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The transition to farming in Mediterranean Europe – an indigenous response

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ABSTRACT – Abstract. The transition to farming in Mediterranean Europe is discussed in the contexts of the DNA analysis of male chromosomes, female mitochondrial genetic gradients, the maritime pioneer colonisation model, the Mediterranean sea voyages in Mesolithic and Neolithic, the "PPNB Exodus" in Near East and the colonisation of southeastern Europe. It was argued that the hunters and gatherers at Ilipinar, in Franchthi and Theopetra caves, at Lepenski Vir and Padina were capable and ready to serve as a promoters of agro-pastoral farming in the course of which these communities could be expected to develop or to adopt and to modify agro-pastoral practices and pottery production and integrate them with existing subsistence strategies.

IZVLEČEK – *Prehod na kmetovanje v sredozemski Evropi obravnavamo v kontekstu DNK analiz moških kromosov in ženskega mitohondrijskega zapisa, morske pionirske kolonizacije, plovbe po Sredozemskem morju v mezolitiku in neolitiku, "PPNB eksodusa" na Bližnjem vzhodu in kolonizacije jugovzhodne Evrope. Ocenjujemo, da so lovci in nabiralci v Ilinira(ju), v jamah Franchthi in Theopetra ter na Lepenskem Viru in Padini sami razvili ali pa prevzeli, priredili in nato vključili posamezne dele kmetovanja in lončarstva v obstoječa gospodarstva.*

KEY WORDS – *Mediterranean; transition to farming; demic diffusion; migration; colonisation; DNA analysis*

INTRODUCTION

Despite many years of modern investigation into the transition from mainly hunter-gatherer Mesolithic to predominantly farming Neolithic societies, there remains a major unresolved problem in European prehistory, with the reasons for the transition and manner, rate and mechanism of this transformation all being subject to debate and controversy.

The very recent debate still underlines the importance of the issue, which has historical and anthropological, as well as political, implications. Historically, the transition to the Neolithic addresses the origin and constituent elements of the Neolithic and subsequent cultures in Europe. Anthropologically, it addresses the transformation of material cultures, processes of diffusion, interaction and adoption and their recognition in the archaeological record. Politically, it raises the question of European cultural identity, and of the genetic and linguistic roots of most present-day Europeans (*Zvelebil 1994(1995). 107*).

INTERPRETATIVE BACKGROUNDS OF FORAGER-FARMER INTERACTIONS

Embedded within the problem of the transition to the Neolithic lies the special issue of the mechanism of the spread of farming, which has often been polarised into a debate between the "diffusionists" and "indigenists". This aspect of the debate has particularly strong political connotations, as it addresses the relationship between the gene pools, language, material culture and ethnicity of present-day Europeans. Ever since Childe's seminal publication (The

Dawn of European Civilisation), it has become an established view to regard the adoption of farming in Europe as a case of the replacement of indigenous hunter-gatherers by farmers migrating from the Near East and colonising uncultivated areas in Europe.

Using the paradigm of the *Neolithic revolution* and diffusionistic assumptions, which claimed that Europe could not have achieved the transition from nomadic foraging to sedentary farming, Childe introduce *"oriental view"* of European cultural development, which also included an evaluation of European Prehistory *"as a story of imitation"* or *"at best an adaptation of Middle Eastern achievements"* and hypotheses that *"Mesolithic microliths in Europe are an expression of the stagnation of groups which were incapable of coming to terms with the difficulties of the natural environment"* (*Trigger 1980.66-67*).

A similar minimisation of the meaning of the European Mesolithic can also be recognised much later in other authors who formulated the complex cultural and historical picture of European prehistory. Thus Müller-Karpe treated Mesolithic cultures as a *"a microlithic cultural phenomenon"* lagging behind in cultural development (*Müller-Karpe 1976.19*). The diminution of the role played by Mesolithic groups in the neolithisation processes in Europe is still current. It is particularly evident in authors who formulate a holistic image of European prehistory on the basis of a linear cultural development and a succession of periods which linked mobile hunter-gatherer groups with the Mesolithic, and sedentary farmers with the Neolithic. This paradigm still maintains that Mesolithic and Neolithic artefact sets are culturally, chronologically and spatially mutually exclusive.

It is interesting to note also that in the context of the humanistic evaluation of the development of European civilisation in the 18th century, Rousseau was sceptical about the appearance of agriculture. It was his view that agriculture was a discovery that caused the first revolution, the civilisation of man, but destroyed humanity (*Harris 1981.3*). Unfortunately, the surviving historical records for the relations between foragers and farmers illustrated the destructive examples in the agricultural frontier zone. Herodotos, Strabo and Diodorus in 5th century BC describe hatred and destruction. The case of the Aithiopi and Garamanti is instructive. The former, hunters and gatherers living in caves, were hunted and killed in their territory by the latter, who were farmers (*Vencl 1982.662-670*).

There is some indirect evidence of inter-group and intra-group violence in European Late Mesolithic and Early Neolithic settlement contexts. First comes from the Große Ofnet (Fig. 1) and Hohlestein rock-shelters in southern Central Europe where human skulls were placed in shallow pits, often described as nets. At Ofnet, 34 skulls were found deposited in two "nests" and, it became clear from the very beginning that some of the skulls show definite signs of violence, indicating a violent death and beheading inflicted by polished stone axes (*Orschiedt 1998. 153,157*). The skulls seem to belong to a group deposited in a single event radiocarbon dated between c. 6400 and 6150 BC (*Hedges et al. 1989.224- 226*). At Hohlestein a child and an adult male and female were deposited after being killed and decapitated as attested by cut marks on the remaining cervical vertebra (*Orschiedt 1998.157; Gronenborn 1999.134-135*).

Fig. 1. Ofnet "skull nest" (After* Schulting 1998a. Figure 12.4*).

Violence in the Early Neolithic has been identified at Vaihingen, a fortified Neolithic settlement, where human bones from disarticulated skeletons in refuse pits were assessed to be more robust that those from ordinary burials in the refilled ditch surrounding the settlement (*Krause 1997, online*). It was suggested that the sturdier skeletons deposited in the disarticulated burials could be the remains of local hunter-gatherers leading a marginalized life within societies and having no rights to a proper burial (*Veit 1993.107-140; Gronenborn 1998*). It seems also that the transition to farming in the Lepenski Vir cultural context in the Danube region was not a peaceful process. Evidence of possible violence has been noted in the burial remains and has been

interpreted as resulting from violent confrontations between the indigenous and intrusive populations (*Voytek & Tringham, 1990.495*), although the traces of violence could likewise be explained by internal conflicts (*Radovanović 1996.42*). And we can not avoid the fact that a high proportion of apparent violence is reflected in human remains in Lithuania which were buried in the period of transition to farming in the Baltic region (*Antanaitis 1999.97*). These records are not in accordance with Zvelebil's model of forager-farmer interactions, suggesting that in the early phase of forager-farmer contact, cooperation would prevail *(Zvelebil 1994(1995).114–116; 1998. 16–21)*.

It has already been pointed out that in spite of the unavoidable fact that Herodotos and Childe are separated by two and half millennia, their ideological perceptions of farming and foraging societies are very similar (*Budja 1996a.69–71*). This perception maintains a cultural and ethnic zoning, with farmers linked to a civilised centre and foragers to the barbaric periphery of Eurasia. The frontier between civilisation and barbarism was defined as an agricultural frontier.

The agricultural frontier zone and the genetic palimpsest: the male and female stories

Perhaps the most popular version of the agricultural frontier is represented recently in the work of Ammerman and Cavalli-Sforza (*1984; 1995; 1996*). They determine the frontier as an "isochronic line of agricultural expansion in Europe" (*Ammerman, Cavalli-Sforza 1984.58–62, fig. 4.5*). Using the concepts of "demic diffusion" and "wave of advance" they anticipate a slow expansion of people into Europe that is driven by population growth resulting from agricultural surpluses, and either the displacement or absorption of the less numerous hunter-gatherer populations. They hypothesise that the rate of advance of agriculture into Europe is compatible with the estimation that the farmers, not farming, spread (i.e. by demic diffusion as opposed to cultural diffusion), assuming rates of fertility and mobility of early farmers comparable to those observed in ethnographically similar situations. In correspondence with the relocation of the agricultural frontier, shifting at a rate of 1km per year across the continent, demic diffusion is supposed to have had a dramatic effect on the European gene pool. The most important consequence is that the major component of the modern European gene pool derives from Near-Eastern Neolithic farmers rather than indigenous Mesolithic foragers. In other words, the European neolithisation process in the period 7500–5500 BP was exclusively the domain of Near-Eastern farmers who were allowed to plant their genes and farming practices across Europe and preserve their ethnic, cultural and social identity.

Ammerman and Cavalli-Sforza introduced into archaeology the principle of syntethic genetic maps, geographical maps of lines of equal value of the interpolated principal component values of gene frequencies of modern European populations. The overall topological similarity between one of these maps, the map of the first principal component (genetic landscape of Europe based on the distribution of the first principal component of the frequencies of 95 genes) and an archaeological map of radiocarbon dates of the earliest Neolithic settlement deposits in Europe leads to the conclusion that modern European populations as a "Neolithic package", arrived in Europe at 7500 BP, the beginning of the Neolithic (*Ammerman, Cavalli-Sforza 1984; Cavalli-Sforza, Cavalli-Sforza 1995.147–153, fig. 6.10; Cavalli-Sforza 1996.53, 57–65, fig. 4.1a*). The indigenous hunter-gatherer communities were deleted or absorbed, and their contribution to the subsequent development of the genetic and cultural history of Europe was insignificant. However, they believe in the story which was recorded in the genetic pattern produced by DNA from the Y (male) chromosomes (*Cavalli-Sforza, Minch 1997.274–251)*.

A different story is found in the pattern of mitochondrial DNA genetic gradients, giving us the female picture. An analysis of five major lineage groups with different internal diversities and divergence times in the European mitochondrial gene pool, which is based on phylogenetic and diversity analysis of the mitochondrial DNA sequence variations in the control region of Europe and the Middle East leads to the conclusion that the ancestors of the great majority of modern, extant lineages entered Europe much earlier, in the Upper Palaeolithic (*Richards et al. 1996.185–203*). On the other hand, geneticists strongly suggest that the spread of agriculture was a substantially "indigenous development, accompanied by only a relatively minor component of contemporary the Middle Eastern agriculturalist". However, they determine the pattern of lineages group (2A) originated in the Middle East and that several different lineages migrated into Europe, dividing into the western (2A–W, halotype 54) and central European (2A–C, halotype 52) clusters, but having little impact on the extant lineage. The ances-

tral halotypes of both groups reach back to Anatolia and the Middle East, implying at least two distinct founding lineages, and it is worth noting that these clusters in Europe do not overlap geographically or chronologically, in spite of being very widespread (Fig. 2). The age of the western lineage was estimated "in minimum age ~12 500 years" and "only 6000" years in central and northern Europe, although estimating the dates of origin of the observed patterns is admittedly difficult (*Richards et al. 1996.185–203; Chikhi et al. 1998.654*). The migration of lineages has been linked to the pioneer colonisation model, whereby there was "selective penetration by fairly small groups of Middle Eastern agriculturalists of a Europe numerically dominated by the descendants of the original Palaeolithic settlements." (*Richards et al. 1996.196,197*). The very well known Neolithic colonisation routes from the Near East through Europe, one through the Balkans to central Europe, and another across the Mediterranean to the Iberian Peninsula, have also been taken up to correlate the two halotype clusters with the process of neolithisation. Halotype 52 has to be linked to the genesis of the LBK culture in Central Europe, and halotype 54 to the cardial ware cultural complexes of the Mediterranean coastline and Atlantic west.

It is suggested, then, that in the 13 millennium BP the small group of middle Eastern farmers (west European lineages) migrated to the Iberian Peninsula. Although having little impact on the extant foraging lineages, they alone initiated the genesis of the west Mediterranean Neolithic cardial cultural complex and farming economy in the region. This interpretation fits almost perfectly with Zilahao's maritime pioneer colonisation model, which assumed that the spread of the Neolithic around the northern coasts of the Mediterranean had involved not just the circulation of ideas, artefacts and resources but also people, if we exclude from consideration the calendriacal time as the first variable (*Zilhão 1997.19– 42*).

Archaeological upgrade: "*maritime pioneer colonisation*" and "*the dual model*"

The maritime pioneer colonisation model demonstrates that Neolithic farmers and herders reached the Mediterranean and Atlantic coast of the Iberian Peninsula in the 7th millennium BP. At the level of radiocarbon dating resolution the process was described as a punctuated event, objectified in the mutually exclusive settlement patterns of an early Neolithic Cardial culture and late Mesolithic shell mid-

Fig. 2. Two currents of movement characterise the colonisation routes of Middle Eastern agriculturalist into the Central Europe (halotype 52 cluster) and Iberian Peninsula (halotype 54 cluster). Source: **Richards et al. 1996.185–203.**

dens. The settlement distributions, although contemporary, were geographically segregated, the former being concentrated in the interior limestone massifs, where no signs of putative late Mesolithic ancestor groups were known, and the latter around the large estuaries of the Rivers Tagus, Sado and Mira. In other words, the earliest Neolithic settlements occur in areas, or "enclaves", between the nuclei of late Mesolithic catchments (Fig. 3). The interpretation of the pattern suggests that the initial settlement had been established by small Neolithic seafaring groups in areas that were not (or were being marginally) exploited by local hunter-gatherers, followed by a more or less delayed assimilation of the latter into the new economic system (*Zilhão 1993.50; 1997. 19–42*). It was also assumed that these colonists "brought their own language with them" which could be placed in the Indo-European language group, and could be developmentally linked to the Levantine pre-Neolithic "Proto-Nostratic" linguistic core and Late Natufian culture (*Renfrew 1996.79–82; Harris 1996.557*).

It was hypothesised that the most westerly colonies appeared at the same time in geographically distinct, but environmentally similar regions in the Algarve to the south, and Estremadura on the north of Atlantic coast of the Iberian Peninsula. The cardial settlements of Cabranosa and Padrão in the Algarve, located only on the south-western end of the European continent, are dated in 6500 ± 70 BP and 6540 ± 70 BP (*Zilhão 1997.36*). In Estremadura there are few ^{14}C dates available within the range of 6870 ± 210 BP (*Zilhão 1992.152*) and 6130 ± 90 uncal BP *(Rowley-Conwy 1992.237*) from Caldeirão. However, it is suggested that a farming economy was present in Estremadura "since at least 6300 BP... and probably as early as 6700 BP" (*Zilhão 1997.19*).

A similar situation has been identified in the Mediterranean region of the Iberian Peninsula. The "*dual model* " of the transition to farming in Spain available recently proposes that there were "external" farming groups involved in the process of neolithisation in the region (*Bernabeu Aubán 1996.37–54; 1997.1–17; 1999.101–118*). Two primary centres of colonisation, located around the mid-low course of the River Llobregat in Catalonia, and along the Alcoi and Serpis river courses in Valencia have been recognised in the region. Using the available radiocarbon dates, Bernabeu Aubán dated the beginning of colonisation to the period within 6820 ± 70 uncal BP

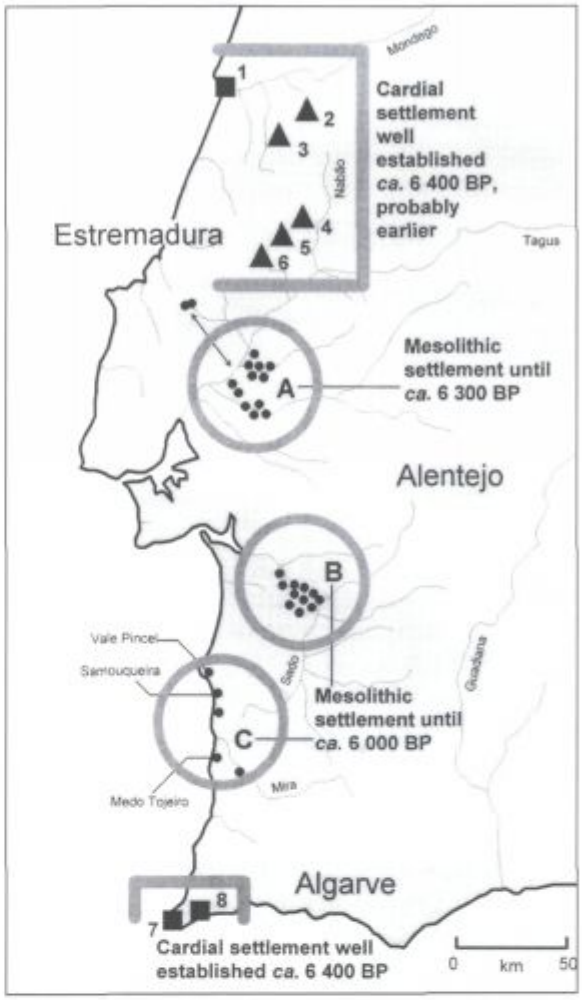

Fig. 3. Settlement clusters of indigenous forager's settlements and logistic camps and contemporaneous farmer's colonies on the Atlantic coast of the Iberian Peninsula. (after* Zilhão 1997.Fig 1*)

and 6680 ± 290 uncal BP (*Bernabeu Aubán 1997. 10; 1999.107–110, Fig. 13*)). The colonisation was spatially and demographically limited to coastal areas (*Bernabeu Aubán 1999.107–111.Fig. 8c*). Forager's settlements of the "Geometric Complex" are randomly dispersed in the region, whilst the contemporaneous "Cardial Complex" of farmers settled niches with highly productive soils and optimal climatic conditions (*Bernabeu Aubán 1997.13, Fig. 10)*. A similar pattern has been recognised in pottery distribution. There were two pottery groups identified in the region within the time span of ca. 6800 bp to 5800 bp. The first was identified as the Neolithic Cardial Complex and linked to the farmer's settlement pattern. The distribution of the later group overlapping with the forager's settlement pattern has been correlated to "the ceramic phases of the Mesolithic Complex" [1] (*Bernabeu Aubán 1999.106*).

1 The pottery group is identified as epicardial. Analysis has shown that pre-existent Mesolithic groups (Geometric Complex) adopted Neolithic pottery technology first, and then adopted domesticated resources (*Bernabeu Aubán 1999.106–111*).

The models suggest that the circulation of people in the western Mediterranean have resulted in a punctuated colonisation of the Iberian Peninsula and, that the spread of agro-pastoral economies along the northern Mediterranean shores had been much faster than was predicted by Ammerman's and Cavalli-Sforza's wave of advance. Despite some doubts (*e.g. Dennell 1983; Lewthwaite 1990.541–542*) there is general agreement that Neolithic farming, as a system, was introduced to the west Mediterranean from the Near East, and that the Neolithic had indeed appeared as a complete package with cardial decorated pottery as its most emblematic feature.

On the Atlantic coast of the peninsula, settlement patterns indicate that the settlement clusters of farmer's colonies were isolated from each other by the contemporaneous logistic sites (shell middens) used in the indigenous framework of hunter-gatherer settlement subsistence systems. There are two alternative interpretations as to what happened in the epicardial period, around 6000 BP, after four hundred years of coexistence and interaction between the systems. The first is recognised as the slow, gradual, piecemeal adoption of several elements of the "Neolithic package" by local hunter-gatherer groups. The second hypothesises an expansion of farmer groups and/or the assimilation of local hunter-gatherer groups due to the superior demographic potential of agricultural societies.

The hypothesis of the neolithisation processes on the Mediterranean coast of the Iberian Peninsula is slightly different. Farming groups that had been introducing agriculture and establishing "primary centres of colonisation" continued to integrate into the settlement subsistence network the most favourable lands. The interaction between the expanding farmers and the indigenous foragers has been described as an adoption of "more technological than economic innovations". Hunters and gatherers are supposed to have accepted and distributed pottery from the very beginning, but domesticates were not adopted before 6000 uncal BP – 5500 uncal BP (*Bernabeu Aubán 1997.14; 1999.111*). Late subsistence changes have also been identified in Brittany much further north along the Atlantic coast, where the stable isotope data suggest the continuation of a Mesolithic economy into the period traditionally seen as the middle Neolithic (*Schulting 1998.211–212*).

However, we have to point out the facts that the large majority of known early Neolithic sites on the Iberian Peninsula are caves or rock-shelters, and that villages became the norm only from the middle Neolithic onwards. With all due respect to the motto "absence of evidence is not evidence of absence", it has to be pointed out that no direct evidence of agriculture has yet been found on the Iberian Peninsula that could have correlated with the initial colonisation. Cereal agriculture appeared a few hundred years later, but as far as pastoral economies are concerned, analysis has revealed a high proportion of domesticated ovicaprines from the beginning of colonisation onwards (*Zilhão 1997.23–26; Bernabeu Aubán 1997.11–12*).

MEDITERRANEAN SEA VOYAGES IN THE MESOLITHIC AND NEOLITHIC

For the Mediterranean no direct evidence has survived, either in the form of actual boat remains or of artistic representations to indicate the size and nature of the craft that carried the first farmers across the Mediterranean, although the odds are that up to the early Holocene, Mediterranean increasingly represented less of a barrier and more of a bridge (*Lewthwaite 1990.541–555; Binder 1989. 199–226; Guilaine 1994; Masseti and Darlas 1999, online*). The prehistoric sea-going craft of the Mediterranean and the Near East have received considerable attention recently. The evidence from Franchthi Cave demonstrates that the island of Melos (in the Aegean Cyclades) was exploited as a source of obsidian in early Mesolithic times (*Perlés 1990.48–49*), although there is no evidence of permanent settlement on the island before the Neolithic. Obsidian, however, occurs at only two localities on a single island in the Aegean archipelago and it is reasonable to assume that the finding of obsidian on Melos was merely a chance by-product of a widespread pattern of movement and exploration throughout the island; the distance travelled is estimated to have been up to 19 nautical miles (*Cherry 1985.15*).

The same pattern of seafaring movement, identified in the Mesolithic colonisation of the island prior to 9000 BP has been documented on the Hebrides in the Atlantic (*Edwards and Mithen 1995.348–365*). On Cyprus, in the eastern Mediterranean, short-term hunting camps of the Akrotiri culture have been connected with hunts for endemic mammals at the end of the 10th and the beginning of the 11th millennium BP (*Cherry 1990. 149–157; Simmons 1991. 857–869; Lax and Strasser 1992.209 Masseti and Darlas 1999. online*). It is interesting that the assemblages of chipped stone artefacts found together with

a huge quantity of bone of extinct endemic fauna were similar to Natufian and early pre-pottery Neolithic artefact sets from the Levant (*Simmons 1991*). Moreover, the island was colonised a millennium later (Khirokitia culture), and there is certainly no evidence of continuity in settlement or coexistence between the hunter-gatherer and farmer communities (*Cherry 1990.149–157; Simmons 1991.857–867; Rizopoulou-Egoumenidou 1996.183–187*). It seems therefore reasonable to actualise the idea of the "*PPNB exodus*", which may not be an isolated event, but an extension of a process of colonisation already attested in Near East (*Perlès 1994.648–49; Cauvin 1989.14–24*), and to link it to the hypothesis that migrant farmers were capable of undertaking sea voyages (*Broodbank & Strasser 1991.233–245*).

The Maritime Colonisation of Mediterranean Islands

However, that the colonisation did take place by sea is amply documented on Crete. Colonising farmers entered the island where no earlier occupation is known close to 8050 ± 180 uncal BP (*Demoule and Perlès 1993.364–365)* or 7910 ± 140 uncal BP (*Bloedow 1991.39–43; Broodbank & Strasser 1991.233–245*). The arrival was linked to the "aceramic deposit" in Knossos, where a complete "Anatolian-Balkan Neolithic faunal and floral" package, with no indication of filtering, and the indirect evidence of a high level of clay technology have been found. After this initial phase of an estimated 140 years, the evidence of permanent architecture and intensive pottery production similar to those found in Asia Minor or even the Syro-Palestinian coast come to light (*Bloedow 1991.43; Davaras 1996.92*). It is possible, therefore, to speculate that one of those regions was the point of origin from which farmers reached Crete. Even more, it is hypothetically possible to link the colonisation of Crete with the "general collapse of the cultural system" and the depopulation of the intensively inhabited regions in South-eastern Anatolia and the Near East which happened during the final stage of the pre-pottery period (PPNC) (*Özdoğan 1998. 35*). It is broadly accepted that the migrations did not take place simultaneously all over the Near East and that the primary groups must have been few, but with enough impact to stimulate a chain reaction. However, most settlements were abandoned, and in those that continued shrank in size, public buildings were abandoned etc. (*Cauvin 1990.191–204*). It is interesting that this depopulation of the Near East and South-eastern Anatolia corresponds to a period of rapid colonisation in Central and Western Anatolia. The similarities in the assemblages indicate the presence of an endemic movement from East to West, which must be understood as a continuous infiltration of groups originating from various parts of the Near East (*Özdoğan 1997.13–17; 1997.35; Özdoğan and Gatsov 1998.223*). There is considerable discussion as to what led to the circulation of the Neolithic population. Were they social tensions and economic changes or climatic fluctuation? An interesting idea was advanced recently by Özdoğan. He speculates that the reason for the migration "...was a social turbulence that took place by the end of the PPNB in the Near East that stimulated an influx of people in small groups to the West. They carried on almost all aspects of their culture with the exception of centralised authority." And in consequence "...throughout the Neolithic of Anatolia and South East Europe, a much more egalitarian rural economy seems to have been implemented than the centralised system of Syro-Mesopotamia." (*Özdoğan 1997. 16–17*). There are indeed clear indications of social stratification and hierarchy available in PPNB settlement palimpsests. At Çayönü "...within the immediate periphery of the specifically reserved cultic areas, there are living quarters which were separated from the rest of the community; there the buildings are bigger, better built and possess what can be called status objects." (*O.c. 10*) These objects were linked to an elite group, evidently in control of spiritual and probably other aspects of the community. Dominance in the community is reflected in the rigid order of the settlement organisation, deliberately designed burial houses and in the construction of plaster floors that evidently needed the extensive organisation of labour.

The maritime colonisation of Cyprus and Crete in the Aegean archipelago was an isolated process, but if we look for Mediterranean island colonisation broadly contemporary with that of Crete and Cyprus, examples are found far to the west on Sicily, Corsica and Sardinia. Whether the farmers brought their social elite with them or not, Neolithic island colonisation involved not only a conceptual shift from the Mesolithic usage of the sea, but also a distinct shift in nautical technology and in the design of boats. It was hypothesised that the total scale of transportation for a mere 40 human colonists and their accompanying cargo, including grains and animal package was 15 400–18 900 kg (*Broodbank & Strasser 1991. 240*). The cargo makes it necessary to imagine a flotilla of 10–15 boats carrying one or two tonnes of cargo each for a relatively small-scale colonisation

Fig. 4. Mediterranean Sea Voyages and accompanying cargo (after* Broodbank & Strasser 1991.240*), including colonists and "Neolithic package".

(Fig. 4). For the East Mediterranean no evidence has survived, either in the form of actual Neolithic boat remains or artistic representations to indicate the size and nature of the craft that carried farmers and "Neolithic package" on the islands. The earliest rock carving of a longboat on Naxos is dated to the Aegean Cycladic Early Bronze age (Fig. 5) (*Cherry 1985.22–23, Fig.2–6*). In modelling the process of colonisation, Williamson & Sabath made the important point that human groups are well aware of the demographic instability of small populations. If the colonisation is intentional and voluntary, a decision concerning group size is taken less with a view to the hypothetical minimum that might succeed, than to the larger number of individuals that the colonising society considers will succeed. Deliberate colonists set out in groups that expect to make it, rather than ones that might or even might not be successful (cfr. *Broodbank & Strasser 1991.240*). The "safe size" on Crete is speculative, but has been estimated that the basic settlement unit appears to be between 40–200 inhabitants (l.c.). Little is known with any certainty about their behavioural and logistic patterns, which hypothetically could have altered the Cretan landscape to the point at which they caused the extinction of the island's endemic fauna (*Lax and Strasser 1992.203–224*).

Whilst the Neolithic settlement's palimpsests, which are clearly connected with the beginnings of farming on Cyprus and Crete, show the movement of farmers, the evidence on Sicily, Sardinia and Corsica, the central and western Mediterranean islands fits far better with the prediction of a long period of acquaintance and experimentation with the new resources by the indigenous hunter-fisher-gatherers before farming became the dominant mode of subsistence.

A model of the slow transition to farming was originally proposed by M. Zvelebil and P. Rowly-Conwy fifteen years ago (*Zvelebil 1990.10–13*).[2] On Sardinia and Corsica, central and western Mediterranean islands, the spread of agro-pastoral economies and the transition to farming began with the piecemeal introduction of pottery and some domesticates, par-

2 The model distinguishes an availability phase, when foraging is the principal means of subsistence, and domesticates and cultigens constitute less than 5% of total remains; a substitution phase, when farming strategies develop, but foraging strategies are retained, and domesticates and cultigens comprise about 5–50% of total remains; and a consolidation phase, when farming is the principal mode of subsistence and domesticates and cultigens comprise more than 50% of total remains (*Zvelebil 1990.12*).

ticularly sheep, and their adoption as prestige items of exchange amongst the hunter-fisher-gatherers' social elite, having been acquired through a long-distance exchange network (*Halstead 1989.23–53; Barker 1996.109*). In conformity with the "island filter model" it was hypothesised that the paucity of large mammals on the Tyrrhenian islands stimulated the rapid adoption of animal husbandry as the major subsistence strategy before the acceptance of crop cultivation. (*Lewthwaite 1990.543–545,547–549*).

On Sicily, a "faunal and floral" package without any indication of filtering was identified in the context of an "aceramic occupation phase" in the Uzzo cave on the northwest coast of the island. Costantini pointed out the close chronological concordance and similarity in the appearance of species of cultivated plants in "an aceramic occupation phase" in the Uzzo cave (7910±70 BP) on Sicily and the Franchthi cave (7980±110 BP) on Peloponnese (*Costantini 1989.202*)[3]. It is interesting that the only difference documented in both deposits is in the type of wheat cultivated: *Triticum monococcum* in Uzzo and *Triticum dicoccum* in Franchthi. The remainder of the "Neolithic package": *Hordeum vulgare and Lens culinaris, Ovis/Capra, Bos taurus* and *Sus domesticus* was the same. The transition to farming at the Uzzo site is supposed to have been a gradual process, with no marked traumatic changes in subsistence; in other words, there was no change during the Neolithic either in the continuation of marine resource exploitation, or in the gathering of wild plants. The only exception was the appearance of the wild olive and fig (*Costantini 1989.202–203; Grifoni Cremonesi 1996.72*).

In contrast to the eastern Mediterranean the appearance and distribution of obsidian tools on Sicily, Sardinia and Corsica correlates strictly with the appearance of Cardial pottery and with the expansion of village-based farming. It is interesting that in the central and western Mediterranean, obsidian was not used before the Neolithic, although Tykot hypothesises that the sources must have been known to the hunters and foragers on the Aeolian Islands and, that virtually all obsidian artefacts found in the central and western Mediterranean come from sources located on four of those islands: Lipari, Palmarola, Pantelleira and Sardinia (*Tykot 1996.46,65*). If we accept the idea that obsidian signified social importance and prestige values in the context of exchange networks and long-distance connections in the eastern Mediterranean even before the Neolithic and the hypothesis of a seafaring farming colonisation from the East, it is extremely surprising that obsidian from Melos should have been found at only a single site in the central and western Mediterranean (*O.c. 42*). Moreover, we should not overlook the broadly accepted fact that the Aegean and Thyrrenian obsidian distributions have been exclusive from the very beginning (*Renfrew 1977.71–90; Perlès 1992; Tykot 1996.fig.10*).

The Sicilian obsidian artefacts were presumed to have originated on Lipari Island, 10 nautical miles

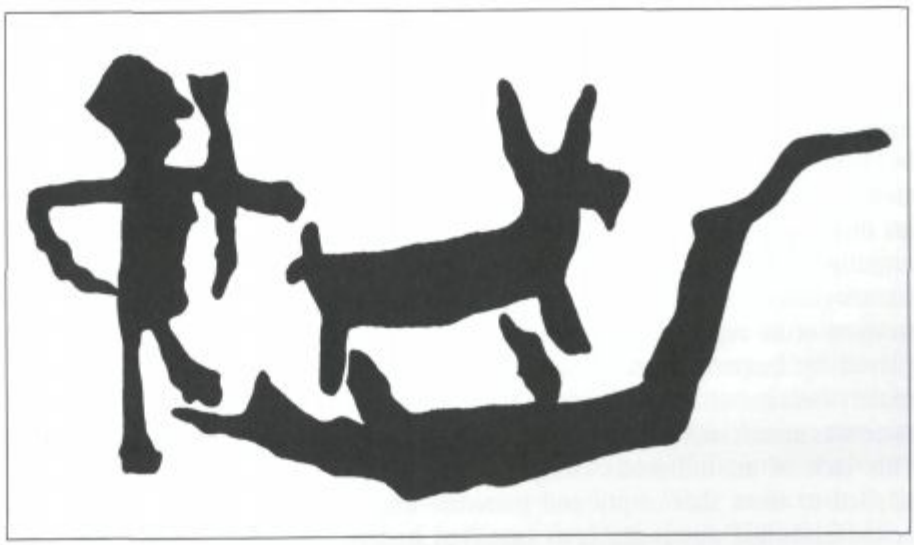

Fig. 5. Rock carving from the site of Korphi t'Aroniou in southeast Naxos, dates to the Early Cycladic period, provides illustration of Mediterranean Sea Voyages and accompanying cargo (after* Cherry 1985.Figure 2–6*).

3 Costantini believed he correlated uncalibrated dates 7981±105 bp in Franchthi and 7910±70 bp in Uzzo (*Costantini 1989.202*; see also the notion in *Harris & Hillman (eds.) 1989.xxxiii-1*). However, the correct chronological positions for both deposits are as follows: in Uzzo 7910±70 BP (*Grifoni Cremonesi 1996.72*); and in Franchthi: 7980±110 BP, calibrated to 2σ 7210 – c.6500 BC (*Jacobsen, Farrand 1987.Plate 71; Vitelli 1993.Table 13*).

away. Surprisingly, more then 40% of the obsidian artefacts found in the Uzzo cave came from Pantelleria Island, which is close to the African mainland, almost 60 nautical miles away. Pantelleria is presumed to have been the source of most of the obsidian artefacts found in North Africa, and it is reasonable to suggest a correlation between Pantellerian obsidian distribution and continual sea voyages and the spread of domesticates from the North Africa to Sicily (*Tykot 1996.58–59*). On the other hand, the high rate of obsidian artefacts in Uzzo allows us to hypothesise that the farmers from Sicily had direct access to the obsidian source on Pantelleria, and their own local production of obsidian tools; that is, there is no straightforward link in principle between the distribution of sources and that of production centres (*Perlès 1992.125–130*). It must be noted that the local, Sicilian domestication of cattle and pig was recently confirmed (*Grifoni Cremonesi 1996.73; cfr. Bökönyi 1988–1989.371–385*). It fits perfectly with Bökönyi's evaluation that "...complete Neolithic domestic fauna containing all five domestic species appeared in southeast Europe some 500 years earlier, around 8500 years ago..." than in southeast Asia (*Bökönyi 1994.393*).

The "PPNB Exodus" in Near East and the Colonisation of South-eastern Europe

In tracing the transition to farming at the regional and continental level it is broadly accepted that the Peloponnese and the tip of the Balkan Peninsula constitutes the contact zone between south-eastern Europe, Anatolia and the Middle East. And, there seems to be broad agreement that in this zone, whether through demic diffusion or migration, farmers entered primarily into the Europe. Although it has become an established view to regard the adoption of farming in Europe as a case of colonisation, an increasing number of "indigenists" have been arguing for the local adoption of farming by local hunter-gatherer communities throughout Europe or in most of its regions. The diminution of the role played by hunter-gatherer groups is still current mainly because of the assumption that the contact zone was almost uninhabited in the early Holocene. This lack of an indigenist component has been applied to show that empty and therefore uncontested landscape was available to Anatolian settlers. It is worth remembering the taphonomic filter – the lack of research thorough enough to justify the inference that the zone was actually uninhabited (*Andreou, Fotiadis, Kotsakis 1996.596–597*).

However, the neolithisation of the contact zone was described as "a fully exogenous process" linked to the "PPNB exodus" in the Near East (*Perlès 1994. 646–649*). A new model of demic diffusion into Europe has recently been published by van Andel and Runnels (*1995.481–500*). The model was based on four basic assumptions: (1) that the Neolithic advance in the southern Balkans proceeded mainly in areas not occupied by an indigenous population; (2) that the migrating farmers preferred to occupy the flood plains of rivers and lakes, as in the environment in the Konya Basin in central Anatolian; (3) it was not only population growth immediately behind the front of "the wave of advance" that drove demic diffusion, but environments – fertile floodplains large enough and available at a considerable distance from each other, supporting populations ultimately large enough to start the next migratory move, and (4) it was the Larissa plain in Thessaly, the only region in Greece that provided a reasonably assured harvest and was large enough for significant population growth. All these assumptions have been already criticised (*Andreou, Fotiadis, Kotsakis 1996.596–597; Wilkie & Savina 1997. 201–207*) the third one the most sharply, as "...their own calculations fail to substantiate the population growth rates necessary for such a model to operate." (*Zvelebil 1998.412*). That is to say that, even in the Larissa plain, it took too long, some 1500 years, to reach "saturation" and demic diffusion into the nearest floodplains large enough in Macedonia and Thrace. The initial demic diffusion into the Larissa plain has been correlated with the "preceramic" level in Argissa (*Demoule and Perlès 1993.365–366*), although a re-examination of the "Preceramic Neolithic" sites in the region clearly shows that the pottery was found and documented in all the "aceramic strata" (*Bloedow 1991.1–143; Gallis 1996. 61*).

The concept of an "aceramic Neolithic cultural phase" in Europe similar to those in the Near East was introduced V. Milojčić in the 'sixties to support idea that all the inventions took place in the Orient and the domesticates and pots came to Europe as part of an already developed tradition. An aceramic phase implies the introduction of farming and herding at the beginning, and the later introduction of pottery as a second influx of "influence" (*Milojčić 1952. 313–318; 1956.208–210; 1960.320–335*). Milojčić identified an "aceramic stratum" in Argissa Magoula and his results were soon followed by the identification of a similar phase at other sites in the region, so that in the 'seventies Theocharis could claim five

aceramic sites: Argissa, Sesklo, Soufli, Achilleion and Gediki (*Theocharis 1973.35*). As far as pottery production is concerned, Bloedow believes that there is no evidence available of any incipient experimentation in pottery making in the region, and when pottery containers appear, the technology is already advanced. We have mentioned already that, "absence of evidence is not evidence of absence", but this does not necessarily disprove the idea that at least the knowledge of clay technology came from outside Europe. At the same time, cultural discontinuity between Mesolithic hunter-gatherers and Neolithic farmers is broadly accepted. On the basis of the standardised production of blades in Argisa, most probably produced by using the complex pressure-flaking method of debitage, it was concluded that there is no argument for the local evolution of lithic production (*Perlès 1990.130–136; Bloedow 1991.18*). And it is almost a matter of course that the complete "Anatolian faunal and floral" package, without any indication of filtering has been found (*Demoule and Perlès 1993.362,365–366*).

However, it is worth remembering that van Andel & Runnels have been dealing with non-representative settlement patterns[4] and that the settlement tells in the Larissa floodplain were temporary and not permanent, being occupied only outside of the flood seasons. The analysis of soil history shows that floods in the region were quite frequent during the period of incoming demic diffusion from Anatolia. The choice of site for repeated occupation and the permanence and continuity of that occupation has already been discussed, and doubt about year-round occupation has been shown very clearly (*van Andel et al. 1995.131–144; Whittle 1996.49–54*). The "preceramic levels" on all the sites were thin, with no definite structures other than ditches and pits, and there were sterile layers separating these levels from the Early Neolithic ones. Extrapolation from the radiocarbon dates has suggested a maximum duration of 200 years (*Bloedow 1992/93.56*). We would speculate that the initial agriculture was not so intensive as it is hypothesised in the estimation that "...the Thessalian floodplains as floodplains have done elsewhere, offered Neolithic farmers dry dwelling places and much arable land on abandoned levee/channel systems..." (*van Andel & Runnels 1995.490*). Our speculation is in complete agreement with the recent work carried out by Willis and Bennett (*1994.327; Willis 1995.9–24*) suggests that the archaeobotanical evidence is recording early farming communities that were small in size, and occupied sites on a short-term basis without a significant impact upon the landscape. The impact of agriculture is not in evidence until ca 6000 BP, which is not to say that farming did not occur earlier, but that it had a negligible impact on the landscape.

AN INDIGENOUS RESPONSE (Fig. 6)

Alternative data are still available in the cave deposits in the Theopetra cave in eastern Thessaly. In the Mesolithic deposit, which has been chronologically fixed by seven radiocarbon dates as ranging from ca. 9780–6700 BC, *Horedum vulgare*, *Triticum boeticum*, wild goat, pig and "primitive pottery" have also been found. It should be pointed out that the Mesolithic has been dated for the first time in Thessaly and stratigraphically separated from both Neolithic and Paleolithic deposits. Interestingly, the lithic industry does not seem to be typical of the Mesolithic as known from other European or Greek littoral sites. The assemblage consists of a large number of flakes but no baked bladelets or geometric microliths, and no evidence of the microburin technique (*Kyparissi-Apostolika 1998.247,249; 1999. 237–238*).

The interpretation of the process of transition to farming in the Argolide on Peloponnese was based on the decoded palimpsest of Mesolithic/Neolithic transition in the Franchthi cave. In contrast to Thessaly, an indigenous hunter-gatherer tradition in flint working techniques is clearly presented (*Perlès 1990. 135; Demoule and Perlès 1993; 365,368*). Pottery appeared beside the complete faunal and floral package in the initial, "aceramic" Neolithic. However, here it is interesting to note that "...the abrupt increase in quantity and varieties of pottery..." in the following phase "...points to abrupt change in cultural practices and possibly to a hiatus in site use." (*Vitelli 1993.39*). In other words, abrupt changes happened 200 years after the initial introduction of the farming economy and pottery production if Bloedow's (*1992/93.56*) calculation of the available radiocarbon data is correct. Wild barley, oats and lentils were adopted as part of the subsistence strategy in the late Palaeolithic. While an increase in the use of both was detected about 9300–9100 BP, a "sickle-gloss" on a stone tool that could relate to har-

4 258 Neolithic settlements have been identified in the eastern Thessalian plain and both the hilly and mountainous regions surrounding it. During the Early Neolithic 35–50% of settlements were located in a hilly or mountainous region (*Gallis 1996.64*).

Fig. 6. Cluster of indigenous forager's settlements in south-eastern Europe and north-western Anatolia capable and ready to serve as a promotion centres of agro-pastoral farming in the course of which process these communities could be expected to develop or to adopt and to modify agro-pastoral practices and pottery production and integrate them with existing subsistence strategies.

vesting was identified after about 8700 BP in botanical zone V, corresponding to the later part of the upper and the final Mesolithic lithic phase from about 9000 BP to 8000 BP as defined by Perlès (*Hansen 1991.135,161,169; cfr. Perlès 1990*). The paucity of botanical remains in the Late Mesolithic has been interpreted as a decrease in intensity of occupation of the cave that may have been the results of either a seasonal pattern or periodic longer abandonment. In the following, early Neolithic sequence (i.e. zone VI) an abrupt change in the botanical record was identified. The hypothetical absence of wild oats and barley on the one hand, and the appearance of emmer wheat and two-row hulled barley, along with domestic ovicaprids on the other, have been interpreted as proof of the sudden appearance and external origin of the Neolithic agricultural system at the Franchthi cave and in northern Greece (*Hansen 1991.161,169–170,182–183*). Whereas a hypothetical discontinuity between the Mesolithic and the Neolithic is seen in the fact that the wild cereals, oats and barley completely disappear from the botanical record before the appearance of domesticated cereals, while other species previously present, such as lentils, pistachio, almond and pear continue to be exploited. In addition, it was emphasised that "...there is no positive evidence of cultivation prior to the sudden appearance of domesticated emmer wheat and two-row barley." and that the increase in lentil size apparently coincides with these domesticates (*O.c. 163*).

Although the idea of an abrupt change in the botanical record was broadly accepted (*Halstead 1996. 299*), and the "indigenists" in debate with "diffusionists" have already been labelled as "reactionist" (*Özdoğan 1997.2),* some further thoughts on the restrictions connected with the definition of artefact and ecofacts sets in Franchthi cave should be considered. The taphonomic filter can be traced at the documentary and interpretative levels, primarily in connection with inadequate sampling, (mis)understanding of the formation processes of the deposits, and stratigraphic contexts, etc. Hansen herself has pointed out very clearly that the absence of wild oats and barley in the Neolithic botanical sequence "...could be the result of a sampling problem, in that the final sieving and cleaning of the plants to remove the larger weeds may not have taken place in an area that has not been excavated, or in the Neo-

lithic village on Paralia, where plant remains have not been preserved." (*Hansen 1991.142*). Sampling and water sieving had been limited to two small excavation units located beside one another (FAS and FAN). We believe that the interpretative relevance is weak beside the unrepresentative sampling pattern mostly because of the exclusive results of the sampled units. Namely, in the FAN interzone V/VI (i.e. Mesolithic /aceramic Neolithic interzone) "...several units contain both oats and emmer wheat (*Triticum turgidum ssp. dicoccum*), while in the same interzone FAS the first appearance of emmer wheat is in the unit above that containing the last appearance of oats." (*O.c. 24–5,138*). Inconsistency in determining the chronological and cultural context of "an abrupt" change is also intriguing. While the abrupt change in the botanical record has been embedded within the discontinuity between the Mesolithic and the Neolithic and linked to the sudden appearance of Neolithic farming and herding, there was no discontinuity in flint working techniques (*Perlès 1990. 135; Demoule and Perlès 1993.365*). It appears later, parallel with the abrupt change in pottery technology, which was identified 200 years after the initial introduction of the farming economy to the "ceramic" Neolithic (*Vitelli 1993.39; Bloedow 1992/ 93.56*). Changes have more in common with Neolithic open settlements in Thessaly than with Mesolithic Franchthi. The same pictures emerge from the study of marine molluscs from the cave, which exhibit continuity in the mollusc assemblage dominated by *Cerithium vulgatum*. A change to a more mixed assemblage occurs in the "ceramic" Neolithic. It was suggested that these changes correlate with the founding of the open settlement at Paralia outside the cave, based on a sedentary, mixed farming economy (*Halstead 1996.300*). However, it might be realistic to link the change to a corresponding rise in sea level, when the transgression reached a short distance to the settlement (*van Andel and Sutton 1987.44*).

The long-term cultural continuity in the Mesolithic and the initial Neolithic in Franchthi has been interpreted as an expression of cultural identity (*Perlès 1990.135; Demoule and Perlès 1993.365,368*), and it is reasonable to hypothesise that the transition to farming in Argolide was an autochthonous process, although the introduction of at least some domesticates has been thought suggestive of immigrant farmers. However, plant remains, harvesting and plant processing, as well cattle and pig hunting, hint at Mesolithic pre-adaptation to the use of cultigens. Moreover, it is no coincidence that in Franchthi before 9000 BP, lentils were roasted prior to being ground or pounded into a coarse flour, and they are wide enough in diameter to be identified as domesticated (*Hansen 1991.124,138*).

In the case of barley the genetic data indicate that the domestication event was polyphylethic, which means that the crop has been taken into cultivation more than once and in different places (*Zohary 1996.155*). And, it is important to know that the detection of the start of cultivation is problematic and that cultivation prior the domestication can be recognised only from indirect evidence, not from the remains of the crops themselves. The experimentally-based model of Hillman and Davies (*1990.157–222*) suggests that, once the wild types of cereals were under cultivation, morphologically altered domestic forms could have "taken over" the crops within two centuries if the cultivators used harvesting methods favouring the domestic mutants and, while these methods would have offered the cultivators some immediate advantages, some groups may well have used methods which left their crops in the wild species state for centuries or millennia. In addition, even when domestication-inducing methods were applied, the harvesting of genetic infiltration of wild type genes from nearby populations of wild cereals, could have caused domestication to take many centuries. It is inevitable even with the most rapid domestication that these genes would have ensured that the crops continued to contain an admixture of wild forms. This "genetic contamination" resulted in a correspondingly protracted period of "pre-domestication cultivation". This effect, combined with the inherent problems of distinguishing wild and domestic cereals from charred remains, ensures that the detection of continuing domestication in the archaeological record is extremely difficult (*Hillman 1996.194, see also Hansen 1991.173*). While it is possible, therefore, that barley and lentils had reached at least the level of "pre-domestication cultivation" in Franchthi and in Argolide (*Zohary 1996.145,155*), there is no evidence for local wild progenitors of emmer and einkorn wheat (*Hansen 1991.138,145*), which means that *Triticum turgidum subsp. dicoccum* (*T. dicoccum*) and *Triticum monococcum subsp. monococcum* (*T. monococcum*) must have been introduced from Anatolia or the Near East. There is also no evidence for *Triticum monococcum ssp. aegilopoides* (*T. aegilopoides*), another einkorn wheat which occurs in the wild mainly in the Balkans and Western Anatolia, where it occupies marginal habitats. It is of interest because it shows domestication traits similar

to those of *T. monococcum*, although the genetic data "...seem to be compatibile with the notion of single origin." (*Zohary 1996.155*) and, "...that *T. aegilopoides* is probably a feral form of the cultivated types which reached the Balkans as a result of the spread of agriculture." (*Heun et al. 1998.67*). However, the situation has become even more complicated since the appearance of wild progenitors of einkorn wheat, *Triticum boeoticum* in Mesolithic context in Theopetra cave allow us to hypothesise the autochthonous process of plant cultivation in eastern Thessaly.

It is necessary to incorporate all these fragmentary data into the interpretative context of an indigenous adoption of agriculture, which has had nothing directly in common with the "PPNB exodus" we mentioned before. In eastern Thessaly the wild progenitors of barley and einkorn wheat, as well as wild goat and pig, suggest local processes of plant cultivation and animal domestication. It is reasonable, therefore, to accept the idea that the transition to farming was an autochthonous process there, and that the adoption of domesticates took place piecemeal over a period of several centuries (*Halstead 1996.297*). In Argolide barley and lentils were locally adopted. Emmer, sheep and goat were introduced in the initial "aceramic" Neolithic. Einkorn wheat and cattle are first documented in the "ceramic" Neolithic, although it is not clear if the earliest specimens of cattle and pig (from the end of the "aceramic" Neolithic) were domesticated or not (*O.c. 297*). In this way we can really "...envisage the transition as an enhancement of the existing social system, rather than as the kind of radical break which is often proposed." (*Whittle 1996.43*). The system seems to collapse after 5000 BP, when the site and the site catchment area, located on a terrace, were flooded in the process of marine transgression (*van Andel and Sutton 1987.44; Lambeck 1996.597–610*). But before being flooded, these people were takers of opportunities and, on voyages by sea for the acquisition of obsidian and tunny fishing, could have been involved in the Aegean Mesolithic and Neolithic forager-farmer exchange network, where they could have been moved to adopt pottery, as well the chance to collect some domesticates and cultigens. There is indirect evidence of Neolithic exchange in the Franchthi cave. Statuette-like artefacts have been interpreted as tokens designed either as contractual devices or as identifying tokens between individuals or groups, symbolising the obligations of an agreement, friendship or common bond. It is hypothesised that in the context of inter-settlement contact in the region, various types of bonds between communities would have been beneficial during the Neolithic, and that contractual devices or identifying tokens could have been used in a variety of contexts. They may have been used as tokens in a "down the line" mode of exchange or, perhaps, to identify messengers between villages, particularly in times of crisis, or even as markers of inter-village marital connections (*Talalay 1993.45–46; Budja 1998.222–223*).

It is much more difficult to decode the late foraging and early farming palimpsest in the Marmara area, although the north-western part of Anatolia, comprising of the littoral areas around the Sea of Marmara and the Black Sea, has always been considered a cultural bridge between Europe and the Near East. It is well known that the region underwent a series of environmental pressures due to drastic changes in the marine conditions of Marmara. The Sea of Marmara in the Holocene was subject to alternating brief episodes of more saline or brackish periods. At first there was an overflow of cold and fresh water from the Black Sea, soon to be followed by the resumption of lacustrine conditions. The first intrusion of warm and saline waters from the Aegean had taken place by 6500 BC, and was soon followed by the establishment of a link with the Black Sea. The radiocarbon dating of the death of freshwater molluscs in the Black Sea, and therefore the ingression of the saltwater from the Marmara is around 5600 BC. It is suggested that the Black Sea did not assume its present form immediately after the breakthrough. As late as the end of the third millennium BC, people were able to live in settlements along the western Black Sea coast, all of which are now about 8–10 meters underwater (*Özdoğan 1998.29; Kuniholm 1999.on line*)

However, in the context of neolithisation there are three different processes identified in the Marmara area (*Özdoğan 1997.3–33; Özdoğan and Gatsov 1998.209–232*). The first was linked to an endemic movement from central Anatolia which took place by the end of PPNB. The migration was identified by the sites indicated in the mound formations in Çalca, Musluçeşme, Kabakli, Keçiçayi, Ağaçli Anzavurtepe, Gavurtarla (*Özdoğan and Gatsov 1998.214,223; Thissen 1999.Fig. 1*) and by the lithic assemblages, which are distinctively different from those of the local Epi-Palaeolithic. The most specific aspect of these assemblages is the presence of technologies of "large blades with occasional ventral retouch" and "bifacially pressure-flaked points". It was hypoth-

esised that because the sites are located in a mountainous region, far from the alluvial plains, subsistence "depended more on hunting than farming" (*Özdoğan 1997.18; Özdoğan and Gatsov 1998. 214–223*).

The second was linked to permanent fishing sites at Fikirtepe, Pendik, İçerenköy and Tuzla on the Marmara coast which were settled by "a direct offspring of the Epi-Palaeolithic industries of the region" (*Özdoğan 1983.409; Thissen 1999.34*). Subsistence was based on hunting, fishing and mollusc collecting. The buildings are oval wattle and daub hut-like structures.

The third has been identified in Ilıpınar (phase X), the earliest farming village site settled by farmers migrating from central Anatolia around 6000 BC (*Roodenberg 1993.251–267; 1995.171–174*). The founding of the village was linked up with the genesis of the Fikirtepe culture (*Özdoğan 1997.19–23*). The contrast in settlement location, house structure and subsistence with the Ilıpınar phase is evident. The Ilıpınar and Menteşe dwellings were built of *pisé* with wood reinforcement (*Roodenberg 1993. 253–254,264, Fig. 3*).

There are some interesting details that should be pointed out if the Özdoğan palimpsest reading was correct. It seems that the first wave of an endemic movement originated in the Konya plain in the "later phases of the pre-pottery Neolithic", although during what has been determined as the "initial phase of neolithisation" (*Özdoğan 1997.18*) it had no impact on stimulating the process of adopting agriculture in the region. There was a second, much more intrusive wave, directly linked to "late Çatal Höyük" (*O. c. 22*). The area around Lake İznik was directly colonised by setting up the primary centre of farming colonisation in Ilipinar[5]. Although the complete Neolithic subsistence package was available, local fishers and foragers living in permanent villages at Fikirtepe, Pendik, İçerenköy and Tuzla on the Marmara coast were much more interested in pottery than domesticates and cultigens. Comparative analyses of dominant vessel categories between the farmers' and fishers' pottery assemblages show that the introduction must have been selective. Differences in the quantitative ratio of "open vessels" in farmers' (> 5 %) and fisher's (27.7 %) settlements have led to the conclusion that the pottery was introduced selectively according to subsistence strategies (*Thissen 1999.32*).

In the scenario of endemic movement the beginning of colonisation of northern Aegean was linked up with the foundation of a farmers' colony at Hoca Çesme in Eastern Thrace[6]. The small colonial settlement by the estuary of the Maritza River was heavily fortified with a massive stone wall (*Özdoğan 1997.23–27*). Perhaps it would be too simplistic to correlate the fortification at Hoca Çesme and "aceramic" walls at the colony at Knossos with the structures of power and the agricultural frontier. However, we believe that Özdoğan's scenario of endemic movement is highly compatible with van Andel's and Runnel's demic diffusion – the modified version of wave of advance model, where the idea of an agricultural frontier has usually been associated with models of colonisation analogous to farmer colonisation in the colonial period of recent centuries. On the other hand, permanent and fortified communities might reflect a new ideology of social order and control over social and natural resources. It was hypothesised that the underlying basis for greater social domination was domestic production, and productive activities were couched within the ideology of *domus* as the guarantor of social life against the wild (*Hodder 1990*). A fortified *domus* as a structure of power and signification located on the agricultural frontier could have been provided a new and powerful way in which social relationships between farmers and foragers at the local level could be created and manipulated.

5 Analysing the colonisation route from the Konya plain to the northern Marmara region, Thissen suggested recently that the clusters of sites at Menteşe, Marmaracık, Yenişehir and Demircihüyük, which are located more to the south, were settled a few centuries earlier than Ilıpınar (phase X). Using morphological similarities in pottery production, he hypothesised the beginning of colonisation in the period of Çatalhöyük East levels VIA–III as being "anywhere between 6500/6400–6300/6200 cal BC" (*Thissen 1999.37*).

6 There is chronological inconsistency in Özdoğan's scenario of endemic movement. That is, there should have been a farmer's settlement colony in Ilipinar in the Marmara region established first, followed after a few centuries by Hoca Çesme in the north Aegean (*Özdoğan 1997.19–27*). In the available ^{14}C sequence the later settlement predates the former. It is worth noting that the founding of Hoca Çesme (6400-6100 cal BC) fits with the "exodus" in the Konya plain in the period "anywhere between 6500/6400–6300/6200 cal BC" (cf. supra 2) on the one hand, and the "ceramic" early Neolithic in Thessaly on the other. Bloedow has proposed 6438–6221 cal BC for Argissa, 6489–6406 cal BC for Sesklo, 6469–6373 cal BC for Nea Nikomedeia and 6481–6216 cal BC for Achilleion. The proposition was based on the selection of calibrated (1σ) dates (*Bloedow 1992/1993.56*).

Despite the strong evidence for forager-farmer interaction and their coexistence for certain period of time, little attention has been paid to the existence of farming-foraging frontiers and forager-farmer interaction in western Anatolia and Balkan. The agriculture frontier and principles of forager-farmer interactions are conceptualised in Zvelebil's model of agricultural transition, describing the process in three stages: availability, substitution and consolidation (*Zvelebil 1990; Zvelebil and Rowley-Conwy 1990*). Each is defined by the economic evidence, which is considered at a regional scale in order to interpret the traditional notion of a rapid transition to farming by colonisation (*supra 1*). It is suggested that in the early phase of forager-farmer contact the effect of the frontier would have been largely supportive and that co-operation would prevail. The exchange of foodstuffs across the frontier would reduce the stochastic variation in food supply and the risk of failure for both the hunting and farming communities. This would have been especially true for farmers who had recently adopted farming, or recently moved into a new area. With the increasing duration of the agricultural frontier, disruptive effects gained the upper hand. This may have been marked mainly by increased social competition, the opportunistic use of hunter-gatherer lands by farmers through the establishment by the farmers of "hunting lands" in hunter-gatherer territories as part of a secondary agricultural expansion, and by the increased exploitation of export commodities by hunter-gatherers to the long-term detriment of the forager economy (*Zvelebil 1994(1995).107–127; Zvelebil 1998.9–27*). Inter-group violence, the presence of fortified farming villages, and the existence of a "no-man's land" in the north European plain, could have also been interpreted as indicators of conflict and competition within the agricultural frontier (*Zvelebil 1998.21*).

It is broadly accepted that contacts between foragers and farmers, occurring within an agricultural frontier zone must have had a direct effect on the nature an the rate of the transition, and may have acted as a delaying mechanism in the process of the transition in north-western and eastern Europe (*Dergachev et al. 1991.1–16; Zvelebil 1996.341; Zvelebil 1998.23*). However, one of the most important points is that playing an active part as individuals and as communities, hunters and gatherers contributed to the generation of a different kind of Neolithic through their own communities and their influence on the established farming settlement (*Zvelebil 1998.21; cf. Bogucki 1988; Whittle 1996*).

IN PLACE OF CONCLUDING REMARKS

There are not very many Mesolithic-Neolithic palimpsests available in south-eastern Europe which can be used to decode the hunter-gathers' and farmers' interactions. It is not because they do not exist, but because of taphonomic filters which operate in the context of unsystematic and inconsistent research procedures, and interpretative postulates which maintain that Mesolithic and Neolithic artefact sets are culturally, chronologically and spatially mutually exclusive. Many of these have been successfully erased from the archaeological records in the last few decades (*Budja 1996a.61–76; Budja 1996b. 323–329).*

However, one of the best-documented examples of long-term forager-farmer interactions in south-east Europe is embedded in the Lepenski Vir culture in the Danube Gorges region. Mesolithic communities continued to reside in the region for several hundred years after the appearance of the local Early Neolithic and did not adopt available farming practices. But they did adopt pottery, which was buried within the multi-layered Mesolithic sites of Lepenski Vir and Padina. There could be several reasons for resistance and the refusal to accept the complete "Neolithic package". The geographical isolation of the deep Danube gorges is one of the frequently stated explanations, implying that the Mesolithic population lived in a "dead end", off the beaten tack of the "neolithisation process" and indifferent to it. However, Radovanović, Voytek and Tringham have suggested recently that the reasons seem to be decoded in another aspect of the Iron Gates Mesolithic – its intensive contact with neighbouring, as well as more distant communities. It was hypothesised that there were groups undertaking "expeditions" to acquire particular goods in distant areas, skipping the "down-the-line" mode of exchange. Evidence comes in the form of lithic resources and ceramics (*Voytek & Tringham 1990; Radovanović 1996. 39–43; Radovanović & Voytek 1997.21*).

Unfortunately, most of the pottery assemblages are still scantily published and there is no direct evidence of any incipient pottery available, and one might speculate that the pots appear as prestige items or as containers for plant foods, which were the real items of barter. However, pottery has been reported in the contexts of Mesolithic trapezoidal houses at Lepenski Vir and Padina. Interpreting the Mesolithic cultural phase Lepenski Vir I and II D, the excavator pointed out that the houses "contained

some sherds of monochrome ware" (*Srejović 1968.24; 1969.153–154;*). He was very precise in locating the pottery distribution, mentioning that pottery fragments had been lying on the floor in the houses "Am Fußboden der Häuser 19, 24, 26, 28, 35, 47, 48, und 54 wurden auch vereinzelt Tonscherben gehoben. Die erwähnten Bauten sind der Endstufe von Lepenski Vir I zuzuweisen." (*Srejović 1971.5*) (Fig. 7)[7]. A similar pattern has been recorded at Padina, where whole pots were deposited in trapezoidal houses 7 and 15 (or 18) (*Jovanović 1969.30; 1987.1–16*).

Srejović has proposed the idea of post-depositional processes that caused the infiltration of pottery fragments from the upper Early Neolithic layer into the lower Mesolithic one. It is worth remembering that a recent analysis did not confirm the hypothesis "of intrusion" (*Radovanović 1996.39–43; Borić 1999.47–53*). They show, on the contrary, that the pottery deposition in Lepenski Vir I and II was not a matter of a taphonomic filter – stratigraphic problems of vertical displacement and post-depositional disturbance. It is hard to believe, indeed, that complete pots found *in situ* on the house floors at Padina were infiltrated through the superposed layers. On the other hand, there is "one almost metaphorical piece of evidence" available. We believe that a fragment of monochrome pottery was not firmly embedded by coincidence between the red deer's teeth and the floor of house 28 at Lepenski Vir I (*Borić 1999.52*). In interpreting the pottery's appearance in the foraging context of Lepenski Vir I and II the correlation between the pottery distribution and the distribution of sculptures and "altars" should be pointed out very clearly (Table 1). There are houses: 1, 16, 19, 20, 24, 26, 28, 32, 35, 37, 46, 47 and 54, where pottery fragments, "stone heads" and other decorated sculptures, "altars" and artefacts ornamented by motifs that perhaps represent various symbols have been found (*Срејовић 1969; 1971. 1–39; Srejović, Babović 1983*).

It is not our intention to enter into the discussion of the cognitive principles operating at Lepenski Vir (*Hodder 1990.20–31*) or to contextualise the symbolic structure and social power in the Djerdap Mesolithic (*Chapman 1993.71–121*). And, whether Chapman's principal conclusion "that the social transformations in the gorge moved largely parallel to those of farming cultures outside the gorge but that increased interaction between the two social networks led to the collapse of one without any significant change in the other" (*Chapman 1993.115*) is

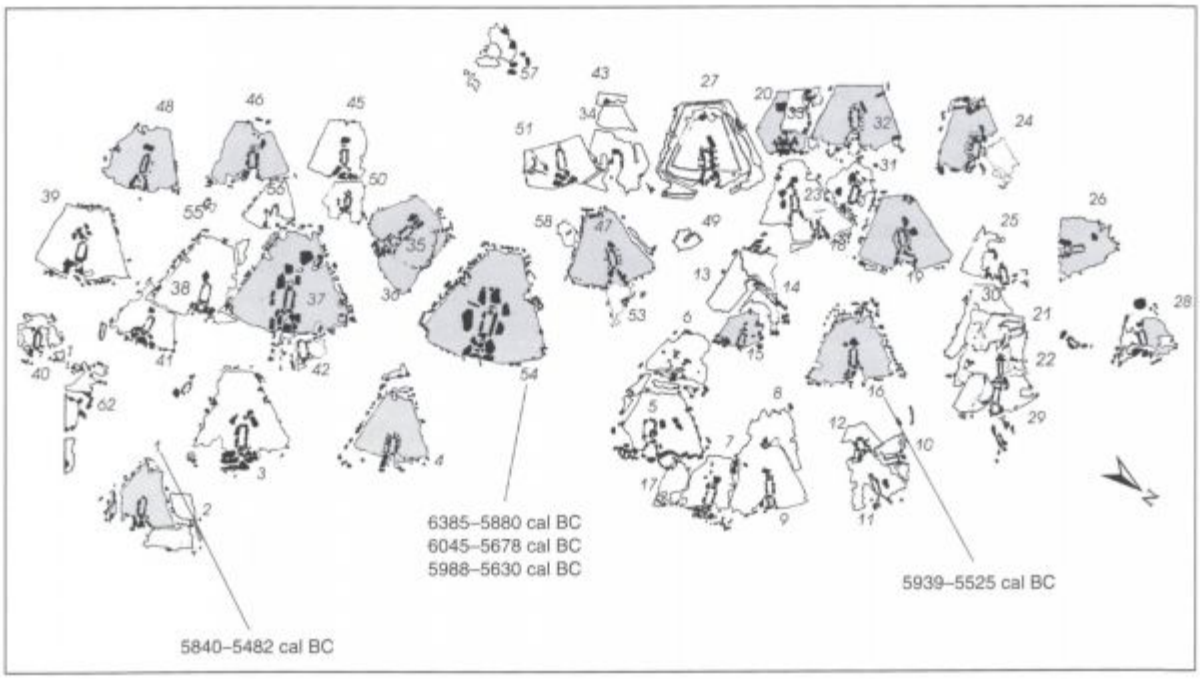

Fig. 7. Lepenski Vir, phases I and II. Pottery distribution, marked with shaded house plans (after* Срејовић 1969; Srejović 1971; Srejović, Babović 1983*) and ^{14}C dates calibrated on 2σ (after* Bonsall et al. 1997.Table 1*).

7 Two years before Srejović published a slightly different list of houses of Lepenski Vir I and II: 1, 4, 15, 16, 19, 20, 24, 26, 28, 32, 35, 37, 46, 47 and 54 (*Срејовић 1969.153,154*).

House No.	Pottery	Stone sculptures	Stone "shrines"
1	●		
4	●		
15	●		
16	●	▲	
19	●	▲	■
20	●		■■
24	●	▲	■
26	●		■
28	●	▲▲	
32	●		■
35	●		■
37	●	▲	■■
46	●	▲	■
47	●	▲	
48	●		
54	●	▲▲	■

Tab. 1. Lepenski Vir, phases I and II. Correlation between the houses, pottery distribution and the distribution of sculptures and "altars". Sources: **Срејовић 1969; 1971; Srejović, Babović 1983*).**

correct or not, the presence of features bearing witness to participation in regional exchange networks within both Mesolithic and Early Neolithic contemporary settlements, speaks in favour of a process in which a sedentary hunter-gatherer community in the Djerdap was first "neolithicised" – in all aspects except the essential one (*Radovanović 1996.43*). It is worth remembering that pottery appears to have been adopted before the full adoption of cultigens and domesticates, and that the areas where the pots occur are marked by a continuity between the Mesolithic and the Neolithic in settlement location and material remains, especially in burial procedures and architectural elements, including the famous sculptures.

We may hypothesise that the pottery was introduced selectively, related to changes in subsistence strategies, which are a far cry from the "Neolithic package", and did not coincide with a wholesale shift in subsistence from foraging to farming. A shift in dietary patterns, identifiable within the variability of stable isotopic values of $\delta^{15}N$ and $\delta^{13}C$ in collagen samples occurred at Lepenski Vir (phases I and II) between 7600 and 7300 BP. The dietary shift has been interpreting as a change in foraging subsistence patterns from an economy based on the exploitation of aquatic (riverine) resources to a more broadly-based economy in which traditional food resources were supplemented to a much greater degree by terrestrial resources in theform of herbivores and/or protein-rich plants (*Bonsall et al. 1997.50–91*). In this interpretative context it seems reasonable to relate the pots at Lepenski Vir and the Padina settlement to the beginning of local pottery production and to processes of food preparation and serving dishes, whether to alive or in sacrificial rituals to dead ancestors buried beneath the houses. It is worth remembering that pounders and mortars, although variously interpreted as shrines and altars, have been recently interpreted on the basis of wear patterns as grinding and/or pounding stones (*Radovanović & Voytek 1997.21*).

All of this points to the conclusion that in many parts of south-eastern Europe, there were clusters of Mesolithic settlements (Fig. 6) capable and ready to serve as a promotion centres of agro-pastoral farming in the course of which process these communities could be expected to develop or to adopt and to modify agro-pastoral practices and pottery production and integrate them with existing subsistence strategies.

REFERENCES

AMMERMAN A. J. and CAVALLI-SFORZA L. L. 1984. *The Neolithic Transition and the Genetics of Populations in Europe.* Princeton University Press. Princeton.

ANDREOU S., FOTIADIS M., KOTSAKIS K. 1996. Review of Aegean Prehistory V: The Neolithic and Bronze Age in Northern Greece. *American Journal of Archaeology 100: 537–597.*

ANTANAITIS I. 1999. Concerning the transition to farming in the East Baltic. In Budja M. (ed.), *Documenta Praehistorica XXVI, 6th Neolithic Studies: 89–100.*

BARKER G. 1996. Early Holocene environments and subsistence strategies in the Mediterranean basin. In *The Colloquia of the XIII International Congress of Prehistoric and Protohistoric Sciences. Forli (Italia) 8–14 September 1996. The Mesolithic. Section 7. Adaptations to Postglacial Environments. Colloquim XIV: 105–112.*

BERNABEU AUBÁN J. 1996. Indigenismo y migracionismo. Aspectos de la neolitización en la fachada oriental de la Pennninsula Ibérica (Indigenism and migrationism. Aspects of the Neolitization in the East of the Iberian Peninsula). *Trabajos de Prehistoria 53/2: 37–54.*

1997. Indigenism and Migrationism. The Neolithization of the Iberian Peninsula. *Poročilo o raziskovanju paleolitika, neolitika in eneolitika v Sloveniji XXXIV: 1–18.*

1999. Pots, symbols and territories: the archaeological context of neolithisation in Mediterranean Spain. In Budja M. (ed.), *Documenta Praehistorica XXVI, 6th Neolithic Studies: 101–118.*

BINDER D. (1989). "Aspects de la néolithisation dans les aires padane, provençale et ligure". In Aurenche O. and Cauvin J. (eds), *Néolithisation. British Archaeological Reports International Series 516. Oxford: 199–226.*

BLOEDOW F. E. 1991. The "Aceramic" Neolithic Phase in Greece Reconsidered. *Mediterranean Archaeology 4: 1–143.*

1992/93. The dates of the Earliest phase at Argissa Magouls in Thessaly and other Neolithic sites in Greece. *Mediterranean Archaeology 5–6: 49–57.*

BOGUCKI P. I. 1988. *Forest Farmers and Stockherders: Early Agriculture and its Consequences in North-Central Europe.* Cambridge: Cambridge University Press.

BÖKÖNYI S. 1988–1989. Take-over and local domestication: the double faced nature of early animal husbandry in South Italy. *Origini XIV: 371–385.*

1994. Domestication of animals from the beginning of food production up to about 5,000 xears ago. An overview. In S. J. De Laet (ed.), *History of Humanity, Vol.1: 389–397.*

BONSALL C., LENNON R., McSWEENEY K., STEWART C., HARKNESS D., BORONEANT V., BARTOSIEWICZ L., PAYTON R. and CHAPMAN J. 1997. Mesolithic and Early Neolithic in Iron Gates: A Palaeodietary Perspective. *Journal of European Archaeology 5: 50– 92.*

BROODBANK C. & STRASSER F. T. 1991. Migrant farmers and the Neolithic colonization of Crete. *Antiquity 65/247: 233–245.*

BUDJA M. 1996a. Neolithisation in the Caput Adriae region: between Herodotus and Cavalli-Sforza. *Poročilo o raziskovanju paleolitika, neolitika in eneolitika v Sloveniji XXXIII: 61–76.*

1996b. Neolithisation of Europe: the Slovene Aspect. Contribution to the Discussion. *Arheološki vestnik 47: 323–329.*

1998. Clay tokens – accounting before writing in Eurasia. In Budja M. (ed.), *Documenta Praehistorica XXVI, 5th Neolithic Studies: 219– 235.*

CAUVIN J. 1989. La néolithisation au Levant et sa première diffusion. In Aurenche O., Cauvin J. (eds.), *Néolithisation BAR IS 516.*

1990. *Naissance des divinités. Naissance de l'agriculture.* Paris: CNRS Editions.

CAVALLI-SFORZA L. L. and CAVALLI-SFORZA F. 1995. *The Great Human Diasporas. The History of Diversity and Evolution.* Addisson – Wesley Publishing Company. Reading.

CAVALLI-SFORZA L. L. 1996. The spread of agriculture and nomadic pastoralism: insights from genetics, linguistics and archaeology. In D. R. Harris (ed.), *The Spread of Agriculture and Pastoralism in Eurasia: 51–69.*

CAVALLI-SFORZA L. L. AND MINCH E. 1997. Paleolithic and Neolithic Lineages in the European Mitochondrial Gene Pool. *American Journal of Human Genetics 61: 247–251.*

CHAPMAN J. 1993. Social Power in the Iron Gates Mesolithic. In J. Chapman and P. Dolukhanov (eds.), *Cultural Transformations and Interactions in Eastern Europe. Worldwide Archaeology Series 6. Centre for Archaeology of central and Eastern Europe. Monograph 1: 71–121.*

CHERRY J. 1985. Islands out of Stream: Isolation and Interaction in Early East Mediterranean Insular Prehistory In Knapp, T. Stech (eds.), *Prehistoric Production and Exchange. Monograph XXV.*

1990. The first colonization of the Mediterranean islands: a review of recent research. *Journal of Mediterranean Archaeology, 3: 145–221.*

CHIKHI L. et al. 1998. Clinical Variation in the Nuclear DNA of Europeans. *Human Biology 70/4: 643–657.*

COSTANTINI L. 1989. Plant exploitation at Grotta dell'Uzzo, Sicily: new evidence for the transition from Mesolithic to Neolithic subsistence in Southern Europe. In D. R. Harris, G. C. Hillman (eds.), *Foraging and Farming. One World Archaeology 13: 197–206.*

DAVARAS C. 1996. Crete. In G. A. Papathanassopoulos (ed.), *Neolithic Culture in Greece: 92–93.*

DEMOULE J. P. and PERLES C. 1993. The Greek Neolithic: A New Review. *Journal of World Prehistory 7/4: 355–416.*

DENNELL R. 1983. *European Economic Prehistory.* New York: Academic Press.

DERGACHEV V., SHERRATT A. and LARINA O. 1991. Recent results of Neolithic research in Moldavia. *Oxford Journal of Archaeology 10: 1–16.*

EDWARDS J. K. AND MITHEN S. 1995. The Colonization of the Hebridean Islands of Western Scotland: evidence from the palynological and archaeological records. *World Archaeology 26/3: 348– 365.*

GALLIS K. 1996. Neolithic habitation in central and western Thessaly. In G. A. Papathanassopoulos (ed.), *Neolithic culture in Greece: 61–66.*

GRIFONI CREMONESI R. 1996. La Neolitizzazione dell'Italia: I – L'Italia centro meridionale. In *The Colloquia of the XIII International Congress of Prehistoric and Protohistoric Sciences. Forli (Italia) 8–14 September 1996. The Neolithic in the Near East and Europe. Section 9. The Processes of Neolithisation and the Development of Neolithic Cultures in Large Geographical Areas. Colloqium XVII: 69–80.*

GRONENBORN D. 1998. Ältestebandkeramische Kultur, La Hoguette, Limburg and ... What Else? – Contemplating the Mesolithic-Neolithic Transition in southern Central Europe. In Budja M. (ed.), *Documenta Praehistorica XXVI, 5th Neolithic Studies: 189–202.*

GUILAINE J. (1994). *La Mer Partagée. La Méditerranée Avant l'Écriture (7000–2000 avant Jesus-Christ).* Hachette. Paris.

HALSTEAD P. 1989. Like rising damp? An ecological approach to the spread of farming in southeast and central Europe. In A. Milles, D. Williams, N. Gardner (eds.), *The beginning of agriculture BAR IS 496: 23–53.*

1996. The development of agriculture and pastoralism in Greece: when, how, who and what. In D. R. Harris (ed.), *The Spread of Agriculture and Pastoralism in Eurasia: 296–309.*

HANSEN M. J. 1991. *The Palaethnobotany of Franchthi Cave. Excavations at Franchthi Cave, Greece. Fascicle 7.* Indiana University Press. Bloomington and Indianapolis.

HARRIS D. R. 1981. Breaking Ground: Agricultural Origins and Archaeological Explanations. *Institute of Archaeology Bulletin 18: 2–19.*

1996. The origins and spread of agriculture and pastoralism in Eurasia: an overview. In D. R. Harris (ed.), *The Spread of Agriculture and Pastoralism in Eurasia: 552–574.*

HEDGES R. E. M., HOUSLEY R. A., LAW I. A., BRONK C. R. 1989. Radiocarbon dates from the AMS system, datelist 9. *Archaeometry 31: 224–226.*

HEUN M., BORGHI B. and SALAMINI F. 1998. Einkorn wheat domestication site mapped by DNA fin-

gerprinting. In Budja M. (ed.), *Documenta Praehistorica XXVI, 5th Neolithic Studies: 65–69.*

HILLMAN C. G., DAVIES M. S. 1990. Measured Domestication Rates in Wild Wheats and Barley Under Primitive Cultivation, and Their Archaeological Implications. *Journal of World Prehistory 4/2: 157– 222.*

HILLMAN G. 1996. Late Pleistocene changes in wild plant-food available to hunter-gatherers of northern Fertile Crescent: possible preludes to cereal cultivation. In D. R. Harris (ed.), *The Spread of Agriculture and Pastoralism in Eurasia: 159–203.*

HODDER I. 1990. *The domestication of Europe.* Blackwell. Oxford

JACOBSEN W. T. & FARRAND R. W. 1987. Franchthi Cave and Paralia. Excavations at Franchthi Cave, Greece. Fascicle 1. Bloomington & Indianapolis

JOVANOVIĆ B. 1969. Chronological Frames of the Iron Gate Group of the Early Neolithic Period. *Archaeologica Iugoslavica X: 23–38.*

1987. Die Architektur und Keramik der Siedlung Padina B am Eisernen Tor, Jugoslawien. *Germania 65(1): 1–16.*

KRAUSE R. Online. Bandkeramische Siedlung in Vaihingen/Enz. http://www.bawue.de/~wmwerner/grabung/vaih.html

KUNIHOLM I. P. 1999. Aegean Dendrochronology Project December 1998 Progress Report. http://www.arts.cornell.edu/dendro/98news/98adplet.html

KYPARISI-APOSTOLIKA N. 1998. The Significance of Theopetra cave for Greek Prehistory. Préhistoire d'Anatolie. Genèse de deux mondes, *ERAUL 85: 241–152.*

1999. The Palaeolithic deposits of Theopetra Cave in Thessaly (Greece). In Bailey G. et al. (eds.), *The Palaeolithic Archaeology of Greece and Adjacent Areas British School at Athens. Studies 3: 241–252.*

LAMBECK K. 1996. Sea-level change and shore-line evolution in Aegean Greece since Upper Paleolithic time. *Antiquity 70/269: 588–611.*

LAX E. AND STRASSER F. 1992. Early Holocene Extinctions on Crete: The Serach for the Cause. *Journal of Mediterranean Archaeology 5/2: 203–224.*

LEWTHWAITE J. 1990. Isolating the Residuals: the Mesolithic Basis of Man-Animal Relationships on the Mediterranean Islands. In C. Bonsall (ed.), *The Mesolithic in Europe. Papers Presented at the Third International Symposium Edinburgh 1985: 541–555.*

MASSETI M. and DARLAS A. 1999. Pre-Neolithic man and other mammals on the Eastern Mediterranean islands. In A. R. Cruz, S. Milliken, L. Oosterbeek & C. Peretto (eds.), *Results from the Human Population Origins in the Circum-Mediterranean Area: Adaptations of the Hunter-Gatherer Groups to Environmental Modifications. Mediterranean Prehistory Online.* http://www.med.abaco-mac.it/home.htm

MILOJČIĆ V. 1952. Die frühesten Ackerbauer in Mitteleuropa. *Germania 30, 3/4: 313–318.*

1956. Die erste praekeramische baeuerliche Siedlung der Jungstenzeit in Europa. *Germania 34, 3/4: 208–210.*

1960. Praekeramisches Neolithikum auf der Balkanhalbinsel. *Germania 38, 3/4: 320–335.*

MÜLLER-KARPE H. 1976. *Geschichte der Steinzeit.* 2. Aufl. München.

ORSCHIEDT J. 1998. Ergebnisse einer neuen Untersuchung der spätmesolithischen Kopfbestatungen aus Süddeutschland. In N. J. Conard and C. J. Kind (eds.), *Aktuelle Forschungen zum Mesolithikum. Urgeschichtliche Materialhefte 12: 147–160.*

ÖZDOĞAN M. 1983. Pendik: a neolithic site of Fikirtepe culture in the Marmara region. In Boehmer R., Hauptmann H. (eds.), *Beiträge zur Altertumskunde Kleinasiens. Festschrift für Kurt Bittel: 401–411.*

1997. The beginning of Neolithic economies in Southeastern Europe: an Anatolian perspective. *Journal of European Archaeology 5.2: 1–33.*

1998. Anatolia from the last glacial maximum to the Holocene climatic optimum: cultural formations and the impact of the environmental setting. *Paléorient 23/2: 25–38.*

ÖZDOĞAN M., GATSOV I. 1998. The Aceramic neolithic Period in Western Turkey and the aegean. *Anatolica XXIV: 209–232.*

PERLÈS C. 1990. Les industries lithiques taillées de Franchthi. Tome II: Les industries du Mésolithique et

du Néolithique. In T. W. Jacobsen (ed.), *Excavations at Franchthi Cave, Greece. Fascicle 5: 47–279.*

1992. Systems of Exchange and Organisation of Production in Neolithic Greece. *Journal of Mediterranean Archaeology 5/2: 115–164.*

1994. Les débuts du Néolithique en Grèce. *La Recherche 25: 641–669.*

RADOVANOVIĆ I. 1996. Mesolithic/Neolithic Contacts – The case of the Iron Gates Region. *Poročilo o raziskovanju paleolitika, neolitika in eneolitika v Sloveniji XXIII: 39–43.*

RADOVANOVIĆ I. & VOYTEK B. 1997. Hunters, fishers or farmers: sedentism, subsistence and social complexity in the Djerdap Mesolithic. *Analecta Praehistorica Leidensia 29: 19–32.*

RENFREW C. 1977. Alternative models for exchange and spatial distribution. In T. K. Earle, J. E. Ericson (eds.), *Exchange Systems in Prehistory: 71–90.*

1996. Language families and the spread of farming. In D. R. Harris (ed.), *The Spread of Agriculture and Pastoralism in Eurasia: 70–92.*

RICHARDS M., CÔRTE-REAL H., FORSTER P., MACAULAY V., WILKINSON-HERBOTS H., DEMAINE A., PAPIHA S., HEDGES R., BANDELT H.-J., SYKES B. 1996. Paleolithic and Neolithic Linages in the European Mitochondrial Gene Pool. *American Journal of Human genetics 59: 185–198.*

RIZOPOULOU-EGOUMENIDOU F. 1996. Cyprus. In G. A. Papathanassopoulos (ed.), *Neolithic Culture in Greece: 183–190.*

ROODENBERG J. 1993. Ilıpınar X to VI: links and chronology. *Anatolica 19: 251–267.*

1995. Chronologies and conclusions. In J. Roodenberg (ed.), *The Ilıpınar excavations I. Five seasons of fieldwork in NW Anatolia, 1987–91: 167–174.*

ROWLEY-CONWY P. 1992. The Early Neolithic animal bones from Gruta do Caldeirão. In J. ZILHÃO (ed.), *Gruta do Caldeirão. O Neolítico Antigo. Trabalhos de Arqueologia 6: 231–257.*

SCHULTING R. J. 1998. Slighting the sea: stable isotope evidence for the transition to farming in northwestern Europe. In Budja M. (ed.), *Documenta Praehistorica XXVI, 5th Neolithic Studies: 203–218.*

1998a. Creativity's coffin: innovation in the burial record of Mesolithic Europe. In Mithen S. (ed.), *Creativity in Human Evolution and Prehistory: 203–226.*

SIMMONS A. H. 1991. Humans, island colonisation and Pleistocene extinctions in the Mediterranean: the view from Akrotiri-Aetokremnos, Cyprus. *Antiquity, 65: 857–869.*

SREJOVIĆ D. 1968. Lepenski Vir 7000 Years Ago. *The Illustrated London News. January 20: 23–25.*

СРЕЈОВИЋ Д. 1969. Лепенски Вир. Нова праисторијска култура у Подунављу. Београд.

1971. Die Lepenski Vir – Kultur und der Beginn der Jungsteinzeit an der mittleren Donau. In H. Schwabedissen (ed.), *Die Anfänge des Neolithikums vom Orient bis NordEuropa. Teil II. Östliches Mitteleuropa. Fundamenta. Reihe A. Band 3: 1–39.*

SREJOVIĆ D., BABOVIĆ L. 1983. *Umetnost Lepenskog Vira*. Beograd.

TALALAY E. T. 1993. Deities, Dolls, and Devices. In T. W. Jacobsen (ed.), *Excavation at Franchthi Cave, Greece.* Fasc. 9. Indiana University Press. Bloomington & Indianapolis.

THISSEN L. 1999. Trajectories towards the neolithisation of NW Turkey. In Budja M. (ed.), *Documenta Praehistorica XXVI, 6th Neolithic Studies: 29–39.*

THEOCHARIS R. D. 1973. *Neolithic Greece.*

TRIGGER B. 1980. *Gordon Childe. Revolutions in Archaeololgy*. London.

TYKOT H. R. 1996. Obsidian Procurement and Distribution in the Central and Western Mediterranean. *Journal of Mediterranean Archaeology 9/1: 39–82.*

VAN ANDEL H. T. AND SUTTON S. B. 1987. Landscape and Peple of the Franchthi Region. In T. W. Jacobsen (ed.), *Excavations at Franchthi Cave, Greece. Fascicle 2.* Indiana University Press. Bloomington and Indianapolis.

VAN ANDEL T. H., GALLIS K AND TOUFEXIS G. 1995. Early Neolithic farming in a Thessalian river landscape. In L. Lewin, M. G. Macklin and J. C. Woodward (eds.), *Mediterranean Quaternary River Environments: 131–144.*

VAN ANDEL H. T., RUNNELS N. C. 1995. The earliest farmers in Europe. *Antiquity 69/264: 481–500.*

VEIT U. 1993. Burials within settlements of the Linienbandkeramik and Stichbandkeramik cultures of Central Europe. On the social construction of death in early-Neolithic society. *Journal European Archaeology 1: 107–140.*

VENCL S. 1982. K otázce zániku sběraèsko-loveckých kultur. *Archeologické rozhledy XXXIV/6: 648–694.*

VITELLI D. K. 1993. Franchthi Neolithic Pottery. Volume 1: Classification and Ceramic Phases 1 and 2. In T. W. Jacobsen (ed.), *Excavations in Franchthi Cave, Greece. Fascicle 8.* Indiana University Press. Bloomington & Indianapolis.

VOYTEK B. A. and TRINGHAM R. 1990. Rethinking the Mesolithic: the Case of South-East Europe. In C. Bonsall (ed.), *The Mesolithic in Europe. Papers Presented at the Third International Symposium Edinburgh 1985: 492–499.*

WILKIE C. N. & SAVINA E. M. 1977. The earliest farmers in Macedonia. *Antiquity 71/271: 201–207.*

WILLIS K. J. AND BENNETT K. D. 1994 The Neolithic transition – fact or fiction? Palaeoecological evidence from the Balkans. *The Holocene 4: 326–330.*

WILLIS K. 1995. The Pollen-Sedimentological Evidence for the Beginning of Agriculture in Southeastern Europe and Anatolia. *Poročilo o raziskovanju paleolita, neolita in eneolita v Sloveniji XXII: 9–24.*

WHITTLE A. 1996. *Europe in the Neolithic.* Cambridge.

ZILHÃO J. 1992. Conclusão: a Gruta do Caldeirão e neolização do território português. In J. Zilhão (ed.), *Gruta do Caldeirão. O Neolítico Antigo. Trabalhos de Arqueologia 6: 144–162.*

1993. The Spread of Agro-Pastoral Economies across Mediterranean Europe: A View from the Far West. *Journal of Mediterranean Archaeology 6/1: 5–63.*

1997. Maritime pioneer colonisation in the early Neolithic of the west Mediterranean. Testing the model against the evidence. *Poročilo o raziskovanju paleolitika neolitika in eneolitika v Sloveniji XXXIV: 19–42.*

ZOHARY D. 1996. The mode of domestication of the founder crops of Southwest Asian agriculture. In D. R. Harris (ed.), *The Spread of Agriculture and Pastoralism in Eurasia: 142–158.*

ZVELEBIL M. 1990. Mesolithic Prelude and Neolithic Revolution. In Zvelebil M. (ed.), *Hunters in Transition: 5–15.*

1998. Genetic and cultural diversity of Europe: a comment on Cavalli-Sforza. *Journal of Anthropological research 54: 411–417.*

ZVELEBIL M., ROWLEY-CONWY P. 1990. Foragers and Farmers in Atlantic Europe. In Zvelebil M. (ed.), *Hunters in Transition:* 67–93.

1994(1995). Neolithisation In Eastern Europe: A View From The Frontier. *Poročilo o raziskovanju paleolitika, neolitika in eneolitika v Sloveniji XXII: 107–127.*

1996. The agricultural frontier and the transition to farming an the circum-Baltic region. In D. R. Harris (ed.), *The Spread of Agriculture and Pastoralism in Eurasia: 323–345.*

1998. Agricultural frontiers. Neolithic Origins, and the Transition to farming in the Baltic Basin. In M. Zvelebil, L. Domanska and R. Dennell (eds.), *Harvesting the Sea, Farming the Forest. The Emergence of Neoltihic Societies in the Baltic Region: 9–27.*