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"The rehabilitation of a 'demonised' concept: Neolithic expansion and migrations".

1. Prehistoric research, whether it is conducted from an historical or an anthropological perspective, is grounded into the study of change in material culture. Transformations in material cultural have traditionally been interpreted according to two main paradigms, present in the earliest writings of the XIXth century: diversification (or « internal evolution »), and migrations. These paradigms can still been recognized in the most modern forms of evolutionary archaeology, as the "branching" or "cultural drift" and "merging" processes.

2. The preference for one or the other of the two explanatory paradigms has shifted markedly during the past century. Under the influence of the German archaeologist Gustav Kossina (1911) and the Australian archaeologist Gordon Childe (1925, 1950), migrations followed by cultural diffusion between normatively defined cultures were systematically invoked until the late 60' to explain sudden and important local transformations. This was, in particular, the case for the introduction of a settled way-of-life and a farming economy in Europe, what we call the Neolithic. In Greece, where the introduction of the Neolithic is now dated to ca 6700 BC, this perspective was well exemplified by Vladimir Milojcic (1949, 1960) and Saul Weinberg (1970: 308) for instance, and, to a lesser extent by V. Theocharis (1973).

There is indeed no possibility to deny that prehistoric human societies have constantly been on the move. The first bipedal hominins appeared in East Africa perhaps 7 millions years ago. When their bipedal gait became sufficiently assured, they used their hands to make tools and their feet to explore and expand their range. More than two million years ago, they had already reached Jordan and, by 800,000 years ago, *Homo erectus* was seemingly able to cross short sea channels to reach islands such as Java, Flores and Luzon.

Several hundred thousand years later, those that had remained in Africa evolved into what we call Archaic *Homo sapiens*. Again, they walked and walked, reached Morocco

some 300,000 years ago, the Levant at least 100,000 years ago, went on, and finally colonized the whole planet by feet and boats. In the meanwhile, Neandertal man, a late descendant of *Homo erectus*, also navigated to reach the Cycladic islands during the Middle Palaeolithic. Crete was possibly colonised earlier (Runnels 2014) but the matter remains hotly debated.

Boats were also widely used during the Mesolithic, some 10,000 years ago, both inland and on Sea. The Aegean, for instance, was intensely navigated during the Mesolithic, as demonstrated, in particular, by the diffusion of obsidian from Giali and Melos. Thus, in a way, humans have always been 'migrating'. But these Palaeolithic and Mesolithic groups were mobile hunter-gatherers. Their geographic expansion was therefore not a problem.

3. Not so for settled farming populations. In the late sixties, the criticisms of the former 'culture-historical' paradigm, which equated ethnic or cultural groups with definite sets of material culture, and the emergence of the "New Archaeology" or "Processual archaeology", followed by "postprocessual archaeology" marked the demise of migrations. For political, ideological and scientific reasons —in particular the rise of systemic conceptions of societies—migrations, especially for post-Palaeolithic periods, were virulently rejected in anglo-saxon writings as simplistic and unscientific explanations of culture change, as *ad hoc* explanations. Migrations were stigmatized as an archaeologists' neurosis, as a myth: "Migration in a sense is as old as tribal mythology; indeed, it is a rare corpus of myth that does not include at least one migration episode." (Adams et al. 1978: 483). The concept, as stated by Anthony (1990) became "demonized".

This led to "the retreat from migrationism". The new Anglo-Saxon paradigm had taken over. During more than 20 years, "immobilism" became a dogma among (mainly but not only) anglo-saxon archaeologists: Neolithic groups never moved out of their own territories. As supposedly confirmed by the first 14C dates, the light no longer came from the East (Renfrew 1972, 1973). There seems to have been an implicit postulate, according to which, once they had adopted a settled way of life, farmers remained where they were and where their ancestors had lived. Any change in material culture, no

matter how drastic it was, could be explained internal evolution, drift effects and systemic effects.

4. There was no denying, however, that the earliest permanent villages had appeared in the Levant some 14,000 years ago, when European communities were still hunting reindeer or deers, nor that the domestication of plants and animals initially took place in the Near East, between 10,000 and 7,000 years BC. It was also rarely denied that among the domesticated species, some, like the sheep and the wheats, were not indigenous in Europe and were necessarily introduced from the East. Finally, it could not be denied that the introduction of a settled way of life and domestic species in Europe, just after 7,000 BC in Greece and 6,000 BC in the Balkans, went hand in hand with a complete turnover in all the technical spheres: (DIA) new architectural techniques, new flaking techniques for the stones tools, stone polishing, new techniques for the production of bone tools, introduction of milling stones, of weaving and possibly basketry, of new ornament types, etc.. But it was then considered that local European Mesolithic hunter-gatherers themselves adopted and appropriated these domestic species and all the new techniques, through contacts (of an undefined nature) with Anatolian or Near-Eastern farmers.

Despite claims to the contrary this new stand was readily embraced in many countries and by many scholars, for ideological and political reasons. In France for instance, Jean Guilaine was initially a fervent proponent of a local process of neolithisation. In Italy, Spain, Slovenia, everywhere scholars defended an indigenous development ("the indigenism"), sometimes claiming that the domesticated plants and animals were local, or suggesting they had been acquired by local communities through exchange. Needless to say that this held true in Greece also where, with very few exceptions, only foreign scholars defended the exogenous origins of the Neolithic and the presence of colonists.

5. **Population genetics**

The first refutations of 'immobilism' did not so much come from archaeologists, who were not listened to, but from linguists, and, above all, from geneticists. Cavalli-Sforza pioneered studies on the distribution of genetic markers (protein polymorphism) among present-day Near eastern and European populations in the 70'. The distribution maps

showed a clear clinal distribution from East to West. This was interpreted as the result of the dispersal into Europe of Near-eastern populations through demic expansion.

These 'classical' studies were followed by analyses of the diversity of specific loci on the maternal mitochondrial DNA and paternal Y-chromosome DNA. On the whole, the results from the Y chromosome show a clearer East-West cline and higher impact of near-eastern genes than did the mtDNA, with estimates for the former varying between 15 and 70%. These results raised virulent debates between the tenants of both approaches, but do not appear altogether surprising from an anthropological point of view, considering the probability that some male colonists may have taken local wifes. The most recent analyses concluded in favour of a "predominantly [Near Eastern] Neolithic origin for European paternal lineages", linked to a rapid expansion dating to the Early Neolithic across Central Europe and along the Mediterranean coast.

It was easy, however, to criticise or ignore the results of population genetics considering (a) the very important disagreements among specialists on the spatial patterning, the mutation rates, the dates at which specific haplogroups spread into Europe, the amount of admixture between local hunter-gatherers and farmers, and the numerical importance of the Near-eastern colonists, (b) the confusion between biological populations and archaeological cultures, (c) the profound disdain (or ignorance ?) of the large scale historical movements of populations that took place after the Neolithic The present-day genetic pattern in Anatolia and Greece, for instance, is all but a reflection of the Neolithic pattern…

6. Human palaeogenetics

It was therefore necessary to study the DNA from ancient, rather than modern populations if one wanted to apprehend the reality and importance of Neolithic migrations. Direct comparisons of aDNA sequences from Mesolithic hunter-gatherers and Neolithic farmers have recently become not only possible but more easily implemented. Although still limited in number and with huge geographic gaps, palaeogenetics fully establishes a genetic break between Mesolithic and Neolithic populations in southern, central and northern Europe. The majority of Mesolithic hunter-gatherers carry mtDNA U haplotypes absent from in early Neolithic farmers, which instead reveal a Near-eastern component with varied amounts of local admixture.

In Greece, archaeogenetic results are still very scarce, amongst other reasons for preservation problems and the scarcity of inhumations in southern Greece. To my knowledge, they only concern six individuals from Macedonia. According to Hofmanova et al. (2015), the three Macedonian individuals analysed clearly differ from the Mesolithic individuals from Theopetra in Thessaly. For another Macedonian individual, the picture is unclear, and does not discriminate between multiple westward migrations from Anatolia or local adoption of a farming economy (**Kılınç, G. et al. 2017).** For southern Greece, which I consider as an area of Neolithisation distinct from Macedonia, there are no direct archaeogenetic data, but recent results that compare ancient and modern mtDNA suggest a maritime route of colonisation from the Levant to Cyprus and Crete or the Dodecanese, and then onwards up to the Iberian Peninsula and Central Europe (**Fernández, E. et al. 2014).** This supports a previous conclusion based on the genetics of modern populations (Pachou et al. 2014), and, above all, long-established archaeological observations about the coastal spread of the Neolithic with the Impressa and Cardial cultures.

7. The interpretation of archaeogenetic results is still open to debate and conflicting interpretations. Nevertheless, with the rapidly growing set of paleogenetic results, the reality of demic migrations into and within Europe can no longer be questioned. However, the term 'migration' is still often avoided in favour of demic expansion and of colonisation!

The recognition that migrations were an essential component of the expansion of the Neolithic has opened, for a generation of younger scholars, a new range of scientific perspectives: migrations are no longer the focus of a simplistic dichotomous debate (a 'yes' or 'no' approach). "If anything has come out of recent work it must therefore be that the question is [no longer] whether people migrated — because they clearly did" (van Dommelen 2014: 480). Neolithic migrations are recognised as a recurrent component of the spread of a Neolithic way-of-life and can, for the first time, be studied *per se*, as a social, economic and symbolic phenomenon. Research thus focuses now on the factors, the rhythms, the modalities and rates of expansion, the natural and social barriers, the role of the environment and the impact of the new colonists on the environment.

7. Why migrate?

The vast majority of hypotheses concerning the causes of these Neolithic migration rest on “push” rather than “pull” factors. In other words, Near eastern Neolithic groups, and later on, those that had settled in Europe, were forced to migrate, rather than attracted by the prospect of exploiting new lands. Depending on the scientific inclination of the scholars, the causes of Neolithic migrations are searched either in external causes, most commonly climatic deterioration or climatic improvement (and even a postulated dramatic rise of the Black Sea) or in economic and social causes: demographic pressure (a direct consequence of sedentism), rejection of constraining ruling systems, internal conflicts or social inequality. Yet, I consider that the impact of climatic change is often over-estimated, while the capacity of resilience of these farming groups is equally under-estimated. In fact, territorial expansion is a universal tendency of early farming societies, which, in my opinion, gives more weight to economic and social factors, common to all sedentary farming societies, than to regionally variable environmental changes.

9. Who?

The varied causes that led individuals or groups to leave their original home certainly impacted the composition of the migrant groups. I believe we can also assume, and to a certain extent demonstrate, that the composition of the migrant groups differed according to the routes they followed.

From the very beginning, within the Near-East and Anatolia, pioneer colonists went away both by land and sea. The same pattern was replicated to reach Europe, and later on within Europe. For instance, there are arguments to suggest that Southern Greece was colonised by sea, while Macedonia was colonised by land. Similarly, the two major axis of expansion of the Neolithic in Europe respectively follow the Mediterranean coasts (Impressa/Cardial expansion) and the Danube valley and its affluents in Central Europe (Linearbandkeramik, or LBK).

Expansion by land, possibly helped by fluvial navigation, allowed the relocation of entire families and communities. This is confirmed both by genetic and archaeological studies. Each new LBK village faithfully reproduced all the characteristics of the parent ones. This indicates that the new community comprised individuals mastering all the skills needed for building their long houses, and all the skills practiced in everyday life. In other words, the new community had a composition

similar to the original one. Their DNA analyses confirm the presence of both men and women in these migrating groups: both paternal and maternal lineages differed from Mesolithic genotypes and carried near-eastern genes. The LBK farmers married within the LBK community, even if the stable isotopes suggests female exogamy from a region to another.

Conversely, a maritime expansion entailed more risks, and the capacity of the boats, man-powered and loaded with seeds and animals, must have limited the size of the migrant groups. We can thus envision that some of the craft specialists may have been missing, as, I consider, was the case in Early Neolithic Knossos for stone blades production. In parallel, the number of women participating to the expedition may have been limited, thus leading to inter-marriage with local hunter-gatherers. This hypothesis is supported by results of DNA analyses in Spain and Southern France, two regions colonised by maritime expansion. They show that some maternal mitochondrial haplogroups (lineages) are compatible with local hunter-gatherer genotypes, while paternal haplogroups (Y-chromosome) present near-eastern affinities.

10. How ?

Whether by land or sea, Neolithic migrations differed profoundly from earlier demic expansions. Contrary to mobile hunter-gatherers, Neolithic farmers did not travel alone: they needed to bring along viable stocks of seeds and live animals. Any relocation of a farming group therefore requires advanced planning and sophisticated logistics. This has three important consequences on the modalities of expansion.

First, the idea that Neolithic expansion could results from unintentional, unconscious movements, as emphasized by some authors in the 70's, is untenable, and constitutes a good example of the lack of practical sense of many archaeologists. Good grazing and pastures had to be provided to the animals, both during a voyage of dozens of kilometres and at the final location. Suitable soils and adequate water supply were necessary to cultivate the wheats and legumes. Therefore, scouting ahead of time was a prerequisite. Although these preliminary expeditions leave little archaeological traces, we nevertheless have some evidence for it.

Despite these precautions, long-term success was not guaranteed: the first villages established in the Languedoc by colonists coming from Tuscany and Liguria in Italy did not last more than a few generations, and the initial colonisation of southern

Belgium by Early Neolithic farmers collapsed after two centuries. Thus, 'reverse migrations' have to be considered as well.

Second, not all natural environments are suitable for the establishment of a farming community, its herds and crops. This explains why Neolithic demic expansion was not a spatially continuous 'wave of advance', in all directions (radial expansion), as initially suggested, but a leapfrog expansion, from one suitable region (mostly fertile alluvial basins or river banks) to another.

Third, although it is nowadays fashionable to talk about the co-evolution of man and environment, or of *natureculture*s, the truth is that pioneering groups created, around their villages, a completely artificial, anthropic environment, composed of non-native plants and animals, of cleared and cultivated land, with a strong impact on the environment. This is especially pregnant on islands. On Cyprus, for instance, the endemic fauna disappeared and was replaced by wild and domestic species introduced intentionally or carried along as commensals. On the mainland, the natural ecosystem was rejected at the margins of village territory, and, in the early colonising phases, mostly ignored. Compared with hunting and the collection of wild resources, there is actually little benefit in herding animals and cultivating plants, except, precisely, that they are no longer tied to their natural ecological niche and can be transported to areas where they did not live and grow spontaneously.

As we just observed, these expansions were not spatially continuous. But they were not either continuous through time. Along the two major routes of expansion, the northern Mediterranean basin and Central Europe, the phenomenon was, as termed by Guilaine 'arrhythmic', or, according to others, followed a punctuated directionality. This arrhythmia can be linked to two factors: first, the fact that certain recently colonised areas were large enough to sustain a continuous demographic expansion from the pioneer settlements. The Thessalian plain is a good example of this progressive infilling of the land, along several centuries. Secondly, the necessary adaptations of economic strategies and exploited species, the further one went from the original Near Eastern areas of origin. Genetic studies have now confirmed that all the domestic plants and animals exploited during the Neolithic in Europe, with the exception of the poppy, descended from Near Eastern progenitors. Wheats and barley, for instance, had to adapt

to wetter and cooler winters, and farmers in Central Europe had to shift from hexaploid to tetraploid wheats and modify the range of cultivated taxons. Similarly, in the exploitation of domestic herds, the emphasis shifted from sheep and goats in the Mediterranean area to bovids in Central Europe.

The peculiarities of each new environment exploited, as well as the impact of climatic fluctuations, are some of the key-factors integrated in the most sophisticated research concerning the Neolithic expansion, its successes and failures. Based on multiple environmental, biological and social factors, these agent-based models confront observed archaeological patterns and theoretical models. This allows to suggest some of the key factors underlying affecting population expansion and the sustainability of these early farming economies.

11. Incoming farmers, local hunter-gatherers

It is also necessary, in modelling the expansion of Neolithic communities, to take into account the presence of local groups of hunter-gatherers Indeed, these pioneering farming groups did not settle in a human void, and early Neolithic Europe was a mosaic recently cleared and cultivated land, and vast areas where hunter-gatherers continued to live from hunting, gathering and fishing (DIA). Although the most favourable environments for farming were not necessarily those preferred by the local hunter-gatherers, the latter were not far away. Archaeology and archaeogenetics alike show that interactions between local hunter-gatherers have been diverse.

We have already indicated evidence for intermarriage between colonists and local populations around the Mediterranean. A scarcity of women among the newly arrived farmers would not have been the sole reason for this. The Mediterranean area was not an easy environment for Mesolithic hunter-gatherers, and the local groups readily adopted the new economic basis and way-of-life. They rapidly merged with the incoming groups, as testified by mixed traditions such as cremation of the dead, a typical European Mesolithic tradition, or the permanence of some ornaments, and mixed genetic pools.

Along the Danubian axis of expansion, interaction has sometimes been more confrontational (Hersheim, Talheim), and we can observed a longer time-lag before some Mesolithic traditions become assimilated by farming groups. This is again confirmed by archaeogenetic studies that show an influx of European lineages in farming communities only by the Middle Neolithic. Finally, further North, local hunter-

gatherers and farmers ignored each other for several centuries, creating a ‘no man’s land’ between their respective territories, until the hunter-gatherers finally also adopted a farming economy and settled way-of-life (Ertebölle).

12. Where from?

It is now recognised that the initial spread of a Neolithic economy and way-of-life was triggered by the colonisation of new lands by incoming farmers of Near-Eastern origins, and that it was a complex, diversified phenomenon that involved both colonists and local actors. Detailed studies of plant and animals assemblages, as well as aDNA analyses of animals and humans, also confirmed that it took place independently and differently along the two major routes, the maritime and terrestrial one (DIA).

This map summarizes the present-day conception of the Early Neolithic spread in Europe (DIA). However, this classical representation of the Neolithic expansion obscures the incessant attempts, failures, reverse migrations, renewed attempts that took place all along the Neolithic (Kotsakis 2008). It still reflects the old paradigm of migrations as discrete, well-characterized, single episodes. It still rests implicitly on the idea that the Neolithic expansion in Europe had a single origin in time and space, when we can actually demonstrate that it originated in different regions of the Near East and Anatolia, and corresponds to a recurrent phenomenon. And it now becomes also clear that the vast area of Anatolia and the Near East that witnessed the emergence of the Neolithic was neither culturally nor genetically homogenous**.** There is thus no reason to expect that the first Neolithic settlements in Europe would show similar cultural and economic features and I consider Greece itself, with the contrasts between Southern Greece and Macedonia, and between different regions of Macedonia, as a good example of a mosaic of different traditions in the Early Neolithic.

This, added to cultural processes inherent to migrations, which lead to recomposition of the material culture, explains why archaeologists have difficulties to pinpoint the precise origins of the Anatolian and Near-Eastern farmers that settled in Europe. Indeed, migrants rarely reproduce their original culture in full: either because the migrant group only comprised a fraction of the original population or because they deliberately redefined part of their culture. New cultural identities could also be created in areas colonised by groups of different origins, and, above all, by the assimilation of local traditions inherited from former hunter-gatherers. Identifying precise origins of migrant Neolithic groups may therefore be an unattainable goal.

13. Conclusion

Archaeologists still have difficulties accepting the fact that Neolithic migrations were not exceptional historical events, linked to specific environmental, climatic or sociological conditions, but, on the contrary, a most common and normal phenomenon. They cannot but admit the early Neolithic migrations, but, as I entitled a recent paper, "Migrations, yes, but not too many!". As though, again implicitly, once the great move was accomplished, immobilism was again the rule.

Movement of population within Neolithic Europe, after this initial expansion, are either denied or ignored despite ample archaeological evidence. It remains unfashionable, or politically incorrect, to evoke migrations during, for instance, the Middle or Late Neolithic. Yet, archaeogenetics show, for instance, important recompositions of the genetic pools at the end of the Neolithic, with the expansion across Europe of the Corded Ware, Bell Beakers and Yamna cultures and the problem of the spread of the Indo-European languages. Yet, the reluctance of archaeologists to accept the "massive migrations" suggested by archaeogenetic studies (Furholt 2018 and refs. therein) shows that the debate about prehistoric migrations is far from settled.

The constant flux of individuals, families and communities moving away from their original homestead had occurred millennia before the Neolithic; it continued after the Neolithic, and is well-documented in historical periods. The Neolithic was no different. In fact, with the development of agriculture and herding, the search for new pastures and fields sustained by a marked demographic expansion, it probably constitutes one of the periods in history when movements of population across lands and seas were most intense. In a sense, Neolithic Europe was not all that different from present-day Europe, and if this was acknowledged, it may lead to a less dramatic perception of the recent 'migrant problem'.