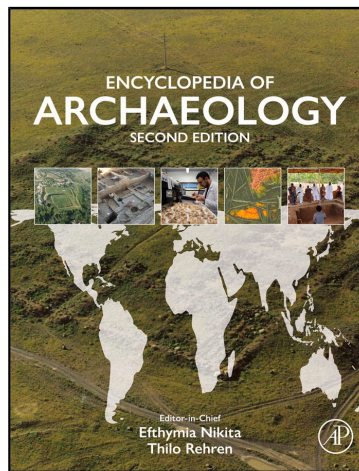


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Mediterranean: Neolithic

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Key Points

- The Neolithization of the Mediterranean was a long, complex, non-centralized process, involving the movement of people and the transmission of ideas
- The establishment of the Neolithic in the Near East took place over 5000 years: from c. 12,000 cal BC, with the first signs of sedentarization of Natufian communities, until c. 6500 cal BC, with the appearance and widespread adoption of ceramics
- The Neolithic dispersal from the Near East toward the Western Mediterranean proceeded in an arrhythmic manner, through pioneer incursions, pauses, and cultural reconfigurations, and is hallmarked by Impressed Ware pottery
- During the development of the Neolithic in the Near East, Mesolithic hunter-gatherers inhabited the European part of the Mediterranean
- The last hunter-gatherers of the Western Mediterranean are associated with the Blade and Trapeze Techno-complex
- During the advanced Neolithic and Chalcolithic, farming communities experienced socio-economic transformations such as the intensification of agriculture, the development of craft specialization, long-distance trade, social complexification, and hierarchization

Abstract

The Neolithization of the Mediterranean was a long, complex, non-centralized, arrhythmic, and regionalized process involving multiple parameters and variables, entailing a non-linear interplay between the movement of people and the transmission of ideas. Once agriculture was established, the development of the Neolithic took on a new dynamic as agrarian economy and village life were consolidated. Finally, the appearance of metallurgy announced the beginning of the Chalcolithic, and Neolithic societies once again experienced socio-economic transformations such as the intensification of agriculture through irrigation, further development of craft specialization and long-distance trade, social complexification and hierarchization.

Introduction

At the eastern fringes of the Mediterranean basin, the area known as Fertile Crescent represents one of eight recognized centers of domestication, i.e. a location where crop plants first developed their distinctive properties. This Near Eastern “center of origin” is considered to be the oldest: archaeological evidence suggests that from c. 9000 cal BC domestication of cereals (einkorn wheat, emmer wheat and barley) and legumes (lentil, pea, bitter vetch and chickpea) took place here.

Subsequent domestication of major animal species such as sheep, goats, and pigs also occurred in this region, beginning with the already established agriculture from c. 8500 cal BC. According to genetic studies, modern sheep, goats and pigs descend from wild progenitors that lived in the Near East (Caliebe et al., 2017).

However, agriculture did not emerge in one single locale in Western Asia; rather, the domestication of different species occurred independently in various regions over the course of several centuries. For instance, barley was domesticated at sites as widespread as Abu Hureyra (Syria), Jericho (Palestine), and Ali Kosh (Iran). Similarly, goats were domesticated independently in central Iran and eastern Turkey as early as 10,000 years ago. In addition, the first farming communities of the southern Levant (Israel and Jordan) and the Zagros Mountains (Iran) do not show strong genetic affinity, with each appearing to descend from different local hunter-gatherer groups (Lazaridis et al., 2016).

The domestication of plants and animals that would lead to the establishment of a Neolithic way of life, based on farming and settled villages, was a long, gradual and non-linear process, which lasted over 5000 years (Guilaine, 2001). It originated from deep social, economic, technical and cultural transformations that affected the sedentary hunter-gatherer groups which occupied the region during the climatic improvement that marks the beginning of Holocene. The Early Neolithic period begins with the sedentarization of Natufian communities dating to c. 12,000 cal BC and ends c. 6500 cal BC, with the appearance and general adoption of ceramics.

This Near Eastern center is responsible for the Neolithization of the entire Mediterranean (Fig. 1), temperate Europe, North Africa (on the east, alongside Nile as far as the Khartoum region of Sudan), Western-Central Asia and north-westernmost Southern Asia (Baluchistan in North-Western Pakistan).

While evidence from areas both west and east of the Fertile Crescent show that the Neolithic dispersal started during the aceramic phase (PPNB), from c. 7000 cal BC in Iran and c. 6800 cal BC in Greece (Initial Neolithic), it accelerated notably with the generalized use of ceramics. The drivers behind this diffusion from the Near East are still subject to debate and cannot be explained by a single cause, but probably reflect the conjunction of multiple social, environmental and cultural factors.

In the centuries around 6700 cal BC, Neolithic communities and ways of life dispersed relatively quickly throughout the Aegean, reaching mainland Greece at c. 6500 cal BC, the Ionian and Adriatic coasts by c. 6000 cal BC, the Gulf of Lyon at c. 5800, and the westernmost parts of the Mediterranean by c. 5400 cal BC.

This dispersal is evidenced by archaeological data, which show the sudden appearance of a new farming way of life, based on an agro-pastoral economy and numerous technical innovations, all integral components of the so-called “Neolithic package”. Technical innovations include ceramics, polished stone tool technology, weaving, more “complex” modes of lithic production (elaborate pressure flaking, mining activities), changes in bone technology (mechanical perforation systems, appearance of everyday utilitarian objects such as bone spoons, hooks, etc.), architectural techniques (rectangular houses, mud bricks, plaster or lime floors, complex fireplaces, adobe benches), appearance of new objects with complex typological characteristics (anthropomorphic figurines, pintaderas, “ear-plugs”/labrets, etc.), some of which can be considered as socially and/or symbolically valorizing (Perlès, 2005).

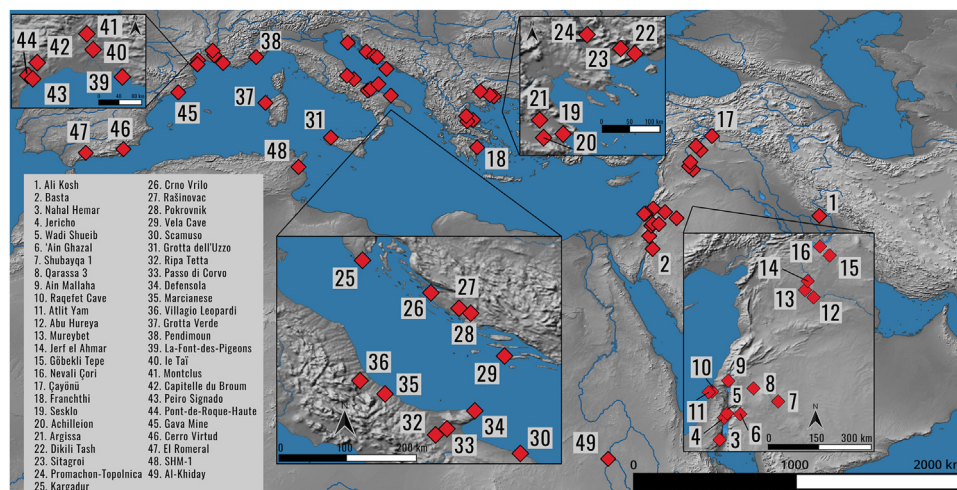


Fig. 1 Map showing the location of key sites indicated in text.

DNA analyses of human remains indicate that a large majority of Neolithic farmers have Near Eastern origins (Hoffmanova et al., 2016). This implies that migration was at least one major driving force behind the Neolithization process. However, these Neolithic migrations were not simply a colonization of virgin territories. The areas the migrants arrived in were inhabited by indigenous groups of hunter-fisher-gatherers to varying degrees. Therefore, the emergence of the Neolithic in the central-Western Mediterranean should be understood as the result of interactions between migrant farmers and indigenous hunter-fisher-gatherers. In some regions, in all likelihood coexistence led to repeated contacts between these groups, resulting in social and techno-economic changes.

In practice, these interactions are, however, difficult to demonstrate archaeologically. Interactions are suggested primarily by material culture (technology and symbolism) (Rigaud et al., 2018; Kačar, 2021) or via aDNA analyses (Rivollat et al., 2020; Arzelier et al., 2022). The coexistence of two populations living in close proximity over an extended period of time may also be discerned through careful analysis of radiocarbon dates, although this is not clearly evident in the western Mediterranean (Perrin and Manen, 2021). Much evidence is also invisible to archaeological inquiry (perishable material culture, social relations).

As Neolithic ways of life spread throughout the Central-Western Mediterranean from c. 6000 cal BC onwards, the Neolithic societies of the Eastern Mediterranean underwent major socio-economic transformations that marked the beginning of the Chalcolithic. In addition to technical innovations, such as metallurgy, these included agricultural intensification through new technologies such as irrigation, further development of craft specialization, long-distance trade, increased social complexity and hierarchization. The latter is attested archaeologically through changes in settlement patterns, architecture, material culture, symbolic, ritual and funerary practices.

Overview and Key Issues

Paleoenvironmental and Paleogeographic Background

The Mediterranean landscape that we know today, with pine forests, maquis, and garrigue scrubland where olive, juniper, laurel, rosemary, myrtle and other emblematic plants grow spontaneously, did not appear like this at the onset of the Neolithic. Indeed, today's scrub-dominated landscape was caused by degradation and succession of former evergreen oak forests that existed until the mid-Holocene, and is the result of continuous human (and animal) impact on regional vegetation structure.

In addition, the present-day Mediterranean climate - characterized by dry and hot summers and mild, wet winters - emerged gradually from c. 8850 cal. BC and was firmly established only between c. 5600–4000 cal BC (Combourieu-Nebout et al., 1998; Rossignol-Strick, 1999).

Following the cold and dry conditions that dominated the region during the Late Glacial Maximum, the still somewhat turbulent climate of the Terminal Pleistocene/Early Holocene (Bölling-Allerød, Younger Dryas, Preboreal Oscillation) stabilized gradually. Climatic improvement in the form of wetter and warmer conditions and an associated forest expansion, accelerated during the Boreal and reached its peak during the Atlantic ("Holocene Optimum") as evidenced by palynological records throughout the Mediterranean. Marine cores indicate the deposition of sapropel S1, an organic rich layer, between 8850 and 4195 cal BC, which shows that the once open landscape of *Artemisia*-*Chenopodiaceae* steppe was progressively replaced by thermophilic mixed-oak canopy forests. Furthermore, Mediterranean taxa such as *Pistacia*, *Quercus ilex*, *Phyllirea* and *Erica*, while present in some cases from the onset of Sapropel S1, increase over time (Martinez-Ruiz et al., 2015).

The coastline of the wider Mediterranean area was considerably altered through the course of the late Pleistocene and Holocene due to sea-level changes. These changes can be related to a combination of coastal tectonic and eustatic or isostatic factors. In areas such as the northern Adriatic, eustatic sea-level fluctuations at various times laid bare vast swathes of landscape which are now submerged. At the Last Glacial Maximum (LGM), the maximum sea level regression in this region was approximately –112 m (Rossi Radić et al., 2020). These areas would have represented attractive resource-rich environments for hunter-gatherer groups before gradually becoming inundated. Throughout the Mediterranean basin, the presence of submerged prehistoric sites is a clear indicator that rapidly rising sea levels flooded the coastal margins at various times. For instance, at Atlit Yam in Israel, material associated with Pre Pottery Neolithic C has been dated to c. 9000 BP. Remarkably, this site is situated up to 400 m offshore and at depths down to –12 m (Galili and Rosen, 2011). Similarly, at Grotta Verde in Sardinia, ceramics and human remains dating to c. 7300 BP have been recovered at depths down to –10 m (Antonoli et al., 1996). Evidence from Mediterranean regions which are more tectonically stable appear to indicate that sea level approximated current conditions by c. 4000–3600 BP, fluctuating only slightly above or below present levels from that time onward (Galili et al., 2005).

Eastern Mediterranean and the Dawn of Agriculture

The Fertile Crescent: Hunter-Gatherer's Invention of Agriculture

The warmer and wetter climatic conditions of the Bölling-Allerød interstadial gradually facilitated the spread of grasses and trees into upland, steppe and desert-steppe regions. This occurred around 13,000 cal BC and probably offered the right conditions for the establishment of the first sedentary Epipaleolithic settlements. From c. 12,650 cal BC, hunter-gatherer groups associated with the Natufian culture settled on the Euphrates riverbanks, in the open grass woodland dominated by oak and *Pistacia*, where they constructed small, semi-circular or circular semi-subterranean dwellings (pit houses). Examples of this were found at Ain Mallaha and Qarassa 3. The arrangement of the dwellings indicates carefully planned settlement organization and groupings into hamlets. In

some cases, houses were built either above graves or the construction was simultaneous with burial activity. This funerary tradition or codified ritual process may imply a shared understanding that the boundaries between the living and the dead were somehow intertwined on both a cosmological and physical level.

The subsistence base, which can be described as “broad spectrum”, included a wide range of gathered wild plants such as cereals, legumes, tubers, fruits, nuts and grasses, and a variety of hunted animals such as small mammals, birds, fish, amphibians and reptiles. The hunting of gazelles, which would have been among the most abundant larger game, played an important role as well.

The intensive and extensive practice of harvesting wild cereals probably led to small-scale cultivation, as evidenced by archaeological remains, ground-stone tools including grinding and pounding utensils as well as sickle blades and architectural features like threshing floors and bedrock cup holes. The earliest evidence for bread-making has been recovered at Shubayqa 1, a 14,500-year-old Natufian site in Jordan (Arranz-Otaegui et al., 2018).

The adoption of a cereal-based diet, which necessitates storage for delayed returns, enabled Natufian hunter-gatherers to employ more predictable strategies for resource exploitation. This, coupled with their sedentary way of life, engendered a certain social complexity, marked by heightened interactions, specialized roles, and the establishment of more enduring social structures.

The appearance of organized cemeteries with over 450 individuals buried in places such as Raqefet Cave also points to major socio-economic transformations which affected these hunter-gatherer groups. In all likelihood, burials were performed alongside complex rituals, with rites possibly including feasting and the consumption of food and alcoholic beverages. This is supported by the results of residue analysis on 13,000-year-old stone mortars from Raqefet cave that were interpreted as the earliest archaeological evidence of fermentation and cereal-based beer brewing (Liu et al., 2018).

Early Neolithic

The Early Neolithic in the Eastern Mediterranean, characterized by a farming way of life and the absence of pottery, is divided into two phases: Pre-Pottery Neolithic A (PPNA) (c. 9600–8800 cal BC) and Pre-Pottery Neolithic B (PPNB) (c. 8800–7000 cal BC). This is followed by the Pottery Neolithic (PN), sometimes referred to as the Late Neolithic (from 7000). This phase is characterized by the appearance and general use of ceramics and comes to an end with the emergence of metallurgy.

The first phase of the Neolithic, the PPNA, marks the beginning of pre-domestic cultivation, i.e., the cultivation of wild cereals, which complemented a broad spectrum economy in which gazelle hunting still had an important role. Regional diversity at this time is reflected by variations in material culture (e.g., stone tools) and groups together several regional entities such as Khiamian and Sultanian in the southern Levant and Mureybetian in Syria.

The Khiamian culture developed locally c. 10,200/10,000–9500 cal BC and has long been considered a transitional phase between the Natufian and PPNA (Simmons, 2007), with important continuities with the preceding period. Indeed, change is primarily indicated by the appearance of flint arrowheads known as “El-Khiam points”, while other aspects of life do not differ substantially from the Natufian: sedentary communities lived in hamlets of round houses and practiced a broad-spectrum economy (Cauvin, 2010). While differences between Natufian and PPNA in material culture, architecture, and ritual practices will increase over time, population continuity is indicated by aDNA. A study by Lazaridis et al. (2016), suggested that some early Levantine farming communities may have derived up to two-thirds of their genetic ancestry from Natufian hunter-gatherers. During the PPNA, sedentary communities across the Fertile Crescent increasingly started to produce food by cultivation of wild cereals. The adoption of agriculture led to the growth of regional populations, leading to important changes in settlement patterns, with sedentary villages becoming the norm. Settlements were characterized by tightly-packed dwellings and round, semi-subterranean houses with one or more rooms. Houses had stone foundations and the upper walls were constructed of mud bricks.

In addition to these domestic dwellings, generally interpreted as households, there are structures that stand apart due to their size and shape. These are often considered “special” and non-residential, perhaps serving some communal function. The stone tower (c. 9 m in diameter at the base) and associated ditch and wall at Jericho, as well as the large circular structures supported by massive stone pillars at Göbekli Tepe (Fig. 2) are examples of such monumental architecture, together with the so-called ‘community buildings’ found at sites such as Jerf el Ahmar and Mureybet. Although the precise function of these buildings is uncertain (ritual, ceremonial, gathering places), their construction and maintenance indicate a high degree of social organization.

At Göbekli Tepe, massive T-shaped stone pillars were carved, most often in low relief, but sometimes in high relief. There are depictions of a range of wild animals such as serpents, foxes, gazelles, vultures, and, more rarely, humans and various human anatomical parts (hands, arms). Smaller portable stone objects were also carved or engraved with animal motifs and/or incised signs. The best-known examples come from Jerf el Ahmar and include engraved stone vessels, animal figurines, grooved stones (arrow shaft-straighteners) and plaques.

Similar to the Natufian, graves were often located inside the village, underneath houses or in the spaces between houses. The practice of removing the skulls of the deceased, which has been recorded in Natufian contexts, became more frequent, and for the first time there are examples of modifying skulls by covering them with plaster, implying a certain elaboration of the ritual.

Lithic production also points to important socio-economic changes that occurred with the PPNA. Exchange, including long-distance networks, appears to have been established. This is indicated by the widespread circulation of materials such as obsidian, greenstone, malachite and marine shells.



Fig. 2 Göbekli Tepe monumental structure. Photo by Željko Krnčević.

The Pre-Pottery Neolithic B is characterized by the complete adoption of an agropastoral economy from c. 8700 cal BC. Another significant change in relation to the PPNA relates to the very concept of the village itself. At this time, a completely new style of village is emerging, sometimes of considerable size (mega-sites of 25–35 ha, such as 'Ain Ghazal, Wadi Shueib, Basta in Jordan, Abu Hureyra). However, small specialized, seasonal sites, including caves, are also present. The use of village space is more thoughtful, testifying to a considerable degree of collective organization. Changes in architecture are apparent in the transition from circular to rectangular house plans. These new rectangular houses were large, multi-roomed and had solid stone walls and plaster floors.

Significant changes also affected the artisan, ritual and trade spheres. Lithic knapping is oriented toward the production of bipolar blades and bladelets. These were obtained by direct percussion, using a soft hammer and naviform cores. Pressure flaking is also recorded in some regions. Tool categories became more diversified and contained, among other tools, sickle blades and various projectile points (known as Byblos, Jericho and el-Khiam points). The standardization of naviform bipolar production suggests a certain degree of craft specialization. Ground stone production is also common and includes querns and vessels (such as bowls, plates and platters, the latter being a PPNB innovation). Lime plaster vessels also appear for the first time. The use of plaster for a variety of purposes (vessels, architecture, sculpture) points to a sophisticated pyrotechnology that requires the application of high temperatures to manufacture the plaster from limestone (Simmons, 2007). Plasters were also used in the ritual sphere, as ceremonial practices established during the Natufian and PPNA are again further elaborated. Plaster masks were sometimes modeled on the skull, perhaps with the aim of reconstructing the face of the deceased. The eyes were replaced by shells, nacre, or flint. Sometimes teeth were removed and the skulls were painted.

A certain importance of the human figure in the symbolism of the PPNB groups is also reflected in sculpture. Many anthropomorphic sculptures were discovered in Jericho, Nahal Hemar and 'Ain Ghazal. While the legs and the arms are very roughly formed, the face, which is often painted, is generally depicted with a greater attention to detail. Finally, anthropomorphic and animal figurines are numerous. They are made from different materials (stone, clay, bone) and can be more or less realistic or schematic, sexed or non-sexed.

Non-domestic buildings (communal/cultural/ritual) have been discovered primarily in Eastern Anatolia; for example, in Çayönü and Nevalı Çori. In Çayönü, large numbers of disarticulated human skulls and limb bones were buried together with skulls originally displayed on the shelves in the so-called "Skull Building". In Nevalı Çori, a cult complex had been cut into the hillside. Monolithic pillars similar to those at Göbekli Tepe were built into its dry stone walls and its interior contained two free-standing pillars 3 m high.

Compared to the previous phase, the PPNB sphere of influence extended over a larger geographical area, stretching across the entire Levant to central Anatolia and Cyprus. However, it is commonly regarded not as a monolithic entity, but as regionalized variations of similar phenomena, through the idea of a *koiné*, or a "sphere of interactions" (Cauvin, 2010). Indeed, apart from regional variabilities visible in all spheres of life (subsistence, adaptation to different environments, including desert material culture), changes associated with the PPNB did not occur suddenly nor synchronously over this large area.¹ Therefore, the development of the PPNB, i.e., a village lifestyle that relies on agriculture and herding and as such marks the completion of the neolithization processes, should be understood as a regionalized process that took almost two millennia to become fully established.

¹PPNB is commonly divided into Early (8700–8200 cal BC), Middle (8200–7500 cal BC), Late (7500–7000 cal BC) and, regionally, Final (also known as PPNC, 7000–6500 cal BC). There are therefore considerable chronological variations which are, due to the lack of space, not explicit here.

Go West—The Emergence of Neolithic Ways of Life in the Central-Western Mediterranean

The spread of Neolithic lifeways toward the western Mediterranean did not follow a linear pattern with a regular progression, but, on the contrary, proceeded in an arrhythmic manner, through pioneer incursions, pauses and cultural reconfigurations (Guilaine, 2001).

Mesolithic Background

During the development of the Neolithic (PPNA and PPNB) in the Near East, Mesolithic hunter-gatherers inhabited the European part of the Mediterranean.

However, from c. 8850 cal BC, which coincides with climatic improvement in the eastern Mediterranean and the development of PPNA, the Aegean region sees a marked increase in occupation intensity, as hunter-gatherer groups began to adopt more sedentary lifestyles (Sampson, 2014). Here, sedentism coincides with intensified fishing and possibly storage, suggesting a certain social “complexity”. Some degree of interaction between Mesolithic communities in the Aegean and Neolithic groups in the Near East may have occurred. This is perhaps suggested by palaeogenomic studies, which appear to indicate a Near Eastern lineage for two Mesolithic individuals (Hoffmanová et al., 2016). The existence of pre-Neolithic maritime networks in the Aegean from the beginning of the 9th millennium cal BC, which imply the mastery of navigation and deep-sea fishing by hunter-fisher-gatherers, is evidenced by the presence of obsidian artifacts from Melos found on numerous sites in the southern Aegean (Franchthi, Cyclops Cave). It suggests that obsidian distribution networks intensified considerably during the Neolithic and may have roots in Mesolithic traditions (Perlès, 2001; Horejs et al., 2015).

Nothing similar was observed in the Early Mesolithic of the central-western Mediterranean. However, during the 7th millennium cal BC (= Late Mesolithic) the “Blade and trapeze Complex - BTC” (also known locally as Castelnovian) developed. This technocomplex is characterized by the appearance of production systems which represent a clear break from the previous period, being oriented toward the manufacture of regular and standardized blades and bladelets obtained using complex knapping techniques, such as pressure flaking and indirect percussion (e.g., at Uzzo cave, Montclus rockshelter and La-Font-des-Pigeons). Some of the blanks produced in these ways were then transformed further into typical Castelnovian type tools: notched blades and trapezes (Fig. 3).

To what extent the BTC societies can be characterized as “complex hunter-gatherers” is still unclear (cf. Marchand and Perrin, 2017; Kačar, 2020). The emergence of the BTC was probably a complex and regionalized process, involving multiple parameters and variables, entailing a non-linear interplay between the movement of people and the transmission of ideas. The arrival of new populations is supported by genetic data from sites such as the Uzzo cave in Sicily, which indicate a population shift at the start of the Late Mesolithic (Yu et al., 2022). The BTC spread relatively quickly throughout the central-western Mediterranean, reaching the western fringes (SW France and SE Spain) by c. 6400–6300 cal BC. At the same time, c. 6500 cal BC, the Capsian technocomplex emerged in the Maghreb region of Northern Africa. This is similarly characterized by the blade and trapeze industries (Perrin et al., 2022). However, the Eastern Mediterranean, including Greece and the Aegean, was not affected by a similar phenomenon. This may be explained regionally by the presence of Neolithic settlers in Greece from c. 6800 cal BC (=Initial Neolithic). These communities may have represented a “barrier” to the spread of Castelnovian innovations.

Initial and Early Neolithic in Greece: Europe's First Farmers

Farming first reached Greece, located between the Near East and Europe, around 6800/6700 cal BC. This occurred through a number of different routes, both terrestrial (through Thrace and Macedonia) and maritime (via the Aegean islands) (Perlès et al., 2013).

This first phase, known as “Initial Neolithic”, probably came about due to encounters between incoming farming communities of diverse origin and local hunter-fisher-gatherers. This scenario is suggested by lithic and ornament assemblages, archaeozoological remains and aDNA data (Perlès et al., 2013; Hoffmanová et al., 2016).

This pioneer and exploratory colonization is attested primarily in the southern Aegean, on the island of Crete, and on the Peloponnese in southern Greece (Franchthi cave). According to the oldest radiocarbon dates, it approximately coincides with the PPNB/PN transition in the Near East, predating the emergence of the Neolithic in Anatolia at c. 6500 cal BC.

However, Thessaly, the fertile floodplains of northeastern Greece where the majority of open-air sites are found (e.g., Argissa, Sesklo), was settled somewhat later, c. 6500 BC, which coincided with the Early Neolithic phase (c. 6500–5800 cal BC). This is simultaneous with the emergence of the Neolithic in Anatolia, with which it shares many traits such as ceramic styles (painted pottery, impressed ware), and other ceramic items (such as figurines, seals, and clay altars), bone tools (hooks), and lithic technology. There are, however, also some notable differences in regards to architecture (for instance the absence of closely-grouped villages, or the absence of wall art).

Although the character and origin of the Greek Neolithic remains somewhat obscure due to patchy data susceptible to subjective interpretations, it is clear that the Neolithic in Greece cannot be viewed as a monolithic entity (Perlès, 2001; Reingruber, 2011; Horejs et al., 2015). On the contrary, the Neolithic developed over the course of millennia, first as the result of interactions between hunter-fisher-gatherers and incoming farmers, but perhaps also as the result of interactions between different farming communities, with distinct origins and cultural traditions. There is still no consensus on a number of important questions such as whether there is an aceramic phase in the sense of a distinctive period that corresponds to the PPNB of the Eastern Mediterranean, which sites can be

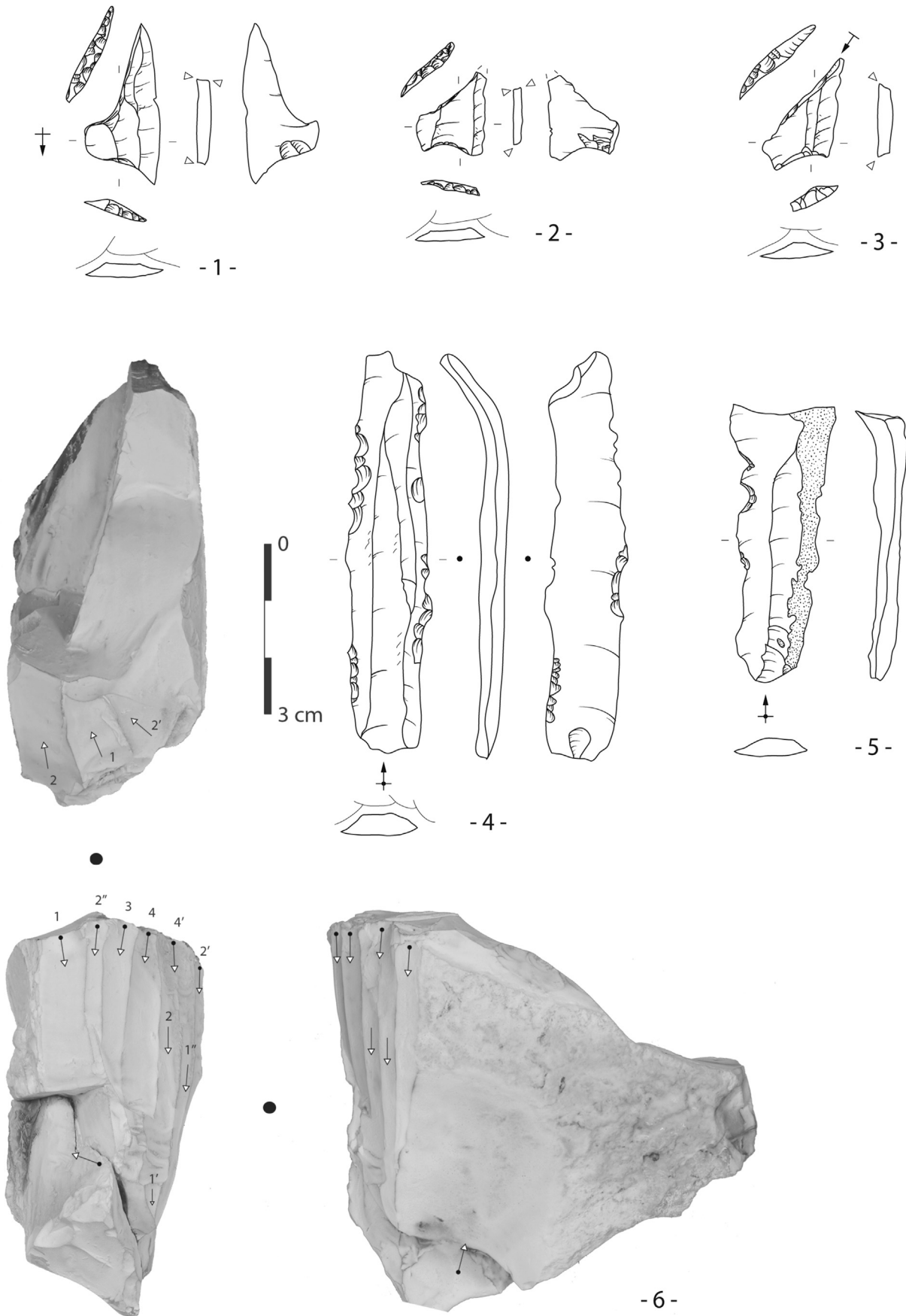


Fig. 3 Castelnovian/ BTC lithic industry from the Montclus rockshelter (Gard, southern France). 1-3 : Trapeze arrowhead, 4-5 : Notched blade, 6 : Blade core. Photo and drawings by Elsa Defranould.

ascribed to the Initial Neolithic and which to the Early Neolithic, whether the Anatolian Neolithic precedes the Greek Neolithic, i.e., whether the latter can be derived from it. In any case, in addition to the diversity in settlement types, architecture (houses, tells), ceramic production (different varieties of painted pottery, impressed pottery, different vessel types), there is also considerable diversity in the lithic production systems, for instance the use of different raw materials, including “Silex blond”, “White spotted/Balkan flint” and obsidian, and the employment of different techniques, such as pressure flaking, indirect percussion and direct percussion.

Cultural Reconfiguration in the Central Mediterranean

In the centuries around 6100–6000 cal BC, a new cultural horizon emerged in the area between western Greece and southeast Italy. This was the so-called Impressed ware/Cardial culture, which later became the main component of the maritime current of Neolithization and a cultural marker of the Early Neolithic for the whole central-western Mediterranean (Guilaine, 2001). Although this ceramic style was already known and is recorded in ceramic assemblages from Greece, Western Turkey, and the central Balkans (Çilingiroğlu, 2016; Vuković and Silar, 2016), in this area it became the dominant and almost exclusive manner of decorating ceramic vessels. This new cultural horizon is well-documented in the Adriatic, where the Impressed Ware culture (*Impressa arcaiche*, *Impressa Guadone*, *Impressa medio-adriatica*) marks the onset of the Neolithic (Fig. 4).

The transition to farming occurred relatively quickly in the south-central part of the Adriatic basin (Dalmatia and Apulia) and was broadly driven by colonization (Forenbaher and Miracle, 2005; McClure et al., 2014; Kačar, 2021). According to palynological data, the emergence of the Neolithic in this region coincides with the climatic fluctuation known as the “8.2 ka event”, which manifested here as drier conditions leading to a more open landscape. This implies that incoming farming communities could have easily spread into the hinterland where they settled fertile plains (e.g., Ripa Tetta, Rašinovac, Pokrovnik). Their subsistence was almost exclusively based on agriculture and livestock. While the origin of these newcomers in the Adriatic and their dispersal along the Adriatic basin is still a subject of debate, it is clear that the sea did not represent a barrier or impediment to travel. On the contrary, archaeological evidence indicates cultural homogeneity among the first farmers on both sides of the Adriatic. This is attested by the emergence of the Gargano chert network which had been developing in southeastern Italy and expanding across land (e.g., Ripa Tetta, Scamuso) and sea since the beginning of the Neolithic. On the other side of the Adriatic, in Dalmatia, lithic blade production was almost exclusively based on Gargano cherts, despite the fact that good quality rocks were locally available (e.g., Vela cave on Korčula). This hints at important social aspects and complex management strategies, such as mining activities, more complex modes of pressure flaking, and specialized distribution networks, all marking a break with preceding Mesolithic traditions.

Shortly after c. 5900 cal. BC, agricultural communities continued to expand northward and westward. One group continued its expansion along the Adriatic coast, and around 5700 cal BC the first Neolithic settlements north of Gargano were established (e.g., Marcianese, Villaggio Leopardi). They do not seem to have been included in the Gargano distribution network and were relying on local lithic sources, while ceramics also appear somewhat different in character, and are known as *Impressa medio-adriatica*. The head of the Adriatic was reached around 5500 cal BC, but the first farmers in that northernmost region were not bearers of the *Impressa* style, whose northernmost distribution is restricted to southern Istria (e.g., Kargadur). Indeed, c. 5500 cal BC, different cultural groups coexisted in the northern Adriatic. In northern Istria and the Karst the Danilo culture appears, in the Emilia-Romagna Fiorano, while in the Veneto-Friuli plain, different stylistic facies develop, grouped under the name “Friul group”.

The spread of Neolithic lifeways to the North-west, along the Tyrrhenian coast to Liguria and Provence, and west, to the islands of Corsica and Sardinia, seems to have occurred relatively quickly. Here, a certain cultural reconfiguration took place, since Impressed Ware pottery became more stylistically diverse (Binder et al., 2010).

Emergence of Farming in the Western Mediterranean

From an Italian origin, Impressed Ware settlements on the Provençal and Languedoc coasts developed between 5900 and 5600 cal BCE (Pendimoun, Peiro Signado, Pont-de-Roque-Haute). The geographical discontinuity of the settlements reported at this period and their location suggests a leapfrog colonization along the coast. In this period, the Tyrrhenian region seems to have been widely settled, which implies a good knowledge of navigation and long-distance maritime travel. The small Impressed Ware communities there, although they seem to have adapted very well to their new environment, show strong affinities with their area of origin in south-central Italy. This can be seen in their material culture, particularly ceramics and lithics, but also in the exploitation of obsidian from the island of Palmarola or, occasionally, from Sardinia (Guilaine et al., 2007). In addition, their subsistence economy is based on the cultivation of emmer wheat and einkorn, and the exploitation of goat herds, with sheep presenting morphometric characteristics comparable to Italian herds (Guilaine et al., 2007).

The fate of the Impressed Ware communities remains unknown; a few centuries after these first settlements appeared in the north-western Mediterranean, another cultural entity succeeded them: the Cardial. This entity developed from the Ligurian-Provençal arc to the Iberian Peninsula, and exhibited a strong regional polymorphism that could indicate important cultural reconfiguration. Cardial groups seem to have had a strong anchorage in their territories; their subsistence economy shows a varied exploitation of resources and mobility. Agricultural practices are based on the cultivation of a variety of cereals, in particular different varieties of wheat and barley, and the exploitation of goat herds and, more marginally, some beef and pork. However, the exploitation of wild resources, whether game, fish or wild fruits, completes the diet in a substantial way (e.g., at Taï: Bouby, Durand, Rousselet et al., 2018). Finally, ceramic studies indicate domestic production based on the exploitation of local clays



Fig. 4 Adriatic Impressed Ware pottery (Rašinovac, Dalmatia, Croatia). Photo by Emil Podrug.

(Binder et al., 2010), while flake stone production can be described as domestic, exploiting local resources, alongside more specialized production circulating on a regional scale (Defranould, 2021).

Neolithization of the Southern Mediterranean: A Patchy Record

For the southern part of the Mediterranean, it is more difficult to reconstruct the processes of Neolithization, due to a general paucity of reliable data. Beyond fragmentary data, the very notion of Neolithization, as it is conceived in the Near East, is difficult to transpose to North Africa, as the adoption of Neolithic lifestyles takes on varied rhythms and forms that are still poorly understood.

Little is known, for instance, about the Egyptian coast and the Nile Valley. It is presumed that many sites were destroyed due to erosion or human activity, or buried under several meters of sediment.

Much further south, in the Khartoum region of present-day Sudan, between 7000 and 5000 BC hunter-gatherer-fisher societies stored fish, as evidenced by the salting practices attested at the site of Al-Khiday, and produced elaborate ceramics (Maritan et al., 2018). Caprine originating from the Near East appears from c. 6200 BC, however, domesticated cereals, wheat, and barley, while also of Near-Eastern origin, appear to be adopted later. These agro-pastoral innovations do not seem to have fundamentally modified the lifestyles of the hunter-fisher-gatherers, who progressively developed pastoral lifestyles that remained semi-nomadic (Cauliez et al., 2021).

The Neolithization process in the Maghreb region is also poorly documented. Despite the geographical proximity of the Maghreb and Southern Italy, with Sicily located approximately halfway, the archaeological data do not—for the moment—support the hypothesis of a Neolithization route via this direction. Indeed, the most recent data appear to indicate that there is a time lag and relatively few exchanges between the Impressed Ware of southern Italy and the Capsian in North Africa, which seems to have lasted until c. 5000 cal BC (Perrin et al., 2022). Only a few obsidian pieces originating from the island of Pantalleria were found in the Capsian deposit of SHM-1 (Hergla) in the Gulf of Hammamet and testify to exchanges with Sicily. Thus, it seems that the Neolithic appears in small discrete steps, which suggests the emergence of agro-pastoral practices from a Capsian Mesolithic tradition in this area.

Further west, archaeological data from the Moroccan and Oranese coast suggest that the Strait of Gibraltar acted as a bridge between the northern and southern shores of the Mediterranean. Indeed, from the second half of the 6th millennium, many similarities are observed in material culture on both sides of the Strait of Gibraltar (Manen et al., 2007). They include similarities in the lithic production (use of pressure flaking, similar type of arrowheads) and ceramic decoration techniques. In addition, and despite the poor radiocarbon datasets, striking similarities—formal, technical, narrative and thematic—are observed between the parietal art of the Spanish Levant and the Sahara. Human representations, particularly of men, depicting episodes of hunting or confrontation (López-Montalvo, 2015, 2018) are present in both Iberian and Saharan ornamental sites (Perrin et al., 2022). The figures are frequently painted in red ochre, seen in profile and with the outline of muscular bodies respecting anatomical proportions (Fig. 5). These different elements thus show important convergences between the southern Iberian Peninsula and the southern shores of the Mediterranean. It is difficult, however, to specify the tempo or the direction of these contacts.

Consolidation, Regionalization and Social Complexification During the Advanced Neolithic of the Central-Western Mediterranean

Throughout Mediterranean Europe, following the establishment of agriculture and the requisite adaptations for different environments, the development of the Neolithic experienced new dynamics as the consolidation of a farming economy and village way of life took place. Structural changes that occurred during this period led to cultural reconfigurations, testifying both to contacts established over very long distances and to the regionalization of communities anchored in their territory.

These changes do not occur uniformly and regional variations are evident. “Full Neolithic”—implying adoption of all components of the Neolithic package—occurred in some regions from very early on and coincided with the Early Neolithic (e.g., Dalmatian Impressed Ware). Meanwhile in other regions, the consolidation of a farming economy and village way of life might correspond to the phases that local archaeologists would describe as advanced Early Neolithic or Middle Neolithic (e.g., Chassean). The evidence of social complexification and eventual hierarchisation is, in general, not encountered before the Late/Final Neolithic or Chalcolithic.

Structuring of Space: Territorial Anchoring and Complementarity of Sites

The permanent occupation of new territory is reflected in the increasing number of settlements, and especially, in the structured use of space, i.e., construction of villages with individual houses, materializing the shared vision of communal living while maintaining a certain degree of division within the community.

Due to the limited scale of most research excavations, it is not always practically possible to meaningfully address or establish the precise nature of settlement (permanent vs seasonal), the delimitation of the space (open vs enclosed villages), nor the internal structure of a village (relationships between buildings).

In Greece, from at least the Early Neolithic onwards, sites located in the Thessalian plain (Sesklo, Achilleion, Argissa etc.) have often been organized as tells, locally known as *magoula* or *toumba*. Repeated construction activities on the same spot point to the permanence of the settlement, given that the same space was occupied over many generations. Large, extended sites are also evidenced during the Early Neolithic (Sesklo) or later phases (Dimini). The houses are indicative of the PPNB traditions: they are



Fig. 5 Wild goat hunting scene from Cova Remigia IV (Castellón, Spanish Levant). Digital tracing by E. López-Montalvo. Published in López-Montalvo (2018).

rectangular or square in shape and often contain only one single room, but two-room houses are not unusual as well. Building techniques are extremely variable, including stone, mud bricks, pisé and wattle and daub constructions. However, enclosures (such as surrounding walls and ditches) are not evident before the Middle Neolithic (Perlès, 2001).

In Apulia, the most densely occupied region of Southern Italy, the first settlements appear to have been open, and only later enclosed by one or more concentric rings of ditches (Passo di Corvo, Fig. 6) (Pessina and Tiné, 2008).

On the Croatian side of the Adriatic, the oldest remains of villages with rectangular houses can be dated to the advanced phase of Impressed Ware (Crno Vrilo) while enclosures seem to be constructed later, from the Middle Neolithic onwards (circular stone walls and ditch in Pokrovnik) (Marijanović, 2017).

In the Western Mediterranean, France and Spain, large sites covering several hectares were developed on low alluvial terraces during the Middle Neolithic (see in particular the sites in the Rhône valley). They are associated with the emergence of enclosures, large rectangular buildings on supporting posts and the development of large domestic combustion structures filled with heated stones (Bréhard et al., 2010; Martí and Bernabeu, 2012). The status of these enclosed sites is still the subject of much debate and it is possible that they may have evolved over time: it is unclear whether they served strictly residential or defensive functions, or as places for occasional gatherings, ceremonial purposes or exchange (Beeching, 2011; Pons and Gandelin, 2018).

In comparison to open-air sites, cave sites often had a distinctive function (sheepfold caves, places of burial, ritual, storage) and were complementary to the village settlements in some ways. While there is evident continuity with the Early Neolithic, it seems that during the advanced Neolithic phase, socio-economic behavior became more diversified and site networks became more complex.

The intensification of anthropic impacts on the landscape marked a new wave of agricultural expansion that conquered mountain territories (Pérez Díaz et al., 2015; Antolín et al., 2018; Battantier, 2022). However, despite the fact that many cave sheepfolds are located at elevated altitudes, in areas where transhumance has been strongly practiced until relatively recently, there is only very limited evidence of periodic movements of livestock between winter pastures and summer pastures in the Neolithic (Zavodny et al., 2014; Varkuleviciute et al., 2021).

Intensification of Long Distance Networks

The identification of circulation networks is based primarily on the petroarchaeological characterization of exogenous raw materials (fine-grained rocks such as cherts and obsidian or coarse-grained rocks such as metamorphic “greenstones”). However, other



Fig. 6 Passo di Corvo (Apulia, Italy): Reconstruction of the Neolithic house enclosed by circular ditches. Photo by Sonja Kačar.

materials, such as shells (e.g., *Spondylus gaederopus*, an oyster collected in the shallow waters of the Aegean and Adriatic) or salt, can also be taken into account. The characterization of different parameters of material circulation, such as the location of raw material sources, the organization of production, the modalities of consumption (quantity, use) or of distribution (distance, preform or finished product), allows to define different systems (Perlès, 2012). Exchange networks assume a social and structuring function. They testify to the interdependence of communities, perceived as constitutive of the Neolithic and the sedentary way of life. These links guarantee the regulation of conflicts, the integration of dispersed communities and the circulation of information (Guilaine, 2012; Perlès, 2012).

Long distance circulation of *silex blond* and Gargano cherts suggests complex chert circulation networks—implying mining activities (e.g., Defensola mine in Southern Italy), over-land and over-sea distribution and artisan specialization—and is documented in Greece and the Adriatic from the Early Neolithic onwards.

In the Western Mediterranean, the integration of populations into vast networks of circulation intensified with the advanced Neolithic, from c. 4500 cal BC. This expansion was supported locally by the development of specific techniques (mines, sawing of tenacious rocks, heat treatment of flint, reduction of metal ores, etc.) and by a segmentation of the *chaînes opératoires*. These characteristics indicate trade-oriented production logistics and suggest the development of artisanal specialization (Binder, 2015). The expansion of the distribution network for large jade (“greenstone”) axes from the Mont Viso in the Southern Alps is emblematic of this phenomenon (Pétrequin et al., 2012). In more southerly regions, network growth gained new impetus in the 4th millennium. Among the most significant examples, we can mention the diffusion network of heated blond flint that extends from the Provence to North-Eastern Spain, seconded by that of obsidian from the islands of Lipari and Sardinia (Léa and Vaquer, 2010). In Spain, the distribution of ornaments linked to the mining of variscite (e.g., Gavà Mine) radiates as far as Liguria and the Atlantic domain (Querré et al., 2019). The last circulation networks of large flint blades occurred during the 3rd millennium, in competition with the diffusion of copper objects following the advent of metallurgy (Léa and Vaquer, 2010).

Emergence of a Symbolic System: The Development of Monumentalism

A more substantial anchoring of Neolithic communities in their territory is expressed in the funerary domain with the development of necropolises. These sites testify to the desire to create a space distinct from the habitat, specifically dedicated to burials. In some regions, this phenomenon was accompanied by the emergence of funerary megalithism, which sometimes led to the creation of monumental architecture. Megalithism was also introduced into the world of the living by the erection of blocks, whose forms varied from simple standing stones to anthropomorphic representations. These different manifestations participate in the marking of the territory. They reflect the development of a symbolic system that structured the relationship between agro-pastoralists and their environment (Laporte et al., 2011). They are also interpreted as a reflection of certain social inequalities and community segmentation (Garrido Pena et al., 2012).

Long considered as a late phenomenon and consecutive to the monumental expressions of the Atlantic domain, the megalithism of the North-Western Mediterranean is now interpreted as an autonomous movement guided by its own internal cultural dynamics. Its peculiarities lie in the diversity of architectural forms and the spatial dispersion of monuments (Ard and Mens, 2018). Thus, this

includes the stone slabs burials that appear from the middle of the 5th millennium in the South of France and the North-East of Spain (Gibaja et al., 2020). The construction of dolmens developed from the 4th millennium onwards. A number of different types are recorded: simple dolmens, chambers with a corridor, dolmens with a vestibule, associated with tumuli whose architecture is still poorly documented (Garrido Pena et al., 2012; Ard and Mens, 2018). These funerary structures generally have a complex history and were reused or reorganized until the end of the 3rd millennium. Among the various funerary monuments, some have a truly ostentatious character, such as the dry-stone tholoi of south-eastern Spain (e.g., El Romeral) or the hypogeums (Ard and Mens, 2018). During the 4th and 3rd millennia BC, from southern France and Iberia to north-central Italy, including Sardinia and Corsica, there is a proliferation of engraved stelae and anthropomorphic figures (Robb, 2009; Laporte et al., 2011; Dolfini, 2020). While their social and symbolic significance is still debated, a speculative hegemonic male narrative (elite formation, warrior figures, ancestor worship, etc.) still persists.

Developments in Copper Metallurgy

The process of social complexification which characterizes the advanced Neolithic is not a linear and continuous phenomenon. The invention and development of metallurgy in the Mediterranean is a good illustration of the plurality of economic and social behaviors (Carozza and Mille, 2007).

In northern Greece, copper metallurgy was adopted early on, already by the start of the 5th millennium BC, and is connected to the local and independent development of metallurgy in the Balkans. At several sites (Promachon-Topolnica, Sitagroi and Dikili Tash), a limited number of copper objects (pins, needles, awls, pendants and beads) have been found in Late Neolithic contexts (Nerantzis et al., 2016). The nature and rarity of metal objects suggests that copper production was small-scale and integrated in other domestic activities. In south-central Italy, the first copper objects (awls and axe heads) appeared in the Late Neolithic. Metallurgy was most likely introduced here from the western Balkans via the eastern Alps and northern Italy (Dolfini, 2020).

In the northwestern Mediterranean, the first evidence of local metallurgical production is dated to the late 4th and early 3rd millennia in southern France (Capitelle du Broum). Some earlier evidence is known from south-eastern Spain (Cerro Virtud), from the mid-5th millennium (Rovira and Strahm, 2019). The products are often interpreted as the result of occasional household activity, but they are sometimes referred to as a workshop industry, meaning a collective and organized activity. However, metal objects, often found in funerary contexts, testify to the targeted production of symbolic items (ornaments, daggers), disseminated on a regional scale. Thus, it is reasonably inferred that metals were introduced into pre-existing circulation networks, without modifying the exploitation of bone and lithic raw materials that were cut or polished (Carozza and Mille, 2007; Obón Zúñiga, 2020). Furthermore, in certain regions, such as Provence, the presence of important lithic production centers (Oligocene flint from Forcalquier region) structured by vast circulation networks could have acted as a brake on the spread of metallurgy. The different technical spheres which competed with one another would have proceeded with reciprocal copies or imitations, reflecting the complexity of interactions and cultural transfers which took place during the Neolithic (Cauliez, 2019). Finally, throughout the 3rd millennium in France and Spain, local metallurgical production became widespread during the Bell Beaker period. Objects such as daggers and Palmela points then tended to be more standardized (Rovira and Strahm, 2019).

Summary and Future Directions

On the scale of the entire Mediterranean, the Neolithic was developing in diverse environments and on diverse cultural backgrounds over a period of almost 8000 years, from c. 12 000 to 4000 cal BC. This implies that the transformations which characterize the Neolithic way of life in this vast region did not occur synchronously. Throughout the long development of the Neolithic in the Near East (c. 12,000–6500 cal BC), Mesolithic hunter-gatherers inhabited the European part of the Mediterranean. The period between c. 8800 and 6500/6400—coinciding with general climatic improvement—appears to have been marked locally by numerous interactions, migrations and cultural upheavals. As migrant farming communities carried Neolithic lifeways with them across the western Mediterranean (from c. 6000 cal. BC), farming societies that remained in the eastern Mediterranean again underwent major socio-economic transformations that marked the beginning of the Chalcolithic. While the development of the Neolithic appears to show an “evolutionary” trend, from foraging to farming and social complexification, the process itself was far from linear, guided by the whims of nature and human choices.

As we contemplate the future trajectory of Neolithic research in the Mediterranean, the importance of promoting interdisciplinary collaboration among scholars from various Mediterranean regions is evident. The emphasis here should be on harnessing the power of multi-proxy approaches, which may also necessitate a thoughtful reconsideration of pre-existing paradigms.

In addition, there is an enduring necessity to deepen our understanding of the social structures that prevailed among the final hunter-gatherer communities in this region. This understanding should be framed within the context of the rise of agriculture in the Near East and the participation of indigenous European hunter-gatherers in the process of westward expansion. The early Holocene epoch was characterized by a vibrant and dynamic Mediterranean region, replete with diverse cultural entities each possessing unique lifestyles and roots. As such, there is a clear imperative to probe the interactions and relationships that evolved among these cultural entities—interactions among different hunter-gatherer groups, hunter-gatherers and farmers, and among disparate farming communities. Furthermore, we must place an urgent priority on directing research efforts toward regions hitherto inadequately explored, such as the African Mediterranean seaboard, the Ionian Sea, and central-western Taurus.

Taking a more localized perspective, there is an urgent need to re-evaluate existing data and initiate new research, again with an emphasis on the pivotal role of multi-proxy analyses and fostering an environment of international cooperation.

See Also: Africa, North: Neolithic and Predynastic Egypt; Asia, Southwest: Neolithic Onset of Modern Societies; The Neolithic and Chalcolithic of West Asia; The Neolithic of Temperate Europe.

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