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Giant stone buildings (I) - Megalithic prehistoric buildings - division, origin and spread

Krešimir Šaravanja
Ministry of Construction and Physical Planning of HNC and Faculty of Civil Engineering, Architecture and Geodesy, University of Mostar, Ph.D, kresimir.saravanja@fgag.sum.ba
Frano Oreč
Association "Sound of Stone" Posušje, B.Sc (Mining), frano.orec@zvukkamena.com
Valerija Kopilaš
Faculty of Civil Engineering, Architecture and Geodesy, University of Mostar, Ph.D, valerija.kopilas@fgag.sum.ba

Abstract: Giant stone structures all over the world, with their millennia-old age, size, durability, construction method that surpasses the technical capabilities of ancient cultures, but also with a mysterious purpose, have aroused the interest of experts and the general public for years. Megalithic architecture, which is part of the eponymous culture, the longest-lasting and most widespread building culture in human history, is characterized by the placement of monumental stone blocks of various shapes - megaliths, single or grouped into different structures/buildings. This overly broad definition includes Neolithic (and later) megalithic monuments (*dolmens, menhirs, cromlechs* and others), but also later structures of the so-called "more advanced architecture", which had architectural features, built from megaliths of regular geometric shape, weighing tens and hundreds of tons. These structures are often popularly called "cyclopean", which some authors contest by using that name only for the so-called "Mycenaean civilizations/ cultures". Therefore, the authors decided to use the universal name "giant stone buildings" and divide this broad topic into separate papers, trying to encourage readers to further study the extensive available literature in search of answers to the many doubts that we all still have...
Key words: megalith, megalithic, architecture/building, monument, monolith, *dolmen*, *menhir*, *cromlech*, megalithic seafaring

Divovske kamene građevine (I) - Megalitske pretpovijesne građevine - podjela, vrijeme i mjesto nastanka

Sažetak: Divovske kamene građevine širom svijeta, svojom višetisućljetnom starošću, veličinom, trajnošću, načinom gradnje koji nadmašuje tehničke mogućnosti tadašnjih kultura, ali i zagonetnom namjenom, godinama pobuđuju zanimanje stručne i šire javnosti. Megalitska arhitektura, koja predstavlja dio istoimene kulture, najdugotrajnije i najraširenije graditeljske kulture u ljudskoj povijesti, obilježena je postavljanjem monumentalnih kamenih blokova raznih oblika - megalita, pojedinačnih ili grupiranih u različite strukture/građevine. Ovakva preširoka definicija uključuje neolitičke (i kasnije) megalitske spomenike (*dolmeni, menhiri, kromleki* i drugi), ali i kasnije građevine tzv. „razvijenije arhitekture“, koje su imale arhitektonska obilježja, izgrađene od megalita pravilnog geometrijskog oblika, mase desetke i stotine tona. Često se nazivaju „kiklopskom“, što neki autori osporavaju koristeći taj naziv samo za građevine tzv. „mikenske civilizacije/kulture“. Stoga su autori odlučili koristiti univerzalni naziv „divovske kamene građevine“, te ovu tematiku podijeliti u zasebne radove, pokušavajući potaknuti čitatelje na daljnje proučavanje obimne raspoložive literature u potrazi za odgovorima na brojne dvojbe koje nam svima i dalje ostaju…
Ključne riječi: Megalit, megalitska, megalitička, megalitna, arhitektura/građevina, spomenik, monolit, *dolmen, menhir, kromlek/kromleh/kromles/kromleks,* megalitičko širenje morem

Šaravanja, K., Oreč, F., Kopilaš, V.

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1. INTRODUCTORY NOTES ON MEGALITHS AND MEGALITHIC ARCHITECTURE

According to the French linguist, mathematician and encyclopedist Pierre Athanase Larousse (1867), the name **megalith** (Ancient Greek: *μέγας/megas* = large; and *λίθος/lithos* = stone/rock) means "large stone" that was used in prehistoric construction around the world in different time periods. It is a kind of smallest unit of megalithic construction, but also a concept of buildings made of large stone blocks, slabs or simple blocks of different sizes (large stones). Thus, megaliths can be single or grouped into different formations/structures, or megalithic buildings, constructed by different ancient civilizations, such as the famous English Stonehenge. The so-called trilithons in Lebanese Baalbek and the Egyptian pyramids are also megaliths, but it is not usual to call them that. [1], [2]

Megalithic culture means human activity in prehistory characterized by the placement of megaliths or the construction of buildings made of megaliths without any binder (the so-called "dry stone wall construction"). [1]

Megalithic architecture is used to describe a number of ancient prehistoric stone monuments of giant dimensions (*menhirs*, *dolmens*, *cromlechs* and *allées couvertes* - "covered streets", temples in Malta, labyrinths of small stones, individual stone blocks with petroglyphs, but also *dolmens* of Korean nobility and the tombs of Japanese emperors) in a wide area from Western Europe to North Africa, and from the Middle East to the Far East, for the construction of which almost untreated stones were used, but also numerous buildings of later cultures and civilizations, the so-called "more advanced architecture", predominantly cult and defensive buildings (or part of fortifications) built from the so-called megalithic walls, or surrounded by ramparts and towers, built at least partly from large stone blocks, usually of regular geometric shape, weighing tens, even hundreds of tons, which with such dimensions belong to megaliths. These are different buildings, from those in the so-called "Mediterranean circle" (megalithic structures of the Mycenaean civilization, pyramids in Egypt, tombs, temples, *nuraghe* in Sardinia, and Illyrian hill-forts in Croatia and Albania). These buildings are characteristic of early powers, which were not built in later times, so the question is where to include the giant walls and pyramids built by the Incas, Mayans and Aztecs in Central and South America (Chile, Bolivia, Peru, Colombia), or they only adapted and extended the existing complexes built by an older civilization. The authors are preparing a special paper about these buildings. [2], [3]

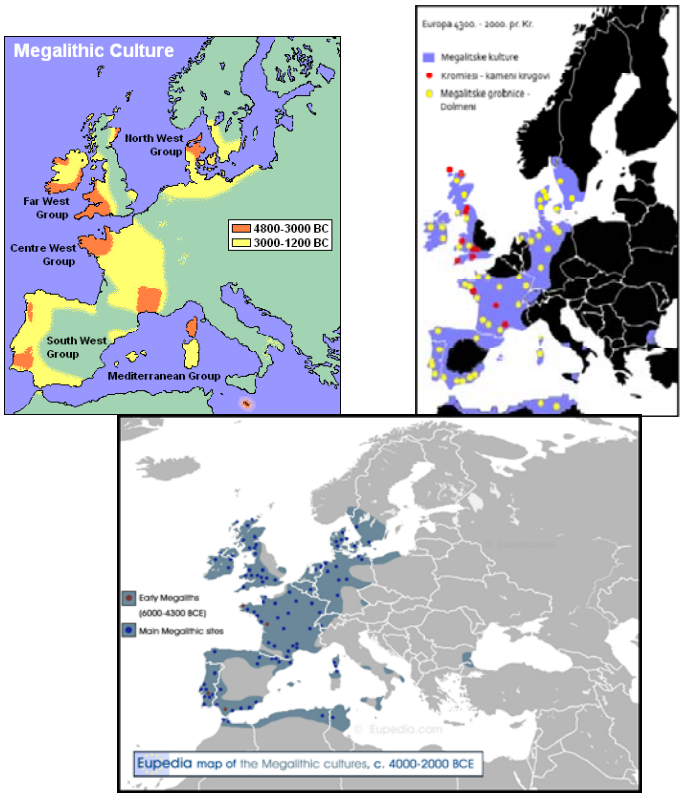
Of hundreds of thousands around the world, megaliths are most often found in Europe (about 35,000), of which about 5,000 in France (according to others, twice as many - about 6,000 *dolmens* and 5,000 *menhirs*), about 3,000 in Denmark, and about 2,000 in the British Isles. These are mostly cemeteries. The list of UNESCO World Heritage Sites includes Stonehenge and Avebury. [2], [4]

Figure 1. Map of the most significant locations of megalithic construction around the world [5]

They are generally more common in the west and northwest, in a belt extending along the Atlantic coast (from Portugal and northern Spain, through northwestern France, southern England, Wales, Scotland and Ireland, to northern Germany, the Netherlands, Belgium, Denmark and southern Sweden) and throughout the Mediterranean (southern and southeastern Spain, southern France, the islands of Corsica, Sardinia, Sicily, Malta and the Balearic Islands, as well as Apulia, northern Italy and Switzerland). More and more megaliths are being found in Central and Eastern Europe (Ukraine, and Russia, where there are 3,000 *dolmens* and other structures, with the largest group of as many as 580, especially in the Caucasus and Siberia), but also in the Mediterranean (Malta, Italy and North Africa) in India, and there are especially many of them in North and South Korea, and parts of China and Japan, even on the islands of the Pacific Ocean. [4], [6]

2. ORIGIN AND SPREAD OF PREHISTORIC MEGALITHIC STRUCTURES

Megalithic architecture is the longest and most widespread construction culture in history, with which the beginnings of real construction are associated. A distinction should be made between the **period of megalithic civilization**, which is dated from the 5th to the 1st millennium BC in the history of Europe, and the **megalithic construction** itself, which goes beyond these time frames, both thousands of years back into the almost unknown past of the Earth, and later, almost until the present time. Most of them were built in the Neolithic (Younger Stone Age), with some older examples from the Mesolithic (Middle Stone Age), and they continued to be built in the Eneolithic (Copper) and Bronze Ages. [1], [3], [7]



Figures 2-4. Map of the development of megalithic culture in Europe and North Africa from 4,800 to 1,200 BC (left), [7] and from 4,300 to 2,000 BC (middle); [6] Map of the development of megalithic culture in Europe and North Africa from 4,000 to 2,000 BC, with the early megaliths, marked with red dots, 6,000-4,300 BC (right); [8]

In the area of Western and Northern Europe, it most likely appeared for the first time in the late Neolithic period, in the so-called "primitive age" of human civilization, related to the tombstones of the "cult of the dead", but also the Eneolithic, and the Early Bronze Age (from 4,500 to 1,500 BC). Most of them were located in Ireland, Great Britain (Stonehenge, Avebury and Castlerigg in England) and France (Carnac). According to ancient tradition, Druid priests conducted religious and magical ceremonies in these buildings. The monistic belief in the Neolithic was replaced by a dualistic one, where the spirit world (*animism*) is parallel to the ordinary world. The cult of the dead initiated the construction of cult buildings or tombs with a shorter or longer approach, which gradually widened into a monumental burial chamber with an approach made of stone slabs, weighing up to 45 t. In Europe, Neolithic people built huge burial or holy places from upright stones (*menhirs*), as a precursor of tombstones. [1], [6]

Other researchers are of the opinion that the megalithic culture in the area of Western Europe matured around 3,800 BC and that it lasted almost three millennia. The oldest megaliths were erected on large meadows and hillsides (3,800-3,000 BC), and were worked with stone tools. A new phase, marked by the fact that metal tools began to be produced, began about 2,600 BC. Most of regular stone circles were erected, many of which have been preserved to this day. Around 900 BC, interest in erecting megalithic buildings was decreasing. So, it emerged suddenly, in the time when man is considered to have set off for the first time from a primitive lifestyle towards more sophisticated civilizations. Megalithic culture spread rapidly around the world, but it is not known what prompted this development. Such expansion is attributed to ancient seafarers, which suggests itself as a logical explanation to this puzzle, but the emergence of many native megalithic cultures in other parts of the world that are very far from each other (India, Oceania, Central America) calls such an explanation into question. [9]

The third researchers locate the origin of the megalithic culture in Europe in central Portugal (around 6,000 BC), and a little later in Britain and Spanish Andalusia (4,800-4,300 BC), claiming that the megaliths did not spread throughout Western Europe until the period of 4,000-2,000 BC. [8]

According to the Swedish archaeologist prof. Schulz Paulsson, there were two competing hypotheses about the origin of megaliths in Europe. According to the first hypothesis, the "nativeness (continuity) theory" advocated by a small number of authors, the transition of human communities from the Mesolithic to the Neolithic is a consequence of independent (native) development, so it insists on continuity. The second hypothesis, the so-called "diffusion theory", insists on the mobility of the population, so the expansion of megaliths was realized through a number of possibilities: gradual demographic expansion, resettlement of entire communities, selective colonization with fast jumps, control of the flow of goods, infiltration of small groups of people, border contacts, trade. According to this conventional view from the late 19th and early 20th centuries, the spread of megaliths to Europe came from sources in the Near East through the Mediterranean and along the Atlantic coast. [10], [11], [12]

As far as can be concluded today, megalithic construction came from the southeastern Mediterranean, from the area of present-day Libya and Palestine, where it emerged in various forms as early as the 5th millennium BC (in the Sahara desert, the age of one megalithic temple is estimated at around 5,000 BC). The oldest European megalithic culture arose on the Iberian Peninsula, and then very quickly spread to the area of present-day France, Italy, England, the Netherlands, Germany, Denmark and Sweden, all the way to the remote Orkney and Shetland Islands, north of Scotland, where megalithic buildings were also erected. This is supported by the results of DNA analysis, which showed that people came to England and Ireland from the Iberian Peninsula, over the coast of the Atlantic Ocean, and the Mediterranean coast. [3], [9], [10], [13]

Megalithic temples and tunnels in Malta are a transition. These free-standing structures, older than the Egyptian pyramids, emerged between 3,600 and 2,500 BC, and seven of them are included in the UNESCO World Heritage List as "the oldest free-standing structures in the world". [1], [10]

During the later 19th and first two-thirds of the 20th centuries, archaeologists such as Montelius (1905), Childe (1925, 1940, 1950, 1958) and Daniel (1960) proposed models of a single origin of megaliths from which they then expanded by a process of diffusion. Montelius advocated for the Near East as a potential region of origin, Childe, building on Montelius, supported the idea of a diffusion of "oriental cultures" by maritime exchange. The expansion was supported by a megalithic religion of migrant priestly elites who settled down long enough among local societies for the new ideas to take root. He proposed a route from the Mediterranean to the Atlantic northwest across the Pyrenean Isthmus and an onward dissemination of the megalithic tradition to Britain and then later over the sea route around Spain and Portugal. Later, Childe expanded his theory about the spreading of a megalithic religion along the coastlines of Western Europe by way of missionaries or prospectors. [10] Daniel conceptualized the expansion through traveling priests from the Mediterranean to the northwest and the Atlantic, across the Pyrenean Isthmus to Great Britain, and later by sea, bypassing Spain and Portugal.

Another alternative hypothesis on an independent emergence of megalithic construction in several regions and sedentary, immobile farming communities emerged after carbon analysis in the 1970s. They had some common characteristics that suggest a relationship, such as an orientation of the graves towards the east or southeast in the direction of the rising Sun. Besides, the French region of Brittany is the only one with evidence of pre-megalithic construction that could have led to megaliths. Renfrew (1977) pointed to the more or less simultaneous appearance of several independently developed cultures throughout Europe, with certain characteristics suggesting a connection (the orientation of graves to the east or southeast in the direction of the rising Sun), and hypothesized five independent nucleus centers in the origin of megaliths: Portugal, Spanish Andalusia, Brittany, southwest England, Denmark (and possibly Ireland). [2], [10], [14]

Schulz Paulsson conducted research for 10 years, analyzed literary data in 11 languages, and conducted age tests of 2,410 megalithic, partially pre-megalithic and contemporary non-megalithic contexts in Europe using the C14 radioactive carbon method (megalithic tombs, standing stones, stone circles, alignments and megalithic buildings or temples), using a statistical method called Bayesian probability when analyzing the obtained results, with the observed trend of older monuments on the coastlines which then spread inland. She also considered recent genetic DNA evidence that people came to Ireland and England from the Iberian Peninsula. [10], [13]

Schulz Paulsson found that the oldest megalithic graves date from the period 4,800-4,000 BC in the northwest France, and in Corsica and Sardinia. The first megalithic graves in Europe were closed small structures or *dolmens* built above ground with stone slabs and covered by a round or long mound of earth or stone. These graves emerge in the second half of the 5th millennium BC within a time interval from 4,794 BC to 3,999 BC (probability of 95.4%), or from 4,770-4,034 BC (probability of 68.2%). The largest site of megalithic stones in Carnac is dated around 4,700 BC, at the time of the civilization of hunters and gatherers. Northwest France is the only megalithic region in Europe which exhibits a premegalithic monumental sequence and transitional structures to the first megaliths (the first monumental complex earthen tombs around 5,000 BC), suggesting northern France as the region of origin for the megalithic phenomenon. Somewhat later, the first monumental graves emerge in Brittany (around 4,500 BC), and especially in Carnac in the form of round *tumuli* covering pit burials, stone cists and dry-wall chambers. [10], [14]

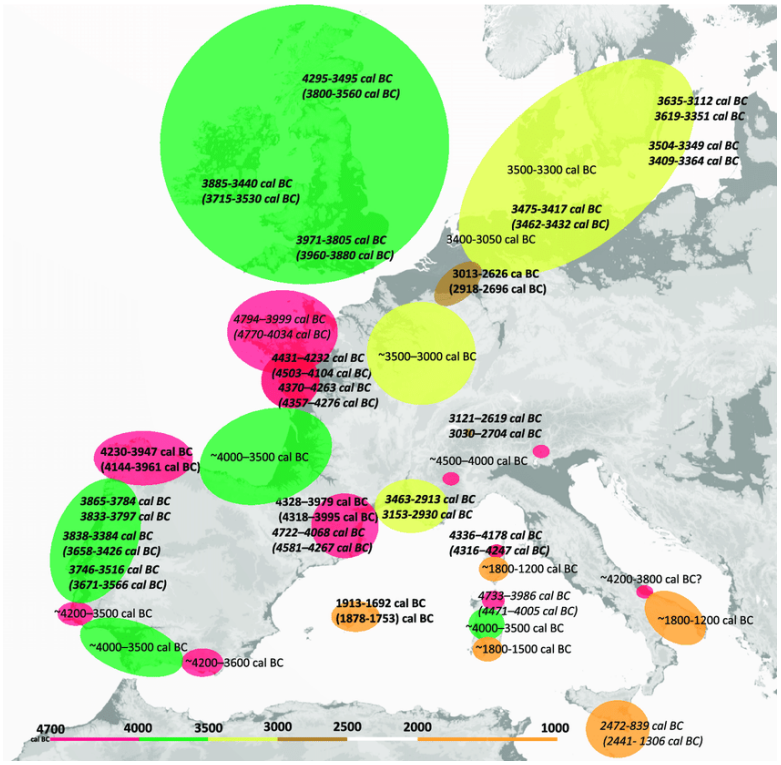


Figure 5. Map of the estimated beginning of megaliths in the part of Europe obtained by C14 analysis, with the expansion routes in three main phases (red-green-yellow), with a period of megalithic stasis (brown) and episode of a megalithic Mediterranean revival in the 2nd millennium BC (orange), as well as the estimated start of megalithic graves in the different European regions, [15]

It was followed by the spread along the Atlantic and Mediterranean coasts (Channel Islands, Catalonia, southwestern France, Corsica and Sardinia) over a period of 200 or 300 years, and then to England, Ireland and Scandinavia. Megalithic graves from Andalusia, Galicia and northern Italy presumably belong to this first stage. [10], [13]

The presented results suggest advanced maritime technology and their maritime mobility by ships along the coasts in the megalithic age, along with intercultural exchange, i.e. the diffusion of megalith construction methods, which in her opinion is the most likely explanation. [10]

According to her colleague prof. Kristiansen, the research for the first time provided both the origin and evidence for a coastal, maritime spread of the megaliths, which suggests that people of the time had boats and skill to travel along the coasts and quickly spread the megalithic method. [13]

An additional interesting detail is that the earliest standing stones in Brittany were some of the largest. The massive *menhir* near Locmariaquer in Morbihan, measuring over 20 m and weighing 350 t, broken into four pieces, is probably the largest *menhir* in the world.

Up to 4,300 BC, monuments appeared along the coasts of southern France, the Mediterranean and the Atlantic side of the Iberian Peninsula, through three waves. One occurred in the 5th millennium BC (or slightly longer), with megaliths emerging in Catalonia, southern France, Corsica, Sardinia and probably the western part of the Iberian Peninsula and the Italian mainland, the remaining regions with an early megalithic proliferation. Megaliths are found occurring in small clusters, as exceptional grave forms for this period in their respective regions. About 4,300. BC *dolmens* began to be built so that they could be

reopened for repeated burials of human remains. The earliest such grave is also located in France. The earliest registered one is in Prisse-la-Charriere in western France, constructed in the period 4,371-4,263 BC. [10], [13], [14]

One wave occurred in the period 4,000-3,500 BC, and involved the construction of thousands of passage graves along the Atlantic coast of the Iberian Peninsula, Ireland, England, Scotland and France. Their distribution emphasizes the maritime linkage of these societies and the diffusion of the passage grave tradition along the seaway, as a radical change of burial rites, along with other economic and social changes in Europe. In the second half of 4th millennium BC, the passage grave tradition finally reaches Scandinavia (the Swedish islands of Oland and Gotland in the Baltic) and the areas of the so-called Funnelbeaker culture (4,300-2,800 BC). [10], [13], [14]

After some time, there was a megalithic revival in Sicily, Apulia and the Balearic Islands, including Majorca and Ibiza in the period 2,000-1,000 BC. [13]

Famous and more elaborate megaliths like Stonehenge came around 2500 BC. [13]

The maritime diffusion presented in Schulz Paulsson's research calls into question the development of megaliths, and also sheds new light on the maritime nature of Brittany's hunters and the people they came into contact with. The megalithic movements must have been powerful to spread with such rapidity at the different phases, and the maritime skills, knowledge and technology of these societies must have been much more developed than hitherto presumed. [14]

Eventually, let's try to move the consideration of the megalithic buildings construction period dramatically back many thousands of years in relation to Europe, to the little known past of the Earth at the beginning of the Neolithic (around 10,000 BC), closer to the hotbed - the prime mover of social flows, called the Fertile Crescent (Libya, Palestine, Israel, Syria, Iraq), which stretched across plateaus (not valleys) from the Levant across Asia Minor to the present-day part of Iraq inhabited by the Kurds, south of the Caspian Lake, where in the late Mesolithic they moved from gathering fruits and hunting to agriculture, as well as the production and use of weapons and tools made of polished stone. At least three centers of Neolithization can be distinguished here: the western slopes and valleys of the Zagros Mountains (Kurdistan), the hilly part of Turkish Mesopotamia (Karim Shahir culture) and the southern Anatolian plateau - the Levant, from the southern slopes of Taurus in the north to the Sinai Peninsula in the south. [11], [12]

Precisely in that "cradle of agriculture", even in the 10th and 9th millennia BC (from 9,600-8,200 BC), we come to the great Mesolithic ceremonial complexes of Göbekli Tepe and Nevali Cori, in present-day eastern Turkey, near the border with present-day Syria, where the Levant meets Anatolia. The archaeological site of the **Göbekli Tepe** sanctuary is not only the oldest temple in the world, where the surrounding population made pilgrimages, but also the **oldest megalith in the world**. Abundant resources encouraged groups of hunters from searching for food to a more settled lifestyle. Finally, some lived in permanent settlements. Its last construction phase is dated 8,000 BC, with an earlier phase ending around 9,000 BC. The circles of T-shaped pillars are decorated with reliefs of animals. They are similar to those on the later monument in Nevali Çori, 30 km from Göbekli, which indicates the continuity of the population from the Mesolithic to the Neolithic. [16]

Some researchers have offered maps of the spread of this Neolithic (pre-pottery) culture of Fertile Crescent towards Europe through a large-scale process of migration that began around 9,000 BC, from the plateau of Anatolia to its coasts and the coasts of Lebanon in the initial phase, and the area of the Aegean Sea (7,000-6,500 BC), and later it spread throughout the coastal area of the Mediterranean Sea and the Atlantic coast. [10], [17]

Figure 6. The area of the so-called Fertile Crescent around 7,500 BC with the main archaeological sites of the pre-pottery Neolithic; black squares indicate pre-agricultural sites, such as the large ceremonial complexes of Göbekli Tepe and Nevali Cori, and the famous megalithic monument of Nabta Playa, west of the Nile River, [18]

From the Fertile Crescent, the expansion went from Anatolia (a bridge between the European and Middle Eastern areas), through Southeastern Europe (Greece, Thessaly, Aegean Macedonia, Thrace, the Danube area). In Europe, migrating people and Neolithic lifeways dispersed along two main routes: an inland route (partly along the Danube River) and a route along Mediterranean coastal areas. Enough secure C14 radiocarbon dates have now been gathered to trace the Western tradition of megalithic monuments. Paleogenomic and archaeological studies show that Neolithic agricultural communities reached Portugal 5,000 BC, Brittany 4,500 BC and from there the British Isles 4,000 BC and Scandinavia. In addition to Portugal, these are the dates that agriculture itself arrived. The concept was traveling with farmers. Portugal therefore comes under scrutiny as the apparent seedbed of the Atlantic brand of megalithic monument. Farming arrived in southern Portugal around 6,000 BC. But the first megaliths are not associated with the best-known Neolithic culture to arrive there - the coastal makers of Impressed Ware. Instead, they first appear inland, in the southern lowlands of Alentejo, that provide some of the best agricultural land in the country. The culture that built them appears to be a simple farming type, with Mediterranean links. [16]

Possible spread of the Neolithic through own cultivation, by transferring knowledge through mutual contacts with communities that are not in the Neolithic, through the demographic expansion of communities towards the Southeast or Europe. [12]

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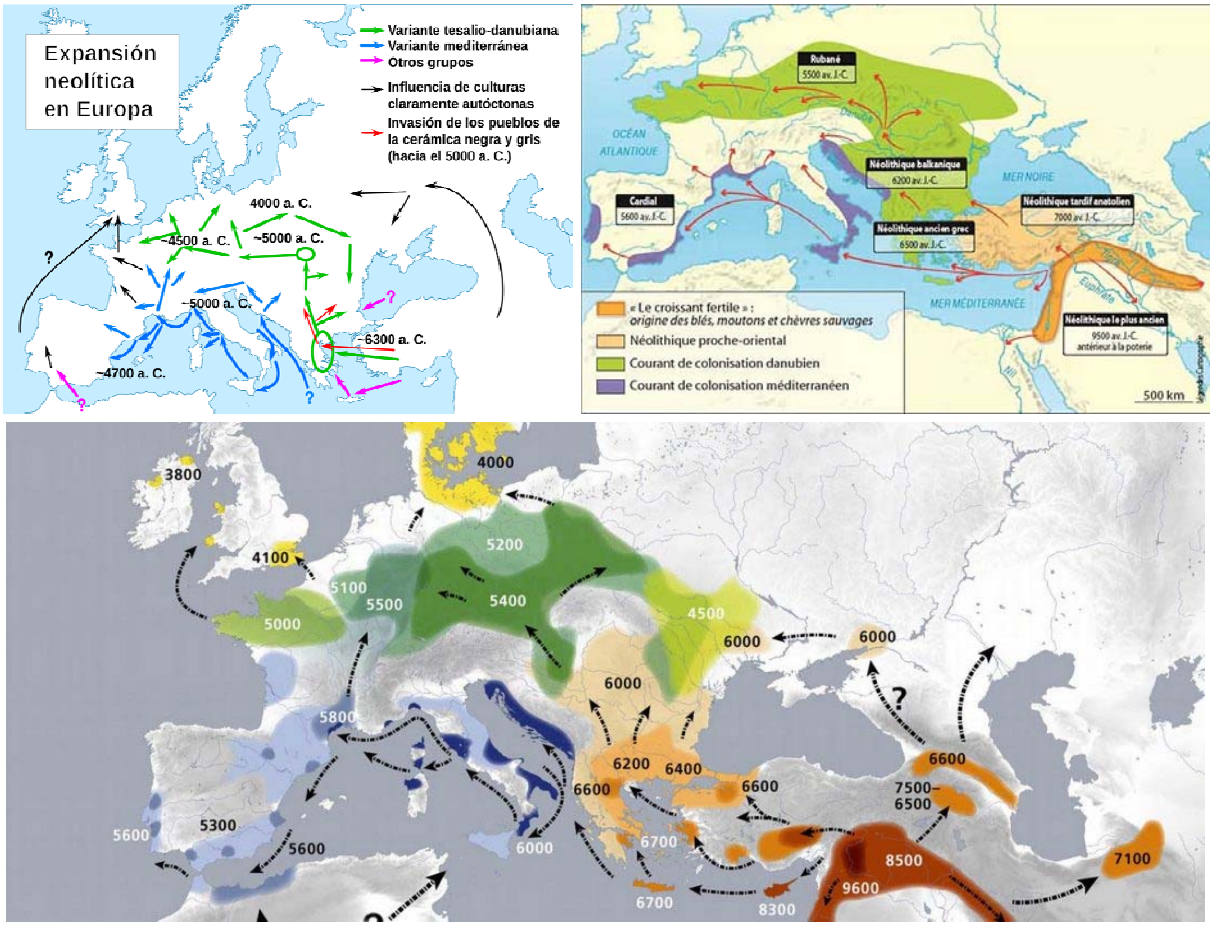

Figures 7-9. Map of possible multi-thousand-year expansion of megalithic culture towards Europe: from the direction of Asia Minor (above, left); [18] pre-pottery cultures of the Fertile Crescent (dark brown), over the Late Anatolian in Turkey, Ancient Greek and Balkan (light brown), and further over the Danube basin to France, Great Britain and Scandinavia (green), and the Mediterranean (blue), (above, right and below), [19], [20]

The emergence of many native megalithic cultures in other parts of the world that are very far from each other (Africa, India, East Indochina, Tibet, Oceania, Central America) continues to be a puzzle and additionally calls the above explanation into question. Richardson and Barth were amazed when they found in the Sahara Desert the same trilithons and raised stones that they had encountered in Asia, the Caucasus, Circassia, Etruria and throughout Northern Europe. [13]

According to A. A. Formozov, who studied *dolmens* in the Caucasus, similar ones were built in Syria, Palestine, North Africa, Spain, France, England, Denmark, the southern regions of Scandinavia, Iran, India, and Southeast Asia. They were built by different tribes and not always in the same period, but the idea of such a construction should undoubtedly have a common origin...

3. DIVISION OF PREHISTORIC MEGALITHIC MONUMENTS

Megalithic monuments are built from one type of megalith - **monoliths** (Greek: "one stone") or a combination of different megaliths - **polyliths** (Greek: "many stones"). Monoliths are: *menhir* (individual upright megalith), stone ship (Germanic custom of arranging *menhirs* in

the outline of a ship), *taula* (structure of two stones in the shape of the letter T), *trilithon* (structure of two upright stones supporting a third one, like a lintel), *orthostat* (individual upright stone that was once part of a larger building) and megalithic sculptures (e.g. Moai on Easter Island). Polyliths are: *dolmen* (a single-cell structure made of megalithic stones), *cistvaen* (burial chamber in the form of a chest made of stone slabs), *tumulus* (burial mounds made of megaliths), *cairn* (conical pile of stones marking a place), *cromlech* (megalithic constructions made of *menhirs* or *trilithon*s arranged in geometric forms), *nuraghi* (megalithic structures in the form of a cylindrical tower) and *marae* (Polynesian square sanctuary in the form of a terrace with a central sacred *menhir*). [1]

Figure 10. Basic groups of megalithic monuments and their combinations: menhir, trilithon, dolmen, cromlech and cromlech with trilithon, [21]

Although there is no generally accepted typological division of megalithic monuments, due to the great differences in their appearance and structure, today it is suggested that there are four basic types of megalithic structures: *menhirs*, *dolmens*, *cromlech*s and *"allees couvertes"* (French: covered streets), of which the first three types are present everywhere and in large numbers. [3], [6]

Menhir (Breton/Celtic: *men hir*: long stone; Welsh: *maen hir*; English: *standing stone* or upright stone), the oldest (precursor) and simplest type of megalithic structures. They were built during the megalithic culture (Neolithic), mainly during the Copper and Bronze Ages. Their meaning is not fully determined yet, although there are numerous assumptions: from various ritual ceremonies, ceremonial altars for offering sacrifices, territorial markers, to complex ideological systems such as early calendars, specific astronomical observatories. [1], [2], [6]

So, *menhirs* are simple large, firmly embedded, vertically placed monoliths, mostly made of natural or roughly hewn stone with traces of processing. They can stand in prominent places in nature in the form of individual vertical massive boulders or stones - megaliths (monoliths) or be part of combined megalithic complexes, in groups, forming rows, sometimes several parallel rows that led to a grave site or shrine (alley of *menhirs* in Carnac consists of three rows in the form of a slightly wavy line, 3.9 km long, with 2,935 *menhirs*, and in the field near Menec 11 rows with 1,100) and avenues, circular or semicircular in shape. Group *menhirs* are mostly regularly oriented, and the latest research has revealed that they mark the path of the Sun, or its rising points at the transitions of the seasons. One of the amazing examples is the complex in Callanish (Scotland), where they are arranged in the form of a large cross, perfectly oriented to the sides of the world. [2], [6], [9]

They have different dimensions, height above the ground from 1.4 (2.0) to even 20 m, most often from 4 to 7 m. Their mass ranges from a few (3 t) to almost incomprehensible 350 t, most often from 15 to 40 t. Their shape is almost always elongated, with an irregular square, cylindrical, conical or spindle-shaped section, which tapers at the blunt tip. They are anthropomorphic, they gradually assumed a geometrical scheme, and only a small number of them are stylized in the form of a woman or a man (in Sardinia, these are female figures with round breasts, and in Corsica, warriors with horned helmets), and there is also a certain

number of human figures of undefined gender, which still differ from each other at least in some detail. Some *menhirs* were shaped into sculptures, and in addition to those in Europe, the most famous are the *moai* from Easter Island. [1], [6], [9]

According to legends, *menhirs* mark "fertile zones, places where earthly and heavenly energies flow, performing the function of earth acupuncture, which makes it possible for earthly energies to emerge and unite with the heavenly energies." Most of *menhirs* in Europe are found in France (especially Brittany), about 6,000 (6,200?) of them, of which a third are single, and two thirds are grouped differently in the two above-mentioned sites in Brittany. Other *menhirs* are in England, Scotland and Ireland, which led to the theory of Celtic builders led by druids, but also in Scandinavia, Germany and Italy (Sicily), and in the Caucasus, Crimea, Siberia, Africa (Morocco and Ethiopia), even in Korea, which undermined the theory of Celtic builders! [4], [6], [9]

Figure 11-12. Alley of menhirs in Carnac, Brittany (left); [22] Dolmens, Guernsey (right)

Dolmen (Breton/Celtic: *taol, tol* "dol": table and *men*: stone, meaning "stone table"), or **hall tomb, *cromlech*** and ***quoit*** (Welsh), the design of which ranges from the simplest three-stone structures in the form of a table (from two upright massive stone blocks of the same height (*menhirs*), covered with a heavy horizontally laid stone slab), to large monumental tombs with an access corridor and several chambers, which are constructed using hundreds of thousands of roughly hewn stone blocks. It is the most numerous, widespread and diverse type of megalithic monument in Europe in the form of the Greek letter *"pi"*, built in the form of a collective burial chamber, or a single-chamber megalithic tomb (shrine or primitive temple). People call them "thrones of the devil", "druid stones" or "tombs of giants". [2], [6], [9], [23]

Most *dolmens* were used for burials, and they also had religious and magical meaning. For them also, the builders chose a prominent and noticeable place in nature. They served as the entrance to the tomb, and as the tomb itself. In the beginning, they reached a length of 2 m, and the height did not exceed 1.5 m. Over time, their size became larger, their approach was arranged in the form of a stone gallery. The length of such galleries could reach 20 m. [2]

They usually consist of several vertically set massive stone blocks-*menhirs* (monoliths), as supports of the same height (2, 3, less often 4, and in Poitou even 6 or 7^2), which are covered by one or more large horizontally laid stone slabs, or capstones (*trilithon*, or slab), of gigantic dimensions, weighing from several to tens of tons. Some were covered with earth or small stones so that they formed *tumuli* (heaps or mounds), and for some, this covering was washed away over time. [2], [6]

Dolmens were built during the Neolithic, Eneolithic, Bronze and Early Iron Ages in the coastal areas of northwestern and western Europe (Portugal, France, Great Britain, Ireland, northern Germany, Denmark and the Iberian Peninsula). [2] They began to be built in France

around 4,300 BC, after which the construction took place in waves: from 4,000 to 3,500 (3,000?) BC, and from 2,000 to 1,000 (500?) BC. *Dolmens* in the form of a table, with minimal stylistic differences, are found in large numbers in Russia, India, and even in Korea, and in the south of Japan.

We distinguish apsidal temples and tombs covered with *tumuli*. Apsidal temples are formed from only a few stone blocks in the shape of a table or by their successive repetition, thus forming long galleries. The most beautiful and largest ones are located in Essé in France and in San Agustin in Colombia, so it is unclear with what kind of connections a practically analogous idea was achieved by builders separated by thousands of kilometers of the ocean.

The second subgroup of *dolmens* consists of the so-called tombs that are real monumental structures, and for the construction of which hundreds of thousands of cubic meters of stone blocks, gravel and earth were needed. Two vertically raised monoliths covered by a third one were used as the basic building structure. By arranging them next to each other, closed corridors were formed, sometimes several of them, which lead to a circular central room, the walls of which are built of stone slabs and is mostly covered with a stone slab of giant dimensions, such as the roof slab of the *dolmen* in Los Millares, measuring 9x5 m, almost 1 m thick. In the end, the entire *dolmen* would be covered with smaller stones and earth, thus creating an artificial mound from the tomb. As many as 80 complexes in Los Millares, 30 temples in Malta, and many sites in England, Ireland, Scotland and France are evidence of the construction activity of amazing scope. In North America, there are mounds similar to those in England, but their study has not yet been undertaken. [6]

Figure 13. Map of dolmen sites around the world, [24]

There are about 9,000 *dolmens* in the world, and they are found in almost all latitudes - in Brittany, Denmark, Ireland, Scotland, Sweden, Germany, Spain, Sardinia and Sicily, in Russia (significant groups on the Black Sea coast of the Caucasus), in Algeria and wider in the north of Africa, in the Middle East, starting from the Turkish border in the north of Syria near Aleppo, south to Yemen, in northern Lebanon, southern Syria, Israel, Jordan (highest concentration), in Saudi Arabia, in India, Korea, in the south of Japan, even in Colombia, Peru and Bolivia. [2] The "Standing Stone" has a very old tradition in the Middle East, dating back to the Mesopotamia times.

Cromlech (cromleh, cromles, cromlex) (Breton/Celtic: "crom"-circle, "lech"-place, i.e. "circular place"; Welsh: *crom*, feminine of *crwn*: curved/bent and *llech*: flat stone/ slab, i.e. "bent stone slab", English: *cromlech* [kro'mlek, kro'mlex]), the most interesting and intriguing

group of megalithic monuments from the Neolithic and mostly Bronze Age. In the Neolithic, they had a ceremonial and religious meaning, a ritual place where honor was paid to the deceased and sacrifices were offered, or were part of larger structures such as stone *tumuli* with burial corridors.

These are architecturally complex large-scale structures in the form of circularly or elliptically arranged formations of ten to a hundred unhewn or roughly hewn massive stone blocks - pillars, up to 6-7 m high (*menhirs*), connected by lintels (*dolmens*) so as to enclose a defined geometric shape. [2], [6], [9]

They can be found throughout the world and were built at different times, but most of them are in Neolithic Europe. More than a thousand stone circles are discovered in Western Europe, mostly near the sea coast (up to 100 km), and their stones vary in size and number. They were often the central part of larger complexes of earthen mounds (English: *henge*). They are particularly numerous in Brittany (Er-Lannic and Kerlescan) and England (Stonehenge and Avebury), and are also found in Denmark (Jelling), Sweden (in the shape of a ship outline, so-called "stone ships"), Portugal (Almendres) and Croatia ("Mali sveti anđeo" near Poreč which was used for astronomical observations), then in northern Egypt, Syria, India and more widely in Asia, and America. According to recent research, there is a significant number of circular *cromlechs* in Gambia, while Nabta Playa in Egypt is called the Saharan Stonehenge. They certainly had a religious and magical meaning. In older literature, they were considered temples of druids or were associated with astronomical observations and the calendar. [2], [3], [4]

Their number ranges from about ten to about six hundred, as many as were erected in Avebury, England, with an average weight of 40 tons, and 250,000 m^3 of stone, gravel and earth were used for the construction of the nearby largest artificial mound in Europe, the famous Silbury Hill. [4], [6]

Cromlechs were the first to shake the established idea of the primitive purpose and origin of megaliths. The very first serious studies revealed the exceptional precision and clearly defined geometric form described by the placed megaliths. What were once considered awkward circular forms are actually large groups of *menhirs* that are arranged in four types of curves: circle, ellipse, ovoid and so-called. "flattened circle", and sometimes the circles consist of several rows of vertically arranged stones. The oldest ones had the shape of a circle, while the younger ones are mostly ellipse or ovoid in shape, with exceptional precision of realization, because on the basis of geodetic surveying it was revealed that (considering the possibility that many stone blocks are no longer in their original places) the maximum deviation from the ideal geometric shape is below 1%. There are also rectangular *cromlechs*, e.g. in French Morbihan or Russian Khakassia. On the island of Malta, *cromlech* temple complexes were built in the shape of "petals". [2], [6], [9]

The English **Stonehenge** is the best known megalithic monument in Europe, and also the most monumental *cromlech*. The outer circle, with a diameter of 88 m, is formed by 30 large vertical blocks, interconnected by horizontal slabs, and on the inside there is another circle of 49 *menhirs* of a smaller height, inside which there are five gigantic *trilithon*s of two vertical stones each and a horizontal one above them. which are formed in the shape of a horseshoe. In the center there is a horizontally placed stone - the altar, and outside the outer circle at a distance of 30 m there is an astronomical stone 5 m high in the place where the rising of the Sun on the summer solstice can be watched from the altar for 4,000 years now. Around the monument there is a circular ditch with a radius of 114 m with 56 pits that play the role of a stone clock, which can be used to predict eclipses of the moon during the winter solstice in a span of 300 years, and this is repeated every 19 years. In the vicinity there are two stones diametrical with respect to the center of the monument and two hills in diametrical positions, which together form what is called the four seasons. [4]

Figures 14-15. Appearance (left), [22] and artistic reconstruction (right), [4] of Stonehenge, erected at the end of the period of construction of megalithic monuments

"Allées couvertes" (French: "covered alley/street"), consist of parallel long rows of stone blocks covered with horizontal massive stone slabs, usually ending in a polygonal or circular burial chamber. *Menhirs* arranged in long rows form alleys of *menhirs* (Carnac). [8]

4. CONCLUSIONS

The paper presents giant stone structures that include Neolithic (and later) megalithic monuments (*dolmens*, *menhirs*, *cromlechs* and others) in the prehistoric, so-called "primitive age" of humanity, in the coastal areas of Europe (and beyond), built mainly from unworked stone, which is in accordance with the work tools that the people of that time had at their disposal. Simply put, a *menhir* is a tombstone or pillar-like monument, a *dolmen* is a crypt, tomb or sarcophagus, and a *cromlech* in Stonehenge is already a kind of temple, although a very primitive one. Stonehenge is a well-known megalithic structure, which already has such architectural elements as a center, rhythm, symmetry, unlike other megaliths. Despite this, the *cromlech* at Stonehenge also cannot be called an architectural structure because it is unnecessarily massive in relation to the horizontals and its verticals are too heavy. The art form arose only in the final phase of the Bronze Age, when crafts and the art industry actively emerged. The mystery spills over from the roughly hewn giant stones to numerous other more sophisticated megalithic structures that were built by the first known civilizations of the Middle East, Africa and South America, whose builders, for unknown reasons and with unknown tools, used stone blocks weighing tens and hundreds of tons for the construction. The development of tools and craftsmanship is evident on the structures of the so-called "more advanced architecture", built from megaliths with a regular geometric shape, which the authors plan to treat in another paper within this main topic. [2], [9]

It is interesting that the preserved parts of the megalithic structures were used by later civilizations as a foundation for their own structures, which is best seen in the Lebanese Baalbek, where the Roman temple of Jupiter was built on a "stone base" in which about five million cubic meters of stone were built, including three huge stone blocks (the famous "*trilithon*s"), ones of the largest ever, as well as numerous blocks slightly smaller than them...

As the remains of objects from different periods were often found, it was very difficult to determine the identity of the builders and the time of construction. A major breakthrough in this sense is the most recent ten-year research by archaeologist Dr. Schulz Paulsson on 2,410 megaliths in Europe using the C14 radioactive carbon method, which partially resolved the decades-long debate about the age of megalithic monuments in northwestern Europe (and beyond). According to her, the first such graves appeared in France about 6,500 years ago, and then spread along the Atlantic and Mediterranean coasts during the next 200 or 300 years, and then to England, Ireland and Scandinavia.

Šaravanja, K., Oreč, F., Kopilaš, V.

Giant stone buildings (I) – Megalithic prehistoric buildings – division, origin and spread

The paper shows that the likely origin of megalithic culture, or human civilization, is in the area of present-day Turkey (9,600-8,200 BC), within the Neolithic (pre-pottery) culture of the so-called Fertile Crescent, and also shows how it was transferred in the next several thousand years along the coastal area of the Mediterranean Sea and the Atlantic coast to northwestern Europe and Scandinavia. However, the question that remains unresolved is not only what prompted its emergence and development, but also what the course of its expansion was, which coincided with other social and economic changes in Neolithic and Copper Age societies. The older generation of archaeologists was probably correct concerning a maritime diffusion of the megalithic concept, and wrong regarding the region of origin and direction of the megalithic diffusion, the movements of which must have been powerful to spread with such rapidity at the different phases, and the maritime skills, knowledge and technology of these societies must have been much more developed than could reasonably be presumed.

Much is still unclear about the giant stone structures, built by a "man with a stone axe", who was able to organize megalithic construction of amazingly similar shape around the world, or was it built by some advanced civilization? Many questions are increasingly important: Who, when and where started their construction? How did they spread throughout the world? Did they appear independently of each other or are they the result of communication between different peoples? How were these giant stone blocks, weighing tens of tons (or even hundreds of tons), made and transported to very remote locations, and precisely arranged in an era when human civilization was at its lowest level of development, that is, what knowledge did those who placed them have? And finally, what is the purpose of megalithic monuments and what motivated their builders? The striking similarity between the ancient colossal structures in Peru (e.g. in Cuenlap) and the architecture of ancient European peoples, as well as the similarity between the ruins of the Inca civilization and the cyclopean remains of the Pelasgians in Italy and Greece, may not be a mere coincidence, but there may be a certain connection between them... This topic will be discussed in the third paper of the planned trilogy on this big topic... [2], [6], [9]

Although megalithic societies and their giant dry-wall stone structures from the title of this paper, made all over the world from stones, blocks and slabs (monoliths and polyliths), weighing up to several tens, even hundreds of tons, have been discussed by researchers for more than a hundred years, again in recent years they have become the subject of research aimed at revealing man's past, specifically the most famous sites with *cromlechs*, such as Stonehenge and Avebury in England, Nabta Playa in Egypt, *dolmens* from Newgrange in Ireland, Los Millares in southwest Spain and many others. They came to the conclusion that the ancient builders were not only experts in geometry. Through various studies and computer reconstructions of the sites, the stones placed randomly at first sight, some of which were placed completely outside the central complex, as well as the pits dug around for an unknown purpose, have became points that trace the complex paths of the Sun and the Moon that are observed by a viewer from Earth. The already extensive archaeoastronomical studies established that these monuments did not only function as a place for holding rituals and ceremonies, but also as solar and lunar calendars and as a kind of Stone Age observatories. [6]

All this can greatly affect not only archaeological science and force scientists to seriously, even radically, question the established knowledge about human civilization and its development, especially the horizons of megalithic culture, maritime mobility and the rise of seafaring, the organization of Neolithic societies, the nature of these interactions through time, and spatial and temporal connection of megalithic sites throughout the world, thousands, even tens of thousands of kilometers apart.

REFERENCES

1. https://hr.wikipedia.org/wiki/Megalitska_kultura
2. Poznate megalitske građevine. Megalitske građevine - podignute prije potopa - Zemlja prije potopa: nestali kontinenti i civilizacije; https://peskiadmin.ru/hr/izvestnye-megaliticheskie-sooruzheniya-megaliticheskie.html
3. Majetić, G.: Megaliti - divovski tragovi drevne prošlosti; http://piramidasunca.ba/bs/press/item/1774-megaliti-divovski-tragovi-drevne-pro%C5%A1losti*.html, 2010
4. Barta, A.: Fenomen kamenog doba - najpoznatiji svjetski megaliti, Nova akropola za boljeg čovjeka i bolji svijet, No. 8, pp. 8-13, Zagreb, 2019
5. Mitchell, M. A.: The Knowledge of the Ancient World; Crossing the Ocean Sea Little Known Trivia, Legends & Mysteries about Exploring Atlantic, 2015 https://crossingtheoceansea.com/OceanSeaPages/OS-03-KnowledgeAncientCiv.html
6. Barta, A.: Megaliti - divovski tragovi drevne prošlosti, Nova akropola za boljeg čovjeka i bolji svijet, No. 7, pp. 10-15, Zagreb, 2019
7. https://en.wikipedia.org/wiki/File:Megalithic_Culture.PNG
8. New map of the Megalithic cultures; https://www.eupedia.com/forum/threads/40082-New-map-of-the-Megalithic-cultures
9. Stojković, B.: Tajna megalita, Hrvatska udruga „Štit“ (Za ljudska prava), https://blog.dnevnik.hr/misakvecernji/2008/04/1624695824/tajna-megalita.html?page=blog&id=1624695824&subpage=0&subdomain=misakvecernji
10. Schulz Paulsson, B.: Radiocarbon dates and Bayesian modeling support maritime diffusion model for megaliths in Europe, Proceedings of the National Academy of Science of the United States of America (PNAS), Vol. 116, No. 9, 2019 https://www.pnas.org/doi/full/10.1073/pnas.1813268116
11. https://bs.wikipedia.org/wiki/Neolit
12. Mitrović, M.: Neolitik Bliskog Istoka i jugoistočne Europe (Neolithic of the Middle East and Southeast Europe), course material for students, University of Zadar - Department of Archaeology, Zadar, 2014
13. Gorman, J.: Ancient European Stone Monuments Said to Originate in Northwest France, The New York Times, 2019 https://www.nytimes.com/2019/02/11/science/megaliths-archaeology-tombs.html
14. Otkrivamo: Rodno mjesto drevnih europskih megalita, https://hr.gov-civ-guarda.pt/discovered-birthplace-europes-ancient-megaliths
15. https://www.researchgate.net/figure/Map-showing-the-hypothetical-route-of-the-megalithic-expansion-in-three-main-phases_fig3_331038309
16. https://thewaythetruthandthelife.net/index/2_background/2-5_societal/0-000-043-000-bc-to_2-011-ad_2-5-2_wider-view/0-000-043-000-bc-to_2-011-ad_2-5-2-04-megaliths.htm
17. Sánchez-Quinto, F., Malmström, H., Fraser, M., Girdland, L., Svensson, E. M., Simões, L. G., George, R., Hollfelder, N., Burenhult, G., Noble, G., Britton, K., Talamo, S., Curtis, N., Brzobohata, H., Sumberova, R., Götherström, A., Storå, J, Jakobsson, M.: Megalithic tombs in western and northern Neolithic Europe were linked to a kindred society, Proceedings of the National Academy of Science of the United States of America (PNAS), Vol. 116, No. 19, 2019; https://www.pnas.org/doi/10.1073/pnas.1818037116
18. https://www.wikiwand.com/sh/Neolit
19. https://www.patrimoine-iroise.fr/culturel/archeo/prehistorique/megalithes.php?lang=en Source: F. Giligny (Demoule, J.P.: La Révolution néolithique en France Ed. La Découverte, 2007)
20. Tag: I2a1a2 Demic vs. cultural diffusion and patrilineal Megalithic societies;

https://indo-european.eu/tag/i2a1a2/
21. https://aratta.wordpress.com/2013/11/02/bell-beakers/
22. Hrvatska enciklopedija, mrežno izdanje. Leksikografski zavod Miroslav Krleža, 2021. https://www.enciklopedija.hr/natuknica.aspx?id=39875
23. https://hr.wikipedia.org/wiki/Dolmen
24. AtHope, D.: Kurgans 7,000/6,000 years ago/Dolmens 7,000/6,000 years ago: funeral, ritual, and other?, 2018; https://damienmarieathope.com/2018/07/kurgan-and-dolmens/?v=32aec8db952d