Svitlana Linda, Anna Fedak

IN SEARCH OF THE PERFECT FORM: THE GEOMETRY OF THE CITY IN THE TREATISES BY PLATO, T. MORE, T. CAMPANELLA

Lviv Polytechnic National University, 12, S. Bandera Str., Lviv, 79013, Ukraine
svitlanalinda@gmail.com, ann.fedak67@gmail.com

Abstract: The article has been devoted to the analysis of the architecture and urban structure of utopian cities and states, their interrelation with social and political aspects in the works of "Republic" and "Laws" by Plato, "Utopia" by T. More and "The City of the Sun" by T. Campanella.

Key words: utopia, architectural utopia, public space, public and residential buildings.

1. Introduction

The notion of utopia is used to characterize the model of an ideal social system. The term "utopia" consists of the Greek words οὐ – "no" and τόπος – "place", and is translated as "a place which is not". It comes from the eponymously-named book by Thomas More, which is considered to be the first work to be written precisely as utopian.

Utopia means a certain country or place, often fictitious, where everything is perfect (English Oxford Living Dictionaries). There are significant numbers of utopias, among which we distinguish architectural utopias that are derivatives from socio-political ones. Utopian philosophers, appealing to the historical ideas of mankind about the ideal, described the planning structure of city states. Forming perfect models of social structure, they used architecture as a background to provide a comfortable and functional space that would meet the requirements of an ideal society.

The aim of the article is to determine the main geometric characteristics of ideal cities, based on the analysis of architectural descriptions and urban planning; establish the relationship between socio-political ideas in the treatises by Plato, Thomas More and Tommaso Campanella. This will allow us to trace the relationship between social ideals and possible attempts to implement them, since we get a list of certain patterns and signs that can be used to analyze the concepts of urban development or architectural projects and it will help us get more insight into the influence of utopian works on real changes in society and the architecture of that time and present.

This article presents an analysis of three most famous socio-utopian treatises – "Republic" and "Laws" by Plato (2000), "Utopia" by Thomas More (1988, p. 16–130) and "The City of the Sun" by Tommaso Campanella (1988, p. 131–182). These works are considered to be the first ones to describe the models of utopian states and have a strong influence on all subsequent works of utopian philosophers.

When we talk about the ideal model of society, we focus on social and political aspects, without paying enough attention to the environment in which the inhabitants live. However, analyzing the developments in relation to utopias, it's hard to ignore how in detail the authors of sociological, political or philosophical works

deepened in urban planning and architectural aspects. Some scientists have outlined the problem of coverage of architecture and structure of the city in Plato's, Thomas More's and Tommaso Campanella's works: Heorhiy Hradov (1968); Tatyana Savarenskaya (1984); Michael Chyutin (2006); Tessa Morrison, Mark Rubin (2014); Eva Eylers (2015); Andrew Simoson (2016) and others.

For example, T. Savranskaya (1984, pp. 77–80) analyzed the planning features of Atlantis, which were described in the work of Plato "Critias" as the architecture of the utopian country. In contrast, M. Chyutin (2006, p. 178), writing about the ideal city-state of Plato, gives an analysis of the architectural aspects of the country from the "Laws". Among contemporary researchers, it is possible to distinguish works by Tessa Morrison and Mark Rubin (2014), who analyzed and systematized information about the geometric characteristics of ideal cities and created 3D digital models.

2. Basic Theory Part

The first works in which the ideal social and political system are described were Plato's "Republic" (2000), "Utopia" by T. More (1988, pp. 16–130) and "The City of the Sun" by Campanella (1988, pp. 131–182). They are characterized by attention to everyday life and relationships between people who must be a subject to specific rules and regulations.

Plato's "Republic" (360–370s BC) is his main work, which describes the basic principles of an ideal country. Despite the detailed description of various political and social aspects, this treatise does not provide a clear understanding of the city-building configuration of the republic and cities. The most detailed description of architecture was given in philosopher's late work "Laws" (1994, pp. 71–437), which was written in about 354 BC., where he partially reviewed his own ideas and supplemented them with new details. There is one main city (policy) with twelve colony-villages around. The form of government that Plato prefers is an electoral aristocracy or monarchy; the state is headed by a philosopher who is a wise ruler. There is no private property in the country, so people live in common residential buildings

More precise is the description of architecture in "On the Best State of a Republic and on The New Island of Utopia" by Thomas More, which he wrote in 1516. Following Plato's ideas about common property, More described an island whose inhabitants were living in a country without private ownership and with a clear hierarchy. Thus, the term "utopia» comes from the name of his work. The form of government is a representative democracy and the ruler is elected for life. Thomas More stresses that there is slavery in Amaurot – it serves as a punishment for serious crimes and a travel ban between cities without the prior consent of the ruler. The island was named after- Utop, who was the founder of the island and the cities and the author of the basic idea of area planning

Under the influence of Plato and More, Tommaso Campanella wrote his own work – "The City of the Sun» in 1602 (1988, pp. 131–182). City of the Sun is located on a hill and is an one of the four states on the island in the Indian Ocean. The author considered that everything had a common beginning and was interconnected. Campanella deduced his own model of the unity of people between themselves and with the outside world based on his knowledge of astrology. A theocratic monarchy is a proposed form of government in "The City of the Sun", so the state is headed by a priest. The basis of his utopian model is the notion of social equality for all residents, which is achieved due to community ownership, division of labor and responsibilities.

3. Results and Discussion

For better comparison of the architecture and urban characteristics of the utopian countries that were described by Plato, More and Campanella, the data are structured in Table Characteristics of Urban and Architectural Design in the Works of Social Utopian.

3.1. Architectural and Urban Design in Plato's "Republic" and "Laws"

To ensure the implementation of social utopia, Plato used the correct geometric form-circle, thus forming the circumferential and radial roads in the city. Agora is the main market square in the center of the city and the country and the main public square at the same time. There are public buildings near agora, which looks like a city center with public function. The city around the agora is divided into 12 equal parts – districts of the city. Identical residential buildings create protective walls, because of the very location density (Plato, 1994, pp. 71–437). The city is surrounded by moat.

The territory of the whole country was also divided into 12 equal parts. The colony-village is in the center of each part. The location of gymnasiums (in the city) and hippodromes and sport grounds (outside of it), could be arbitrary, but at the same time, they had to be at the same distance from each other, providing all residents with equal opportunities for their use (Fig.1).
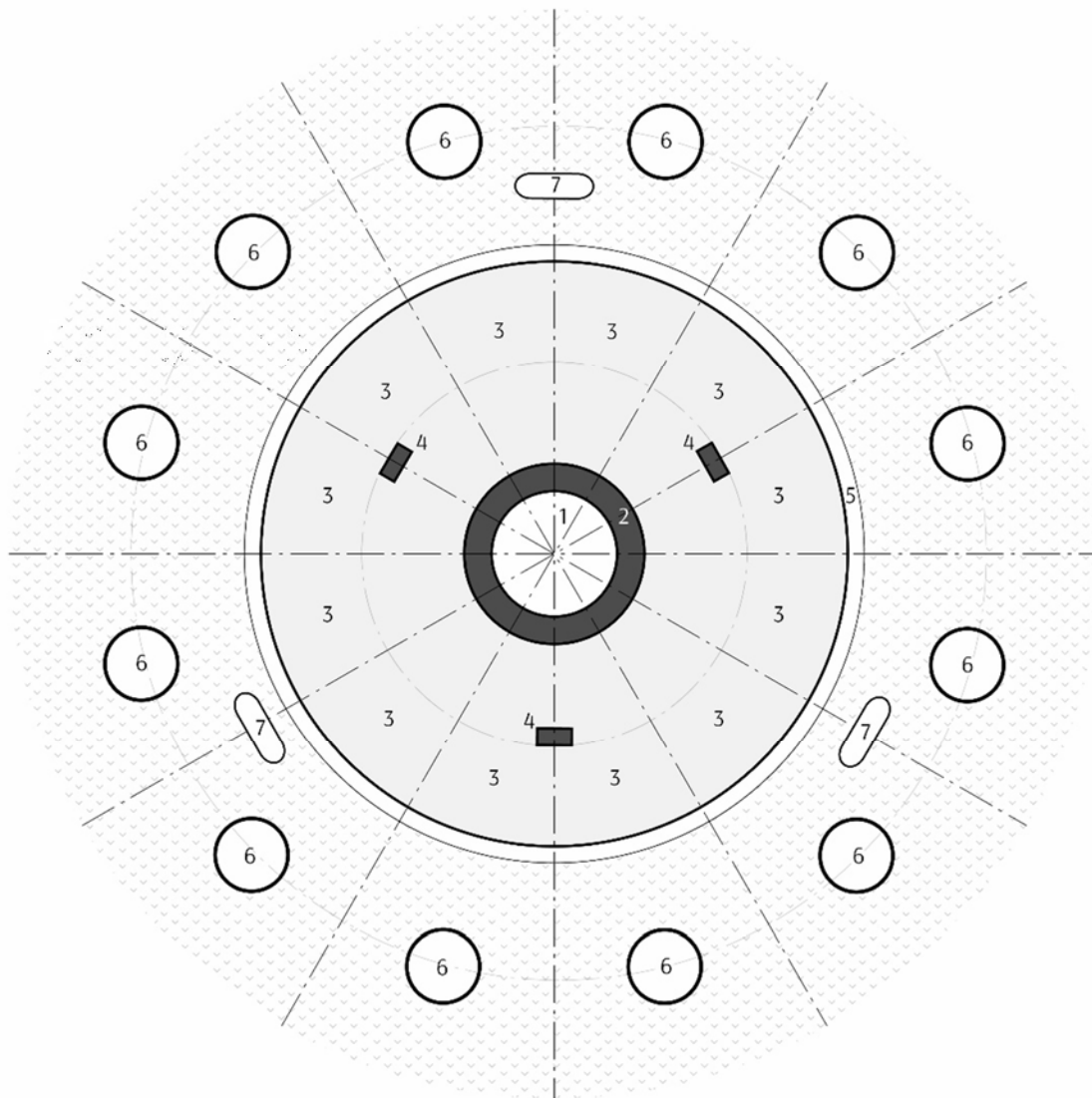
Fig. 1. Scheme of the utopia city by Plato:
1 – agora – the center of the city; 2 – public buildings; 3 – district of the city; 4 – gymnasium;
5 – earth moat; 6 – colony-villages; 7 – hippodromes and sport grounds
(Drawn by Author from the description in Plato's "Laws" (1994, pp. 71–437))

Plato paid special attention to numerical characteristics: exactly 5040 families should live in the city, since this number is most convenient for its proper division. Author did not pay attention to the materials or architectural solutions, but emphasized the comfortable and reliable buildings (Plato, 1994, pp. 71–437).
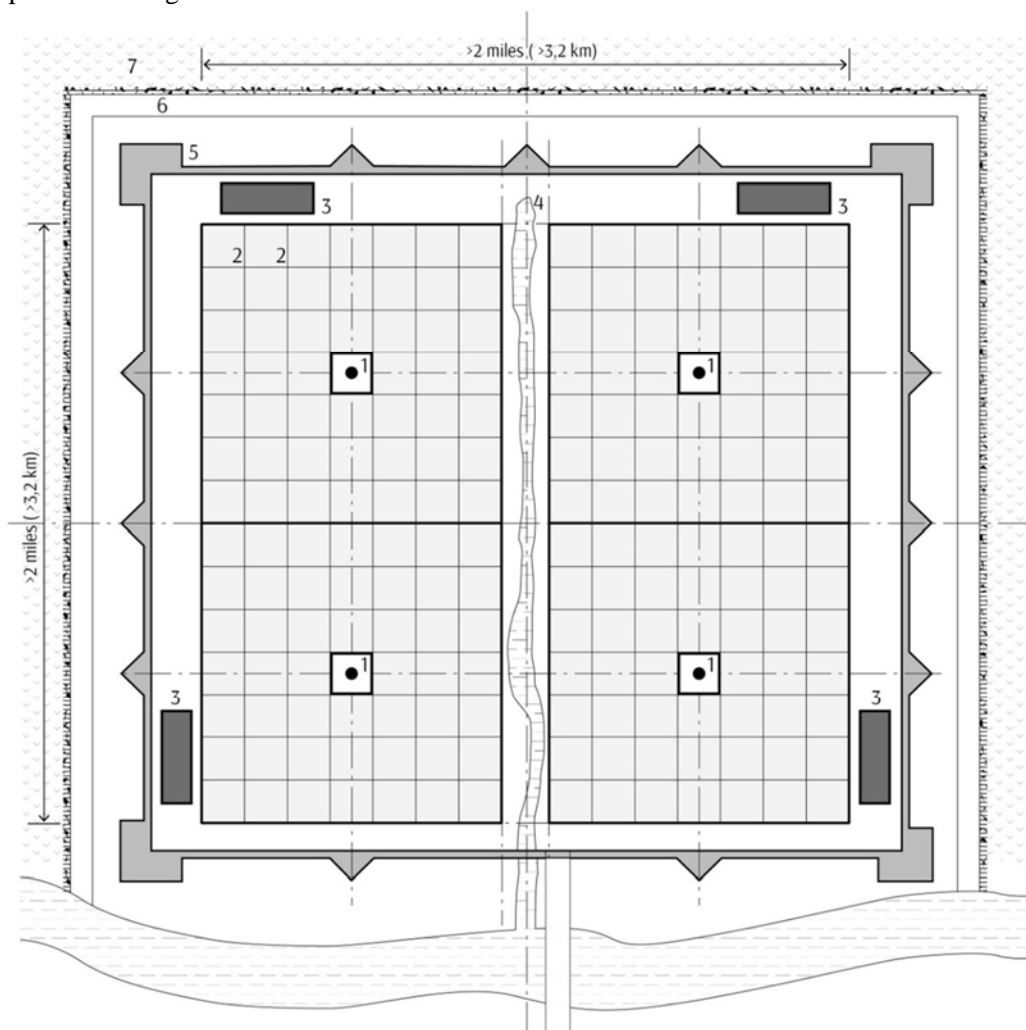
3.2. Architectural and Urban Design in Utopia by T. More

T. More (1988, pp. 16–130) gives a sufficiently detailed description of both urban and architectural and constructive solutions. In spite of this, a number of questions arise as to the correct interpretation of these descriptions. For instance, A. Simoson (2016) gives examples of possible variants of the configuration of the Utopia Island, the rivers and mountains on it, according to various mathematical models. An island that is located in the sea (the name of the sea is not specified), separated by an artificially created canal 15 miles wide (24 km) from the mainland.

The shape of island is close to the correct form and remote from the mainland by 2.4 kilometers by an artificially created strait. The capital of the country – the city of Amaurot is located in the central part of the island that enables residents of all cities to have equal access to it (More, 1988, pp. 16–130).

T. More used the grid pan in the planning structure of the city. He divided the city into four equal areas- districts with 50 residential neighborhoods of each. The lack of private property affects the fact that all buildings should have the same architecture and plan, and all residents have equal access to all buildings on the island. There remains an open question of the location of schools and temples, as well as the Senate and major public institutions. For example, soviet architect H. Hradov (1968, pp. 30–36) drew a scheme of Amaurot, where place around the river is a big public space with sport and public buildings there. Instead, E. Eylers (2015) has drawn the temples and the rest of public facilities on larger quarters than residential and located them around the city.

Fig. 2 shows a simplified general plan of the city with an author's interpretation of the location of the river and some public buildings.


Fig. 2. Scheme of the utopia city Amaurot:
1 – market square; 2 – residential quarter; 3 – hospitals; 4 – river; 5 – stone wall with bastions and towers; 6 – moat; 7 – fields
(Drawn by Author from the description in "Utopia" by More (1988, pp. 16–130))

3.3. Architectural and Urban Design in "The City of Sun" by T. Campanella

In "The City of the Sun" Tommaso Campanella (1988, pp. 131–182) used circumferential and radial roads. His city has four main roads, which are oriented around the world. The central object of the utopian city is a temple, whose architecture had been given considerable attention (Fig. 3). An important part of the city space is the decoration of the buildings-walls drawings, because they become not only the decoration of the city, but also the main place for educating children.

The main difference between the architecture of "The City of the Sun" from the architecture of the cities of Plato and More is not only the astrological context, but also a lack of a significant number of public buildings as separate structures. More (1988, pp. 16–130) allocated separate dining-house buildings in each residential area, foreseeing buildings for hospitals and the Senate, Plato (1994, pp. 71–437) proposed to build a large number of public buildings around the agora. In contrast to them, the main public functions in the city of the Sun are performed by the first floors of residential buildings and the temple of the sun.
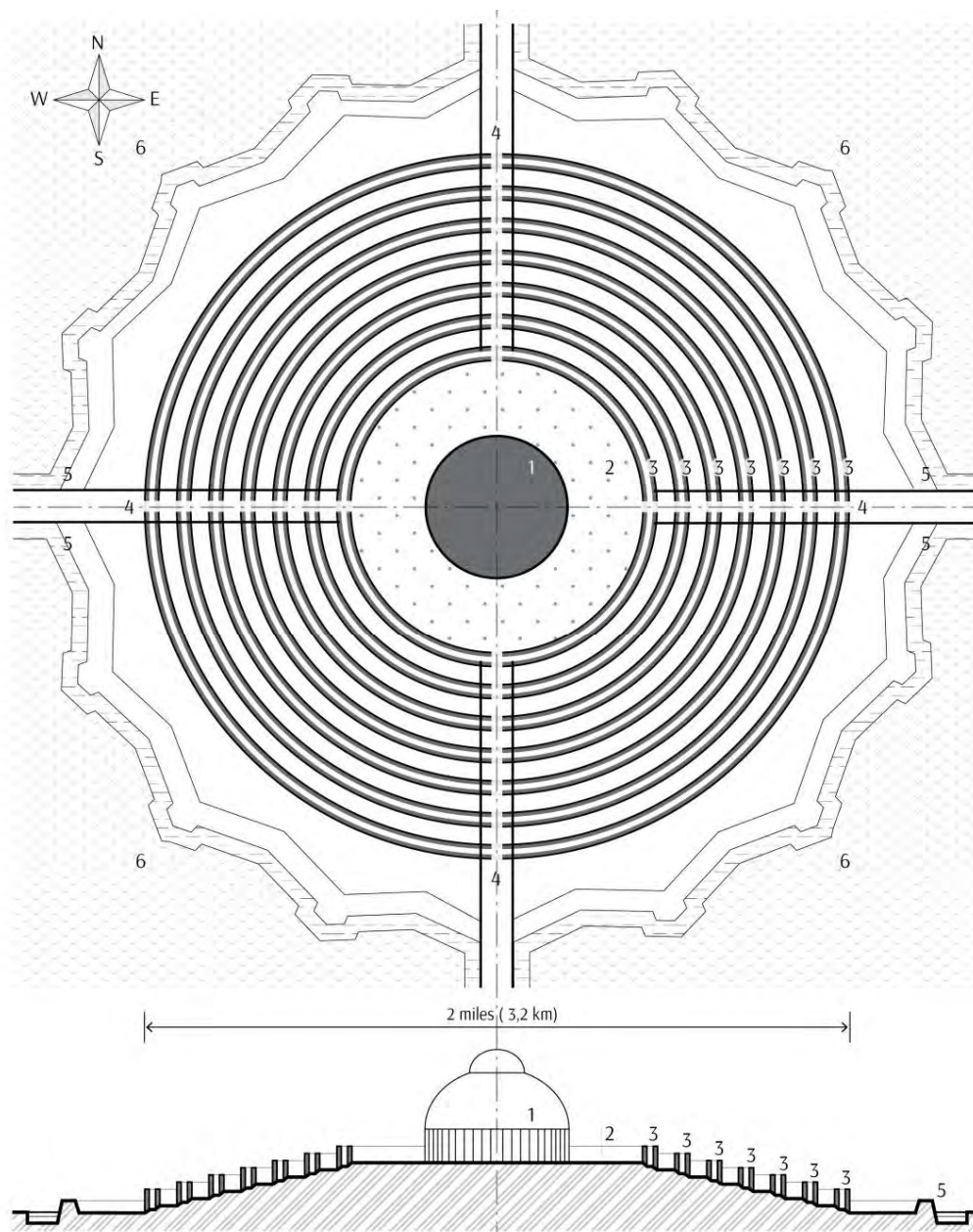
Fig. 3. Scheme of the Campanella's utopia city: 1 – temple; 2 – public space; 3 – belt of residential and public buildings that act as defensive walls; 4 – main road; 5 – earth wall and moat; 6 – fields (Drawn by Author from the description in "The City of the Sun" by Campanella (1988, pp. 131–182))

Characteristics Of Urban And Architectural Design In The Works Of Social Utopians			
Source	"Republic" (2000) and "Laws" (1994, pp. 71–437) by Plato	"Utopia" by More (1988, pp. 16–130)	"The City of the Sun" by Campanella (1988, pp. 131–182)
1	2	3	4
Type of state, by territorial characteristics	City-state	Island country	City-state
Main city	There is one main city (policy) with twelve colony-villages around	Amaurot	–
Forms of government	Elected aristocracy or monarchy, the country is headed by philosophers	Representative Democracy. The ruler is elected for life	Theocratic monarchy. The state is headed by a priest
Territorial location of the country	The city-state is located in the central part of its suburbs, on the areas that can provide consumers with all what they need.	An island that is located in the sea (the name of the sea is not specified), separated by an artificially created canal 15 miles wide (24 km) from the mainland.	One of the four states on the island in the Indian Ocean. Located on a hill, the diameter of which is 2 miles (3.2 km). The city is surrounded by the plain. There are four cobbled roads in direction to the ocean. Near the city, there are villages, groves and forests.
Author / Chief Architect	–	The author is Utop – a founder of the island and the city	–
Administrative division	The main unit of the country is a city, which consists of 12 parts. The outskirts of the city are also divided into 12 equal parts.	The country is divided into 54 cities with the same planning. The minimum distance between them is 24 miles (38.4 km), and the largest one allows a pedestrian to come from one city to another during the day. Also, there are villages, the distance between them and their number is not normalized	1 City Village or villages on the outskirts of the city
The population of the city / town	There should be exactly 5040 families in the city. If the number increases, they are resettled in a colony-village, whose number of inhabitants is not normalized	Each city has 6,000 families; each has from 10 to 16 adults. There is a total of 60–96 thousand adult residents without children. The number of village families is not specified. It is known that there are about 40 adults in each peasant family, and two slaves	–
The shape of the city	Circle	Almost square, each side of which is almost 2 miles (3.2 km)	Circle, with a diameter of 3.2 km (the size is indicated according to the horizontal section of the hill where the city is located)

1	2	3	4
The planning scheme of the city street network	Circumferential and radial roads	Grid plan. The city is divided into four big districts, and 200 small residential quarters .The width of the streets is about 6 meters	Circumferential and radial roads. The city consists of seven rings and four radial roads
Fortifications of the city	The city is surrounded by moat. There is no reason to build stone walls because of the residential houses, located in a close proximity, thus forming protective walls.	There is a stone wall with bastions and towers. The three sides of the city are surrounded by dry moat and hedge, and the fourth one is surrounded by river.	There is a stone wall with bastions and towers. The city is surrounded by moat.
Public space	– Agora – the main market square, which is located in the city center, and is the center of the country too. It serves as the main public space for the residents, performing market functions, and place for judicial and other meetings. – 3 sports grounds, which are outside the city, near hippodromes – Small streets	– Streets that are located along row of residential buildings (6 m wide) – Gardens located in the middle of residential neighborhoods. Planted with a large number of different trees. – 4 main market squares, which are centers for 4 parts of the city.	– Galleries for walking, peristyles that are located on each ring of the city – 4 main streets – Pools, which are constructed both on the outskirts of the city and within its borders – Trading areas outside the walls
Public buildings	– Temples, which are located around agora – Administration buildings, which are near the temples – 3 educational buildings – gymnasiums, located at the same distance from each other within the city. Also, it is mentioned about college – 3 hippodromes, next to which there are equipped areas for sport: exercises in throwing, archery. They are located outside the city – Three types of prisons: the first one is on the square of the city, the second one is near the meeting room, the third one is outside the city, on the most distant area – Public baths – Theaters	– 13 temples that are built as true works of art. The interior space of the temples is semi-dark, according to the advice of the clergy – Palaces of Syphograntus (heads of districts). They are located in each quarter at the same distance from each other. Serving as a dining room and a gathering place for residents. Divided into 2 main rooms, each of them accommodates 15 families (in general, these buildings are for 60 families), and they include a separate room for mothers with infants – Schools – There are no prisons – 4 public hospitals, which are located on the outskirts of the city, and are large in size	– Temple. It consists of two domes, smaller dome relies on the larger one, which is on the columns. The diameter of the temple is 350 steps, which is approximately 310 meters. The large dome is decorated with drawings of stars. Clergy's rooms are near the small dome. The temple also serves as the venue for the courts – Shops – Warehouses, kitchens, dining rooms, baths – are located on the first floors of buildings – Bakery, various workshops for tailoring, forging, joiner's and others – Schools. The walls are the main area for learning, since they represent a significant amount of information that needs to be learned. – Public buildings for mothers and infants – Palaestra for sport – Tower, which is the prison

1	2	3	4
Residential buildings	The city is divided into 5040 sections for residential buildings, according to the number of inhabitants. The buildings are identical, and locate in close proximity, thus forming protective walls. There is no private property in the country – residents cannot change anything in the planning or architecture of their home.	Residential buildings are three stored and blocked into each other, thus forming quarters with common gardens in the middle. All buildings have identical architecture and are common property. The houses have two entrances, one from the street and the other from the garden. Residents change their homes every 10 years according to the decision of the landlord. Rural residential buildings are identical and equipped with everything you need	Residential buildings are in common property (residents change their housing once every 6 months). The buildings are embedded in the outer walls of each of the seven rings, forming a solid row of buildings. Entrance to the house is from the inside of the wall. The first floors are devoted to public functions, living rooms are located exclusively on the second floor. From the outside of the building there are galleries for walks
Memorial monuments / cemeteries	The burial place is located beyond the boundaries of the city, on the territory of non-fertile soils. Residents are forbidden to put monuments on the graves, and the tombstones should be of such size that they can accommodate at most four praise poems about the deceased	– Historical statues and monuments are erected at the square – There are equipped burial places, with a column with the name of the deceased on them	– Historical statues and monuments are erected at the square – There are no cemeteries
Building materials	Stones	– Wood: Used for the construction of bridges, pillars, etc. – Solid stone, sandstone, brick – the outer walls of buildings – Special coating for roofing – Glass or cloth – used in windows	– Paver – used for paving roads – Marble as a material for stairs in buildings – Stone – for the erection of walls, as well as lava around the temple – Iron – doors, shutters – Precious stones used as floor coverings in the temple
Constructive characteristics	–	– The walls are made of stones and brick, the inner gap between them is covered with crushed stone – Roofs are flat	– The thickness of the outer convex walls of residential buildings – 88.9 cm, concave – 53.34 cm. – Interior partitions have a thickness from 17.78 to 26.67 cm
Infrastructure: water supply systems	Primitive constructions for collecting rainwater. There are also special channels that provide water to all areas of the city throughout the year	Within the city, there is a part of the river, from which water disperses all over the city through the pipes. It is foreseen to collect rainwater in tanks in those areas where it is impossible to supply water because of the relief.	Water supply is provided in the bathhouse and in the fountains. There are drains and mourning for dirty water, and special storages for storing rainwater for further use.

1	2	3	4
Applied arts	– Making tableware from gold, bronze, silver – Wooden and stone products for the glorification of gods	– Tableware are made of clay, but night pots are made of gold and silver – Ornaments and chains for slaves are made of gold	– Lamps, tableware, jewelry made of gold and silver – – Mosaic for decorating lower galleries – Paintings adorn all the walls and walls of the city. The paintings provide detailed information on the science, history of the city and crafts

4. Conclusions

1. Utopian thinking has always guided the trajectory of creative thought, based on it as life-affirming goals, as well as ways to search for new social and artistic values. Actually, urban planning and architectural solutions embodied in perfect forms helped visualize utopian ideas, so architecture has become an important part of thinking about the place "which is nowhere".

2. In their writings, Plato, More and Campanella focused on architectural and urban aspects as an important level of social utopia. In their works, special importance was paid primarily to the functional purpose of certain elements of the urban structure, which was expressed in the correct geometry of urban formation (aesthetic and visual characteristics, as a rule, were left out from the attention of philosophers). For example, Plato's work is characterized by greater attention to the location of public buildings in the structure of the city, while More and Campanella define them very broadly. This demonstrates the differences in their socio-political models, since Plato focuses on the complex and more precise hierarchy of various processes, while More and Campanella – on processes integration into everyday life is (as an example, using images on defense rings-ants for teaching children in "The City of the Sun» by T. Campanella).

3. The desire to create the ideal structure of the city, which should reflect the ideal social order, is quite significant. Urban formations are described as ideal geometric shapes (circle or square), divided into identical fragments, forming a holistic centric and at the same time equivalent architectural composition in the direction from the center to the periphery.

4. The central structure laid by Plato and Campanella reflects the concept of vertical hierarchy of the organization of society (domination of law and authority) and horizontal equivalence (social and property equality, lack of private property). At the same time, such geometric structures of cities appeal to archetypal ideas about the ideal world order in human consciousness (the concept of the world tree, mandala, etc.).

5. Numerological aspects that utopian philosophers use to confirm the ideality of their models, can be traced in all works of social utopians. Plato lays the city, which is divided into 12 equal parts, with a population of 5040; T. Moore writes that the state is divided into 54 cities, each of which has 6,000 families; T. Campanella describes a city with 7 building belts that are intersected by 4 main streets.

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Світлана Лінда, Анна Федак

У ПОШУКАХ ІДЕАЛЬНОЇ ФОРМИ: ГЕОМЕТРІЯ МІСТА У ТРАКТАТАХ ПЛАТОНА, Т. МОРА, Т. КАМПАНЕЛЛИ

Анотація. Статтю присвячено аналізу геометричних характеристик, містобудівної структури та архітектури утопічних міст та держав, а також їхнього взаємозв'язку з соціальними та політичними аспектами у трактатах Платона "Держава» та "Закони», Т. Мора "Золота книжечка, така ж корисна, як і забавна, про найкращий устрій держави і про новий острів Утопія» та Т. Кампанелли "Місто Сонця». Дослідження ідеальних міст-держав, описаних філософами-утопістами, часто зводиться до аналізу їхніх політичних та соціальних характеристик. Однак, розглядаючи досконалі моделі суспільного устрою, філософи заторкували усі сфери людського життя, тим самим показуючи їхню взаємозалежність та рівнозначність у процесі формування єдиної системи. Для їхніх трактатів характерна увага до геометричних характеристик міст та архітектури, з метою створення відповідних умов життя для мешканців, в яких вони могли б реалізовувати ті типи поведінки, які передбачало від них суспільство. Фрагментарні описи архітектури та планувальної структури міст призводять до низки неточностей та різних варіантів інтерпретації планування міста. Філософи-утопісти, апелюючи до історично-сформованих уявлень людства про ідеальне, описуючи планувальну структуру міст-держав, використовували правильні геометричні форми, ідею симетрії та центричності. Формуючи досконалі моделі суспільного устрою, вони послуговувались архітектурою, як фоном для забезпечення комфортного та функціонального простору, який відповідав би вимогам ідеального суспільства. В статті представлено розроблені авторами схеми міст-держав, відповідно до їхнього опису, а також проаналізовано та систематизовано інформацію щодо геометричних характеристик міст, публічних просторів, громадських та житлових будівель, що описані в трактатах філософів. Так, у працях Платона, Т. Мора та Т. Кампанелли міста мають правильні геометричні форми (коло, квадрат), розбиті на рівні за площею частини, симетричне планування та уніфіковані житлові та громадські будівлі, – все це є важливим елементом досягнення утопічної моделі суспільства.

Ключові слова: утопія, архітектурна утопія, публічний простір, громадські та житлові будівлі.