Received: 07.08.2023.
Accepted: 26.10.2023.

e-ZBORNIK 26/2023

Professional paper

Electronic collection of papers of the Faculty of Civil Engineering

https://doi.org/10.47960/2232-9080.2023.26.13.76

ISSN 2232-9080

Giant stone buildings (III) - Cyclopean and other buildings of more developed architecture

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Abstract: Megalithic architecture is related to a series of ancient stone monuments of giant dimensions, which were constructed using almost untreated individual stones or stones grouped into certain structures, but also to numerous buildings of more recent cultures and civilizations, the so-called "more developed architecture", which are built entirely or partly from large stone blocks, most often of regular geometric shape, in the drystone wall technique, weighing tons, tens of tons, even hundreds of tons, whose enormous mass raises the question of their transport and installation.
The first part of the paper presents the *megalithic* buildings of the Mycenaean civilization, called *Cyclopean* because the ancient Greeks believed that only the Cyclops could build with such large stone blocks. So, a *Cyclopean building* is megalithic, but not every megalithic building is *Cyclopean*, so it is better to use the general term *megalithic* for buildings that have nothing to do with Mycenaean Greece, like in the case of the megalithic defensive wall of the old Hellenistic city of Daorson near Stolac.
The second part of the paper presents some famous buildings in South America, but also in Baalbek, Lebanon, where three carved giant megalithic blocks called *triliths* (*trilithons*), probably the largest stone blocks made and erected by man, weighing about 800 t, are built into the southwestern wall, as well as the drystone walls of megalithic buildings in Peru, which, due to their flexibility and the double interlocking wall technique, have survived in areas where earthquakes are not a rare phenomenon.
Keywords: Megalith, megalithic, architecture/building, Cyclopean, Mycenaean, Daorson, Baalbek, trilithon, Peru

Divovske kamene građevine (III) - kiklopske i druge građevine razvijenije arhitekture

Sažetak: Megalitska (megalitička ili megalitna) arhitektura odnosi se na niz drevnih kamenih spomenika divovskih dimenzija, za čiju gradnju je korišteno gotovo neobrađeno pojedinačno kamenje ili kamenje grupirano u određene strukture, ali i na brojne građevine novijih kultura i civilizacija, tzv. „razvijenije arhitekture“, koje su izgrađene u potpunosti ili dijelom od velikih kamenih blokova, najčešće pravilnog geometrijskog oblika, u tehnici suhozida, mase u tonama, u desecima tona, čak i u stotinama tona, čija golema masa otvara pitanje njihovog transporta i ugradbe.
U prvom dijelu rada su prikazane „megalitske“ građevine mikenske civilizacije, nazvane „kiklopskim“ jer su stari Grci smatrali da su tako velikim kamenim blokovima mogli graditi samo Kiklopi. Dakle, „kiklopsko zdanje“ je megalitsko, ali nije svako megalitsko zdanje „kiklopsko“, pa je za građevine koje s. mikenskom Grčkom nemaju veze bolje primjenjivati opći termin „megalitski“, kao na pr. u slučaju megalitskog obrambenog zida starog helenističkog grada Daorsona kod Stoca.
U drugom dijelu rada prikazane su neke poznate građevine u Južnoj Americi, ali i u libanonskom Baalbeku, gdje su u jugozapadni zid ugrađena 3 isklesana divovska megalitska bloka zvana *Triliti* (*Trilithon*), vjerojatno najveći kameni blokovi koje je izradio i podigao čovjek, mase oko 800 t, kao i suhozidni zidovi megalitskih građevina u Peruu, koji su se zbog svoje fleksibilnosti i tehnike duplog prianjajućeg zida održali u područjima gdje potresi nisu rijetka pojava.
Ključne riječi: Megalit, megalitska, megalitička, megalitna, arhitektura/građevina, „kiklopske“, mikenske, Daorson, Baalbek, Triliti, Peru

1. INTRODUCTORY NOTES ON MEGALITHS AND MEGALITHIC ARCHITECTURE

Megaliths, "big stones", were used in different historical periods, individually or grouped in different megalithic buildings, without the use of binders (drystone wall construction).

Megalithic architecture involves a series of ancient prehistoric stone monuments of giant dimensions, which were constructed using almost untreated stones, about which we wrote in the first paper, [1] but also numerous buildings of more recent cultures and civilizations, or "more developed architecture", which are built entirely or partly from large stone blocks in the drystone wall technique, most often of regular geometric shape, weighing tons, tens of tons, even hundreds of tons. These are Egyptian, Central American and other pyramids (with tombs and temples) around the world, described in the second paper, [2] while the so-called "Cyclopean buildings" of the Mycenaean civilization (e.g. the ramparts of the Greek cities of Mycenae, Argos, Tiryns and Athens), as well as similar buildings in South America (Sacsayhuaman, and Ollantaytambo in Peru) and beyond, are the subject of this (third) paper. In most of these buildings, the surface of blocks is dressed, mainly from limestone rocks, but also from solid volcanic, hardly workable rocks. Quite often, preserved parts of megalithic buildings were used by later civilizations as a foundation for their own buildings, which can be clearly seen in Baalbek, Lebanon, where the Roman temples were built on a stone base with an area of more than 45 ha, in which about 5 million m^3 of stone were built, including three huge stone blocks (the famous trilithons), ones of the largest ever.

For many megalithic buildings that have been there for thousands and thousands of years, and which are the subject of this paper, we have many doubts about the technology with which they were built, by builders who hardly or never knew the wheel, but that will be the topic of the fourth paper of the tetralogy about the giant stone buildings of these authors.

2. MEGALITHIC BUILDINGS OF MORE DEVELOPED ARCHITECTURE - CYCLOPEAN AND SIMILAR BUILDINGS

2.1 *Cyclopean* construction as a megalithic construction of the Mycenaean civilization

In the 2nd millennium BC (from 1,600-1,200/1,100 BC) Mycenae was the center of the so-called Mycenaean civilization that dominated the area of Attica, Boeotia and the Peloponnese, and over time spread to the entire Aegean and managed trade in the central Mediterranean. The famous Lion Gate, the only preserved monumental example of Mycenaean sculpture and the largest sculpture of the prehistoric Aegean region, is believed to have been built in the 13th century BC. The stone blocks weigh more than 20 tons, and there are examples the weight of which reaches almost 100 tons, [3].

When defining "Cyclopean construction," the essential difference between *Cyclopean* and other megalithic buildings should be emphasized. As *Cyclopean construction* mostly uses huge stone blocks, *Cyclopean building* is megalithic, but not every megalithic building is *Cyclopean*. The term 'Cyclopean' was coined in the context of Mycenaean civilization and purely Mycenaean buildings, [4]. Pausanias, who is considered the creator of this term in archeology, uses it in his travelogue only in this context, although he describes many other megalithic buildings. His interpretation is based on Greek myths that often originate from that very Bronze Age period of Greek prehistory. According to Helena Tomas, it is wrong to use the term 'Cyclopean' for buildings and archaeological contexts that have nothing to do with Bronze Age or Mycenaean Greece, so this term should not be used in archeologically inappropriate contexts and it is better to use the general term 'megalithic', [5].

The Mycenaean civilization had settlements on hilltops - the so-called. citadels (Iakovidis 1973; 1983). Tiryns is the oldest one, so its walls probably served as a model for other citadels.

The next constructed citadel, also the most famous one, is Mycenae, fortified with a wall approximately 30-50 years after Tiryns. It was built in three stages (Iakovidis 1983). So far, the largest number of Mycenaean citadels are located on the Peloponnese, and the citadel of Gla is the largest in terms of area. Another important Mycenaean citadel outside the Peloponnese is Athens, [5].

What remains of the citadels is the famous walls, which Pausanias [6], concluded were not built by humans, but by the Cyclops, a mythical human race of giant stature that lived on Earth in the ancient past, so the term *Cyclopean construction* is still used for the construction method typical of the time of the Mycenaean civilization, primarily fortification walls, but also other buildings (support walls, dams, and bridges, through the opening of which with a Cyclopean triangle the river flowed). Finally, the principle of building the Mycenaean tholos itself is considered *Cyclopean*. The walls of the dromos that led to the tholos often resemble some of the walls of the Mycenaean fortifications (except that the dromos only had the outer face of the wall), [5]. Mycenaean architecture had no knowledge of the relief arch, so the passages through the Cyclopean walls were solved with hollow relief triangles that were supposed to reduce the pressure of the dome-shaped structure on the monumental stone lintel above the entrance to the tholos, like above the lintel of the Lion Gate, with the opening being 'camouflaged' with a decorative relief. The lintel above the entrance to Atreus' treasury weighed as much as 120 tons, [6].

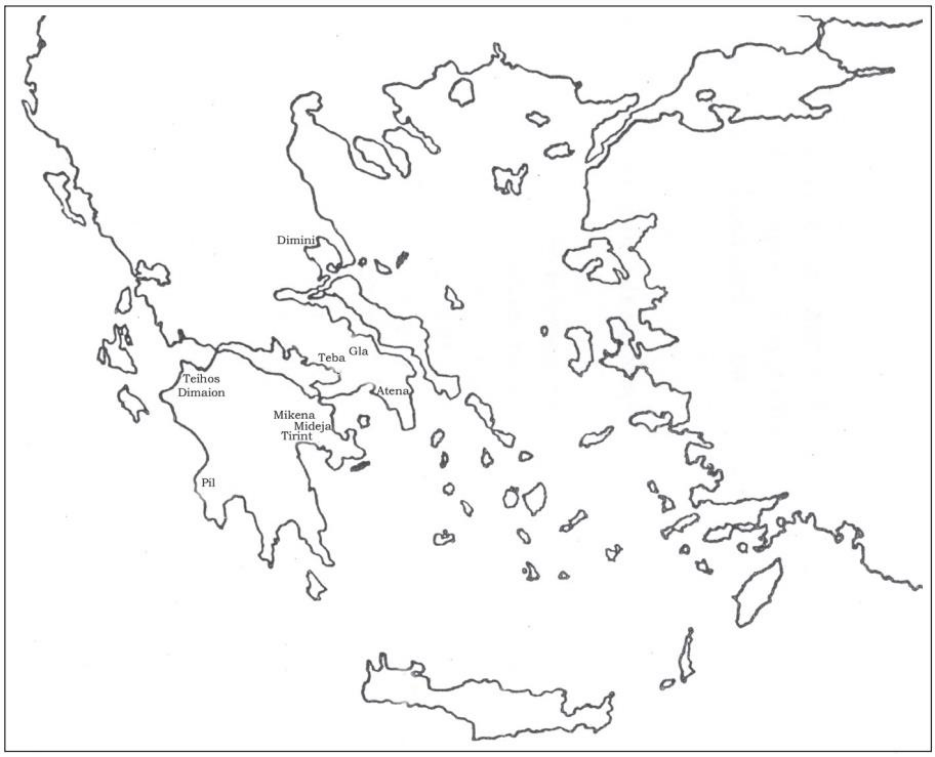


Figure 1. Map of Greece with Mycenaean citadels and palaces (made by M. Burić, 2008) [5]

King Proitus, the founder of Tiryns, was allegedly the first to invite the Cyclops to build him walls around the city, the oldest of all the Mycenaean citadels, [5]. Cyclops are mentioned by Hesiod in *Theogony*, Homer in *Odyssey*, and later Pliny the Elder in his encyclopedic work *Naturalis Historia*, and information about the existence of numerous antediluvian civilizations and their giants can be found in the myths and historical records of other ancient civilizations. Famous ancient historians Herodotus, Diodorus Siculus, Plutarch and many others claimed that giant buildings were built by giants, and their stories match!? [3].

A *Cyclopean wall* consists of an outer and an inner face, built of large, often irregular, stone blocks, which are mostly undressed. These are drystone wall structures, in which no binding material was used. The space between the two faces of the walls was filled with smaller stones. Only the more monumental and prominent parts of the wall, as well as the entrance door, had dressed blocks of a regular shape. The stones had joints and this is what easily distinguishes these ancient walls from the classic ones. The term *Cyclopean construction* has its own spatial and temporal limitations, which are often not recognized in practice, [5].

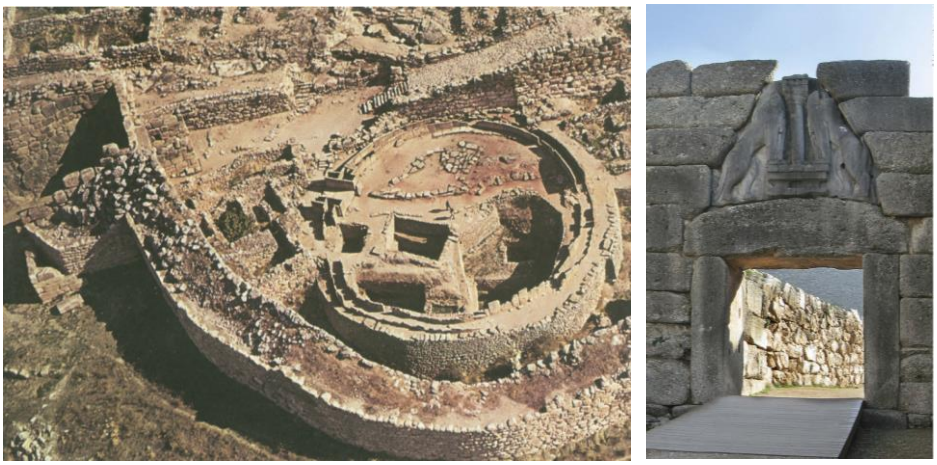
The average length of a stone block of a Cyclopean wall is about 1 m, height 60-80 cm, weight up to several tons. Exceptionally, there are also giant blocks, such as in Tiryns, up to 4 m in length (Iakovidis 1983; Loader 1998). The largest blocks were placed on the outer face of the wall so that it appears impressive, monumental and difficult to conquer. As a rule, it is local limestone from a nearby quarry, [5].

The fortification walls had no foundations, but the blocks were placed directly on solid rock (Iakovidis 1999: 2000). In order to make the walls more stable, they were broken into zigzag units, but again so as to follow the natural configuration of the terrain. This technique was not used in Mycenae, but it is clearly visible in the citadels of Tiryns and Gla. Where the citadel lay on the edge of a steep cliff, the fortification wall was discontinued because it was unnecessary due to such natural defenses, [5].

The symbolism of the massive fortifications described above should also be noted. Although their function was primarily defensive, due to their size and superior construction technique, they symbolize the power of the city and its ruler (Hope Simpson & Hagel 2006). Only the richest and most powerful cities could afford such a demanding and permanent construction project and the immense material, human and animal power required for its execution. Visitors were supposed to be impressed by the first sight of such a fortified city, and the enemy to have an impression that the city was simply unconquerable, [5].

2.2 Mycenae, Tiryns and other citadels of the Mycenaean civilization

The length of the walls of the citadels (as much as 3 km in the case of the Gla citadel) and their height (up to 8 m), required a huge quantity of material, and certainly of effort made. The walls of Mycenae were built by approximately one whole generation. As the citadels were located on high hills, it was necessary to deliver stone blocks from the quarry, which required a gently sloping embankment to be constructed where carts could be drawn, [5].



Figures 2-3. Fragment of the Mycenaean rampart with visible outer and inner faces, and infilling (left); Remains of the Lion Gate in Mycenae (right) [3]

Tiryns, a Mycenaean archaeological site famous for the tunnels and walls of the *Cyclopean* building style, celebrated by Homer in the Iliad, is situated not far from Mycenae. After seeing the walls of the ruined citadel in the 2nd century AD, the Greek geographer Pausanias wrote that two mules could not move even the smallest of the Tiryns stones. Tiryns is associated with the myths of Heracles, citing it as his hometown. Tiryns flourished in the period from the 14th to the 12th century BC, when the *Cyclopean* walls were built to protect the central part of Tiryns. The walls that extend around the entire top of the hill reach up to 7 m in height, slightly lower than the estimated original height (9 m). They are mostly about 6 m wide, while in places, primarily where they open into tunnels built of massive stones, they reach a width of as much as 17 m, [3].

Figures 4-6. Remains of the Cyclopean walls of ancient Tiryns (left);
Nuraghe, a form of ancient megalithic construction in Sardinia (right) [3]

2.3 Sardinian nuraghes

The main form of ancient megalithic construction in Sardinia are *nuraghes*, which have become a symbol of this characteristic culture. Mostly located in the area inhabited by ancient prehistoric cultures, around floodplains, *nuraghes* have the shape of a truncated cone. Their walls are slightly inclined inward, and the size of the stones, often weighing several tons, decreases towards the top. Although they are up to 20 m high and built without the use of binding material, *nuraghes* are very stable. In the interior, regularly there were stairs that led to higher floors or terraces. The purpose of these unusual buildings placed by experts in the 2nd millennium BC can only be speculated: whether they were used as temples, military strongholds, rulers' residences, etc. Recent research has shown that the doors of *nuraghes* are always on the southeast side, and the connection of the openings on these buildings with astronomical events has been established. In addition, the fact that *nuraghes* are often found next to temples, especially those dedicated to water, may indicate their religious function. Detailed archeological research was carried out on only a few of the approximately 7,000 *nuraghes* found, [3].

Similar construction techniques are visible in BiH and on the Croatian coast, for which the use of the name *Cyclopean* in the context of megalithic buildings outside of Bronze Age Greece is questionable.

2.4 Daorson near Stolac (BiH)

The elongated karst plateau above Ošanići near Stolac is bounded on three sides by high, inaccessible cliffs, and the megalithic defensive wall of the old Hellenistic city of Daorson (Greek *ΔΑΟΡΣΩΝ*), Daorsoi, or Gradina Ošanića, as it is popularly called, a national monument of Bosnia and Herzegovina, rises on the fourth side. The name of *Herzegovinian Mycenae* is rightfully associated with it. Dated in the 4th century BC, the wall was originally 60 (65?) m long, up to 4.2 m wide, and between 4.5 and 7.5 m high. At the top of the wall was a walking line with a parapet for archers, 1.5-1.8 m thick and 1.5 m high. Huge multi-ton stacked stone blocks (megaliths) are roughly cut parallelepipeds with anathyroses or edge bands, with finely dressed contact sides. The inner side is untreated. Facade blocks are coarsely treated, with a standard length of 1 m (some blocks are 2 m, even up to 3 m long), with height 0.5-1 m, width 0.7-0.9 (1.2?) m. Roughly cut, horizontally stacked blocks, are in the interior of the wall, [8].

Figure 7-8. Two views of the megalithic walls of the city of Daorson from the southeast side of the Banja plateau, from southwest to northeast. The structure is based on a mass of roughly hewn huge parallelepiped stone blocks and the precise dressing of contact surfaces, which are in some places dressed in a column-like manner, which allows better interconnection and resistance to earthquakes (photo: K. Šaravanja) [8]

More details about Daorson - *Herzegovinian Mycenae* can be seen in the article published in e-Zbornik at the Faculty of Civil Engineering, Architecture and Geodesy, University of Mostar, [9].

2.5 *Triliths* (*trilithons*) in Baalbek (Lebanon)

North of Beirut lie the remains of the ancient Phoenician city of Baalbek, which means "Lord Baal of the Bekaa Valley", the Greek city called Heliopolis ("Sun City"), which was a Roman colony since the time of Emperor Augustus. As early as 9,000 BC (perhaps even much earlier), it was an important pilgrimage site for the worship of the Phoenician sky god Baal and his wife Astarte, Queen of Heaven, to whom a large temple in the heart of the city was dedicated. Today, the temple consists of a platform of over 450,000 m^2, which became the foundation of the later Roman temple complex of three temples dedicated to Jupiter, Bacchus and Venus. The oldest part of the ruins in Baalbek absolutely fits the unknown culture, [10].

Nine rows of stone blocks, individually weighing in excess of 300 tons, were built into the southeast wall. Three dressed giant megalithic blocks called the *triliths* (*trilithons*) *(Wonder of the Three Stones)*, probably the largest stone blocks made and erected by man, are built into the southwest wall. Although each of them has a weight of about 800 t, and a length of over 19 m each (19.1- 19.6 m), 4.2/4.34 m height, 3.6/3.65 m width [10], they are aligned in a row of six granite blocks each 10 m long and weighing over 300 t. It is interesting that traces of machine cutting of the surfaces are visible on the blocks!? Some researchers argue that these megaliths are not foundation stones as they have always been considered, because it seems that it was necessary for the largest stone to be on the top, not the bottom, making the entire building an inverted structure.

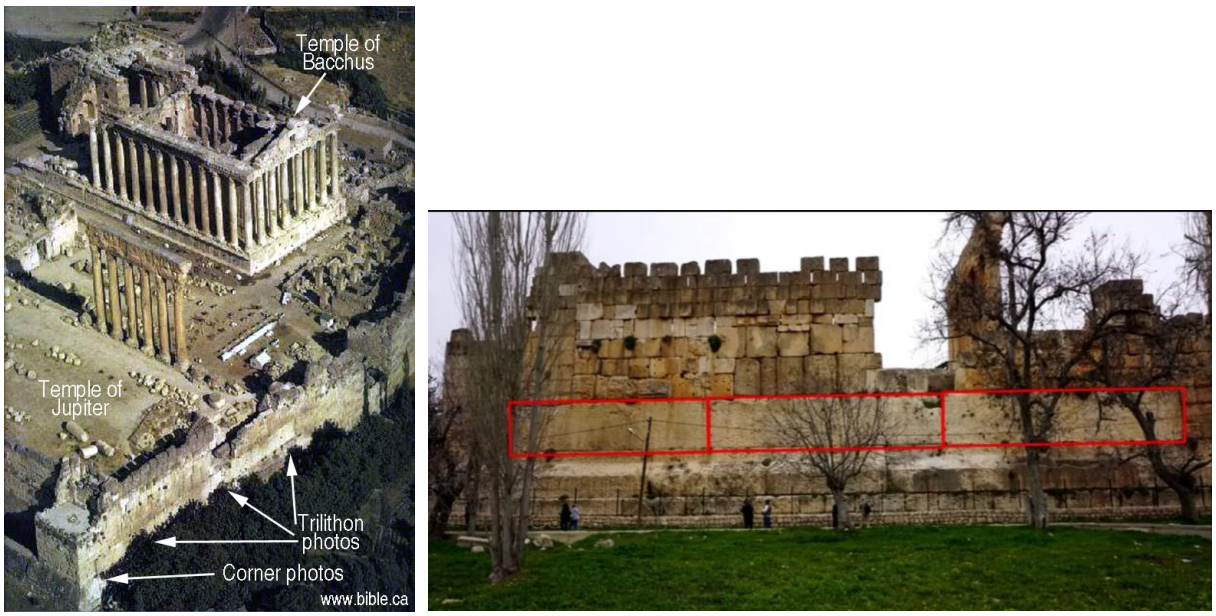


Figure 9-10. Remains of the Temple of Jupiter, in the terrace of which massive triliths are embedded [11], [12]

Although the construction of the temple complex, as well as the huge megalithic terrace on which it is located, is attributed to the Romans (around 27 BC), the extraction and pulling of blocks from the quarry 1 km away, erecting them to a height of ten meters (8 m?) and perfectly precise laying in an exactly designated place exceeded their technological level, so the archaeologists' explanations about the use of the labor of a large number of slaves to move

the blocks are not convincing. In addition, the Roman chronicles do not mention the Romans as the builders of the Baalbek terrace, and the proof of the different time periods of construction of the temples and the foundation are the traces of erosion caused by wind and sand on the foundation, which are not found on (later) Roman temples. In the local tradition, the construction is attributed to beings of superhuman strength.

In recent times, the prevailing opinion is that this happened in the period between 2900 and 2300 BC. However, many researchers do not agree with this idea either and leave the possibility to the theory that these are actually the remains of some other ancient civilizations from an even more ancient civilization epoch. Journalist, author and researcher Graham Hancock "... believes that these huge megaliths are from a much earlier period than the construction of the Temple of Jupiter and possibly 12,000 years old or even more - so from the period when the megaliths at the Turkish site of Göbekli Tepe were built." According to his estimation, it is the work of individuals who survived a lost civilization, and the Romans built their Temple of Jupiter on an already existing, 12,000-year-old megalithic foundation.

Even larger abandoned limestone monoliths were found in a nearby quarry: the block '*Hajjar al-Hibla*' *('Stone of the Pregnant Woman')*, 19.5-20.5 m long, 4.4-4.56 m wide and 4.5 m high, weighing 1,000 t, [14] (1,200 t?), is one of the largest stones in the world, still attached to the rock on one side. As calculated, it would take 40,000 people to move it!? [13]. Archaeologists agree that this huge monolith was left in the quarry because the quality of the edge of the stone proved too poor for transport. Next to it and partially below it, in 2014 archaeologists found an even larger, partially buried block *'Hajar el Gouble' ('Southern Stone')*, 19.6 m long, 6 m wide and at least 5.5 m high, weighing about 1,650 t, [14], which is probably the largest known stone block from antiquity. Archaeologists also concluded that due to the configuration and level of smoothness of the block, it was certainly prepared for transport without cutting, i.e. the builders did not throw it along the road at all and it was not lost during transport - it remained lying in the quarry, and was not even completely separated from the stone base. The slope of the block is given by the general slope of the surface that the rock mass had in this place. The ancient Romans were probably unaware of these giant dressed megaliths since they were covered with sediment in their time, because the last block was covered until 9 years ago.

Figure 11-12. The abandoned monolithic block Hajjar al-Hibla ("The Stone of the Pregnant Woman"), with estimated weight between 1,000 t and 1,200 t (left), and an even larger unextracted monolithic block with estimated weight around 1,650 t (right) [14]

3. MEGALITHIC BUILDINGS OF MORE DEVELOPED ARCHITECTURE - MEGALITHIC BUILDINGS OF SOUTH AMERICA

3.1 Megalithic buildings of Peru

In South America, there are numerous megalithic structures built from pre-prepared and polished stones of regular shapes, which are a vivid example of drystone walls. The blocks are cut to fit tightly and perfectly together without the use of binders. Due to their flexibility and the double interlocking wall technique, the structures have survived in areas where earthquakes are a frequent phenomenon, [15]. It is obvious that their builders knew a special technique of perfect stone dressing and transport.

A saying goes that the Maya dreamed and the Aztecs worshiped deities, while the Incas were undoubtedly the master builders of the New World, building houses, palaces, cities, roads, bridges, irrigation systems and agricultural terraces. They were fascinated by nature, it was their religion, all their sacred things, each of their cities has a Temple of the Sun and some others dedicated to animals, it goes so far that they even built entire cities in the shapes of animals, such as Cusco, which was built in the form of a puma or Machu Picchu in the form of a condor, [17]. The distinctive quality of their buildings was massive simplicity within wonderful proportions. Their only external decoration was an occasional gold or silver plate, or a wall decoration made of feather mosaic. Architects designed buildings in which the walls were often slanted inward, away from the plumb line. The flat surfaces were broken up by small trapezoidal openings and niches that narrowed towards the top. The careful fitting of the giant rocks gave a contrasting light and shadow effect, which was achieved with hair-like thin joints and a special structure of the stone. The result was not only decorative, but also practical. The intermediate connections, precisely jointed pieces without mortar, could withstand extreme pressure and stress. Their buildings have withstood numerous earthquakes, [16].

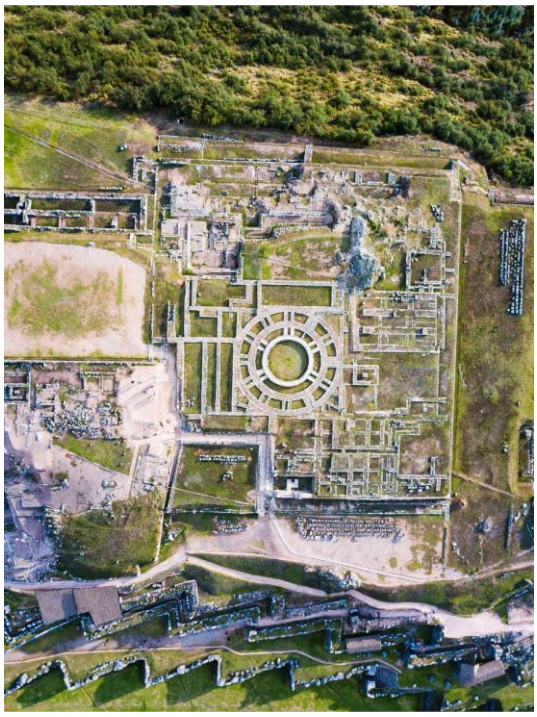
In Qusqu (in the Quechua language: "navel of the world"), today in Spanish, Cusco, the old capital of the Inca Empire, there are the remains of megalithic walls, built of huge stone blocks, finely fitted to each other. It is located in a mountain at an altitude of 3,400 m. In its heyday, the city had more than 50,000 inhabitants. It was an awe-inspiring city, and most of it was built by Emperor Pachacuti Inca. *The Temple of the Sun* was in the center of the city. Many remains of the Incas have been preserved in the present-day city. The upper city (*Hanan Cuzco*) occupies the northwestern area, and the lower city (*Hurin Cuzco*) occupies the southeastern area. A paved street divided the city into four areas, symbolizing the four imperial provinces. In the center was the ceremonial plaza Huacapata, [16]. Cusco was built in the shape of a puma, a sacred animal of the Incas, so that the puma's belly was the city's main square, the nearby river formed its spine, and the puma's head was Sacsayhuamán, located on a steep hill above Cusco. One of the towers (of which only the foundations have been preserved) is considered the puma's eye. On the rocks, one can find various figures, entrances to underground tunnels, an amphitheater, various structures of a ritual character that were probably associated with the water cult. This place played a very important role in Inca rituals. However, most believe that the primary role of the fort was the *Temple of the Sun*, a religious building with several imperial palaces around it. It is estimated that the construction lasted about 50-70 years, and, according to estimates, between 20 and 25 thousand people participated in the construction, [18], [19], [20].

We can learn about how the walls of Sacsayhuamán were built from the records of the Inca Garcilaso de la Vega, the son of a Spanish captain and an Inca princess, who lived the first 20 years of his life (1539-1559) in Cusco with his mother, after which he went to Spain. The record is based on the stories told to him in his childhood by his Inca relatives. He wrote: *"This fortification surpasses the structures known as the Seven Wonders of the World. For example, in the case of the Babylonian Wall, the Colossus of Rhodes or the Egyptian pyramids,*

one can clearly see how they were built... how the builders, uniting strong bodies of workers and collecting building materials, day after day, year after year, overcame all difficulties using human power over a longer period. But it is really difficult for a person to understand how these Indians, without devices and tools, could cut, file, raise and lower such large rocks, more like parts of a hill than building stones, and place them exactly in their places." If some of the builders still lived when de la Vega was young, it is unusual that no one told him the story of the construction, which could mean that Sacsayhuamán is older than we think? [19].

So, the drystone wall complex, built of huge and carefully dressed stones that fit perfectly, was probably built by a civilization older than the Incas, who adapted and additionally developed it. Although its actual function is unknown, due to its location, as well as three giant terraced walls, about 600 m long, it is often called a *fortress*. Rocks up to 6 m high, up to 9 m deep, weighing up to 200 t are embedded in the walls. How is it possible that they could so precisely dress a rock weighing 200 t, which they pulled from a distance of 20 km and besides, they didn't even know the wheel?! [20].

The lower (first) wall, 10 m high, consists of andesite and diorite blocks weighing 100-200 t, for individual stones. The largest of them has dimensions 9 m x 5 m x 4 m. The blocks of the second wall, 10 m high, and the third wall, 5 m high, are somewhat smaller.



Figures 13-16. The best preserved area of the complex in Sacsayhuamán is a large square with three massive terraces; The sanctuaries within the city are arranged according to the position of the stars, which, in addition to the astonishing architectural skills, shows a superior knowledge of astronomy (Source: SHUTTERSTOCK) [19]

Seen from the air, the giant walls built on the slope in a zigzag line look like puma's teeth. Other authors believe that these walls, composed of 60 smaller connected walls, imitate a distant mountain range or symbolize Illapa - the god of thunder and lightning, while the three terraces of the walls represent the three levels of the cosmos: the underworld, the earth and the sky, to which the three sacred animals of the Incas correspond: snake, puma and condor. On top of the walls, on the upper terrace of the fortress there used to be three large towers: *Muyucmarca*, *Sallacmarca*, and *Paucarmaca*, of which the ruins remain (about 20%). Two square towers were at the ends, next to the middle one, the largest tower in the shape of a cylinder, 22 m in diameter, four present-day stories high. Its remains consist of three concentric circular walls interconnected by straight walls, reminiscent of a spider's web, [19]. Back in colonial times, the Spanish demolished the walls to build other buildings in Cusco, [18].

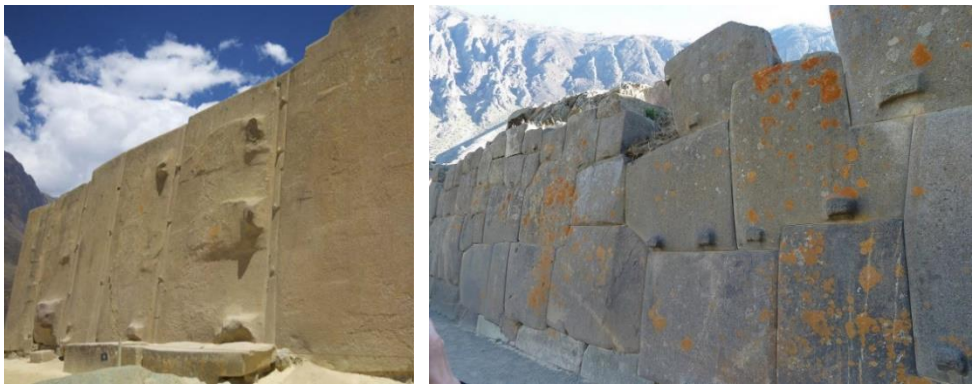
Figures 17-19. The massive Cyclopean walls of Saqsayhuamán fortress above Cusco; [19], [20]; Huge, oddly shaped stone blocks fit perfectly against each other. When looking at these buildings, the general impression is that the people of this part of the world knew a special technique of perfect stone dressing and transport [16]

The smooth and finely rounded edges of the stone, the precision with which the stone blocks, polyhedra of a rather complex shape, are cut, dressed and fitted together, one against the other without any binder, just stacked dry, without any gaps between them, with the variety of interlocking shapes, are fascinating, just like the fact that it is not known how it was built, all of which makes Sacsayhuamán one of the most fascinating sites in South America, [3]. All the more so when considering the fact that the stone blocks were extracted from a quarry 20 km away, with several gorges, steep ascents and descents! [16].

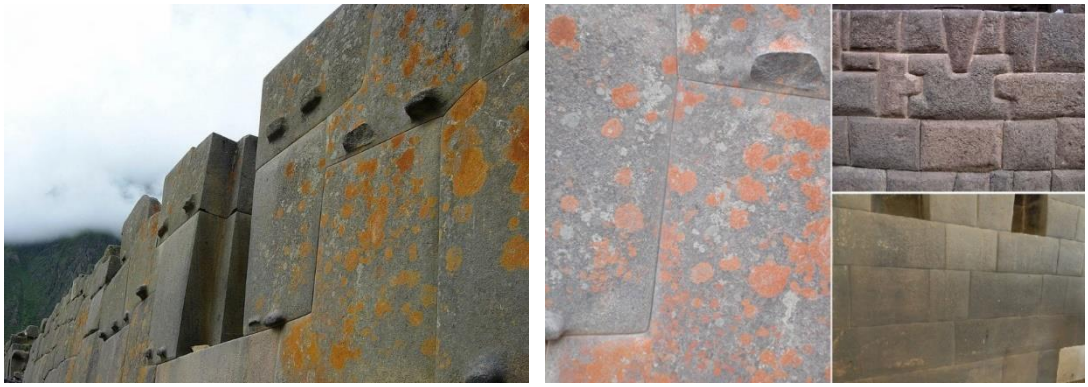
Figure 20-22. Details of the giant terraced walls at Sacsayhuamán; It is believed that this technology, together with the rounded edges of the stones, made it possible to withstand the numerous destructive earthquakes in Cusco [17]

Ollantaytambo is a city founded by Emperor Pachacuti in the 15th century after conquering this area. Pachacuti is most responsible for the great expansion of the Inca empire, which during his reign was the largest and occupied almost all of western South America. Most archaeologists today believe that it was he who built Machu Picchu. The city is still well preserved, [17].

Although the entire archaeological part of Ollantaytambo, a city 60 km northwest of Cusco, is adorned with the remains of impressive architecture, its most monumental part is *the Wall of Six Monoliths* - part of the wall of the unfinished *Temple of the Sun*. The largest stone of the wall is over 4 m high and weighs about 50 tons. The monolithic stone blocks are finely polished and partially decorated with shallow relief, and narrow stone blocks are inserted between them. It just seems incredible that they managed to bring them here, and it's even more incredible how they managed to shape such large rocks to fit so perfectly into each other. The unfinished *Temple of the Sun* and other buildings on the temple hill, as well as numerous giant stone blocks of andesite and pink porphyry, found at the foot of the temple, often reaching weights of 100 tons, indicate that construction was in progress when the site was abandoned. Although the Incas used it as a stronghold in defense against the Spaniards, it is unlikely that they built the entire complex by themselves in the 15th century. But all their buildings are real masterpieces of stonework, and it only remains for us to try to figure out again and again *how*, [17]. As with Saksaywamán, it is much more likely that the Incas only additionally developed the already existing buildings of older civilizations, [3].



Figures 23-24. Ollantaytambo: Wall of Six Monoliths - part of the wall of the unfinished Temple of the Sun, an excellent example of the geometric fineness of walls with stones among the largest in pre-Columbian buildings [3], [21]



Figures 25-27. Ollantaytambo: Details of the Wall of Six Monoliths of the unfinished Temple of the Sun [3], [21]

An example well known to all is the hidden drystone wall city of the Incas Machu Picchu (Quechua language: *Machu Pikchu*, which means "Old Peaks"), built in the 14th (15th?) century, in the Peruvian Andes, since 1983 under the protection of UNESCO. Protected by the mighty Urubamba River on three sides, a peaked hill rises steeply a thousand meters above the river. On the plateau of Old Peaks (*Machu Picchu*), in an area 700 m long and 500 m wide, there is a harmoniously built small town for about a thousand inhabitants, with about 200 stone buildings (fortresses, temples and stone buildings), arranged around a central square. It is divided into 12 quarters on 14 terraces, which are connected by 50 staircases with 3,000 stairs. In the far north, it rises above the city of *Young Peak* (*Huayna Picchu*). It was built at nearly 2,500 m above sea level and surrounded by a defensive wall on the only accessible side, while the other three are surrounded by agricultural terraces located on the tops of inaccessible cliffs, [22].

Figure 28. Panoramic view of Machu Picchu, the hidden drystone wall city of the Incas, from Huayna (Wayna) Picchu (figure above; photo: Martin St-Amant - Wikipedia - CC-BY-SA-3.0) [23]

Figure 29. Detail of the panoramic view of Machu Picchu from Figure 28.
(photo: Martin St-Amant - Wikipedia - CC-BY-SA-3.0) [23]

According to archaeologists, Machu Picchu was built as an imperial property and religious sanctuary and as a secret ceremonial city, or an important place for astronomical observations and a complex cult center. The walls were built of stone blocks of regular shape, which is fascinating because the Incas did not know the wheel or iron tools, so it is unclear what was used to cut the granite with such precision, [21], [24].

Figures 30-31. Temple of the Three Windows (left) and Temple of Viracocha, next to each other on the upper town [22]

Figure 32-33. Detail of massive construction from Machu Picchu [25]

3.2 Tiahuanaco/Tiwanaku/Tiahuanacu/Kalasasaya (Bolivia)

Tiahuanaco is the center of one of the most important civilizations present in South America before the rise of the Inca Empire. It was the administrative and religious seat of the empire that flourished in the period from 300 to 1000.

Figure 34. Temple of Kalasasaya in Tiahuanaco (200 BC-200 AD) [3]

Monumental architecture is characterized by giant stones of exceptionally skillful dressing, drainage system worked out in detail and carved symbols on stone blocks, monumental gates and giant monoliths. Although there are many amazing buildings on this site, such as the Puma Punku Pyramid or the Sun and Moon Gate, this type of construction is best manifested on the walls of the Kalasasaya Temple and the Akapana Pyramid. The Kalasasaya Temple is believed to date from the period 200 BC - 200 AD. Also interesting are the results of petrographic analyses of stone blocks, which show that individual stones, often weighing more than 100 tons, were delivered from quarries up to 10 km away. Even more surprising is the

fact that the green andesite used to make the rich reliefs comes from the Copacabana peninsula, which would mean that this ancient people of pre-Columbian America had to transport stones weighing over 40 tons 90 km across Lake Titicaca, [3].

4. CONCLUSIONS

Megalithic architecture is related to a series of prehistoric stone monuments of giant dimensions, which were constructed using almost untreated stones, individually or grouped into structures, but also to numerous buildings of recent cultures and civilizations, the so-called. "more developed architecture", which were built entirely or partly from large stone blocks, most often of regular geometric shape in the drystone wall technique, weighing tons, tens of tons, even hundreds of tons, which raises the question of their extraction, dressing, transport and installation. At issue is not only the size and massiveness of the stone blocks of these buildings, but even more the method of their construction, which we assume exceeds the technical capabilities of these ancient civilizations.

In addition to all that has been said, we should definitely mention the symbolism of massive fortifications and other buildings, which had not only a defensive function, but symbolized the power of individual peoples, cities, and their rulers due to their size and superior construction techniques. Only the richest and most powerful cities could afford such a demanding and permanent construction project and the immense material, human and animal power required for its execution. Visitors were supposed to be impressed by the first sight of such a fortified city, and the enemy to have an impression that the city was simply unconquerable. Walls and other megalithic structures were often built by an entire generation of the population, or even more.

Megalithic "more developed" architecture applies not only to megalithic buildings of the so-called *Mediterranean circle*, but also to those around the world (other parts of Africa, India, China, Cambodia, Indonesia, Oceania, Central and South America,...), above all, to Egyptian, Central American and other pyramids, tombs and temples around the world , the megalithic structures (the so-called Cyclopean buildings) of the Mycenaean civilization, as well as similar buildings, especially those in South America. In this matter, megalithic buildings are often called Cyclopean because the ancient Greeks believed that only the mythical Cyclops could build with such large stone blocks. Every Cyclopean building is logically megalithic, but not every megalithic building is Cyclopean, since the term Cyclopean refers to the Mycenaean civilization and its buildings, primarily fortification walls, but also other buildings mentioned in the text. Therefore, according to some researchers, it is wrong to apply the term Cyclopean to buildings and archaeological contexts that have nothing to do with Bronze Age Mycenaean Greece, so it is better to use the (general) term megalithic. This principle can also be applied in the case of the megalithic defensive wall of the old Hellenistic city of Daorson near Stolac (BiH), where the use of the name Cyclopean is questionable.

In addition to the Cyclopean buildings of the Mycenaean civilization, the paper presents the famous archaeological site in Baalbek, Lebanon, where three carved giant megalithic blocks called *triliths* (*trilithons*), weighing about 800 tons, probably the largest stone blocks made and erected by man, are built into the southwest wall (at a height of 7-8 m), while stone blocks of even greater mass (even up to 1,650 t) were found in the immediate vicinity!

The walls of megalithic buildings in South America (Peru, Bolivia,...), or the remains of former impressive architecture, represent a wonderful example of drystone wall complexes built from pre-prepared huge and carefully dressed stone blocks of regular shapes that fit tightly and perfectly together. Due to their flexibility and the double interlocking wall technique, the buildings have survived in areas where earthquakes frequently occur. Unfortunately, part of the stone was used by the Spaniards and the local population for construction of other buildings. It seems incredible that the builders of that time were able to transport huge stone blocks weighing tens of tons, even hundreds of tons over a distance of tens of kilometers or

stones weighing more than 40 tons even 90 km across Lake Titicaca. It is even more incredible how they managed to shape these large rocks and adjust them finely to each other so that they fit into each other so perfectly. All these buildings are real masterpieces of stonework, so the big question is whether they were built by the Incas or by a civilization older than the Incas, who adapted and additionally developed them.

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