

METHODS FOR RATIONALIZATION OF THE DESIGN OF RESIDENTIAL BUILDINGS IN CLASSICAL ANTIQUITY

UDC 728.1(3)=111

Aleksandra Mirić¹, Goran Jovanović^{2#}

¹Institut de recherche sur l'architecture antique- IRAA, Université Lyon 2, Lyon, France

²Faculty of Civil Engineering and Architecture, University of Niš, Serbia

[#]goran2@gaf.ni.ac.rs

Abstract. *The description of residential buildings in the past is made possible by studying the physical structure of the preserved architectural and movable archaeological finds, and also by the analysis of the written (epigraphic and numismatic) material findings, as well as the analysis of the written literary works which, through the author's subjectivity, documented the social life. That is why the knowledge of the classical antiquity construction handbooks can only contribute to the understanding of the architecture, housing conditions, and thus facilitate the reconstruction of the ancient houses.*

Works about residential buildings by Columella, Vitruvius and Faventinus, three authors from different periods of the mature antiquity, are fully preserved. This paper presents the results of a comparative analysis of their works, which indicate that the recommendations for determining the properties of various functional units within the residential building were similar over a longer period of time observed here.

Key words: *classical antiquity, habitation, residential architecture, authors of the classical antiquity, Columella, Vitruvius, Faventinus.*

1. INTRODUCTION

Man had a constant need but limited capacity for movement, had to choose a place where to stop and rest, alone or with his companions. Those shelters were designed, organized, and enhanced in accordance with the specific needs and socially acceptable norms. Human survival was largely determined by the capacity to adapt to the harsh natural environment, and by farming, the domestication of animals, and by functionally and spatially shaping his habitat, man tried to appropriate nature.

Undoubtedly, in order to understand the factors that determine the place and form of a habitat, it is necessary to explore the connection of the architect with the group to which

he belongs, the way he understood natural phenomena, and his attitude to the concrete and abstract occurrences – both visible and invisible. It would be pretentious to consider that, in prehistoric, ancient, or classical cultures, the selection of territory for settling, on which people would, with great effort, create their permanent habitat, was left to chance. In accordance with the universal laws of nature, the contours of the settlement followed the shape of the field and the flow of the rivers; forests and cliffs protect the inhabitants from the wind, and the houses were erected near arable fields. First architects passed on, from generation to generation, intuitive or conscious knowledge about life in the wild, in harmony with nature, in such a way that by creating limits with floors and roofs of their first houses, they represented the relationship between the earth and the sky, man and God. Round, square or triangular houses, each in accordance with the individual view of their builder's world, presented its own universe within a complex system of both nature and social environment.

Although important for understanding the structure of housing buildings today, the residential architecture of ancient Rome, which greatly influenced the design of the modern European house, just recently became a subject of interest and research of archaeologists and historians of architecture. During a long period of time, in the shadow of grand monuments of public architecture, residential buildings were only occasionally studied, during the research of urban centers. In addition to this, another reason why they were so rarely studied was because palaces and villas occupied the attention of researches, mainly because of their attractive decorations. Therefore, until recently, with the exception of the elite residential building, little was known about the residential programme of ancient Rome.

Explicit description of residential buildings in the past is made possible by studying the physical structure of the preserved architectural and movable archaeological finds, and also by the analysis of the written (epigraphic and numismatic) material findings, as well as the analysis of the written literary works which, through the author's subjectivity, documented the social life.

The reason for the creation of this paper lies in the need to systematize knowledge and the results from previous archaeological and architectural studies of residential architecture from the period of ancient Rome. The aim of this paper is a bibliographic depiction and critical analysis of the texts of ancient authors, who were engaged in the research of residential buildings throughout the territory and all the periods of ancient Rome, with special emphasis put on those parts of the texts which relate to locating individual rooms within the residential architectural programs of mature antiquity. The aim of this paper is to create a readable and modernized review, which will give the reader an opportunity to get a clearer picture about the most important texts from some ancient authors. Because of the volume of the material involved, we are unable to list them all, so this paper will only present the highlights of the known information, as to create a starting point for further research. Research methods used for the preparation of this paper included analysis, synthesis and comparison of translated texts by some antique authors. The expected result is the systematization of knowledge from the works by antique authors which are referring to the residential architecture, especially to the arrangement of individual functional units in relation to the whole building, as a contribution to the understanding of the archaeological remains and for the easier identification of purposes of individual rooms.

2. ANALYSIS AND EVALUATION OF THE MOST IMPORTANT WORKS OF ANTIQUE AUTHORS ABOUT RESIDENTIAL ARCHITECTURE

While the epigraphic findings give us names and mutual relationships of family members that inhabited a certain territory, from those sources we can rarely find out more about everyday habits and the way the residential buildings were used. We can conclude more about the architectural characteristics of residential buildings and the culture of habitation, with the analysis of the short parts of the few surviving texts of ancient Greek and Roman authors. Aristotle (384 - 322 BC), Plato (427 – 347 BC) and Xenophon (430 – 354 BC) while talking about the city life, they mentioned the position of houses inside of it, like many other authors who, one way or the others, touched on the issue of housing.

One of the oldest monuments of the Latin literary prose is Cato's (234 BC - 149 BC) "On Agriculture" [4], which is a sort of a manual on viticulture, olive growing, vegetable and livestock production, whose main goal was to point out the easiest way to earn money. This document provides us with basic information about the organization of an agricultural property, the villa on the estate and all the utility rooms, albeit with poor notes on how they were constructed. Although data on the residential architecture of ancient Rome are scarce, this is an important piece of work, because it gives us a good insight into the mentality of the Roman aristocracy in the second century BC, from a senator's point of view. Given that being a Roman meant being a farmer or a landowner [1], and knowing that landowners were the ones who significantly influenced the formation of the different concepts of Roman residential architecture, these sources certainly contribute to its understanding.

A similar concept of agricultural textbooks were made by two younger writers, Varro (116 BC – 27 BC) and Columella (4 BC – 70 AD). The first book of Varro's trilogy "On Agriculture" brings us descriptions of the country farm, buildings and equipment on it. He wrote that work in the first century BC in a form of a dialogue, with a subtle dose of humour and a refined sense of what rural life is. A work with the same title by Columella [5] written in 12 volumes, in the first century AD, is fully preserved. In the sixth chapter of the first book, Columella proposed a division of agricultural property into residential, manufacturing and storage area [5]. He emphasized the importance of the functional organization of the rooms, which increases the comfort of living, and the function of the climatic conditions with the prevention of fire and theft.

The first major book dedicated to architecture - The Ten Books on Architecture [14], the most important and most complete record of ancient times, was written by Marcus Terentius Varro (80/70 BC – 15 AD) in the first century BC. In his text, Vitruvius defined the terms of functionality, strength and beauty [13], which were upgraded and modified by the later writers like Alberti, Hector Guimard, Le Corbusier and Durand [3] emphasizing the importance of order, arrangement, eurhythmy, symmetry, style and distribution (*ordinatio, dispositio, eurhythmia, simetria, decor, distributio*) [10], as the basis of architecture, creating the division of architecture and providing the lists of skills that an architect must possess. The value of Vitruvius's works is both in the systematization of older texts and the review of basic architectural types from the period of the prehistoric and ancient Greece. The fact that this was written by an aristocrat who did not have the technical skills and knowledge necessary for writing of such technical manuals, like the ones a modern architect could produce does not diminish his contribution to the

understanding of sociological circumstances of the time when this work was created. Specifically, in the sixth book, Vitruvius speaks about homes exclusively in the context of the luxurious residential architecture of the upper class. He felt it was beneath him, who dedicated this work to the great Augustus and who lived in the centre of the empire, to take into an account the housing conditions of the lower social classes, as well as to describe the architectural styles outside of Italy, except in a few passing references. Knowing that most of the buildings of residential architecture were built in other parts of the Roman Empire, and not in Italy itself [2], it can be concluded that his texts do not list the most important types of a typical Roman house. Despite the fact that the author describes in great detail and lists all the rooms in a residential building and provides basic recommendations for their design, from Vitruvius's writings, as well as from the works of his predecessors, it is impossible to reconstruct an architectural plan of a Roman house.

Thanks to the preserved writings of Pliny the Younger (63 AD – 113 AD), we are able to find out the details about the architecture of his two villas in Lauretum and Tuscany [9]. The importance of these documents lies in their accuracy. In fact, Pliny, unlike his predecessors who were prone to the pretentious imposition of their knowledge and skills, in his texts describes only what he had seen, two buildings with gardens, as they were during his stay there. The author does not consider the earlier architectural stages, which, combined with the fact that many rooms were not mentioned at all (which does not mean they did not exist) allows us only a partial reconstruction of the two villas.

Different rules and customs of behaviour within the context of residential buildings can be found out from various writings of Cicero, Martial, Seneca, Statius and Sidonius [2], and Plutarch [11]. Especially interesting is Petronius's (27 AD – 66 AD) "Satyricon" [7], a satirical sketch of decadence in Roman society in the time of Nero, where the first century eating customs were described in great detail. Given that in these works there are no significant data on the architecture of Roman housing, we will not mention them any further.

3. PROPERTIES OF OBJECTS OF RESIDENTIAL ARCHITECTURE IN THE WORKS OF COLUMELLA, VITRUVIUS AND FAVENTINUS

Texts by Columella, Vitruvius and Faventinus are whole not only because they are completely preserved, but also because of the concisely defined and comprehensively discussed problem of the residential architecture of mature antiquity. For this reason, in this paper we will present the results of a comparative analysis of the mentioned authors' works. All three authors use, as a crucial factor in the selection of the terrain for the construction, winds and their properties. With simple observation we can deduct that a certain terrain, such as the Mediterranean, is characterized by the winds of a certain strength and direction, which led the ancient philosophers to conclude that all the winds come from specific places on the earth, where favorable conditions for their formation exist [14].

The eldest of the three authors, Columella believed that an estate should be built in areas where there is a good ratio of wind strength in the summer and winter periods, so that the residents could benefit from the fresh summer breezes, without being threatened by winter storms [5].

Vitruvius's recommendations for positioning the cities and estates in relation to the dominant winds are different from other authors. While Aristotle recommends that cities

should be open to the winds, and Oribasius too insists, three centuries after Vitruvius, that the city's main streets should be oriented along wind directions, so that the winds keep them clean, Vitruvius believes that the city fortifications should be oriented so that their corners dissipate the winds, with the justification that calm air benefits the human body and mind, and even helps in curing the diseases during epidemics. In accordance with the philosophy that the air flows and heat make people uncomfortable, Vitruvius was against the building sites being exposed to the warmer winds [14], as well as the southern and northern exposure, "because when northern winds are blowing people recover faster, but because of the cold they cannot gather in the streets."

Faventinus believed that there are winds that harm humans and animals, so he recommended that in the colder regions, the doors and windows should open on the south facade, or in the direction of the sunset, while in warmer regions, facades must face north [6].

Regarding the orientation of the residential building alone, all three authors have similar opinions. Columella recommended that the building should be oriented towards the point from where the sun comes up during the equinoxes, and if it is a mountainous region, buildings should be built on the east oriented slopes [5]. Vitruvius recommends that in the north, only fully covered facilities are built, which are oriented toward warmer regions, but not open to them, and on the south, buildings should be facing north and northeast. [14].

In the division of agricultural property to residential, manufacturing and storage area, Columella suggested that the residential part should be made up of two parts; one dedicated for living there during the winter and one during the summer period. Winter bedrooms should be, as recommended by the author, orientated towards sunrise during the winter solstice. Winter dining rooms and bathrooms should be facing the setting sun during the equinox, in order to receive more heat during the afternoon, which is both the Vitruvius's [14] and Faventinus's opinion [6]. (Fig.1)

The summer dining room, according to the Columella, should be oriented toward the direction of the sunrise during the winter, and promenades toward the midday sun during the equinoxes, so as to receive the same amount of light during both the summer and the winter [5]. Vitruvius has a different opinion. He believed that autumn and spring dining rooms should be oriented toward the east, because that is the best way to regulate the temperature during the season when they are used. According to Vitruvius, summer dining rooms should, for the sake of preventing high temperature, be oriented toward the north. [14]. Workshops and studios should have the same orientation because, according to him, under the influence of light from the north, colours will not change their characteristics. Faventinus holds the same opinion [6].

Vitruvius in his article discusses the position of cubicles and libraries which should be facing east, so as to be exposed to the morning sun, and also because the southern and western light causes decay of books in libraries [6].

A whole chapter of Faventinus's text is dedicated to the proper construction of bathrooms, and it is recommended that they should be facing south or west, so that there is a pleasant temperature in the afternoon, when they are used. According to Faventinus, hypocausts and swimming pools with hot water should be built on the northern side. The light would enter the facility through the windows that are on the eastern or southern facade. Summer bath-houses should be oriented toward the north or northeast, as well as the windows, which would regulate the temperature and refresh the swimmers [6]. Both Vi-

truvius [14] and Faventinus suggest that bathrooms in rural households should be in the vicinity of the kitchen, so that the slaves, who used the kitchen as their living space, would be more easily available to their owners.

The kitchen itself, according to Faventinus [6] and Vitruvius [14], should be at the warmest part of the location, as well as patios. A barn for livestock should be built nearby, facing the south or the hearth of the kitchen, according to Faventinus, because bright lights please the animals; but according to Vitruvius, to the east -because if cattle is exposed to fire and bright lights, it gets restless [14].

Near the kitchen, an olive press should be set up, as well as the facilities for the preparation and storage of wine, which should have windows on the northern side. Windows that are located on any other side would cause this room to warm up, and because of that, according to Vitruvius, wine would lose its quality [14]. (Fig.1)

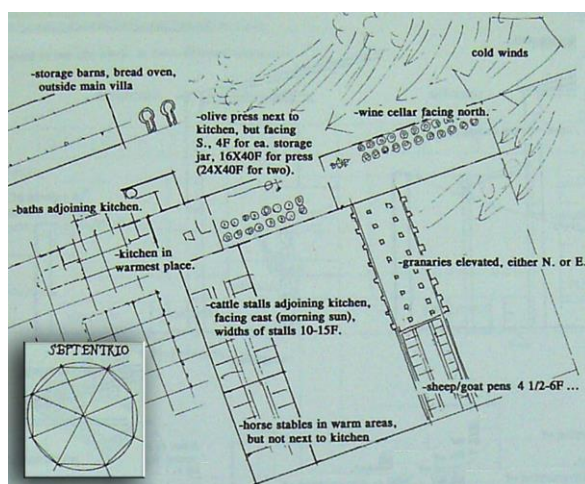


Fig. 1 Rural Buildings, Vitruvius, "Ten Books On Architecture", 6.6.1-6, I. Rowland, T. Howe, 1999, 261

All three authors agree that the storage room for olive oil should be oriented so, that it receives light from the south, as to keep the oil warm and in liquid state [14]. According to Columella, the olive press should be set up in rooms that are illuminated from the south, so that it would not be necessary to light the lamps, because the smoke of oil lamps can badly affect the taste of the oil [5].

All three authors also agree that the grain barn should have windows facing north or northeast, as to ensure the flow of cold air (Table 1).

Table 1. Room properties according to ancient sources

Properties	According to Columella	According to Vitruvius	According to Faventinus
Position of the plots	To benefit from the fresh summer breezes, without being threatened by winter storms	He was against locations with warmer winds as well as southern and northern exposure	
Building orientation	Towards the point of sunrise during the equinox. And if it is a mountainous region, buildings should be built on the east oriented slopes	In the north fully covered building oriented towards south and east. In the south, buildings should be facing north and northeast	In colder regions, openings should be on southern or western facades. In warmer regions, openings should be on the northern part of the building
Winter bedrooms	Oriented towards the sunrise during the winter solstice		
Winter dining rooms and bathrooms	Oriented towards the setting sun during the equinoxes	The same	The same
Summer dining rooms	Oriented in the direction of winter sunrise	Towards the north	
Spring and autumn dining rooms		Towards the east	
Workshops and studios		Towards the north	The same
Cubicles and libraries		Towards the north	
Bathrooms and swimming pools	Winter bathrooms in the direction of the setting sun during the equinoxes	Bathrooms in rural households should be in the vicinity of the kitchen	Western or southern orientation. Hypocausts and swimming pools with hot water on the north side. The windows on the south or east facade. Summer bathrooms to the north or northeast.
Kitchen		At the warmest part of the location	The same
Animal barns		Toward the east	Near the kitchen, facing the south or the hearth of the kitchen
Olive press	Light should enter from the south	Light should enter from the north	
Wine storage room		Light should enter from the north	
Olive oil storage room	Light should enter from the south	The same	The same
Grain barns	Windows towards north or northeast		

4. CONCLUSION

Although written in the chronological span of three centuries of mature antiquity, works by Columella, Vitruvius and Faventinus are largely similar. This conclusion is not surprising because it is likely that, broadly educated and informed, young writers were familiar with the works of their predecessors. Given that most of the recommendations for determining the orientation of functional units in buildings for housing and farms are the same with all three authors, it can be assumed that the reconstruction of residential buildings, according to the presented model, could be generally applied to most objects that were built in the mentioned period.

Residential architecture from the period of ancient Rome is, except in rare cases, very poorly preserved. From the remains of foundation structures, or very low walls, it is difficult to determine the primary functional purpose of that space, even when there are movable artifacts found on the location. That is why the knowledge of classical antiquity construction handbooks can only contribute to the understanding of architecture, housing conditions and habits, and all this makes easier a hypothetical reconstruction of ancient houses.

REFERENCES

1. I.M. Barton, "Roman domestic buildings", Exeter, 1996.
2. S. P. Ellis, "Roman houses", London, 2000.
3. A. McKay, "Vitruvius, Architect and Engineer", London, 1978.

SOURCES

4. M. P. Cato, "De Agricultura", an English translation by William Davis Hooper, London, MCMLX, chapters XIV, XV, 29-31
5. L. J. M. Columella, "De re Rustica", an English translation by Harrison Boyd Ash, London MCMLX, book I.VI. 65-80
6. M. C. Faventinus, "De Diversis Fabricis Architectonicae", translation and commentary by Cam,M., T., Paris 2001
7. Petonius, "Cena Trimalchionis", an English translation by Michael Heseltine, London MCMLXI, 3-323
8. Pliny, Ed. Warmington, E.H., "Letters and Panegyricus" in two volumes, Letters, Books I-VII, an English translation by Betty Radice, MCMLXIX
9. Pliny, "The letters of Pliny the Younger", vol 1, addressed to Charles Loyd Boyle by John Earl of Orrery, London, MDCCLI
10. H. Plommer, "Vitruvius And Later Roman Building Manuals", Cambridge, 1973
11. Plutarch, "Life of Lucullus", 39, <http://penelope.uchicago.edu>, taken on January 2012. Published in Vol.II of the Loeb Classical Library edition, 1914
12. M. T. Varro, "De re Rustica", an English translation by William Davis Hooper, London, MCMLX, chapters XIV, XV, 161-529
13. Vitruve, "De l'architecture livre VI", translation and commentary by Luis Callebat, Paris 2004
14. Vitruvius, "Ten Books On Architecture", translation, illustration and commentary by Rowland, I., Howe, T., Cambridge, 1999.

METODE RACIONALIZACIJE PROJEKTOVANJA STAMBENIH GRAĐEVINA ANTIKE

Deskripciju stambenih objekata prošlosti, uz proučavanje fizičke strukture- sačuvane arhitektonske i pokretne arheološke nalaze objekata, omogućava analiza materijalnih (epigrafskih i numizmatiskih) pisanih nalaza, kao i pisanih književnih dela koji, kroz prizmu subjektivnosti autora, dokumentuju društveni život. Poznavanje antičkih priručnika za gradjenje zbog toga doprinosi razumevanju arhitekture, stambenih prilika, a samim tim olakšavaju i rekonstrukciju antičkih kuća.

Tekstovi Kolumele, Vitruvije i Faventine, tri autora iz različitih perioda zrele antike koji su pisali o stambenim objektima, su u potpunosti sačuvani. U ovom radu predstavljeni su rezultati komparativne analize njihovih dela koji upućuju na zaključak da su preporuke za određivanje dispozicije različitih funkcionalnih celina unutar stambenog objekta bile slične tokom dugog vremenskog perioda koji se posmatra.

Ključne reči: *antika, stanovanje, stambena arhitektura, antički autori, Kolumnela, Vitruvije, Faventin.*