karelin D.A., Zhitpeleva T.I. and Karelina M.A., not published.

¹⁸ We are preparing a publication on this topic.

Reconstruction of architectural and constructional peculiarities of the monuments or their building technology

This problem can be illustrated by a number of examples. One of those is the ensemble of the southern gate of the Roman fortress of Babylon (the end of 3rd – the beginning of 4th centuries)¹⁹. This monument used to be a part of one of the most significant fortresses built during the Roman reign in Egypt (SHEEHAN 2010). It was erected during the rule of Diocletian. The reconstruction of the gate (Fig. 4a) shows a number of important architectural and constructional features that were typical for Roman fortresses which belong to the end of 3rd – beginning of 4th centuries. First of all, there were posterns in the towers or the walls. Besides, this might be the only fortress in Egypt where the gate had portcullis. This monument also shows that there used to be fortified courtyard after the first passage in the gate, which was a widespread technique in Roman fortification architecture. Moreover, there remained some evidence of a fortified locking bar and arrow slits in this gate, which was typical for Roman fortresses of that period. The reconstruction allows to easily demonstrate all these peculiarities.

For the course of lectures on the history of Russian architecture there has been created a lot of scientific reconstructions with comment on their characteristic features and their constructional peculiarities. Among them are: a Moscow Renaissance masterpiece, the first stone tent-shaped Church of Ascension in Kolomenskoye; a unique church-mausoleum in form of rotunda in the residence of I.I. Baryshnikov in Nikolo-Pogoreloye (Fig. 4b) (Smolensk region, demolished)²⁰; the original large-span constructions of the Moscow Manege (designed by A. Betancourt and J. Bové)²¹; a dynamic model (a video) showing the process of delivery and lifting the columns during the construction of Saint Isaak's Cathedral in St. Petersburg (Fig. 4c) (designed by A. Betancourt and A. Montferrand)²² and many others.

These works show that, depending on the monument chosen for research, its peculiarities, and also on the aims of the architect, the latter can use various means and methods of presenting, lighting, generalizing, detailing or coloring, and also different kinds of videos, animation and other techniques.

¹⁹ Made in 2015 by Karelin D.A., Zhitpeleva T.I. and Karelina M.A., published in: KARELIN ET AL. 2015b.

²⁰ Made in 2011 by students Gulich S., Rakhimov K., Yakovleva E. under the supervision of Klimenko Yu.G., published in: KLIMENKO AND KLIMENKO 2011, KLIMENKO 2015.

²¹ Made in 2011 by students Bukharova L., Karacharskova K., Miroshkina E., Puzankova K. under the supervision of Klimenko S.V., Klimenko Ju.G., published in: KLIMENKO AND KLIMENKO 2011, KLIMENKO 2015a.

²² Made in 2011 by student Andreev D. under the supervision of Klimenko S.V., Klimenko Ju.G., not published.

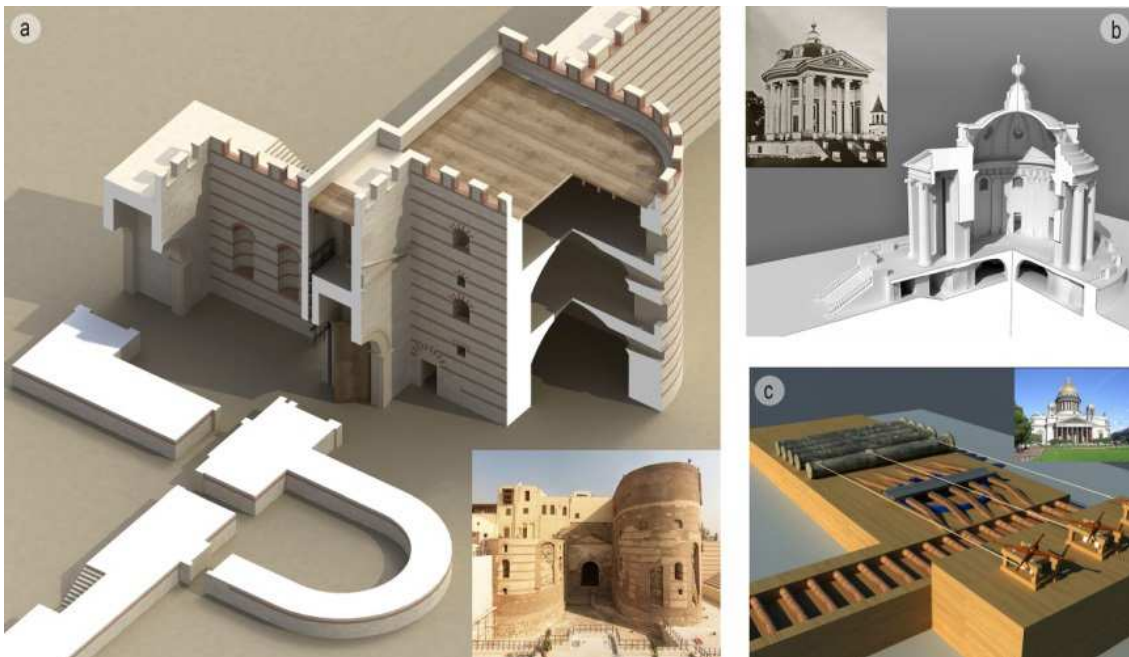


Fig. 4. – Reconstruction of architectural and constructional peculiarities of a building or building technology. A. The southern gate of fortress of Babylon in Egypt. Reconstruction of constructional peculiarities and the state of preservation (authors: Karelin D.A., Karelina M.A.). B. Church-mausoleum at I.I. Baryshnikov's estate Nikolo-Pogoreloye (Smolensk region). Main view and the reconstruction of the section (authors: Gulich S., Rakhimov K., Yakovleva E. Supervisor: Klimenko Yu.G.). C. Reconstruction of the transportation and erection process of columns during the building of Saint Isaac's Cathedral in Saint Petersburg (author: Andreev D. Supervisors: Klimenko S.V., Klimenko Yu.G.).

Conclusion

Thus we can conclude that the typology of reconstructions could be connected with aims of reconstructions and features of monument. However suggested typology isn't able to be definitive, because the architectural monuments and their peculiarities are very complex and this complexity could bring to appearing of more types and sub-types. Furthermore some types which seem different could have similar peculiarities, for example, the scientists who tried to make the reconstruction of villa of Pliny the Younger had the same problems as with the reconstruction of unrealized projects, because the monument and his location were lost. It seems that the borders between the types are diffuse, but the scientific investigations on typology could be fruitful for the development of methods of reconstruction's creation in architectural theory.

It seems important that the role and the possibilities of making architectural models and maquettes of our great cultural heritage are practically limitless. Working on this phenomenon helps to erase linguistic and cultural boundaries, and so it becomes the means of communication between scientists in architectural history from different countries who receive the possibility to study the architectural heritage of another region without full-scale investigation.

It is also necessary to emphasize that the reconstructions created for the course “The History of Russian Architecture” in MARCHI can never be considered as attempts to actually rebuild any lost historical constructions. It must be explained to students from a scientific viewpoint why constructing such “remakes” or

"modern replicas" is unacceptable, though it might sometimes seem an enticing idea. It is really important to use historical 3D-reconstructions only for studying purposes and not for forgery; in other case we can someday find ourselves surrounded by actual size maquettes. Any attempts to transfer historical reconstructions into real construction site will lead to degradation of professional architectural community and condemn it to replicating the same ideas over and over, but it is a question of another discussion, rather public than scientific, which is very important from the point of view of attitude to the architectural heritage in whole.

Acknowledgement

The paper was prepared as a part of project 15-04-00349 "From a maquette to a virtual model. Scientific reconstruction in the Architectural history considering the newest technologies (on the example of "classical" architectural monuments)" supported by the Russian Foundation for Humanities.

References

- ARNOLD, D. (2002). *The Pyramid Complex of Senwosret III at Dahshur: Architectural Studies* (The Metropolitan Museum of Art Egyptian Expedition. Vol. 26). New York: Yale University Press.
- ARNOLD, D. (2008). *Middle Kingdom Tomb Architecture at Lisht* (The Metropolitan Museum of Art Egyptian Expedition. Vol. 28). New York: Yale University Press.
- CARPO, M. (2001). *Architecture in the Age of Printing: Orality, Writing, Typography, and Printed Images in the History of Architectural Theory*. London: Cambridge University Press.
- CRUZ, E.A. (2006). *Hypnerotomachia Poliphili: Re-discovering Antiquity through the Dreams of Poliphilus*. Oxford: Trafford Publishing.
- DE FRANCESCO, G., D'ANDREA, A. (2008). Standards and Guidelines for Quality Digital Cultural Three-Dimensional Content Creation. In: Ioannides, M., Addison, A., Georgopoulos, A., Kalisperis, L. (Eds.), *Digital Heritage: Proceedings of the 14th International Conference on Virtual Systems and Multimedia. Project Papers*. Budapest: Archaeolingua, 229-233.
- DECKERS, J.D. (1979). Die Wandmalerei im Kaiserkultraum von Luxor. - *Jahrbuch des Deutschen Archäologischen Instituts* 94, 600-652.
- GORSKY J.G., PACKER J.E. (2015). *The Roman Forum. A Reconstruction and Architectural Guide*. Cambridge: Cambridge University Press.
- KARELIN, D.A. (2011). Imaging of the Late Roman Castrum. Hypothetical Computer Reconstruction of Nag el-Hagar Fortress in Egypt. - *Architecture and Modern Information Technologies* 2(15), accessed 13 January 2016, <<http://www.marhi.ru/eng/AMIT/2011/2kvart11/karelin/abstract.php>>.
- KARELIN, D.A. (2014). Imaging of the Late Roman Castrum - 2. Computer Reconstruction of the Roman Imperial Cult Temple in the Late Roman Fortress at Luxor in Egypt (in Russian with English abstract). - *Architecture and Modern Information Technologies* 1(26), accessed 13 January 2016, <<http://www.marhi.ru/eng/AMIT/2014/1kvart14/karelin/abstract.php>>.
- KARELIN, D.A. (2015). Reflection on Some Architectural Peculiarities of the Late Roman principia in Egypt by the Example of Luxor. In: Vagalinski, L., Sharankov, N. (eds.) *Limes XXII. Proceedings of the XXIIth International Congress of Roman Frontier Studies held in Ruse, Bulgaria* (September 2012). Sofia: National Archaeological Institute with Museum, Bulgarian Academy of Sciences. 359-368.
- KARELIN, D.A., ZHITPELEVA, T.I., KARELINA, M.A. (2015a). Imaging of the Late Roman Castrum - 3. 3D Reconstruction of the Late Roman Fortress at Dionysias in Egypt (in Russian with English abstract). - *Architecture and Modern Information Technologies* 1 (30), accessed 13 January 2016, <<http://www.marhi.ru/eng/AMIT/2015/1kvart15/karelin/abstract.php>>.
- KARELIN, D.A., ZHITPELEVA, T.I., KARELINA, M.A. (2015b). Some Problems and Peculiarities of the 3D-reconstructions of the Late Roman Fortresses in Egypt (in Russian with English abstract). - *Architecture and Modern Information Technologies* 3 (32), accessed 13 January 2016, <<http://www.marhi.ru/eng/AMIT/2015/3kvart15/karelin/abstract.php>>.

- KALAVREZOU-MAXEINER, I. (1975). The Imperial Chamber at Luxor. - *Dumbarton Oaks Papers* 29, 225-251.
- KLIMENKO, S.V., KLIMENKO, Ju.G. (2011). Modeling During the Creation of Scientific Reconstruction of Monuments of Russian Architecture (in Russian with English abstract). - *Architecture and Modern Information Technologies* 4 (17), accessed 13 January 2016, <<http://www.marhi.ru/eng/AMIT/2011/4kvart11/klimenko/abstract.php>>.
- KLIMENKO, S.V., KARELIN, D.A., KLIMENKO, Ju.G. (2015). About Submenu Understood by the Creation of Scientific Reconstructions Historical and Architectural Research (Dangerous Trend of Recent Decades) (in Russian with English abstract). - *Architecture and Modern Information Technologies* (special issue), accessed 13 January 2016, <<http://www.marhi.ru/eng/AMIT/2015/special/klimenko/abstract.php>>.
- KLIMENKO, Ju.G. (2015a). Les maquettes dans l'enseignement de l'histoire de l'architecture à l'Institut d'architecture de Moscou. In: *La Maquette: un outil au service du projet architectural. Actes du colloque qui s'est tenu les 20-21 mai 2011 à la Cité de l'architecture du patrimoine*. Paris: Éditions des cendres ; Cité de l'architecture & du patrimoine, 181-192.
- KLIMENKO, Ju.G. (2015b). *Architectes of Moscow. Igor' Grabar'* (in Russian). Moscow: Progress-Tradizia.
- LAIDLAW A., STELLA M.S. (2014). The House of Sallust in Pompeii (VI 2,4). *Portsmouth, Rhode Island: Journal of Roman Archaeology*.
- MONNERET DE VILLARD, U. (1953). The Temple of Imperial Cult at Luxor. - *Archaeologia* 95, 85-105.
- PACKER J.E. (2006). Digitizing Roman Imperial Architecture in the early 21st Century: Purposes, Data, Failures, and Prospects. In: Haselberger, L., Humphrey, J. *Imaging Ancient Rome: Documentation – Visualization – Imagination*. Portsmouth, Rhode Island: *Journal of Roman Archaeology*, 309-320.
- REDDÉ, M. (1999). Sites militaires romains de l'oasis de Kharga. - *Bulletin de l'Institut français d'archéologie orientale* 99, 377-396.
- SHEEHAN, P. (2010). *Babylon of Egypt: The Archaeology of Old Cairo and the Origins of the City*. Cairo: The American University in Cairo Press.
- WITTUR, J. (2013). *Computer-Generated 3D-Visualisations in Archaeology: Between Added Value and Deception*. Oxford: Archaeopress.

Imprint:

Proceedings of the 20th International Conference on Cultural Heritage and New Technologies 2015 (CHNT 20, 2015)

Vienna 2016

<http://www.chnt.at/proceedings-chnt-20/>

ISBN 978-3-200-04698-6

Editor/Publisher: Museen der Stadt Wien – Stadtarchäologie

Editorial Team: Wolfgang Börner, Susanne Uhlirz

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