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THE NEOLITHIC IN THE IBERIAN PENINSULA: AN EXPLANATION FROM THE PERSPECTIVE OF THE PARTICIPATION OF MESOLITHIC COMMUNITIES

El Neolítico en la Península Ibérica: una explicación desde la perspectiva participativa de las comunidades mesolíticas

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ABSTRACT: An analysis of the documents on the late Mesolithic and early Neolithic groups would seem to confirm that the participation of the former was decisive in the formation of the Neolithic. The influence of the East on the Neolithisation of the Iberian Peninsula is plainly essential, as all that was necessary to set up a production economy originated there, including population. However, the very characteristics of the documentation (geographical and geological location of the sites), radio-chronological dating (showing a speedy arrival of Neolithic elements on the coast and inland) or the Mesolithic organization of the territory into networks, also active in the Neolithic, make sense of the thesis of participation that we put forward.

Key words: Mesolithic. Neolithic. Iberian Peninsula. Agriculture. Farming. Prehistoric Navigation. Radiochronology.

RESUMEN: El análisis de la documentación de los grupos del Mesolítico final y del Neolítico antiguo de la Península Ibérica parece confirmar que la participación de los primeros fue decisiva en la formación del Neolítico. Obviamente esencial es la influencia oriental en la Neolitización ibérica, de donde llega todo lo necesario para poner en marcha la economía de producción, incluyendo contribuciones endémicas. Sin embargo las propias características de la documentación (ubicación geográfica y geológica de los yacimientos), las dataciones radiocronológicas (demostrando una rápida llegada de los elementos neolíticos a la costa y al interior) o la articulación territorial mesolítica en redes, activas también en el Neolítico, dan sentido a la tesis participativa que proponemos.

Palabras clave: Mesolítico. Neolítico. Península Ibérica. Agricultura. Ganadería. Navegación prehistórica. Radiocronología.

Introduction

There is no doubt that Neolithic culture began in the Middle East, when the first domestication experiments began approximately 10.000 years ago, and spread to Europe via the Anatolia bridge. Scientific debates focus on the mechanisms involved in this expansion: population and cultural movement, with the transfer of animals, plants, materials and, perhaps, genes and languages (Diamond and

Bellwood, 2003; Jobling, Hurles and Tyler-Smith, 2004; Pinhasi, Fort and Ammerman, 2005; Price, 2000).

The LBK culture in Central Europe includes the first Neolithic era, originating in western Hungary around 5550-5400 BC (Bánffy, 2004; Pavúk, 2004; Price, 2000; Price *et al*., 2001; Zvelebil, 2004), and quickly moving to the Paris Basin. The high mobility of people has sometimes been used to explain this rapid propagation (Oelze *et al*., 2011), though other authors reinforce the role of local populations (Jeunesse, 2002; Amkreutz, 2010; Amkreutz, Vanmontfort and Verhart, 2008).

In the Mediterranean, Neolithic expansion affected both shores, creating distinct cultural units with differentiated ceramics as elements of identity. One is surprised by the following: a) the rapid rate of its incorporation (derailing the figure of 1 km per year calculated by Ammeman and Cavalli-Sforza, 1973, 1979; Bocquet-Appel *et al*., 2009, 2011; Lemmen *et al*., 2011; Isern and Fort, 2010, 2011), b) the presence of ceramic components earlier than expected and c) the discovery of Neolithic production elements among Mesolithic groups (Oversteegen *et al*., 2001; Raemaekers, 1999; Woodman and McCarthy, 2003).

Within the Neolithic debate, great interest lies in recognizing population continuity or rupture; DNA tests are very powerful tools for this, but their results are far from conclusive. The samples used depend on the archaeological record: if it is insufficient or not well-defined (e.g., if there are doubts about cultural consideration), the DNA results do not provide a clear historical answer. Different approaches –the study of the Y chromosome *versus* mtDNA– provide different answers. The contradictory theses of geneticists likely reflect, at least in part, the variability of the Neolithic dynamics, which do not conform to a single model. References on these controversies are Barbujani and Goldstein (2004), Chikhi *et al*. (1998, 2002), Dupanloup *et al*. (2004), Richards *et al*. (2000), Semino *et al*. (2000) and Simoni *et al*. (2000). Take for example Malmström *et al*. (2009): in Scandinavian countries, there is no continuity between Mesolithic groups and current populations, except in the Western Baltic; the Neolithic process is only formalized when new populations enter on the scene. The interpretative line of Balaresque *et al*. (2010) is similar but it fails to demonstrate that the distances between the Mesolithic groups and current populations are the result of the Neolithic process: they could respond to other historical causes. The opposite position is evident in the work of Haak *et al*. (2005) who, after reviewing central European Neolithic tombs, believe that Palaeolithic groups had a significant effect on present-day Europeans and that Neolithic groups had hardly any or none. The theoretical work of Currat and Excoffier (2005) follows this interpretation. According to this point of view, small groups brought production techniques to Europe, but, once assimilated, the ancient hunter-gatherers were the ones who were really responsible for its expansion. The diverging results reached by studies of ancient DNA in relation to Neolithic demography are directly related to the complexity of the Neolithisation phenomenon: they show the multiplicity of interacting factors and the impossibility of offering a single discourse (Regueiro *et al*., 2012).

The paleodiet study, which compares the diets of Mesolithic and Neolithic groups, is also part of the Neolithic debate. In evaluating this area, we are faced with the same situation as with genetic studies: a) dependence on the archaeological record and, therefore, what is defined as the Mesolithic or Neolithic, and b) inconclusive results, reflecting situations that cannot be generalized. For example, in the case of the Iberian Peninsula, Muge yields an estimate of 40-50% contribution of seafood protein (Lubell *et al*., 1994), but the pattern is actually more complex (Fernández and Gómez, 2009): Jackes and Meiklejohn (2004) suggest that during the Mesolithic, diets tended to be land-based, perhaps deriving from ecological phenomena that affected the Tagus estuary; in other words, it was not a phenomenon of cultural opposition. Similarly, at the Late Mesolithic burial of the El Collado coastal site, the paleodiet surprisingly reveals a low dependence on marine resources (García Guixé *et al*., 2006). With respect to diet, diversity is the norm at the peninsular and European level. Claiming that some groups demand marine products and some do not is simplistic (Lightfoot,

2011). We must question our ability to understand the paleodiet during the Mesolithic-Neolithic transition.

1. The case in the Iberian Peninsula

Recent research on the Neolithic groups of the Iberian Peninsula has developed significantly[1]. A comprehensive documentary body supported by proper stratigraphic and chronological contextualization is available. Further, the involvement of auxiliary sciences (analytical studies of the landscape and its uses, fauna or sediment) is filling historical gaps in the environmental and economic data, improving the detection of early signs of plant and animal domestication. The peninsular Neolithic era is being rethought theoretically, as regards the hierarchy of its material elements and redefinition of its stages and time frames. Obviously, data are not uniform, and gaps, both thematic and geographical, remain, due to little research, conservation restrictions or problems inherent in the discipline.

When the data is reviewed holistically (despite the gaps), a more accurate and robust picture of the Neolithisation process emerges. We propose a comprehensive view which, while aware of its limitations, does not enter into the discussion of specific aspects (the viability of a deposit, confidence in a radio chronological value, the role of a lithic or ceramic element). However, it does require developing a clear concept of Neolithisation from two perspectives, the archaeological and the cultural, in order to reach a historical explanation.

The Iberian Peninsula is no stranger to these European debates; indeed, new data has reactivated the discussion. For example, a) radio chronology requires reconsidering the speed of the Neolithic as well as its access mechanism, indicating that, as proposed here, maritime colonization (Zilhão, 2003) is not the only expansion force that gives meaning to the archaeological record, and b) the presence of ceramics before the cardial paradigm relegates this episode to the background (Bernabeu and Molina, 2009). Progress in the interior of the Peninsula and upper Ebro valley casts doubt on some assumptions presumed given for the peninsular Neolithic.

In Portugal, these debates reveal the conflict of ideas between Silva and Soares (1987) and Soares and Silva (2004), defenders of the progressive acquisition of Neolithic skills by the Mesolithic communities, and Zilhão (2000, 2003) and Carvalho (2002, 2008) who defend the inclusion of new populations for the Algarve. On a more general level, there is the diffusionist approach of Vicent (1997) and Cruz and Vicent (2007) and the colonialist approach of Zilhão (1993, 1997, 2001) and Juan-Cabanilles and Martí (2002).

Describing the lifestyle of the last hunter-gatherers and contrasting it with that of the first agricultural and livestock farmers is not a complicated exercise. In principle, comparing accounts offers two historical realities: a contrast such that each world appears to have distinct origins. These findings challenge our analysis of these societies and affect even further our view of the process of change. Nevertheless, the distance between the two communities during the transition phase was not as great as the accounts suggest.

The hunting lifestyle had not ended when Neolithic developments arrived: their arrival did not resolve a hypothetical structural problem. There are no signs to imply that, due to the specific living conditions of Mesolithic groups, Neolithic developments had a liberating effect on them, with respect to subsistence or social tensions. In the Ebro Basin, from where most data on the Pre-Neolithic

[1] Alday, 2003, 2006, 2009; Alday and Cava, 2009; Alday *et al.*, 2009; Arnaud, 2000; Barandiarán and Cava, 2000, 2003; Barrios, 2004; Bernabeu *et al.*, 2003; Bernabeu, 2006; Bernabeu and Molina, 2009; Biagi, 2003; Bicho *et al.*, 2000; Carvalho, 2003, 2008, 2010; Cerrillo and González, 2006; Diniz, 2007; Esquembre *et al.*, 2008; Estremera, 2003; Fernández Eraso and Polo, 2009; García Puchol and Aura Tortosa, 2006; Guibaja and Carvalho, 2010; Guilaine, 2003; Jiménez Guijarro, 2010; Jiménez Guijarro *et al.*, 2008; Juan-Cabanilles and Martí, 2002; Monteiro-Rodrigues and Angelucci, 2004; Morales *et al.*, 2010; Muralhay Costa, 2006; Olaria, 2004-2005; Olaria, Gusi and Gómez, 2005; Ortega *et al.*, 2006; Peña-Chocarro *et al.*, 2005; Ramón, 2006; Ramos and Lazarich, 2002; Rodanés and Picazo, 2005; Rojo *et al.*, 2008, 2010; Sesma, 2007; Soares and Tavares da Silva, 2003; Vergés *et al.*, 2008; Zapata, 2007; Zapata *et al.*, 2004; Zilhão, 2000, 2001, 2003.

FIG. 1. *Maritime colonisation must take into account the naval technology of the time and the sea currents, which are against in the Tunisia-Morocco crossing and the Gibraltar Straits (*vid. *Callaghan and Scarre, 2009).*

population derives (Utrilla and Montes, 2009), this was not the situation. Quite to the contrary, the groups were self-sufficient in matters pertaining to techniques: food and raw materials. They were well-organized, as they took advantage of the resources in each region and maintained fluid contact with remote communities without losing their own character. Mesolithic stability contrasts with archaeological data: there were no compensatory mechanisms to enable alleged crises, nor were there intensified actions on specific resources; groups did not expand their alimentary range to include foods of lower quality or productivity, nor were there splits among groups seeking new opportunities.

How should one view the first Neolithic groups on the peninsula? If the process involved a significant displacement of people, they became communities that, by land and sea, erratically conquered new territories. We say "Erratic" because, from their distant origins, they would have known neither the routes nor their destination (in the same way that Columbus did not know that a new continent would interrupt his proposed journey). It is difficult to imagine, from the standpoint of prehistory, and with few early Neolithic traces, that this rudimentary naval technology was available so that men, women, and children, along with plants, animals and supplies, could undertake long expeditions. Were these not trips with unknown destinations? These voyages are presented as successful, though unlikely to be free of many vicissitudes: with equipment such as the kayak of La Marmotta (Fugazzola and Mineo, 1995). Moreover, if we take into account the Mediterranean currents, navigation must have been very difficult. Undoubtedly, there were multiple maritime routes that connected the Mediterranean islands, Europe and Africa: some authors have pointed out the connections between both shores of the Strait of Gibraltar; the circulation of obsidian is also a well known phenomenon; and the relationship between some pottery productions in Italy, France and the Iberian Peninsula has also been stressed (Gibaja and Carvalho, 2010; Carvalho, 2010; García Borja, 2010). The problem lies in the need for knowledge and infrastructure deriving from an exclusively colonizing approach.

A great deal of time must have passed (how many generations?) before the *conquered landscape* would be filled with large extensions of legume and cereal fields, as well as herds of goats, pigs and cattle, and flocks of sheep, at the expense of forests and native fauna. The picture of the first farmers who came to our shores or crossed the Pyrenees to venture into foreign lands is very different from the image recreated when conceptualizing a developed Neolithic way of life.

These considerations require a position other than the habitual one, one that accepts that the Mesolithic peoples did not live in a state of decline and that the Early Neolithic peoples were far from thriving societies, thus blurring boundaries. Would the balance of power between residents and Neolithic immigrants have been unbalanced? To which side did it tilt? New models must have had attractive properties for them be assimilated so quickly (and given that the economics were determined, would the power generated by product accumulation explain the process compellingly?).

2. A reflection on documentation value

Reflecting on Neolithisation dynamics, one must consider the characteristics and significance of the archaeological record. It is important to know both the value of the documentation and the reason for the gaps. Two examples illustrate the qualities of Iberian Peninsula archaeological repertoire: one from the world of hunters and another from that of farmers.

The most important references for the later Mesolithic period in the Iberian Peninsula are the following: a) Portuguese shell middens, with abundant vestiges and many burials; b) the Ebro Basin, with over two dozen levels with clear Neolithic continuity, for a settlement apparently concentrated at its edges, and c) the Valencia region, with significant historiographical importance in the organization of industrial evolution and its temporal correlation (Fortea, 1973). In other areas, the findings are more discreet, suggesting an image of a peninsular interior void of people.

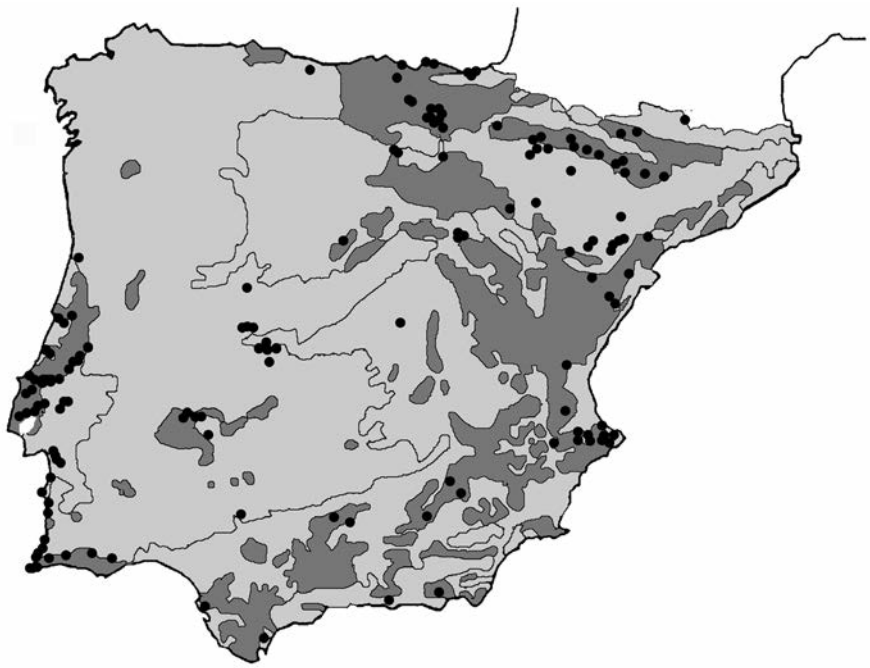

FIG. 2. *Basic units of peninsular lithology: dark grey limestone soils; light grey siliceous and clay soils. The concentration of final Mesolithic and late Neolithic sites coincide with the limestone area. The map can be further refined by comparing it with a speleological map and a geomorphologic map (making sense of the concentration in lower Aragón –predominance of clay). Surface finds in Extremadura, in siliceous dominance, are the result of prospecting campaigns in eroded soils.*

The apparently valid interpretation suggested by the data is the depopulation of much of the territory. This is defended by Zilhão (2000), and reasoned by Guilaine (2003) who attributes it to demographic failure or taphonomic problems. However, careful analysis of the record reveals an alternative perspective. For example, in the Ebro Basin, Mesolithic evidence is concentrated in the west (Araba-Navarre), east *(Lower Aragon)* and north (Pyrenees). In between, in sedimentary strata, data are scarce or absent. This is a 250 km linear axis with no findings, though it is habitually travelled for distribution purposes, and symbolic elements, such as sea-shells, hold social meaning. The regions with the highest documentation density do not appear to have more attractive environmental-landscape characteristics. Intermediate areas are left empty because in theory they offer fewer possibilities. There must be another explanation for the polarization of the record: it can be found in the lithological features of the region. The sites known to us are under rock shelters that are logically located in limestone areas or in such areas as whose morphological structure enables their development. Outside these areas, thick sedimentary layers hide archaeological evidence and only occasionally, when dismantled by contemporary agricultural or infrastructure activities, are exposed.

This reality implies two situations that affect our view of the Mesolithic:

a) A false image of small hunter-gatherer groups who only lived under rock shelters. This image derives both from the perspective of exploration and visibility of these records;

b) The belief that no open-air sites of permanent occupation united groups larger than those which the rock shelters could accommodate.

Conversely, we argue for a completely different model of Mesolithic settlement (Alday and Cava, 2009). Examining the shelters reveals the following: a) their occupation was seasonal, occurring during the less severe seasons, b) actions were directed towards hunting and food preservation (these are specialist sites), c) the management of raw materials is carried out in another kind of circuit and d) the sheltered groups were small. An exclusive shelter network is thus hardly feasible to ensure the survival of the group or its independent functioning. The shelter system existed from at least the early Holocene: three and a half thousand years before the first signs of the Neolith peoples. This is too long a time to be demographically maintained, unless supported by another set of camps. We justified elsewhere *(ibidem)* that the Mesolithic groups in the Iberian Peninsula had a complex life style while carrying out apparently simple activities.

Therefore, the absence of an archaeological record that is necessary and complementary to that available fails to conceal or reveal a more complex reality of surface sites (stable villages) which would have been key elements. Only incidental findings illustrate this diversity. The most representative is the Cabezo de la Cruz, buried under a sedimentary layer excavated during road construction (Rodanés and Pizaco, 2009).

The example of the Ebro Basin can be extended to a larger scale. The Fig. 2 illustrates the correlation between site locations and limestone deposit areas (an example of archaeological display). No environmental obstacles hinder the occupation of the hinterland: these would not be at a disadvantage when compared to more inhospitable and inhabited parts of Europe.

For the Early Neolithic, two sites located outside the theoretical focus of peninsular Neolithic provide evidence: La Paleta (Toledo) and the cave of La Vaquera (Segovia) (Jiménez *et al.*, 2008; Estremera, 2003). These sites represent the first evidence of the Neolithic in their regions. The first is a prototype of an agricultural enclave (dating earlier than the peninsular *Cerealia*), and the second is a livestock site. These are the only points in their geographical realms; that is, no other contemporary sites are known: therefore, though they are sites of great value, they are decontextualized for research purposes. The corresponding question is the following: do they represent true Neolithic lifestyles? The answer is negative, as their cultural background is Neolithic, but they only reveal a small portion of that world. As indicated in the Mesolithic shelters, they are also not autonomous; they must be linked to a more complex prehistoric reality, which remains invisible.

What does a cave such as La Vaquera, at 960 m above sea level, offer, if we are to believe that the greatest part of the interior of the peninsula was deserted? The cave can only be understood in the context of a *Neolithic organisational environment*, a structure that protects a settlement of shepherds and their livestock. La Paleta (uncovered during the construction of industrial buildings) also deserves a similar assessment. Both archaeological sites reveal broader cultural information: the certainty of the existence of ancient *Neolithic structures* in the interior of the peninsular and, therefore, between these areas and the Mediterranean coast and/or the Pyrenees. There is a distance of 400 km between these sites and the Mediterranean, with La Vaquera situated nearly a 1000 m above sea level. During Neolithic population advances, those who founded the enclaves had to travel this region, leaving a record along the path, which, if it has been conserved, could be discovered with the aid of the proper research policies. In this regard, the work of Rojo and his team offers a great lesson (Rojo *et al.*, 2008): intensive and extensive excavation surveys coordinated with a long-term approach and sufficient resources caused a radical change in the Neolithic landscape of the Soria region, which had no previous Neolithic documentation and is, today, envied for the wealth and diversity of the information unearthed.

Contemplating these isolated sites without regard to the *structure* that gives them meaning prompts questions about the purpose and reasons behind the adventure that led some groups to remote interior locations. A convincing answer is difficult to find, unless the mechanisms of Neolithic introduction and consolidation did not imply, in all cases, large-scale population movements.

These specific locations reveal archaeological documentation which is both partial and unbalanced,

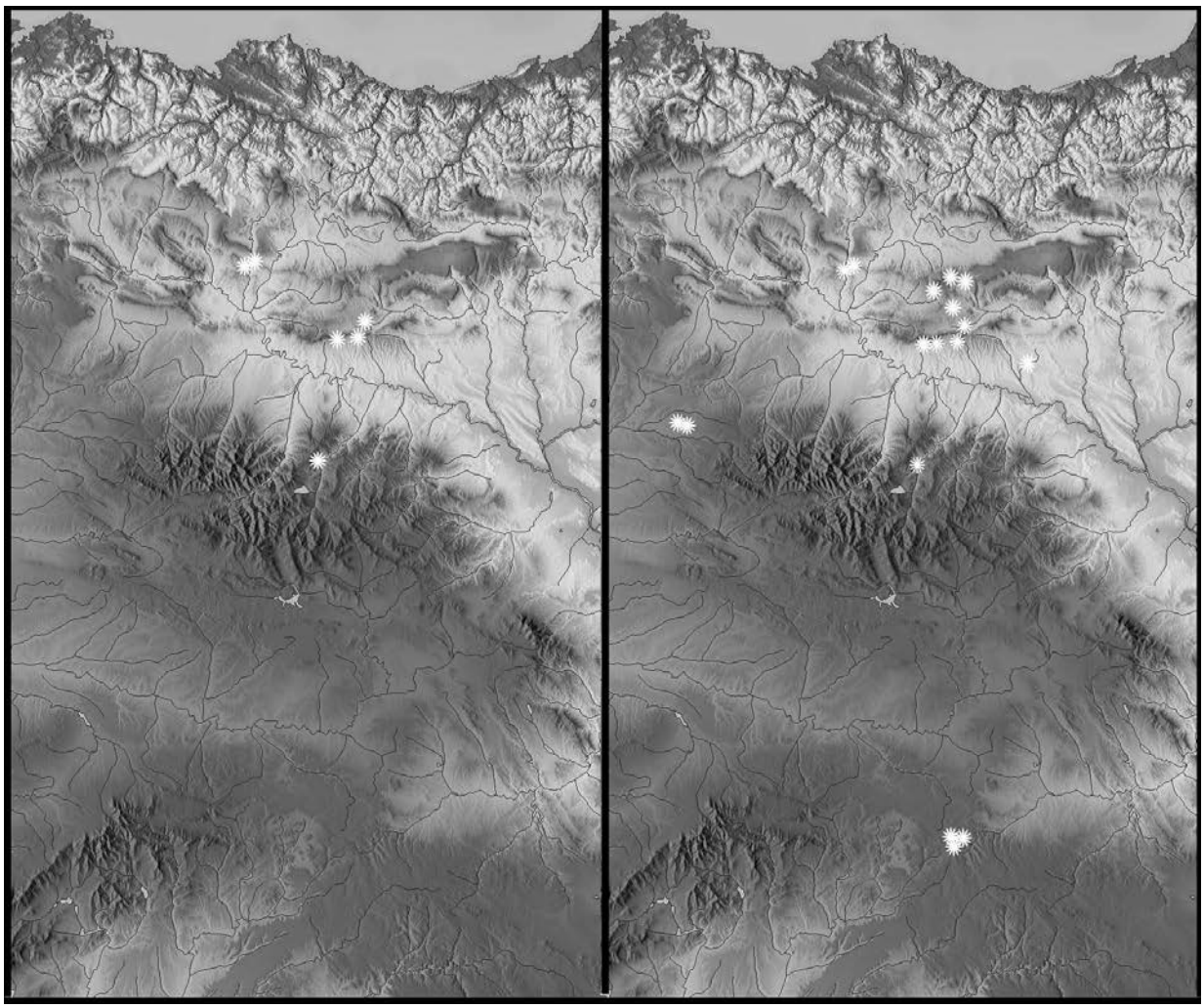

FIG. 3. *Left, Neolithic sites at the beginning of 1990; right, a decade later. Archaeological work is multiplying the amount of information available. Soria offers interesting Neolithic record as a result of work by Rojo. In the Atapuerca range, two complexes are added to the inventory. In the upper Ebro valley, new rock shelters and open-air settlements complete the information.*

but its fragments, when read within a broader context, fill gaps in our knowledge. Instead of considering the data in isolation, we can obtain a comprehensive understanding of the Neolithic.

We must therefore seek a balance between the two extremes: between the Mesolithic and Neolithic depopulation of the interior of the Iberian Peninsula (what reasons could explain this?) and a landscape fully domesticated by Neolithic groups (which had probably neither the capacity nor intention do so).

The Late Neolithic-Chalcolithic offers a clear example of unbalanced documentation. Much of its information comes from its rich funerary evidence. With data only from inhabited sites, reconstructing the period is impossible: in many areas, only burial caves and megalithic monuments exist. Again, as before, the record shows only a very small part of the reality: the documentation of the settlement remains opaque.

In summary, the reflection on the value of documentation underlines the following:

- The Meso-Neolithic database is partial, hiding a substantial part of the past and making explanations conditional.
- This bias generates an image of apparent depopulation of the interior and some coastal areas in the north and west. This situation is incomprehensible from the point of view of climate and landscape as well as history: its explanation resides in the lithological character of the territories and the nature of the sites.
- Overcoming these limitations requires a global interpretation, where each site is an element of a larger pattern.

3. An overview: networks

In reviewing all documentation, the sites themselves are interesting, but how they form part of an explanatory organisation (a context) is even more so. This approach offers the following advantages: a) it resolves problems associated with *irregular data*, and b) it describes networks of sites that are integrated, providing a richer view of the past.

An example of a Neolithic network comes from information on its early stages in the Basque region. Focusing one by one on the sites provides the following data:

- Small-scale camps, where at least one Neolithic ingredient is usually missing (ceramic, polishing, agricultural/animal domestication);
- An industrial catalogue, heavily composed of lithic components in some cases and ceramics in others, as part of incomplete and conflicting realities;
- Points of geographic concentration (noting a contrast in the types of deposits according to zones) and areas with little documentation;
- Mesolithic traces in shelters and *ex novo* foundations from others.

A classic reconstruction of the Neolithic era will view this irregular documentation as a result of the coexistence of colonizing groups (with their Neolithic amendments) and soon to be extinct indigenous Mesolithic peoples (clinging to their old ways and only partially accommodating new developments). Ceramics with few lithic tools correspond to the former, who are responsible for the new establishments, while the latter keep their camps and only accept some new crafts.

Conversely, the holistic overview, where the lack of elements within a site is remedied with their presence in another, describes "a network of networks", adapted to take full advantage of the new ways:

— Along the Bay of Biscay, information is supplied by Arenaza, Herriko Barra, Kobaederra, Kobeaga, Linatzeta, Marizulo, Pico Ramos and Santimamiñe. Except for the first, these sites exploit coastal and tidal resources during occasional visits, according to a strategy operating from the Mesolithic. It is therefore a network that does not meet the needs of the community and is necessarily complementary to other activities that are archaeologically opaque in that environment.

— In the interior, the rock shelters specialize in hunting: Atxoste, Fuente Hoz, Kanpanoste Goikoa, Mendandia, Montico de Charratu and Peña de Marañón. A hunting network is inherited from the Mesolithic but renewed in its material apparatus, and tasks relating to domestication (direct and indirect evidence of agriculture and livestock) are performed. Again, it is insufficient to guarantee a complete way of life.

— Further south, large caves and shelters serve as pens for livestock, forming a cattle network with minor hunting and agricultural activities: Los Husos I and II, Cueva Lóbrega, El Mirador, Peña Larga, and El Portalón de Cueva Mayor de Atapuerca. Logically, it is a new kind of structure, which is not viable on its own because a developed livestock system is understood in conjunction with agriculture.

— The interior also contains open-air settlements that are suitable, because of their location, for farm husbandry: Los Cascajos, Paternanbidea, Larrenke Norte (later Neolithic), the Urbasa Range. The Cascajos provide a good example (Sesma, 2007; García and Sesma, 2001): industrial exploitation of gravel revealed an organized town with a necropolis and the material and financial elements of the Neolithic. This is an isolated piece that forms part of a larger network.

The Early Neolithic of the region is the sum of these and other networks involving the exploitation of siliceous outcrops and the movement of foreign products. This integrative approach dismantles the thesis of the coexistence of old Mesolithic and new Neolithic formulas. It proposes an organized Neolithic functioning as a whole, where the objective of each network is its fellowship with the others. Broadly speaking, this network is a continuation of the one launched in the Mesolithic, and appropriately renovated to accommodate new methods.

— The camps that exploit the coast, hunting shelters, the management of raw materials and social spaces (where exotic materials are traded) are the same;

— The animal stables and open-air settlements (with their record) are incorporated elements, updating former parameters.

Basque networks are suitably sized, allowing efficient interaction between humans and the environment: they perform, at low cost, a variety of actions in a diverse and complementary environment, with a social attitude that is not without complexity.

There is abundant information in this region to indicate the Mesolithic groups' direct involvement in the development of the Neolithic. No break in the pattern of population organisation or network structure exists. This proposal has the advantage of explaining the speed of the process. Indigenous groups, far from opposing the new ways of doing things and delaying their implementation, naturally take on these new ways, but not because they were in a crisis from which the Neoliths saved them. Over time, the assumption of new modes commonly occurred. What they could not foresee was that the new criteria would ultimately and quickly disrupt the former world socially, economically and ideologically. As seen below, this happens in a second phase of the Neolithic era. However, the settlements initially indicate renewed continuity between the final hunter-gatherer episodes and early agricultural-livestock settlements.

Is a similar structure of networks reproduced in other areas of the peninsula as a means of exploiting the environment? Certainly, if the following conditions were met:

— Shell middens in Portugal are viable if understood as complementary to the activities performed in shelters and villages. Carvalho (2003) pointed out the need to understand the functionality of these sites in order to provide a synthetic overview of the Neolithic.

— In the Lower Aragon, shelters and settlements simultaneously combined hunting and agricultural activities. In the Pyrenees and Pyrenean foothills, hunting shelters and large caves were documented, where herds were kept while people lived in *settlements*.

— In the Valencia area, La Falguera is 15 km from the agricultural settlement of Mas d'Is. In the area, other cave-folds are recognized, with surface finds and rock art displays: a system for material and social interaction (García and Aura, 2006; Bernabeu and Molina, 2009; Bernabeu *et al*., 2003).

Regional structures are not new in the Neolithic: in each region, the remodelling of the Mesolithic system occurs, with changes required by the new approaches.

How should these networks be interpreted? They are expressions of a broad-spectrum economy during the Mesolithic: logistic campsites under the influence of stable settlements still unknown to us, which, when combined with their mobility, not only imply stability but also full knowledge of environmental possibilities. This factor, the proper geographical and environmental awareness, is crucial for understanding the speed of the Neolithic beginnings. The maintenance of Mesolithic networks during the Early Neolithic, with reforms, suggests that the economic concept continues under similar rules, where agriculture and livestock remain elements. New production materials and concepts provide a qualitative leap that becomes commonly assimilated and forms the basis for network replacement. In Mesolithic networks, technological products, food (as deduced from conservation practices), means of production and social elements circulate: the same concepts present in the Neolithic. From this perspective, the Late Neolithic, with a specialized agricultural economy that is beginning to leave behind hunting activities, definitively transforms the previous system of "network of networks".

4. Neolithic speed and Mesolithic attitudes

Put this way, the Neolithic transition process appears to have been swift: reality contradicts the idea that a production economy needs experimentation and stabilisation over time. This is probably so, but here one must distinguish between:

a) Archaeological Neolithic, defined by the presence of material items and evidence of domestication and

b) the Neolithic as a mode of production, the implementation of which requires time.

Discussions among Neolithic experts do not reflect on this subtle and interesting nuance, which can be instantiated with a contemporary metaphor that affects all: computers came into our homes and jobs two or three decades ago, but the technological revolution only now socially affects the younger generation more than the original adoptees'. In this case, too, there are two areas: material (computer resources in the material register) and behavioural (reorganisation of tasks and ways of relating with new tools). The distinction between these two versions of the Neolithic does not differ from that indicated by Juan-Cabanilles and Martí (2002).

The *corpus* of C14 dates from the Peninsula confirms the speed of this mechanism. Validating those taken from short-lived samples with variances of less than a century, the harmonisation of the results from the Late Mesolithic/Early Neolithic provide the date, *c*. 5700-5600 cal BC (Alday, 2009). Two or three Mesolithic cases that cross the chronological barrier could be queried regarding the question of samples or the cultural framework ascribed to the site. Apart from these situations, this time frame is common to the whole Peninsula, as a greater number of Neolithic radiometric values are found in that century (and in an earlier one, herein described as that of *Neolithic pioneers*).

Focusing on the reason for the speed and knowledge of the mechanism, it must be pointed out that Mesolithic communities played a key role in successfully installing farming economy (in the same way that people who knew how to grow food were essential and irreplaceable). Logic dictates that where agricultural methods are indicated, communities were forced to rediscover Mesolithic secrets to avail of them. Climate, landscape and soil conditions are clearly different on the east coast in a Mediterranean environment to those in the estuary of the Tagus, with an Atlantic influence. The Neolithic transmission from one point to another thus requires an adaptation phase. Indeed, examples of the failure to introduce animal and plant species with certain characteristics from the twentieth century in the Iberian Peninsula only go to verify that the process is neither automatic nor guaranteed. It hardly could have been so with the technological level of prehistoric societies. Mesolithic groups were well-acquainted with the topography of each environment, flood areas, unproductive land, seasonality, weather, frost, the cycle of *natural crops*, soil properties, pasture locations and forest density, all of which were required to favour the *germination of the Neolithic seed*. If the introduction mechanism only involved migrant populations, the slow reconnaissance of the environmental characters in each area would have delayed the process more than the available dates suggest. The Mesolithic communities would have known the most suitable sites for new towns, places with abundant raw materials. The Neolithic people contributed *technical expertise* to develop the production economy, but the potential of each region worked in favour of those who had lived there for many generations. Both ingredients were necessary and complementary.

The last Mesolithic groups were not only active participants in the Neolithic process, but also the necessary agents for it to be understood within the framework indicated by the archaeological finds. In the documented regions, coastal or inland, there is no staggered *Neolithic drift*: in contrast, the synchronisation of radio chronological values is revealing. If one or several maritime transmissions and another or others by land complemented each other, the speed was identical in the Iberian Peninsula: therefore, the former support the role of the latter, where the participation of indigenous peoples is more decisive.

Mesolithic pathways allowed the transfer of new developments and a certain number of people, and the knowledge they had of the environment facilitated the implementation of the new cultural coordinates. This perspective helps us deal with an unavoidable issue, rarely given a proper answer with the arguments of those who defend a *purely*

colonising model: the cause of migratory movement. In this approach, the adoption of the Neolithic followed the dynamics that guaranteed access to new technology, raw materials or finished products. There was no need to refer to unproven social, demographic or environmental pressures as engines of historical dynamics (Zilhão, 2001; Soares and Tavares da Silva, 2003).

Furthermore, what other alternative is viable regarding what happened to Mesolithic groups?

— Direct confrontation with Neolithic migrants: there is no archaeological evidence to indicate that this was the case (nor would it be easy to find);

— Withdrawal from Neolithic domains, creating a system of boundaries, as in northern Europe. The argument is not sustainable, as the regions with more dense Mesolithic information are precisely those that provide the bulk of the Neolithic documentation;

— A slow dissolution, an alternative that does not conform to radio chronological values that point to an end without extensions for hunter-gatherers (Alday, 2009).

Only in Catalonia and the Soria region, where previous Mesolithic events have not been found, can it be argued that the Neolithic people avoided contact with the last of the Mesolithic people.

The Catalan situation is puzzling for pre-historians: the region was densely occupied in the Late Palaeolithic and the Early and Middle stages of the Mesolithic, but it lacks data for Mesolithic geometrics. What could have happened? Could the region have been abandoned due to a catastrophic event or epidemic? (Biaggi, 2003). Was there a change in settlement norms leading to the abandonment of the traditional cave enclosures? Was it taphonomic problems that undermined the record? Severe erosions are observed in the sedimentological and radio chronological data in several stratigraphic layers of the Mediterranean shores of the Iberian Peninsula: Pardo (Soler *et al.*, 2008), Balma Margineda (Brochier, 1995), Mas Martí (Fernández *et al.*, 2005), La Falguera (García and Aura, 2006), Cendres (Bernabeu and Molina, 2009) or Tossal de la Roca (Cacho *et al.*, 1995).

For their part, the settlements in Soria, 300 km from the coast, must have left intermediate traces that also cannot be found. They are fragments of partial information that lead us back to reflections resulting from the map.

Ultimately, the *participatory model* tallies best with all the archaeological data and shares a historical logic repeated in other more recent circumstances.

5. Comprehensive Neolithic dynamics and local reflections

The Neolithic process had a comprehensive mission, regardless of access mechanisms: the Iberian Peninsula by sea and land and participation from North Africa. Because it is a continent-wide phenomenon with reflections and versions at a regional scale, a comprehensive explanation is required, and within this, regional nuances.

The Neolithic dynamics were not homogenous, with only one particular east-west course: Columbus needed to make several trips and follow several routes before being fully aware of the significance of his discovery, and for both himself and the Castilian kingdom to adopt a position on it. The different *Neolithic paths* and the different times at which they were used explain Neolithic variants. The role played by the resident populations and receivers of the Neolithic, combined with the origins of the influence, had an impact on the choice of method used to craft ceramic (as regard shape and decoration) or lithic crafts.

The Mesolithic unit does not exclude regional particularities: it occurs in lithic industries (Alday and Cava, 2009). The apparent uniformity of geometric armour breaks with the regional exclusivity of some models; the prototypes of each region have a social, but not functional, interpretation. The unit, the worldview and the operating modes are Mesolithic in nature, but there is room for the development of social group identities.

These lithic industry features survive into the Neolithic and are reinforced in other elements. In the Iberian Peninsula, decorative varieties of Neolithic ceramics are linked to different geographical areas: the cardial, in coastal areas, the *boquique*, inland and ochre, in Andalusia. The Mesolithic forces that parcelled different material characteristics continued to act in a similar fashion during the Early

Neolithic. These material differences, interpreted in a social context, offer an argument for continuity in the Neolithic development process.

In short, variations in the transmission of the Neolithic and differences in Mesolithic interests explain the fragmentation of the material culture (Soares and Tavares da Silva, 2003).

Therefore, for methodological reasons and problems with documentation, flowcharts of the stages and evolution of ceramic production fail to explain the complicated Neolithic process. These trials lend too much importance to the concept of the index fossil, the typological value of which does not always coincide with suggested cultural significances. So, the theoretical proposals are thus continually updated to fit new situations. These paradigms are beyond the general development process; they observe regional circumstances and define relationships between areas, but they have little explanatory scope. These exercises organise knowledge on a smaller scale and accurately describe *Neolithic drift* in short time frames, but they run into difficulty in broader applications. These reconstructions represent only a part of the Neolithic reality.

6. Conclusions

This paper attempts a comprehensive analysis of the peninsular Neolithic: it does not raise the archaeological comparison of the character of the societies involved (Mesolithic/Neolithic), but rather it aims at assessing their structural and organisational characteristics. It observes the process from a historical approach under which economic, physical and social aspects flow.

1. Radiochronology indicates that the Mesolithic-Neolithic transition occurred in the Iberian Peninsula around 5700 cal BP. Few Mesolithic sites exist beyond this limit; the few exceptions are explained by the limitations and circumstances of archaeological science in general and the C14 method in particular. Thus, the previously proposed date is brought forward by a few centuries, calling for a review of the general maps of Europe setting out the expansion rate of the Neolithic, faster than was thought, and, consequently, the degree of participation of migrant populations.

2. From that date, a consolidated Neolithic archaeological record emerges. We refer to the concept of the *Neolithic archaeological record* rather than the *Neolithic life model*. The process of changing the economic system could not have been automatic, as reflected in the record. The first documentation of the Neolithic appears simultaneously on the coast and inland, highlighting the speed of the process and the many paths and directions that it takes.

3. The record corresponding to these first stages is still relatively poor, although there have been great advances in their reconnaissance: it is very likely a problem of archaeological visualisation. The limited amount of information available seriously hinders the description and hierarchisation of their characters, but it is significant that all the Neolithic ingredients are present in different proportions: ceramics, renewed lithic industry, domestic animals and plants.

4. It could be argued whether some data that appears to indicate a Neolithic record slightly in advance of the proposed date is a result of an irregular archaeological census or if it points to the movements of pioneers, inroads leaving weak prints which, as precedents, are not the real basis of the Neolithic formation process. On this matter, the case we are most familiar with is level III-upper of Mendandia (Alday, 2006), where carbon 14 dating has indicated, on three occasions, abundant ceramics, lithic industry with Neolithic parameters and aurochs genetically similar to those considered as European domestic animals that originally came from Near East Asia at an early date (Alday, 2006; Alday *et al.*, 2009). Possibly, cases like Mas Nou level I, La Lámpara, according to the fill in hole 9, Pico Ramos level 4 –more doubtful– can be included in this same situation (Olaria, Gusi and Gómez, 2005; Rojo *et al.*, 2008; Zapata, 2007). This solution may likewise be valid for other European cases: to explain the presence of farming practices among Mesolithic groups, of livestock in ancient dates (Behre, 2007; Iriarte, 2006; Joly and Visset, 2005; Leroyer, 2004; Richard and Ruffaldi, 2004; Tinner, Nielsen and Lotter, 2007; Visset, 2004; Visset *et al.*, 2002, 2004), or of ceramics in ancient contexts (Miller, Otte and Stewart, 2009).

5. We accumulated direct documents of early domestication: of cereal from 6600 and 6400 in La Paleta, Mas d'Is, Or, Falguera and Can Sadurní –more indirect ones, using traceology in Mendandia II– (Jiménez *et al.*, 2008; Bernabeu

et al., 2003; García and Aura, 2006; Alday, Castaños and Perales, to be published): they are open-air settlements and rock shelters with or without a Mesolithic past; of fauna in Peña Larga, Nerja, El Barranquet, and La Revilla –plus level I in Mendandia with domestic auroch, although the date is given by a fragment non-identified at the species level (Esquembre *et al.*, 2008; Bernabeu, 2006; Rojo *et al.*, 2008; Alday, 2006). Here too, there are rock shelters or open-air settlements. In both cases, be they farming or livestock, the references affect coastal and inland deposits, thus confirming that there was no staggered progression of the Neolithic in the Iberian Peninsula. It is too soon to specify the economic management models: we have evidence of domestication but we do not know the real significance of the domesticated products in the diet of the populations. Their presence points to the fact that certain production practices gradually alter former economic proposals, but we cannot know the extent to which they affected the administration of the environment, and social organisation in the first stages.

6. We believe that the Iberian Neolithisation process is only understandable with the active participation of Mesolithic populations. Only thus can the geographic cohabitation of most of the ancient information from the Neolithic and the late Mesolithic be understood –this coincidence does not occur in places where Mesolithic *depopulation* may have resulted from problems relating to archaeological documentation, not to the reality of the prehistoric past. It explains the speed of the phenomenon, as it has been a surprise to find Neolithic archaeological record in ancient dates and in areas which are *theoretically marginal*. The exploitation of Mesolithic networks must be behind this process. The proposal, classified as an *indigenist model*, fails to satisfy us because the meaning given to the term (it is difficult to sustain indigenism at all costs; Barandiarán and Cava, 2000) could be branded as a *participatory model.* As such:

a) It accepts different, non-contradictory mechanisms (routes, addresses and a variety of impulses);
b) It does not need to question the controversial and unsatisfactorily solved reason for the *colonising movements*, because it contemplates the phenomenon from a more natural perspective, from the dynamics of the Mesolithic;
c) It solves the frequently unasked question of the process of *liquidation* or dissolution of the hunter-gatherer communities, so highly consolidated in several regions;
d) It assumes that the knowledge of landscapes, climates, raw materials, etc. on the part of Mesolithic societies, as opposed to the ignorance on the part of the Neolithic societies, facilitates the success of the new proposals;
e) It does not forget that, behind this general process, there are interesting nuances to explain Neolithic variants: in the material, funerary and artistic record, variants deriving from Mesolithic social fragmentation and from the different Neolithic impulses.

We have not entered into a discussion of the role of foreign populations. Just as we afford an essential prominence to autochthonous groups, we acknowledge the fact that products and ideas do not emerge on their own. Nevertheless, we are incapable of calculating the extent of said participation: transmitting knowledge required direct contact with the experienced communities, but, if it implied small or large-scale demic movements, it can still not be reliably measured nor can the procedure of the odyssey be described.

7. From 5500-5400 cal BP onwards, the intensity of the Neolithic population appears to have increased: the number of dated sites is not greater but the geographical range is wider. There may have been an increase in population though this is a mere hypothesis: it seems to be a phenomenon that goes hand in hand with the development of a productive economy, or rather with the sedentarisation process, though there is not enough evidence. We believe that the Neolithic way of life was consolidated then, with the network of open-air sites being favoured, though complementary networks for exploiting the coast, hunting, stabling livestock and exploiting raw materials were not abandoned. It is then when ceramic circles were built and had meaning: cardial, *boquique* and red oxide clay. According to our interpretation, they are part (together with

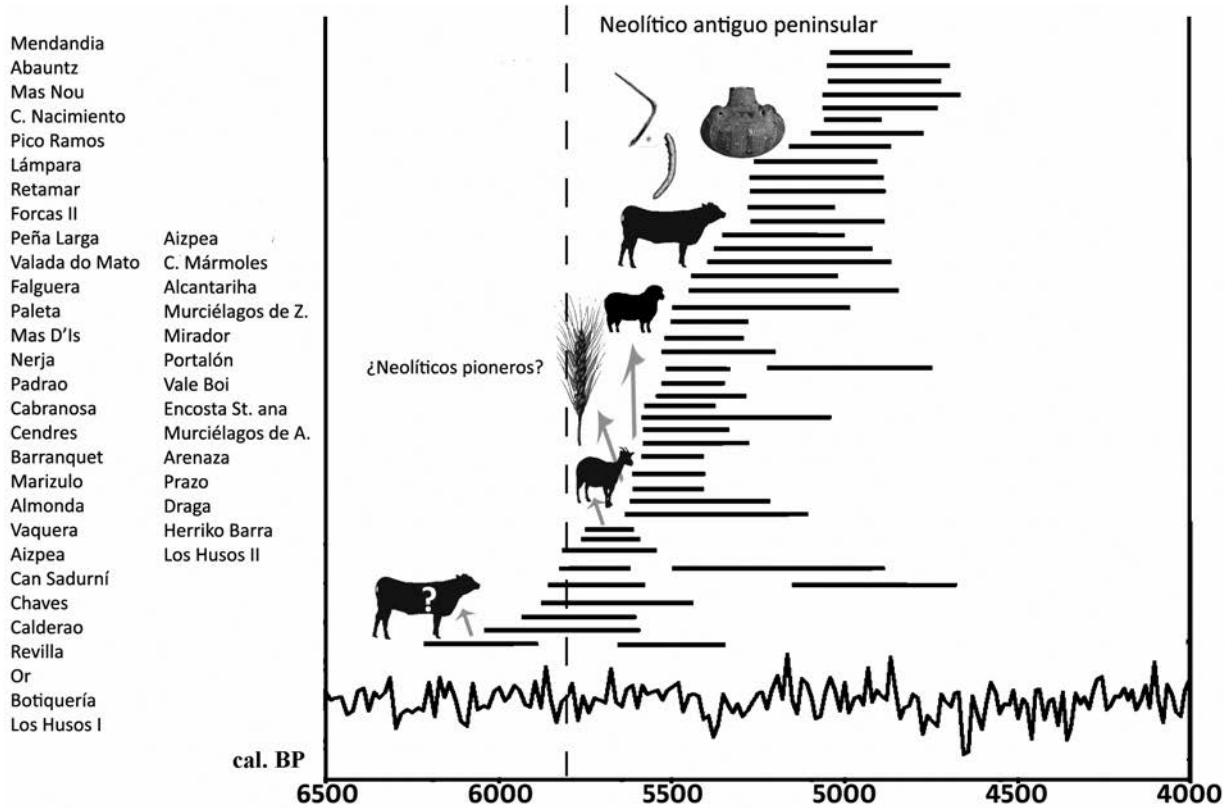

FIG. 4. *Radiochronology of early Neolithic (signs of a short life): the process began towards 5700 cal BP, and accelerated towards 5500. Background: Neolithic pioneers with ceramics, silex tools and domesticated auroch? (Anderug* et al., *2008).*

variants of the lithic models) of that shared social identity, already seen in the Mesolithic. It is easy to associate cardial predominance with expressions from the western Mediterranean. It is more complicated to link *boquique* with other decorative techniques or formulas: its connection with *sillon d'impression* has not been proven, either geographically or technically; moreover, these connections need not be sought, as it could have been a particular recreation which was conceived and developed here.

8. When Mesolithic groups, in a natural way, took on and experienced Neolithic developments, they could not see the consequences. It would have been hard for them to imagine that their world was about to crumble: social relations changed at an unstoppable pace, observation, control and attitude to the environment took a different course, material culture adapted to the new circumstances, the settlement followed other guidelines, economic rules (and ones concerning food) followed a new system, and the ideological foundation was restructured. It is possible that the most reliable proof of these dynamics in archaeology is to be found in the reclassification of traditional settlement networks, which, at the beginning of the fifth millennium focused on other interests: the intensification of the open-air settlement, the use of shelter-stables, but the dismantling of the hunting camps and those for exploiting the coast except for infrequent visits. From then on and until the funerary world came into play, Iberian Peninsula documentation shrank considerably: the effects of Neolithic acceptance were greatly felt. Such Mesolithic communities as had taken part in the project are totally integrated in *Neolithic trap.*

Bibliography

ALDAY, A. (2003): "Cerámica neolítica de la región vasco-riojana: base documental y cronológica", *Trabajos de Prehistoria*, 60 (1), pp. 53-80.

— (2006): *El legado prehistórico de Mendandia: los modos de vida de los últimos cazadores-recolectores en la prehistoria de Treviño*. Arqueología de Castilla y León. Memorias, 15. Junta de Castilla y León.

— (2009): "El final del Mesolítico y los inicios del Neolítico en la Península Ibérica: cronología y fases", *Munibe Antropologia-Arkeologia*, 60, pp. 157-173.

ALDAY, A.; CARVALHO, A. F.; CERRILLO, E.; GONZÁLEZ CORDERO, A.; JUEZ, L.; MORAL, S. y ORTEGA, A. I. (2009): *Reflejos del Neolítico Ibérico. La cerámica boquique: caracteres, cronología y contexto*. EDAR ediciones.

ALDAY, A. and CAVA, A. (2009): "El mesolítico geométrico en Vasconia". In UTRILLA, P. and MONTES, L. (coords.): *El Mesolítico geométrico. El desarrollo de las industrias geométricas del VIII-VI milenio BP*, pp. 93-130.

AMKREUTZ, L. (2010): "All Quiet on the northwestern Front? An overview and Preliminary analysis of the past decade of LBK-research in the Netherlands". In *Die Neolithisierung Mitteleuropa. The spread of the Neolithic to Central Europe*. International Symposium, Mainz 2005. Römisch-Germanisches Zentralmuseum, pp. 535-550.

AMKREUTZ, L.; VANMONTFORT, B. and VERHART, L. (2008): "Diverging trajectories? Forager-farmer interaction in the southern part of the Lower Rhine Area and the applicability of contact models". In HOFMANN, D. and BICKLE, P. (eds.): *Creating communities new advances in Central European Neolithic research*, pp. 11-31.

AMMERMAN, A. and BIAGI, P. (eds.) (2003): *The Widening Hasvest. The Neolithic transition in Europe. Looking Back, Looking Forward. Archaeological*. Institute of America, pp. 133-155.

AMMERMAN, A. and CAVALLI-SFORZA, Ll. (1979): "The wave of advance model for the spread of agriculture in Europe". In RENFREW, C. and COOKE, Ck. (eds.): *Transformations: Mathematical approaches to culture change*. London: Academic Press, pp. 275-294.

AMMERMAN, A.; PINHASI, R. and BÁNFFY E. (2006): "Comments on Haak *et al*. – Ancient DNA from the First European Farmers in 7500-Year-Old Neolithic Sites", *Science*, 312, p. 1875.

ARNAUD, J. M. (2000): "Os concheiros mesolíticos do vale do Sado e a exploração dos recursos estuarinos (nos tempos prehistoricos e na actualidade)", *Trabalhos de Arqueología*, 14, pp. 21-43.

BALARESQUE, P.; BOWDEN, G. R.; ADAMS, S. M.; LEUNBG, H. Y. and KING, T. E. (2010): "A Predominantly Neolithic Origin for European Paternal Lineages", *PLoS Biol*, 8(1): e1000285. doi:10.1371/journal.pbio.1000285.

BÁNFFY, E. (2004): *The 6th Millennium BC boundary in Western Transdanubia and its role in the Central European transition*. Budapest.

BANFORTD, F.; JACKESS, M. and LUBELL, D. (2003): "Mesolithic Neolithic population relationships in Portugal: the evidence from ancient mitochondrial DNA". In LARSSON, L.; KINDGREN, H.; KNUTSSON, K.; LEOFFLER, D. and ÅKERLUND, A. (eds.): *Mesolithic on the Move: Proceedings of the 6th International Conference on the Mesolithic in Europe*. Stockholm (2000). Oxford: Oxbow Books, pp. 581-587.

BARANDIARÁN, I. and CAVA, A. (2000): "A propósito de unas fechas del Bajo Aragón: reflexiones sobre el Mesolítico y el Neolítico en la Cuenca del Ebro", *SPAL*, 9, pp. 293-326.

— (2003): *Cazadores-recolectores en el Pirineo navarro. El sitio de Aizpea entre 8.000 y 6.000 años antes de ahora*. Veleia. Anejos Serie Maior, 10. Universidad del País Vasco.

BARBUJANA, G. and GOLDSTEIN, D. B. (2004): "Africans and Asians abroad: Genetic diversity in Europe", *Annual Review of Genomics and Human Genetics*, 5, pp. 119-150.

BARRIOS GIL, I. (2004): *El yacimiento de Cueva Lóbrega (Torrecilla en Cameros, La Rioja). Una visión acerca del Neolítico y la Edad del Bronce en el área occidental del Sistema Ibérico*. Instituto de Estudios Riojanos.

BEHRE, K. E. (2007): "Evidence for Mesolithic agriculture in and around central Europe?", *Veget Hist Archaeobot*, 16, pp. 203-219.

BERNABEU, J. (2006): "Una visión actual sobre el origen y difusión del Neolítico en la Península Ibérica. Ca. 5600-5000 cal., A.C.". In GARCÍA, O. and AURA, E. (coords.): *El abric de la Falguera (Alcoi, Alicante). 8.000 años de ocupación humana en la cabecera del río de Alcoi*, pp. 189-211.

BERNABEU, J. and MOLINA, Ll. (coords.) (2009): *La Cova de Les Cendres.* Museo Arqueológico de Alicante - MARQ, serie mayor, 6.

BERNABEU, J.; OROZCO, T.; DÍEZ, A.; GÓMEZ, M. and MOLINA, F. J. (2003): "Mas d'Is (Penàguila, Alicante): aldeas y recintos monumentales del Neolítico inicial en el valle del Serpis", *Trabajos de Prehistoria*, 60 (2), pp. 39-59.

BICHO, N. F.; STINER, M.; LINDLY, J. and FERRING, C. R. (2000): "O processo de neolitização na costa sudoeste". In *III Congresso de Arqueologia Peninsular*, 3, pp. 11-22.

BOCQUET-APPEL, J. P.; NAJI, S.; VANDER, M. and KOZLOOWSKI, J. (2009): "Detection of diffusion and contact zones of early farming in Europe from the space-time distribution of 14C dates", *Journal of Archaeological Science*, 36, pp. 807-820.

— (2011): "Understanding the rates of expansion of the farming system in Europe", *Journal of Archaeological Science*, 39 (2), pp. 531-546.

BROICHIER, J. E. (1995): "Estudi geoarqueologic dels deposits holocens de la Balma de la Margineda, capes de 1 a la 6". In GUILAINE, J. and MARTZLUFF, M. (eds.): *Les excavacions a la Balma de la Margineda (1979-1991)*, tome 1. Principat d'Andorre: Ministeri d'Afers Socials i Cultura.

CACHO, C.; FUMANAL, M. P.; LÓPEZ, P.; LÓPEZ, J. A.; PÉREZ RIPOLL, M.; MARTÍNEZ VALLE, R.; UZQUIANO, P.; ARNANZ, A.; SÁNCHEZ MARCO, A.; SEVILLA, P.; MORALES, A.; ROSELLÓ, E.; GARRALDA, M. D. y GARCÍA-CARRILLO, M. (1995): "El Tossal de la Roca (Vall d'Alcalá, Alicante)", *Recerques del Museu d'Alcoi*, 4, pp. 11-101.

CALLAGHAN, R. and SCARRE, Ch. (2009): "Simulating the western seaways", *Oxford Journal of Archaeolog*, 20 (4), pp. 357-372.

CARVALHO, A. F. (2002): "Current perspectives on the transition from the Mesolithic to the Neolithic in Portugal". In BADAL, E.; BERNABEU, J. and MARTÍ, B. (eds.): *El paisaje en el Neolítico mediterráneo*. València: Universitat de València, pp. 135-250.

— (2003): "A emergência do Neolítico no actual território português: pressupostos teóricos, modelos interpretativos e a evidência empírica", *O Arqueólogo Português*, 21, pp. 65-150.

— (2008): *A Neolitização do Portugal Meridional. Os exemplos do Maciço Calcário Estremenho e do Algarve Ocidental*. Promotoria Monográfica, 12. Centro de Estudio de Patrimonio. Universidad de Algarve.

— (2010): "Le passage vers l'Atlantique: le processus de néolithisation en Algarve (sud du Portugal)", *L'Anthropologie*, 114 (2), pp. 141-178.

CERRILLO, E. and GONZÁLEZ, A. (2006): "El Neolítico antiguo en la Cuenca media del Tajo: estado actual de los conocimientos". In *Actas del IV Congreso de Arqueología Peninsular*. Promotoria Monográfica, 04. Centro de Estudio de Patrimonio. Universidad de Algarve, pp. 183-195.

CHANDLER, H.; SYKES, B. and ZILHÃO, J. (2005): "Using ancient DNA to examine genetic continuity at the Mesolithic-Neolithic transition in Portugal". In ARIAS, P.; ONTAÑÓN, R. and GARCÍA-MONCÓ, C. (eds.): *Actas del III Congreso sobre el Neolítico en la Península Ibérica.* Santander: Instituto Internacional de Investigaciones Prehistóricas de Cantabria, pp. 781-786.

CHIKHI, L.; DESTRO-BISOL, G.; BERTORELLE, G.; PASCALI, V. and BARBUJABI, G. (1998): "Clines of nuclear DNA markers suggest a largely neolithic ancestry of the European gene pool", *Proceedings of the National Academy of Sciences USA*, 95, pp. 9053-9058.

CHIKHI, L.; NICHOLS, R. A.; BARBUJABI, G. and BEAUMONT, M. A. (2002): "Y genetic data support the Neolithic Demic Diffusion Model", *Proceedings of the National Academy of Sciences USA*, 99, pp. 10008-10013.

COQUEUGNIOT, E. (2000): "Dja'de (Syrie), un village à la veille de la domestication". In GUILAINE, J. (ed.): *Premiers paysans du monde. Naissance des agricultures,* pp. 55-71.

CURRAT, M. and EXCOFFIER, L. (2005): "The effect of the Neolithic expansion on European molecular diversity", *Proceedings of the Royal Society London*, 272, pp. 679-688.

DIAMOND, J. and BELTWOOD, P. (2003): "Farmers and their languages: the first expansions", *Science*, 300, pp. 597-603.

DINIZ, M. (2007): *O sítio da Valada do Mato (Évora): aspectos da neolitização no Interior/ Sul de Portugal*. Instituto Português de Arqueologia.

DUPANLOUP, I.; BERTORELLS, G.; CHIKHI, L. and BARBUJABI, G. (2004): "Estimating the impact of prehistoric admixture on the Europeans genome", *Molecular Biology and Evolution*, 21, pp. 1361-1372.

ESQUEMBRE, M. A.; BORONAT, J.; JOVER, F. J.; MOLINA, F. J.; LUJÁN, A.; FERNÁNDEZ LÓPEZ DE PABLO, J.; MARTÍNEZ VALLE, R.; IBORRA, M. P.; FERRER, C.; RUIZ PASTOR, R. and ORTEGA, J. R. (2008): "El yacimiento neolítico del Barranquet de Oliva (Valencia)". In *IV Congreso del Neolítico Peninsular*, 1, pp. 183-190.

ESTREMERA, M. S. (2003): *Primeros agricultores y ganaderos en la Meseta norte: El Neolítico de la Cueva de la Vaquera (Torreiglesias, Segovia).* Junta de Castilla y León. Memorias, 11.

FERNÁNDEZ ERASO, J. and POLO, A. (2009): "Establos en abrigos bajo roca de la prehistoria reciente: su formación, caracterización y proceso de estudio. Los casos de Los Husos y de San Cristóbal", *Krei*, 10, pp. 39-51.

FERNÁNDEZ LÓPEZ DE PABLO, J. and GÓMEZ PUCHE, M. (2009): "Climate change and population dynamics during the Late Mesolithic and the Neolithic transition in Iberia", *Documenta Praehistorica*, XXXVI, pp. 67-96. doi:10.4312/dp.36.

FORTEA, J. (1973): *Los complejos microlaminares y geométricos del Epipaleolítico mediterráneo español*. Salamanca.

FUGAZZOLA, M. A. and MINEO, M. (1995): "La piroga neolitica del lago di Bracciano ('La Marmotta 1')", *Bulletino di Paletnologia Italiana*, 86, pp. 197-266.

FUMANAL, P. (1995): "Los depósitos cuaternarios en cuevas y abrigos. Implicaciones sedimentoclimáticas". In ROSELLÓ, V. M. (ed.): *El Cuaternario del País Valenciano*. València: Universitat de València, pp. 115-124.

GARCÍA BORJA, P.; AURA, J. E.; BERNABEU, J. and JORDÁ PARDÓ, J. F. (2010): "Nuevas perspectivas sobre la neolitización de la Cueva de Nerja (Málaga-España): la cerámica de la Sala del Vestíbulo", *Zephyrus*, 66, pp. 109-132.

GARCÍA GÁZOLAZ, J. and SESMA, J. (2001): "Los Cascajos (Los Arcos, Navarra). Intervenciones 1996-1999", *Trabajos de Prehistoria Navarra*, 15, pp. 199-206.

GARCÍA GUIXÉ, E.; RICHARDS, M. P. and SUBIRÀ, M. E. (2006): "Palaeodiets of Humans and Fauna at the Spanish Mesolithic Site of El Collado", *Current Anthropology*, 47 (3), pp. 549-556.

GARCÍA PUCHOL, O. and AURA, E. (coords.) (2006): *El abric de la Falguera (Alcoy, Alicante). 8000 años de ocupación humana en la cabecera del río Alcoy*. Diputación Provincial de Alicante.

GIBAJA, J. F. and CARVALHO, A. F. (eds.) (2010): *Os últimos caçadores-recolectores e as primeras comunidades productoras do sul da Península Ibérica e do norte de Marrocos.* Promontoria Monográfica, 15. Universidad do Algarve.

GUILAINE, J. (2003): *De la vague à la tombe: la conquête néolithique de la Méditerranée (8000-2000 avant J.C.)*. Seuil.

HAAK, W.; FORSTER, P.; BRAMANTI, B.; MATSUMURA, S.; BRANDT, B.; TÄNZER, M.; VILLEMS, R.; RENFREW, C.; GRONENBORN, D.; ALT, K.W. and BURGES, J. (2005): "Ancient DNA from the First European Farmers in 7500-Year-Old Neolithic Sites", *Science*, 310, pp. 1016-1018.

HELMER, D.; GOURICHON, L.; MONCHOT, H.; PETERS, J. and SAÑA, M. (2005): "Identifying early domestic cattle from Pre-Pottery Neolithic sites on the Midddle Euphratesusing sexual dimorphism". In VIGNE, J. D.; HELMER, D. and PETERS, J. (eds.): *The first steps of animal domestication: newarchaeozoological approaches*. Oxford: Oxbow books, pp. 86-95.

IRIARTE, M. J. (2006): "El entorno vegetal del abrigo de Mendandia y su depósito arqueológico: análisis palinológico". In ALDAY, A. (dir.): *El legado arqueológico de Mendandia: los modos de vida de los últimos cazadores en la prehistoria de Treviño*, pp. 405-418.

ISERN, N. and FORT, J. (2010): "Anisotropic dispersion, space competition and the slowdown of the Neolithic transition", *New Journal of Physics*, 12. doi:10.1088/1367-2630/12/12/123002.

— (2011): "Cohabitation effect on the slowdown of the Neolithic expansion", *Europhysics Letters*, 96 (5), pp. 1-5.

JACKES, M. and MEIKLEJOHN, C. (2004): "Building a method for the study of the Mesolithic-Neolithic transition in Portugal. Budja (ed.), 11th Neolithic Studies", *Documenta Praehistorica*, 31, pp. 89-111.

JEUNESSE, Ch. (2002): "La coquille et la dent. Parure de coquillage et évolution des systèmes symboliques dans le Néolithique danubien (5600-4500)". In GUILAINE, J. (dir.): *Matériaux, productions, circulations du Néolithique à l'Age du Bronze*. París: éd. Errance, pp. 49-64.

JIMÉNEZ GUIJARRO, J. (2010): *Cazadores y campesinos: la neolitización del interior de la Península Ibérica.* Bibliotheca Archaeologica Hispana, 31. Madrid: Real Academia de la Historia.

JIMÉNEZ GUIJARRO, J.; ROJAS RODRÍGUEZ-MALO, J. M.; GARRIDO, G. and PERERA, J. (2008): "El yacimiento del Neolítico inicial de La Paleta (Numancia de la Sagra, Toledo)". In *IV Congreso del Neolítico Peninsular,* 1, pp. 126-136.

JOBLING, M. A.; HURLES, M. E. and TYLER-SMITH, C. (2004): *Human evolutionary genetics: origins, peoples, and disease*. New York: Ed. Graland.

JOLY, C. and VISSET, L. (2005): "Nouveaux éléments d'anthropisation sur le littoral vendéen dès la fin du Mésolithique", *Palevol*, 4 (3), pp. 285-293.

JUAN-CABANILLES, J. and MARTÍ, B. (2002): "Poblamiento y procesos culturales en la Península Ibérica del VII al V milenio a. C. (8000-5500 BP). Una cartografía de la neolitización". In *El paisaje en el Neolítico mediterráneo. Saguntum, extra*-5, pp. 45-87.

LEMMEN, C.; GRONENBORN, D. and WIRTZ, K. W. (2011): "A simulation of the Neolithic transition in Western Eurasia", *Journal of Archaeological Science*, 38 (12), pp. 3459-3470. doi: 10.1016/j.jas.2011.08.008.

LEROYER, C.; MORDANT, D. and LANCHON, Y. (2004): "L'anthropisation du Bassin parisien du VII^{e} au IV^{e} millénaire d'après les analyses polliniques de fonds de vallées: mise en évidence d'activités agro-pastorales très précoces", *Annales Littéraires de l'Université de Franche-Comté, serie "Environnement, sociétés et archéologique"*, 7, pp. 11-27.

LIGHTFFOOT, E.; BONEVA, B.; MIRACLE, P. T.; ŠLAUS, M. and O'CONNELL, T. C. (2011): "Exploring the

Mesolithic and Neolithic transition in Croatia through isotopic", *Antiquity*, 85 (327), pp. 73-86.

MALMSTRÖM, H.; THOMAS, M.; GILBERT, P.; THOMAS, M. G.; BRANDOSTRÖM, M.; STORA, J.; MOLNAR, P.; AANDERSEN, P. K.; BENDIXEN, Ch.; HOLMLUND, G.; GÖTHERSTRÖM, A. and WILLERSLEV, E. (2009): "Ancient DNA Reveals Lack of Continuity between Neolithic Hunter-Gatherers and Contemporary Scandinavians", *Current Biology*, 19, pp. 1758-1762.

MILLER, R.; OTTE, M. and STEWART, J. (2009): "Le Mésolithique recent du trou Al'Wesse (Modave, prov de Liège). Découverts des tessons non rubanés ou 'Bereitkeramiek'", *Notae Praehistoricae*, 29, pp. 5-14.

MONTEIRO-RODRIGUES, S. and ANGELUCCI, D. E. (2004): "New data on the stratigraphy and chronology of the prehistoric site of Prazo (Freixo de Numão)", *Revista Portuguesa de Arqueologia*, 7 (1), pp. 39-60.

MORALES, J. I.; FONTANALS, M.; OMS, F. X. and VERGÈS, J. M. (2010): "La chronologie du Néolithique ancien cardial du nord-est de la Péninsule Ibérique. Datations, problématique et méthodologie", *L'Anthropologie*, 114 (4), pp. 427-444.

MURALHA, J. and COSTA, C. (2006): "A ocupação neolítica da Encosta de Sant'Ana (Martim Moniz, Lisboa)". In *IV Congreso de Arqueologia Peninsular*, 1, pp. 157-169.

OELZA, V. M.; SIEBERT, A.; NICKLISCH, N.; MELLER, H.; DRESELY, V. and ALT, K. W. (2011): "Early Neolithic Diet and Animal Husbandry: Stable Isotope Evidence from three Linearbandkeramik (LBK) Sites in Central Germany", *Journal of Archaeological Science*, 38 (2), pp. 270-279.

OLARIA, C. (2000): "Nuevas dataciones de C-14 para el Neolítico mediterráneo", *Quaderns de Prehistòria i Arqueologia de Castelló*, 21, pp. 27-34.

— (2004-2005): "El tránsito hacia las economías de producción de las últimas tribus cazadoras-recolectoras del Mediterráneo peninsular. Una reflexión acerca de la validez de las tesis difusionistas frente a las evolucionistas", *Quaderns de Prehistòria i Arqueologia de Castelló*, 24, pp. 43-60.

OLARIA, C.; GUSI, E. and GÓMEZ, J. L. (2005): "Un enterramiento Mesolítico-Neolítico en el Cingle del Mas Nou (Ares del Maestre, Castellón) del 7000 BP en el territorio de Arte Levantino". In ARIAS, P.; ONTAÑÓN, R. and GARCÍA-MONCÓ, C. (eds.): *III Congreso del Neolítico en la Península Ibérica*. Monografías del Instituto de Investigaciones Prehistóricas de Cantabria, I, pp. 615-623.

ORTEGA, A. I.; JUEZ, L.; CARRETERO, J. M; ORTEGA, M. C.; ARSUAGA, J. L. and PÉREZ-GONZÁLEZ, A. (2006): "El Neolítico en la secuencia estratigráfica del yacimiento de El Portalón de Cueva Mayor". In *IV Congreso del Neolítico Peninsular*, 1, pp. 221-229.

OVERSTEEGEN, J. F. S.; WIJNGAARDEN-BAKKER, L. H.; MALIEPAARD, R. VAN and KOLFSCHOTEN, T. VAN (2001): "Zoogdieren, vogels en reptielen. In Hardinxveld-De Bruin: een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant-cultuur (5500-4450 v. Chr.)". In KOOIJMANS, L. L. (ed.): *Rapportage Archeologische Monumentenzorg*, 88, pp. 209-297.

PEÑA-CHOCARRO, L.; ZAPATA, L.; GARCÍA, J.; GONZÁLEZ, M.; SESMA, J. and STRAUS, L. (2005): "The spread of agriculture in Northern Iberia. New archacobotanial data from El Mirón cave (Cantabria) and the open air of Los Cascajos (Navarra)", *Vegetation, History and Archaebotany*, 14 (4), pp. 268-278.

PINHASI, R.; FORT, J. and AMMERMAN, A. J. (2005): "Tracing the Origin and Spread of Agriculture in Europe", *PLoS Biol*, 3 (12): e410. doi:10.1371/journal.pbio.0030410.

PRICE, T. D. (2000): *Europe's First Farmers*. Cambridge: Cambridge University Press.

PRICE, T. D.; BENTLEY, R. A.; NING, J.; GRONENBORN, D. and WAHL, J. (2001): "Human migration in the Linearbandkeramik of central Europe", *Antiquity*, 75, pp. 593-603.

RAEMAEKERS, D. C. M. (1999): *The articulation of a new Neolithic: The meaning of the Swifterbant culture for the process of Neolithization in the western part of the North European Plain (4900-3400 BC)*. Archaeological Studies Leiden University. Leiden: Faculty of Archaeology, Leiden University.

RAMÓN, N. (2006): "La cerámica del Neolítico antiguo en Aragón", *Caesaraugusta*, 77. Diputación de de Zaragoza.

RAMOS, J. and LAZARICH, M. (2002): *El asentamiento de "El Retamar" (Puerto Real, Cádiz): contribución al estudio de la formación social tribal y a los inicios de la economía de producción en la Bahía de Cádiz*. Universidad de Cádiz.

REGUEIRO, M.; RIVERA, L.; DAMNJANOVICB, T.; LUKOVICB, L.; MILASINB, J. and HERRERA, R.-J. (2012): "High levels of Paleolithic Y-chromosome lineages characterize Serbia", *Gene*, http://dx.doi.org/10.1016/j.gene.2012.01.030.

RICHARDS, M.; MACAULAY, V.; HICKEY, E.; VEGA, E. and SYKES, B. (2000): "Tracing European founder lineages in the near eastern mtDNA pool", *American Journal of Human Genetics*, 67, pp. 1251-1276.

RODANÉS, J. M. and PICAZO, J. (2005): "Excavaciones arqueológicas en el Cabezo de la Cruz (La Muela, Zaragoza). Campaña (2004)", *Salduie*, 5, pp. 295-320.

ROJO, M. A.; GARRIDO, R.; BELLEVER, J. A.; BRAVO, A.; GARCÍA, I.; GÁMEZ, S. and TEJEDOR, C. (2010): "Zafrín. Un asentamiento del Neolítico antiguo en las Islas Chafarinas (Norte de África, España)", *Studia Archaeologica*, 96. Universidad de Valladolid.

ROJO, M. A.; KUNST, M.; GARRIDO, R.; GARCÍA, I. and MORÁN, G. (2008): *Paisajes de la memoria: asentamientos del Neolítico antiguo en el Valle de Ambrona (Soria, España)*. Serie Arte y Arqueología, 23. Instituto Arqueológico Alemán y Universidad de Valladolid.

RUFFALDI, P. (1996): "L'hypothèse du déterminisme climatique des premières traces polliniques de néolithisation sur le Massif jurassien (France)", *Académie Sciences*, 322, Série IIIIa, pp. 77-83.

SEMINO, O.; MAGRI, C.; BENUZZI, G.; LIN, A. A. and AL-ZAHERY, N. (2004): "Origin, diffusion, and differentiation of Y-chromosome haplogroups E and J: inferences on the neolithization of Europe and later migratory events in the Mediterranean area", *American Journal of Human Genetics*, 74, pp. 1023-1034.

SESMA, J. (2007): "Enterramientos en el poblado neolítico de Los Cascajos (Los Arcos)". In *La tierra te sea leve. Arqueología de la muerte en Navarra.* Pamplona: Gobierno de Navarra, pp. 52-58.

SILVA, C. T. and SOARES, J. (1987): "Les communautés du Néolithique ancien dans le Sud du Portugal". In GUILAINE, J.; ROUDIL, J.-L. and VERNET, J.-L. (eds.): *Premières communautés paysannes en Méditerranée occidentale*. Paris: Centre National de la Recherche Scientique, pp. 663-671.

SIMONI, L.; CALAFELL, F.; PETTENER, D.; BERTRANPETIT, J. and BARBUJABI, G. (2000): "Reconstruction of prehistory on the basis of genetic data", *American Journal of Human Genetics*, 66, pp. 1177-1179.

SOARES, J. and TAVARES DA SILVA, C. (2003): "A transição para o Neolítico na costa sudoeste portuguesa". In *Muita gente, poucas antas? Origens, espaços e contextos do megalitismo*. *II Coloquio Internacional sobre megalitismo, Trabalhos de Arqueologia*, 25, pp. 45-56.

— (2004): "Alterações ambientais e povoamento na transição Mesolítico-Neolítico na Costa Sudoeste". In TAVARES, A.; TAVARES, M. J. F. and CARDOSO, J. L. (eds.): *Evolução geohistórica do litoral português e fenómenos correlativos. Geologia, História, Arqueologia e Climatologia*. Lisboa: Universidade Aberta, pp. 397-424.

TINNER, W.; NIELSEN, E. H. and LOTTER, A. (2007): "Mesolithic agriculture in Switzerland? A critical review of the evidence", *Quaternary Science Reviews*, 26, pp. 1416-1431.

UTRILLA, P. and MONTES, L. (coords.) (2009): *El Mesolítico geométrico en la Península Ibérica*. Monografías Arqueológicas. Prehistoria, 44. Universidad de Zaragoza.

VERGÉS, J. M.; ALLUÉ, E.; ANGELUCCII, D. E.; BURJACHS, F.; CARRANCHO, A.; CEBRIÁ, A.; EXPÓSITO, I.; FONTANALS, M.; MORAL, S.; RODRÍGUEZ, A. and VAQUERO, M. (2008): "Los niveles neolíticos de la cueva de El Mirador (Sierra de Atapuerca, Burgos): Nuevos datos sobre la implantación y el desarrollo de la economía agropecuaria en la Submeseta Norte". In *IV Congreso del Neolítico Peninsular*, 1, pp. 418-427.

VIGNE, J.-D.; CARRÈRE, I.; SALIÈGE, J.-F.; PERSON, A.; BOCHERENS, H.; GUILAINE, J. and BRIOIS, F. (2000): "Predomestic cattle, sheep, goat and pig during the late 9th and the 8th millennium cal. BC on Cyprus: Preliminary results of Shillourokambos (Parekklisha, Limassol)". In BUITENHUIS, H.; MASHKOUR, M. and POPLIN, F. (eds.): *Archaeozoology of the Near East IV*, *Archaeozoology of Southwestern Asia and Adjacent Areas*, 32, pp. 73-106.

VISSET, L.; CYPRIEN, A. L.; CARCAUD, N.; OUGUERRAM, A.; BARBIER, D. and BERNARD, J. (2002): "Les prémices d'une agriculture diversifiée à la fin du Mésolithique dans le Val de Loire (Loire armoricaine, France)", *Palevol*, 1, pp. 51-58.

VISSET, L.; CYPRIEN, A. L.; OUGUERRAM, A.; BARBIER, D. and BERNARD, J. (2004): "Les indices polliniques d'Anhropisation précoce dans l'ouest de la France. Les cas de *Cerealia, Fagopyrum* y *Junglans*". In RICHARD, H. (dir.): *Néolithisation précoce. Premières traces d'anthropisation du couvert vegetal à partir des dones polliniques.* Annales Literales, 777, serie Environnement, Sociétés et Archéologie, 7, pp. 69-79.

WELLS, S. (2007): *Deep ancestry. Inside the genographic project*. Washington DC: National Geographic.

WOODMAN, P. and MCCARTHY, M. (2003): "Contemplating some awful(ly interesting) vistas: importing cattle and red deer into prehistoric Ireland". In ARMT, I.; MURPHY, E.; NELIS, E.; and SIMPSON, E. (eds.): *Neolithic settlement in Ireland and western Britain*. Oxford: Oxbow Books, pp. 31-39.

ZAPATA, L. (2007): "Pico Ramos cave shell midden: Mesolithic-Neolithic transition by the Bay of Biscay". In MILNER, N.; CRAIG, O. E. and BAILEY, G. N. (eds.): *Shell middens in Atlantic Europe*, pp. 28-36.

ZAPATA, L.; PEÑA-CHOCARRO, L.; PÉREZ-JORDÁ, G. and STIKA, H. P. (2004): "Early Neolithic agriculture in the Iberian Peninsula", *Journal of world Prehistory*, 18 (4), pp. 283-325.

ZILHÃO, J. (2000): "From the Mesolithic to the Neolithic in the Iberian Peninsula". In PRICE, T. (ed.): *Europe first farmer*, pp. 144-182.

— (2001): "Radiocarbon evidence for maritime pioneer colonisation at the origins of farming in the west Mediterranean Europe", *Proceedings of The Nacional Academy of Sciences*, 98 (24), pp. 14180-14185.
— (2003): "The Neolithic transition in Portugal and the role of Demic Diffusion in the Spread of agriculture across west Mediterranean Europe". In AMMERMAN, A. J. and GUILAINE, P. (eds.): *The Widening Hasvest. The Neolithic transition in Europe. Looking Back, Looking Forward*. Archaeological Institute of America, pp. 207-233.
ZVELEBIL, M. (2004): "Conclusion: The many origins of the LBK". In LUKES, A. and ZVELEBIL, M. (eds.): *LBK Dialogues. Studies in the Formation of the Linear Pottery Culture*. Oxford: Archaeopress, pp. 183-205.

