„BABEŞ-BOLYAI” UNIVERSITY CLUJ-NAPOCA

PhD Thesis

Public edifices in Sarmizegetusa

- Summary -

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September 2018

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The archaeological site Colonia Dacica Sarmizegetusa[1], an emblematic site for Romanian archeology, stands amongst those places with a long tradition of research, that has generated a great amount of data about its monuments. The aim of the current research is to correlate all the available data (both from historical and archaeological sources) into a model that could be reiterated, by ways of including new data and analyzing it. This aim is facilitated through the use of new technologies and tools specific to the field of architecture as they are both contributing to reaching a proposition for conservation and restauration.

Within the current research, the tools specific to architecture that I used are mainly related to documenting the site (building survey and photogrammetry); this choice contributes significantly to achieving a higher degree of precision in collecting, integrating, analyzing and interpreting all the data previously obtain through archaeological research. Also, tools specific to architecture (e.g. 3D models) are contributing to highlighting the interpretations of the analyzed monuments in a useful manner to the specialized public and in a friendly manner for the lay public.

One of the main results of the current research was to place all the plans belonging to all the archaeological researched buildings (the defensive enclosure, the roman roads, all the investigated buildings – most of them being public buildings) in a single, complete and precise master plan. Thus, it was possible to make accurate correlations between the elements of the general plan[2] which led to new observations concerning the centuriation of Colonia Dacica Sarmizegetusa[3] și la unele variante posibile de interpretare a aspectului reîntregit al acesteia.

Another result is the detailed survey of the fragments of architectural elements discovered by the recent researches of two ancient public edifices [4] which allowed a better analysis[5] and, as compared to the architectural elements, the plans and the reconstructions of other public buildings, for a series of assumptions to reconstitute their appearance. These reconstructions are presented in annexes, through perspectives and facades of the three-dimensional model (appendix 4, Plates 125-127).

[1] In this paper i use the term Colonia Dacica Sarmizegetusa as it appears in more recent publicatons: PISO, 2006; PISO, 2017a.
[2] Esplecially for the precise situation of the defensive enclosure and the roads.
[3] For example, the differentiation of the buildings and plots measured with the two ancient units of measure identified*: pes montetalis* (29,57 cm) and *pes Sarmizegetusensis* (28 cm)
[4] „Y building" - PISO & ȚENTEA, 2011 p. 121-124 and *Capitolium* - PISO, 2017c p. 32-38.
[5] Based on research on the proportions of the corinthian column made by M.W. Jones - WILSON JONES, 2000 p. 135-156.

Taking into account the current principles for computer-asisted visualization of digital heritage[6], the reconstruction process is a transparent one, which, in the case of three-dimensional modeling of incomplete objects or monuments, requires an explanation of the way in which missing segments have been identified and replaced.

Therefore, the objectives of the research are: to integrate and set in order all the existing data regarding the public edifices of the *Colonia Dacica Sarmizegetusa* resulting from archaeological research so far, in a transparent manner, allowing them to be altered with the discovery of new information; completing and correcting this data with information obtained by current methods (which require a higher degree of precision) and formulation of reconstruction hypothesys.

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The text of the paper is built on the logic in which it documents the way the reconstructions were made, starting from: (1) the collection of field data (made with the precision of the current methods) and the data resulted from the archaeological researches carried out for more than a century at the Colonia Dacica Sarmizegetusa; (2) analyze all of these data and integrate them into a coherent whole, so that they can be the based for re-iterative interpretations, in other words, the analysis process can be easily restored from new information; (3) the reconstruction assumptions formulated on the basis of the literature: where, on the one hand, I followed the principles and norms that regulate at international level the issue of the reconstruction and the reproduction of the cultural heritage elements by computer assisted technologies (ICOMOS[7], *London Charter*[8], *The Sevilla Principles*[9]) and on the other hand the literature referring to elements of Roman urbanism and architecture, from classical authors such as Vitruvius to fundamental contemporary works[10]. To all of these aspects are added - coming from the intersection of archeology and architecture - a series of information related to the interpretation of the design principles of antiquity (including rules and fashion) as applied to the particular case under consideration.

[6] THE LONDON CHARTER 2009 and PRINCIPIILE DE LA SEVILLA LOPEZ-MENCHERO & GRANDE, 2011.
[7] ICOMOS 1964, ICOMOS 1992.
[8] THE LONDON CHARTER 2009.
[9] PRINCIPILES OF SEVILLA - LOPEZ-MENCHERO & GRANDE, 2011.
[10] WILSON JONES, 2000.

The paper is divided in to two main parts. The first part refers to the frame of the research approach: presenting the research carried out so far on the current principles of computer aided visualization of the patrimony and the methods used for the realization of the second part. The second part illustrates the hypotheses for reconstruction of the layout of the ancient settlement - the shape and position of the enclosure, the parcels, the roads and the two buildings under archeological investigation; also in this part is documented the manner in which the reconstruction proposals were elaborated.

The first part of the paper outlines its context, organizing itself around two essential aspects. The first focuses on the history of the researches presented, depending on the major lines of evolution of the discipline of knowledge which is archeology, and which the research stages of this Roman site illustrate very well. At the same time, the characteristics of the different historical periods and their impact on the general course of excavations from Colonia Dacica Sarmizegetusa.

This research history aims to frame a discussion framework, not a study of the history of archeology itself. For this reason, the authors I have focused on are those whose writings have a high degree of relevance in relation to the general theme of the work, respectively with each section for which I needed to document the process of gathering data from archaeological research .

A second essential element in building a discussion framework is given by research and analysis methods, including a discussion of the working principles that I have pursued in the implementation of the reconstruction proposals and all the plans that comprise them. This part, related to methods, is largely a technical one, with the purpose of presenting the way in which a particular proposal for reconstitution is actually made; the approach is followed from the beginning, that is, from the presentation of the process of gathering the data to the way it is processed, merged and interpreted; this section can also work as a guide for anyone who intends to apply in other research. Particularly the part concerning the interpretation of the data - it includes in practice the way in which the elements underlying the elaboration of the reconstitution variants are documented, how different architectural elements are calculated (based recent archaeological research and existing data), to the general principles recommended in these situations, and to a clear statement of the assumptions of reconstitution. Thus, all the components necessary for the elaboration of architectural and urban reconstruction hypotheses resulting from archaeological researches are extracted from

specialized publications and reorganised in context, with a high degree of precision offered by current technology. For this I considered the following elements: identifying the visible traces of roads and those related to the organization of the territory, establishing the ancient city's plan taking into account the buildings that existed simultaneously, the layout of the elements built on plans that document the different phases of the city, but also the stages in (building scale), understanding of construction techniques in particular cases, inventory of architectural pieces, analysis of finishing details and solution of constructive elements starting from the elements that have been preserved.

The main advantage of such an approach lies not only in the use of complementary research and interpretation methods, but also in the accuracy of the measurements made on the field, in the accuracy with which the different elements of previous research have been compared, as well as the rigor with which the reconstruction assumptions are made, the rigor based on the documentation of each stage of the work, and the presentation and explanation of all the components used as well as the different probability degrees that underlie the proposed reconstructed images.

This chapter also includes a discussion of the current international principles from the Sevilla and London charters, as well as some considerations about the terminology used in relation to the international notion of reconstruction, but also in the writings of the Romanian archaeologists.

By synthesizing, the basic idea of this theoretical part is that at the moment, at international level, the issues around which the discussions about reconstructions are being organized are: rigorous documentation of the process by which a particular reconstruction proposal is made to allow for practically anyone, based on existing documentation, to resume and understand how the proposal for reconstruction was reached.

The second part of the paper contains the results of the application of the methods and principles stated in the first part on concrete cases of public edifices from ancient city of Colonia Dacica Sarmizegetusa. This section is actually the most consistent part of my contribution and relates to the way I interpreted the data to make a series of virtual reconstruction proposals.

In organizing the material I used two criteria: the first is given by the ancient buildings – each are are analyzed and virtual reconstructed (the city's plan, forum vetus, Capitolium and "Y building"). The second is given by the very clear separation, for each of

these buildings, of the sets of information used, namely the specification of the measurable data (those obtained from previous archaeological researches); their analysis, which involves the identification of precise data that can be calculated from the retained, measurable data and from what is derived from the literature on the Roman architectural and urban aspects and calculating of probable data (those whose values can not be specified with a 100% accuracy but which are based on certain data and literature). Finally, reconstruction assumptions based on all of these data are presented in the form of ground-floor plan, section, and 3D model. (Pl. 113-117, 121-127, 192-196).

This section also has a pronounced technical character and the information contained in the text should be read together with the accompanying drawings; these are not just an accessory to the text, but rather the basis on which I built the text and on which I base my conclusions. For reasons related to the organization of the material in this work, all drawings are included in annexes (appendix 4, numbered 1 to 195), but they were designed to go along with the text.

The work ends with a series of final considerations and the highlighting of personal contributions. I avoided the term "conclusions" because, as well as the archaeological research, the process of reconstitution is a process of continuous transformation and, as new data is obtained, the assumptions of virtual reconstruction and, consequently, the reconstruction proposals are modified. This idea concludes, in a circular manner, the entire structure of the work: a valid reconstruction is based on scientific data that can be verified at any time, and the assumptions on which that data is combined must be clearly specified to facilitate, at any time in the future, reiterating the approach by including new data, in addition to the old ones.

Annexes are added at the end and they include: a repertoire of buildings, a repertoire of architectural pieces, a set of 196 plates including: surveys of the researched buildings, architectural details, reconstructions (reconstructions of monuments: gorund-floor plans, facades, cross-sections, images obtained from 3D models, reconstructions of architectural pieces: views and images obtained from 3D models); a series of observations relating to building materials, construction techniques, units of measure, peculiarities; a list of abbreviations; specific technical abbreviations and a glossary of terms.

The main contribution of this work is the collection and integration by placing in the same coordinate[11] all the data regarding the edifices documented in the archaeological researches in the Colonia Dacica Sarmizegetusa, separated on phases of construction and the layout of a complete plan of the ancient city, offset on the stages of its evolution, with the specification of the bibliographic references. To these are added some novelty elements represented by the detailed plans of the Capitolium and the "Y building", the newly discovered and reconstructed architectural pieces and the reconstruction assumptions of theese edifices.

The general plan was made in several variants: a generally integrated plan of all of the discovered buildings (including those observed in remote-sensing), precisely located, with their denomination; a general plan of the building research's history grouped in major periods, the general plans of the ancient city's phases based on the separate redesign of each constructive phase of the investigated buildings, as well as a variant containing a realistic imagined suggestion of the shape of the parcel buildings that were not investigated; and detailed plans of buildings, grouped into research areas and constructive phases, as well as the repertoire of all investigated buildings.

As far as the defensive enclosure is concerned, based on the integration of the existing data, I have achieved the following novelty elements: the location on the general plan of all the archaeological sections made through the defensive system, wich led to the reconstruction of the section and plan of the defensive system, and to the exact location [12] of its plan related to the other buildings, and the positioning of the third ditch[13] present on its northern side.

Along with the exact location of the enclosure, identification of use of the two units of measurement (pes1 and pes2) and the production of a synthesis plate of the ancient units of length and surface expressed in these two units and their equivalent in meters is an useful instrument on the basis of which I made estimates for the reconstructed image of the parcels. Using this instrument I layed out a series of general plans in several variants depending on the type of parcels used and the unit of measurement. The correlation of these parcels with the ground-floor plan of the buildings generated a series of plates organized on the areas where the analysed edifices are concentrated.

[11] Georeferencing.
[12] Based on topographycal survey made by ECK & LOBUSCHER, 2001, p. 267, fig. 2, 3.
[13] DAICOVICIU, et al., 1979a, BĂEȘTEAN, 2015 p. 86, fig. 2.

On the scale of the territory, the estimated routes of Roman roads, as well as the reconstruction of the “imperial road” (based on the corroboration of the description with the orthophotoplan), could be observed and located. Also on this scale were compared large Roman surface units (centuria) to observe the relations used in spatial planning and the analysis of elements of the current parcel that took over the shape of the ancient parcel.

In detail, the plans and cross-sections of the newly researched edifices (Capitolium, "Y building") were made based on photogrammetry and topographic measurements. The architectural pieces of these buildings (about 80 each, depicted in the plates at the same scale) were accurately surveyed, also with the help of photogrammetry, in order to make correct interpretations. Corinthian column analysis was performed on the basis of the relationships observed by M.W. Jones in his study of these columns[14], the proportions of each element analyzed in the site being tested using tables based on these relationships. The analysis of the Tuscan columns was based on the proportions suggested by Vitruvius. Both variants were synthesized in the drawings including the dimensional data ratios and their names together with their abbreviations. To represent the reconstructing hypothesys for the architectural parts and buildings I have made three-dimensional models in several variants by which I have rendered - simple perspectives with blurred textures; realistic perspectives, entourage and suggestions of the colors of the architectural elements; perspectives of the cut-out building to highlight the constructive elements, perspectives that contain the degree of probability for the reconstructed elements.

As a result of the analysis, a number of atypical situations (shapes o building plans, proportions of columns, hybrid decorations) have emerged, which are proof that the antiquity design was based on respecting some principles, some general proportions, the details being open to interpretation . The final form depended on the architect's interpretation, the preferences of the beneficiary, practical solutions to particular technical problems, or could vary with time, just like any other fashion specific to a historical period or area, making it even more difficult to draw a correspondence between the fashions that were running in the center, and those that circulated to the periphery of the empire where the north-Danubian province is situated. This makes the reconstruction of the image of the ancient edifices more complex than the mere use of the well-known proportions, and it can never be true to reality, but it will be able to approach it with each stage of the research. For this reason the way in

[14] WILSON JONES, 2000 p. 135-156.

which all the elements that led to the previous reconstruction was a transparent one and allows them to be modified with the discovery of new information provided by the archaeological research.

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