

Underground architecture: an archetypal experience

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The purpose of this specific study is the architectural approach of underground spaces in volcanic, and not only, grounds in Greece as well as abroad and the connection of this archetypal space to modern architecture.

Man's first residence is formed the moment the embryo is conceived in its mother's uterus. The uterus constitutes the first example of a cramped place without light where man spends the first nine months of life. This form of space also existed in prehistoric times when man found shelter in natural caves so that he could protect himself from animals and freak weather conditions. According to Utudjian Edouard¹ "the earth is the first uterus, the basic raw material, the cave is the cosmic seed". For hundreds of thousands of years, the movement of tectonic plates, the continuous flow of lava and water and the erosion by the wind have been changing the morphology of the natural environment forming cavities and fissures in rocks. It can be argued that underground buildings have a relationship of wisdom to the natural environment and to the earth while at the same time they constitute spaces of life in the natural landscape. They have always offered man a refuge of serenity and psychological tranquility.

A place is defined as underground when it is partly or wholly under the continuous surface of the ground. Underground architecture is the architecture of elimination and of the close contact with the earth. Applications of underground architecture exist in those areas where there is need for protection due to solar radiation during the summer months and where the temperature of the air is particularly high such as in dry regions of north Africa (the area of Matmata in South Tunisia), in central Turkey (Goreme valley in Cappadocia), in the north part of China (provinces of Henan, Shanxi and Gansu) as well as in areas of the Mediterranean.

The reasons for underground spaces of living are various and depend on the specific time period, the region and the circumstances. The main factor is the morphology of the landscape. The topographic conditions together with the fear of attacks led to the quest of a shelter in steep slopes or recesses in rocks. At the same time, financial reasons played a part since the construction of underground places was both cost and time effective. Finally, religious reasons such as the

¹ Utidjian, E. (1966), *Architecture et urbanisme souterrains*, Paris: Laffont

persecution of the first Christians forced people to hide in underground residences in the area of Cappadocia, which was a motive for their construction.

Underground constructions present many advantages. On hot days, because of the height of the roof of the houses, the hot air that rises can easily escape from the opening that usually exists in the facade while their vaulted structure allows for a circular movement of air. The small openings of the one and only side prevent the penetration of radiation and heat in the summer and the loss of heat in winter. Also, their dense construction limits the surfaces that are exposed to the sun. The heat capacity of underground spaces is theoretically infinite because it is the same as that of the earth with the temperature of the wall at a steady 18 °C . The feeling of coolness is due to the absorption of heat from the internal air towards the walls of the cave. For all the above mentioned reasons, underground structures are considered to be a good living space since they combine heat in the winter and coolness in the summer. However, there are also drawbacks basically due to two reasons: first of all, due to high humidity, which may reach 95% and gets even worse due to bad ventilation rendering them unhygienic and secondly due to poor lighting because of the small openings at the facade and the lack of openings at the back of the construction.

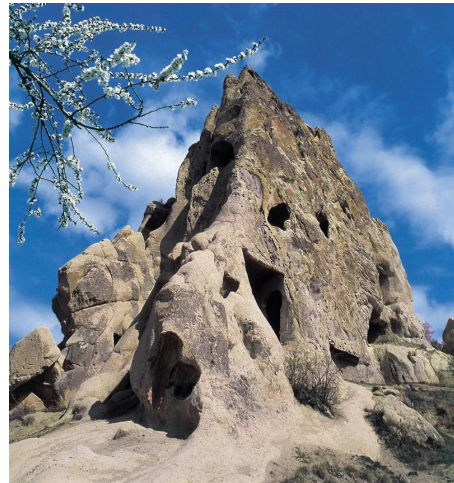
Following, there is a case study of samples of underground spaces that exist in different kinds of landscapes and grounds (eg. rocks). Samples of such structures in the past are the following:

a) Cappadocia

A characteristic example of underground architecture in a volcanic ground is that of Cappadocia (in the area of central Anatolia between the cities of Aksaray, Nigde, Nevsehir and Kayseri). It is a vast plateau full of geological formations of a particular morphological interest, with canyons and countless strange hollow rocks of various shapes (oval, cones or like pyramids). The geological formation of Cappadocia is due to the intense volcanic activity that took place in the region 50,000,000 years ago. The high extent of erosion which gave this wasteland its current shape is due to particularly strong winds, rainfall and the activity of rivers and torrents. Another reason is the harsh winters and the fluctuation of temperature between day and night which caused abrupt expansion and contraction of the rocks.



1. *Characteristic landscape of Cappadocia*



2. *Women's monastery, Cappadocia*

The typology of the various underground buildings differs in size and complexity. Volcanic rocks were soft and easily carved and that's why the builder could easily carve them inside and make rooms round a central space in the front part of the rock which was carved first. If the rock was higher, it was also possible to build multi-storey apartments and if it was wide, it was possible to build many houses in a row. The kinds of spaces observed are cells of ascetics, residences, churches, monasteries and multi-storey underground settlements. The main idea was the adaptation of every place to the environment and therefore every place is unique and does not conform to strict, predetermined criteria but only to the respect of the natural landscape. Also, although most buildings do not have exterior decorative elements, in the interior there are elaborate murals and embossed decorations.

b) Matera

Matera is also a significant kind of underground architecture in the province of Basilicata in the southern part of Italy. The natural landscape in this case is rocky and the spaces have been formed in the rock. The structure of the spaces is characterized by walls of considerable thickness in the long sides so that they can support the rock and by a basic source of light at the opening of the access. The houses consist of a single space which is wholly carved in the rock and its ventilation is achieved by small openings in the facade. The oldest findings in this city date back to Paleolithic times but the biggest part of the findings date back to Neolithic and post Neolithic times.



3. Spaces in the rock, Matera



4. Matera, Italy

c) Vardzia and Uplistsikhe

The city of caves under the name of Vardzia is in Georgia, in a country where Western Europe meets Eastern Asia. Under the mountain of Erusheli, which was chosen for its hard rock, a monastery was built which was used by the inhabitants of the region as a shelter from attacks. Its construction began at the end of the 12th century and comprises 13 levels. The natural caves inside the mountain were expanded and converted into 6,000 rooms, enough to accommodate the monks of the monastery as well as the inhabitants who would seek shelter there. Characteristic samples of underground architecture also exist in the town of Uplistsikhe in Georgia which is built on sandstone rock next to a river and dates back to the Iron Age.



5. Settlement in Vardzia, Georgia



6. Settlement in Uplistsikhe, Georgia

d) Necropolis of Pantalica

The Necropolis of Pantalica is in Syracuse in the eastern coast of Sicily and contains more than 5,000 carved tombs most of which date from the 13th to the 7th century BC.



7. The Necropolis of Pantalica

e) Lalibela

Lalibela is a town in Northern Ethiopia which is famous for its 11 monolithic churches which are carved in its porous, volcanic rock. The churches were built with the elimination of the rock without using any other building material. For their construction, the solid rock was vertically cut so that a peripheral passage was created and in the middle remained the rest of the soil mass. This mass took the form of the church by the stonecutters who chipped the crude mass starting from above

and going downwards. All the churches have multiple levels and are connected through a system of underground passages for the safety of the faithful people that took shelter there. More specifically, the church of St George was built at the beginning of the 13th century and constitutes the most famous and last temple of the eleven temples that exist in the area (it is regarded as the Eighth Wonder of the World).



8. St George church

As regards modern underground architecture, characteristic examples are the following:

a) The Jeju Island

A modern sample is the Jeju Island in South Korea. The volcanic landscape of the island inspired the Japanese architect Kengo Kuma who converted it into a residential area adapting the places to the environment. The specific residences were designed in 2013 and embody the flexibility and the power of the geographic forms while at the same time they express an architecture which is influenced by the natural phenomena. The various spaces seem to gradually emerge and submerge in the earth with their inclined roofs which have a coating of the volcanic rock of the surrounding landscape. The coating allows for particularly good insulation in the interior and protection from weather conditions that prevail in the region (typhoons and very low temperatures).



9. Kengo Kuma's Jeju Ball villas

b) Fogo Island Natural Park

The Fogo Island Natural Park in Cape Verde, East Africa, is another example of underground architecture in volcanic ground. It is the work of Oto arquitectos which was designed in 2013 and consists of a cultural center with an administrative building, conference halls, offices and laboratories adapted to the landscape both in terms of the construction materials and its color. It constitutes a dynamic form which reminds us of a volcanic summit with all its inclinations and synthetic construction.



10. Fogo Island Natural Park

c) Temppeliaukio Church

The Temppeliaukio church or “Church of the Rock” is in Helsinki, Finland. It was designed in 1961 by the Suomalainen brothers and it was completed in 1969 after many modifications. It is built in a rock of natural granite and it can hardly be seen on the outside. The only part that protrudes is the copper dome which allows natural light to enter.



11. Temppeliaukio Church

d) Villa Vals

Villa Vals is in the protected valley of Valsertal in Switzerland, in the village of Vals and it is a small motel. It was designed by the architects Bjarne Mastenbroek and Christian Müller and was completed in 2009. The aim of this specific complex was to achieve the least possible effect on the landscape and to incorporate the construction to the angled level.



12. *Villa Vals*

e) Summer House in Seriphos

A modern sample in the Hellenic area is the summer house in Seriphos, a work by the Mold/ Architects- Iliana Kerestetzi which was completed in 2013. It is a complex that follows the natural inclination of the slope towards the sea and is incorporated in the natural landscape. This logic is reinforced by the construction of underground rooms where edible plants are grown which together with those of the surroundings contribute to the natural continuum of the landscape.



13. *Summer house in Seriphos*

f) The cape of Santorini

The metallic construction which shelters the archaeological findings at the Cape of Santorini was designed by N. Fintikakis (1987) to protect a whole ancient town with its streets, squares, multi-storey buildings, laboratories and frescoes of elaborate art. It comprises specially built

openings in the northern and southern part of the roof, allowing free circulation of air and the natural lighting and coolness of the underground space.



14. The metallic construction

In conclusion, it is obvious from all the above that man always tries to take advantage of the ground so that he can create microclimatic pleasant spaces and adapt them to the topography of each region. Besides the particular characteristics of underground architecture, the need for the conversion of the natural landscape to a residential environment also emerges. It is remarkable that people manage to find effective solutions to the problem of accommodation using materials that are abundant around them and with tools of their everyday life. The scale of diversity of such constructions is also impressive ranging from individual rooms to underground settlements.

From all the above mentioned examples, we observe that the rationale of the underground space remains the same and that the initial underground spaces constitute a kind of archetype for modern architecture.

The term “archetype” means the original form in other words whatever may function as an example, a prototype, a model. Our archetypes guide us in basic forms of behavior representing distinct elements, images, ideas, experiences and feelings. Adherents to different schools of thought maintain that archetypes lie at the foundation of many manifestations of man’s life such as myths, literature, art, symbols and all the basic concepts of science. Carl Jung² compared archetypes to the Ideas of the Platonic Theory of Forms and described them as psychological structures, common to all, parts of the human soul that emerge from the collective unconscious and function as principles and models that profoundly affect human behavior and experience. The collective unconscious,

² Jung, C. (1981), *The Archetypes and the Collective Unconscious*, USA: Princeton University Press

which differs from the personal subconscious, contains all the heritage of the human evolution and to many it is similar to the original Chaos from which consciousness emerged.

Although archetypes are common to all, they manifest themselves in different ways depending on the specific place and time. Archetypes are dynamic, that is they evolve and change so as to live up to the requirements of new eras and at the same time they work as organizational factors of human activity. They are primordial images and spontaneous products of the soul that are based on pre-existing parental capacities and the observation of mythical and religious phenomena. Moreover, archetypes express issues which differ considerably in their details but they never lose their basic structure. Their influence in architectural creation is remarkable. Architecture could be divided in two different components, the art and the technique. The former is abstract, changeable and non-comparable while the latter can be defined as measurable, predictable and possible to evaluate. According to Alan Colquhoun³, architecture commands the use of rationalism and a building has to satisfy both real and constructive criteria which often limit and determine the field in which the architect's imagination works. However, in the experience of even the most rationalistic architect who is involved in a most limited project there comes a moment when on a blank sheet a structure is born as an expression of an archetypal idea. Archetypes, therefore, seem to define the structures of architectural types which lie at the foundation of every thought and expression of architectural activity just as archetypes lie at the foundation of soul. Thus, the archetype as an empirical phenomenon is determined by the place, the time and personal circumstances but on the other hand it is a general, ideal structural element free of particular conditions which constitutes a substantial component of the soul, the spirit and the mind.

Norman Foster⁴ claims that all the structural forms derive from two archetypes of architecture, the cave and the tent which acts as shelter. These constructions constitute samples of an anonymous and authentic architecture which has influenced architectural design in different periods of time. Therefore, the notion of cave, this natural cavity in the interior of the earth is present in different ways over the years and through a series of architectural ventures man's effort to develop a harmonious, symbiotic relationship with nature is evident.

³ Colquhoun, A. (1981), *Essays in Architectural Criticism Modern Architecture and Historical Change*, Cambridge: The MIT Press

⁴ Meijenfeldt, E. (ed) (2003), *Below Ground Level*, Berlin: Birkhäuser Publishers for Architecture

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