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The process of Neolithisation in South-eastern Europe: from ceramic female figurines and cereal grains to entoptics and human nuclear DNA polymorphic markers

Mihael Budja
Department of Archaeology, Faculty of Arts, University of Ljubljana, SI
miha.budja@ff.uni-lj.si

ABSTRACT – *Paper discusses concepts of 'neolithic package', 'demic diffusion' and 'revolution of symbols' in relation to the process of Neolithisation in South-eastern Europe and the phylogeography of Y chromosome haplogroups I1b*, J and E. It is suggested that 'demic diffusion' is not a realistic scenario, and that there were two Neolithisation trajectories and two related, archaeologically and genetically readable, regional palimpsests in South-eastern Europe.*

IZVLEČEK – *V članku analiziramo koncepte 'neolitski paket', 'demska difuzija' in 'revolucija simbolov' v povezavi s procesom neolitizacije jugovzhodne Evrope ter filogenetike in filogeografija Y kromosomskih haploskupin I1b*, J and E. Ocenjujemo, da 'demska difuzija' ni koncept, ki bi ga lahko še naprej uporabljali pri pojasnjevanju začetkov neolitika in pridelovalnih gospodarstev na omenjenem področju.*

KEY WORDS – *hunter-gatherers; farmers; demic diffusion; symbolism; archaeogenetics; Eurasia*

INTRODUCTION

It is doubtless convenient to begin with the simplifying assumption that a new Neolithic way of living and thinking broke completely with the past, spreading en bloc into Europe, and such a formulation may be justified for certain political purposes (see *Ammerman 2003.3–23*), but it seems unlikely that this is actually how Mesolithic-Neolithic transitions were effected in most Eurasian regions.

It is not only that the transmission of the 'Neolithic package' is still believed to explain the Neolithisation of Eurasia, but also that it represents a stable and homogenous set of features, a viable unit which can be analysed as a totality. Its structure is supposed, on one hand, to be composed of a subsistence economy, ceramic technology, and symbolism. On the other, its inter-regional transmission is postulated by the agency of migration, 'demic' and 'cultural' diffusion, and there is a presumption that only a few human communities and 'cultures' are inventive, thus becoming and remaining centres of cultural change and progress.

We have to remember that 'package' was never conceptualized, although it is embedded within the basic principles of 'Neolithic culture, economic practice and technology' on one hand, and in systems of 'typological similarities' and 'structural analogies' in the Levant and Europe on the other. A number of attempts have been made to 'repack' it, and it was suggested finally that such a homogenous, stable and complex entity of 'economic practices and material culture' never existed (*Thomas 1993.357–394; 1998.37–60; 1999.13–17; 2003.67–74; Pluciennik 1998.61–38;* see also *Çilingiroğlu, in this volume*).

In the context of the orthodox 'centre and periphery' perception of Eurasian Neolithic, the 'package' maintains a central position in interpreting the ge-

nesis of European Neolithic cultures, in determining the direction of farmer's movements, and in positioning the geographical boundaries between the groups of hunter-gatherers and farmers. The determination of its structure is based on the assumption that Neolithic colonisers, when crossing the border between the Levant and Europe, brought in their most valuable objects, techniques, symbols and language(s).

We will not concentrate in this paper on migrating farmers' imaginary baggage, but on the instrumentalisation of the ideas of the 'Neolithic package' and 'demic diffusion' that led to the politicisation of the debate about the process of Neolithisation and the transition to farming in Europe between 'diffusionists' and 'indigenists'. While the diffusionist idea of an allochthonous farmers invasion of Europe has been self promoted continuously in a way that "the idea of 'demic diffusion', which is now widely accepted and used in literature .... helped to fill a major gap in terms of how we think about the movement of people in prehistory", the indigenists' idea of autochthonous population participation in the transition to farming was labelled anachronistic and nationalistic (*Ammerman 2003.14–16*).

INSTRUMENTALISATION OF 'FARMING PACKAGE' AND 'DEMIC DIFFUSION'

Parallel with more or less sophisticated approaches in Mesolithic and Neolithic archaeology, interpretative frameworks have evidently been dominated by instrumentalism, at different levels and in different combinations. While its primary function is the *a priori* determination of early domesticates and associated artefacts (not necessarily by context) as Neolithic assemblages, the secondary function is to correlate *a priori* these packages with classic and molecular population genetic determinations of the West Asian farmers' invasion and repopulation of Europe. Five basic postulates were incorporated in this interpretative framework:[1]

- that the 'early farming and Neolithic are virtually equivalent' and, where one and/or two elements (cereals and/or pottery) of the Neolithic 'package' have been documented, the others must necessarily have existed (*Ammerman and Cavalli-Sforza 1971.674–676; 1984.45–52; Renfrew 1987.131*);

- that the spread of agriculture was caused by the agency of 'demic diffusion', by which farmers expanded geographically, 'carrying with them their own culture' (*Ammerman and Cavalli-Sforza 1973.344; 1984.61; Ammerman 2003.5–6; Bar-Yosef 2002. 113–122–123; Cavalli-Sforza 1996. 52–69; 2002.80; Renfrew 1987.126–131; 1996.77; 2002.8; Rowley-Convy 2004.83–113*). Their expansion into Europe was of the final episodes of the Levantine PPNB 'great exodus' (*van Andel and Runnels 1995.481–499; Cauvin 1997.310–311; 2000.141–142; Perlès 2001.283–290; 2003.99– 113*);

- that the language(s) of the nuclear area of farming were transmitted to south-east and central Europe through 'demic diffusion' (*Renfrew l.c.*, but see also *Renfrew 2000.26; 2002.3–16*);

- that a 'revolution of symbols', changes in collective psychology must have preceded and engendered those in the economy and technology, so all regions peripheral to the Levant did not become Neolithicised until the new ideology reached them (*Cauvin 1978.134; 2000.22–25, 207–208*);

- that the transition to a theorising culture which utilised 'external symbolic storage' and employed a symbolic material culture was not a characteristic of hunter-gatherer, but of agrarian, societies (*Renfrew 1998.3–4*).

Forty years ago, two paradigmatic works coincidentally appeared in the same year. Robert Rodden (*1965.152–153*) formulated a list of farmers' settlements and artefact sets in south-eastern Europe and the Levant, emphasising that, because of similar economic, technological and symbolic features the former was 'not peripheral to the region within which the Neolithic revolution began, but was an integral part of it' (Fig. 1). Grahame Clark (*1965a.45–48; 1965b.58–73*) presented the results of 'a pure scientific approach in chronological determination of the expansion of farming culture' which was based on the radiocarbon dating 'of materials from the actual settlements of the prehistoric cultivators themselves'. The decreasing values of uncalibrated radiocarbon dates that appeared to be arranged in a southeast-northwest cline he described as 'the gradual spread of farming culture and the Neolithic way of life from the Near East over Europe'.

1 We neither discuss the process and the tempos of Near Eastern origin of farming nor archaeobotanical evidence of spread of cultigens but regional South-eastern European trajectories. For cultigens dispersal see *Colledge, Conolly and Shennan 2004.35-58* and attached Kotsakis' Ozdoğan's and Peltenburg's comments (l. c., 50–53).

ARCHITECTURE	ARCHITECTURE	**Techniques**	**Objects**
1 Square house plan	1 Square house plan	- weaving	- sling bullets
2 Wood frame and mud wall	2 Wood frame and mud wall	- matting	- disk spindle whorls
3 Open settlement plan	3 Open settlement plan	- stone polishing	- belt hooks
		- pressure flaking	- stamp seals
SUBSISTENCE	SUBSISTENCE	- bone grooving	- ear studs
4 Cattle?	4 Cattle?	- pottery making	- stamp-seals
5 Pigs?	5 Pigs?	- agriculture and husbandry	- stone vases
		Architecture	- bone spatula
ADORNMENT	ADORNMENT	- rectangular houses	- awls on metapodials
6 Studs and nails	6 Studs and nails	- pier houses	- pierced needles
7 Clay stamps ('pintaderas')	7 Clay stamps ('pintaderas')	- mudbricks	- axes, adzes and chisels
8 Belt-fastener	8 Belt-fastener	- wattle and daub	**Figurines**
		- "plastered" floors	- schematized seated figurines
POTTERY DECORATION	POTTERY DECORATION	- clay benches	- coffee-bean eyed figurines
9 White-painted and finger impressed	9 White-painted and finger impressed	- complex hearths	- pebble figurines
10 Red-on-cream painting	10 Red-on-cream painting	**Economy**	
11 Modelled face	11 Modelled face	- domesticated plants	
		- domesticated animals	
Rodden 1965.153	*Renfrew 1987.170, Fig. 7.9*		*Perlès 2005.Tab. 1*

Fig. 1. Lists of artefacts and symbols that mark 'cultural similarities' between Anatolia and Balkans (*Rodden 1965.152–153*), 'demic diffusion' (*Renfrew 1987.Fig.7.9*) and 'pioneer colonisation' (*Perlès 2005. Tab. 1*).

The same cline of radiocarbon dates and related, supposedly initial Neolithic settlements dispersal, six years later Ammerman and Cavalli-Sforza (*1971. 674–688; 1984*) saw as the marker of 'demic diffusion'. In the time-space-transgressive settlement pattern they recognized the continuous displacements of farmers at an average of 1 km per year. The rate of displacement was calculated by the ratio between the time of departure from the Levant (Jericho was used as the starting point of diffusion), time of arrival in Europe, and the geographical distance between the two. There was not very much attention devoted to the discrepancy between the rates of advance of farmers on the continental and regional levels. Along with a continental average of 1.08 for 'all of Europe', the most extreme regional rates of 0.70 for 'Balkans' and 5.59 for 'Bandkeramik' were suggested (Fig. 2). The authors believed, however, that such an 'average constant rate of diffusion' must have been driven by permanent population growth, and that the continuous waves of population expansion must have been distinct from 'cultural diffusion'. While in 'demic diffusion', a movement in a radial expansion of populations, farmers themselves caused the spread of agriculture; in 'cultural diffusion' it was spread by the transmission of farming techniques. The population growth was explained as the result of surpluses and storage in farming societies, which allowed the carrying capacity of the land to rise.

Marina Gkiasta and her colleagues recalculated the mean rate of spread in Europe by linear regression analyses of calibrated radiocarbon dates, and produced results similar (1.3 km per year) to those of Ammerman and Cavalli-Sforza. But when all calibrated date distributions are used to show the spread, the pattern is far less obvious, and a clear co-occurrence of hunter-gatherers' and farmers' sites was shown within the south-east European regions (*Gkiasta et al. 2003.45–62*). In Eurasia and Mesoamerica continental average rates of spread range between 0.5 and 1.25 km per year, but on regional levels it was much faster, ranging from 2.5 to 5 km per year (*Belwood 2001.181–207; 2005.12–43*). We can predict, however, the rapid spread of a farming economy in those environments in which they had developed, as that it was much slower where ecological, transitional, demographic and social boundaries exist, but substantial evidence for population growth per se to induce population pressure has not yet been proven archaeologically (*Bellwood 2001.197–198; Cohen 2002.41–47*).

Sites	*Correlation coefficient*	*Diffusion rate*
Mediterranean	0·975	1·52 km per year
Western Mediterranean	0·915	2·08
Balkans	0·458	0·70
Bandkeramik	0·494	5·59
All of Europe	0·892	1·08

Fig. 2. Regional diffusion rates, taking Jericho as the centre of 'demic diffusion' (from* Ammerman and Cavalli-Sforza 1971.Tab. 2*).

Menozzi, Piazza and Cavalli-Sforza (*1978.786–792; 1994;* see also *Ammerman and Cavalli-Sforza 1984*) seven years later, for the first time postulated that 'demic diffusion' and the replacement of indigenous European population are genetically and archaeologically grounded in the resemblance of a south-east-northwest gradient of the first principal component of 95 gene frequencies of 'classic' non-DNA marker dispersal (allele frequencies for blood groups, the tissue antigen HLA system, and some enzymes) and the gradual farming settlement distribution as measured by radiocarbon dates.

From this point onwards, interpretations of the processes of Neolithisation and transition to farming in Europe were dominated by concepts of permanent population growth and subsequent 'demic diffusion' taking over new lands. While at interregional level the macro model of 'wave of advance' has been applied, the micro models of 'availability', 'leapfrog' and 'saltatory' jumps from one suitable environment to another, 'pioneer' and 'insular' colonization were suggested for regional and local levels (*Zvelebil and Rowley-Conwy 1984.104–128; Zvelebil and Lillie 2000.62;* seee also *Zvelebil in this volume; Zilhão 1993.37; 2001.14180–14185; van Andel and Runnels 1995.481–499; Perlès 2001.62; 2003.99–113*).

It is noteworthy that over the same period Colin Renfrew (*1987.169–170, Fig. 7.9*), working on the arrival of a Proto-Indo-European language in Europe with the arrival of farmers, objectified 'demic diffusion' archaeologically through the catalogue of artefacts and symbols attached to Rodden's map twelve years earlier (Fig. 1). It has become an icon perpetuating the legitimacy of both 'demic diffusion', and 'great exodus', in which Levantine and Anatolian farmers carried with them all the features of their cultures but, paradoxically, not the central authority and symbolic representations that maintained this power (*Özdoğan 1997.16–17; Perlès 2005.276–278, Tab. 1;* see also *Çilingiroğlu in this volume*).

MtDNA AND Y CHROMOSOME HAPLOGROUPS AND 'DEMIC DIFFUSION'

The map of the first 'principal components' in classical marker frequency dispersal across Europe and the Near East (*Menozzi, Piazza and Cavalli-Sforza 1978.786–792*) has perpetuated the legitimacy of Neolithic ancestry for modern Europeans. The question 'Who are the Europeans?' that Alberto Piazza (*1993.1767–1769*) addressed in this context was not at all rhetorical. The Near East was recognized as an ancestral homeland for the people who now live in Europe. The elimination of the European Mesolithic population was supposed, despite only a 27% total variation in 'classical marker' frequencies attributed to Neolithic populations across the Europe. We should certainly not overlook the assumption driven by population geneticists that there was no genetic interaction between hunter-gatherers and farmers (*Cavalli-Sforza, Menozzi & Piazza 1993.639–646;* see also *Sokal et al. 1991.143–145; Cavalli-Sforza et al. 1994; Cavalli-Sforza and Cavalli-Sforza 1995; Cavalli-Sforza 1996.51–69; Renfrew 1996.70–92; Belwood and Renfrew 2002; Dupanloup et al. 2004. 1361–1372; Barbujani and Bertorelle 2001.22–25*).

This interpretative discourse was mainly the outcome of a low-resolution map of allele frequency distribution, showing that Europe as a whole is quite homogenous, as the genetic distances between different populations are relatively short, and the genetic landscape is rather uniform. Only some clear outliners, such as Basques and Saami have been shown to emerge from this homogeneous entity as hunter-gather Mesolithic relics.

Simulations of the colonisation process of Europe by Neolithic farmers have been performed, however, in parallel to test the effect of the Neolithic expansion on European molecular diversity, as well as their potential admixture and competition with local Palaeolithic hunter-gatherers. The results strongly suggest that the scenario of 'demic diffusion' is unrealistic, as it would only have occurred if Neolithic migrants had contributed more than 66% of the genes at the time of the admixture (*cfr. Goldstein and Chikhi 2002.143*), and, as mathematical simulations suggest that there should have been a massive Palaeolithic contribution to the current gene pool of Europeans (*Currat and Excoffier 2005.679–688*).

After the revolution in the study of the human genome the debate has moved from 'classical' markers of certain genes to loci in humans, the mitochondrial DNA, which is present in both sexes, but inherited only in the maternal line, and the Y chromosome, which is present only in males and inherited through males. Because they are non-recombining and highly polymorphic, the mitochondrial genome and the Y chromosome are ideal for reconstructing human evolution, population history and ancestral migration patterns.

The analysis of uniparentally inherited marker systems allows population geneticists to study the gene-

tic diversity of maternal and paternal lineages in different Eurasian populations, as well as the environmental and cultural processes that might have been involved in the shaping of this variety. Thus different human nuclear DNA polymorphic markers (polymorphisms) of modern populations have been used to study genomic diversity and to define maternal and paternal lineage clusters, haplogroups, and to trace their (pre)historic genealogical trees and chronological and spatial trajectories. Particular attention, however, has been drawn in recent years to the power of Y Chromosome biallelic markers, which allows the construction of intact haplotypes, and thus male-mediated migration can be readily recognised (for a review of the literature see *Richards 2003.135–162; Goldstein and Chikhi 2003.129–152; O'Rourke 2003.101–109; Jobling and Tyler-Smith 2003.598–610*).

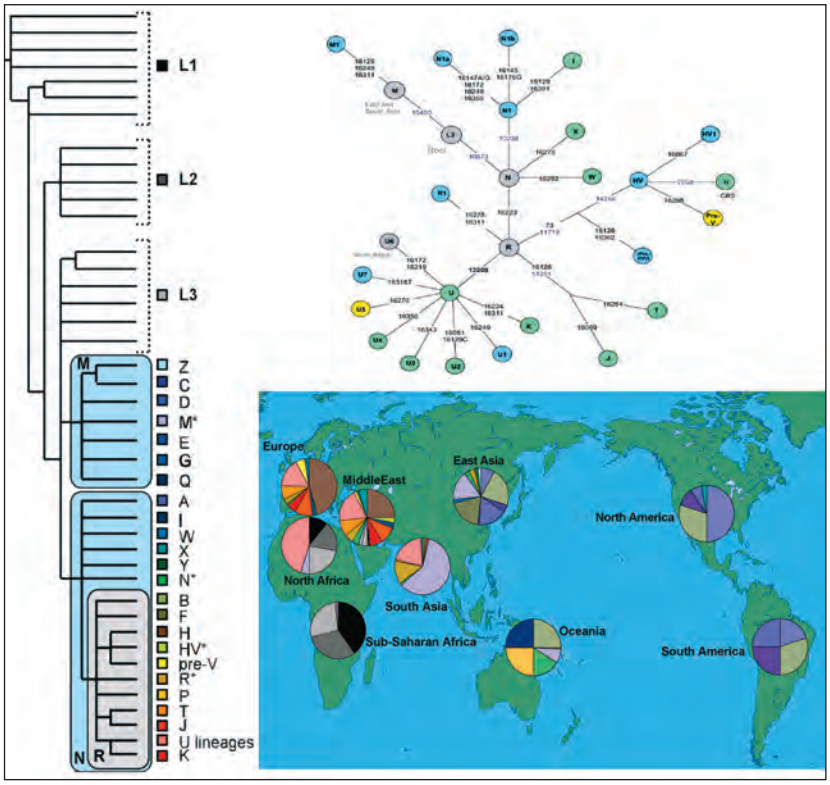

Fig. 3. MtDNA haplogroups and their worldwide distribution (from Richards M. 2003. The Neolithic Invasion of Europe. Annual Review of Anthropology 32: Figure 3, Copyright © 2003 by Annual Review of Anthropology, and after http://www.mcdonald.cam.ac.uk/genetics/images/MtDNA_DistributionMap.gif).

Over 90% of maternal lineages present in European populations can be classified into 8 major (macro)-haplogrops, designated H, V, T, J, N1, U, X and W, characteristic of western Eurasians in general (Fig. 3). Haplogroup H is the most frequent cluster but it occurs at frequencies of only around 25%–30% in the Near East, whereas its frequency is about 45%–60% in European populations. The cline of its spatial frequency is quite the opposite of what one would expect had it been distributed by 'demic diffusion' during the Neolithic. Indeed, haplogroup H and its sister clade V arrived in Europe during the Middle Upper Palaeolithic and re-expanded after the Last Glacial Maximum. The haplogroups J and T1 that are linked to Neolithic gene flow from the Near East and Anatolia present only a small minority of lineages at frequencies between 12% and 23%. It is noteworthy that these haplogroups did not play an equivalent role in the diffusion of farming towards the East (*Richards et al. 1996.185–198; Richards et al. 2000. 1251–1276; 2003.135–162; Richards and Macaulay 2000.139–151; Pereira et al. 2005.19–24; Torroni et al. 2000.1173–1177; Quintana-Murci 2004.838*).

After the study of female lineages that provided "uniquely authoritative glimpse of the African origin and subsequent dispersal of our species, the Y Chromosome has finally come into its own", Colin Renfrew and his colleagues euphorically hailed the recognition of new Y chromosome markers (*Renfrew, Forster & Hurles 2000.253–254*). Three paradigmatic papers were published at the same time, sorting the paternal genetic legacy of our species that has persisted to the present in ten, globally distributed haplogroups, I–X (*Underhill et al. 2000.358–361;* see also *2001. 43–62; 2002.65–78*) (Fig. 4), and twenty-two haplotypes, Eu 1–Eu 22 (*Semino et al. 2000.1155–1159*) (Fig. 5), and ten haplogroups (1–3, 8–9, 12, 16, 21–22, 26) (*Rosser et al. 2000.1526–1543*) with corresponding binary Y Chromosome markers that relate to the demographic history of Europe and Near East.

Two main migratory scenarios have been proposed. At the global level the expansion of Homo sapiens sapiens out of Africa via the Levantine corridor to Europe at approximately 45 000–30 000 years BP was said to have been recognized in markers M89/213 and haplogroup VI. Its appearance in Europe

is very low (0.2%), indicating that few of these lineages have survived to the present (*Underhill et al. 2001.53*). An alternative chronology forthese events has been suggested: that the separation of the out-of-Africa branch of modern humans from Africans was embedded within 13 5000 bp for the earliest and 57 000 bp for the latest chronological limits, and that the Asian and European populations diverged some 20 000 years later (*Zhivotovsky 2001. 700–708*).

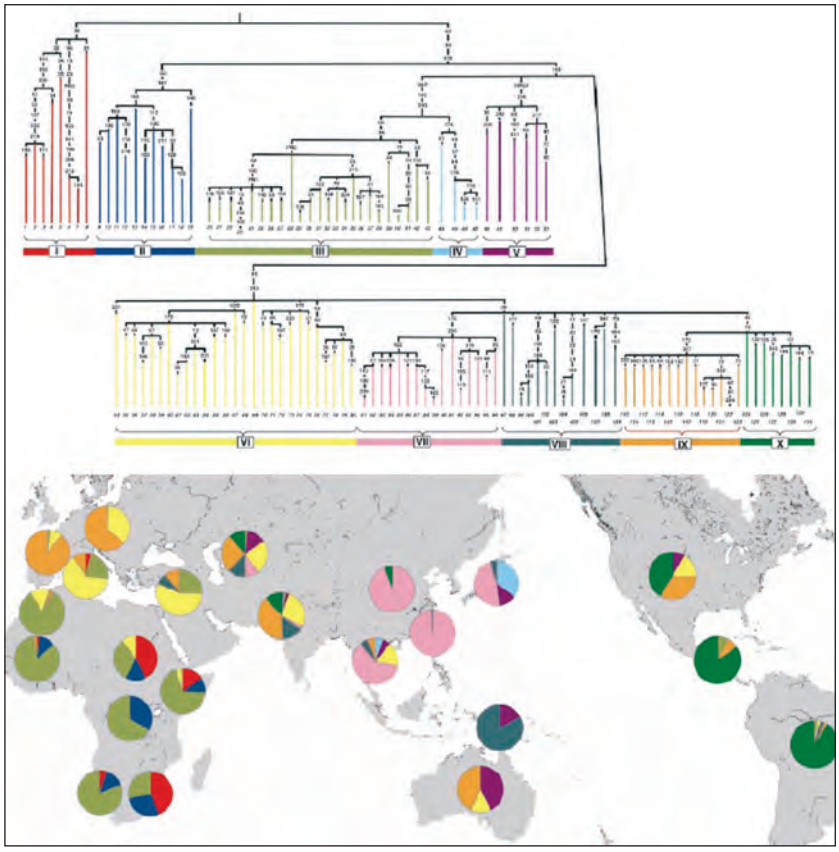

Fig. 4. Y chromosome haplotypes assorted into 10 haplogroups (I–X) and their worldwide distribution (from Underhill P. A., 2001. The phylogeography of Y chromosome binary haplotypes and the origins of modern human populations. Annals of Human Genetics 65: Figs 1 and 2, Copyright © 2001 by Blackwell Publishing Ltd).

At the inter-regional level, two Palaeolithic migratory episodes, and one Neolithic, were recognized as having contributed the modern European gene pool. The first is linked to the expansion of haplotypes Eu18 and Eu19 (M173 and M17) from isolated population nuclei in the Iberina peninsula and the Ukraine around 30 000 bp. The second relates to haplogroup Eu7 (M170), which originated in Europe in descendants of men who arrived from the Middle East 25 000 to 20 000 years bp, who could have been associated with the archaeologically traceable Gravettian culture.

The southeast-northwest cline of frequencies for haplotypes Eu4, Eu9, Eu10 and Eu11 (M35, M172, M89 and M201) is believed to mark the male contribution of a 'demic diffusion' of farmers from the Near East to Europe. In interpreting the mtDNA and Y Chromosome spatial frequency patterns in Europe Ornella Semino and colleagues calculated that European gene pool 'has ~80% Palaeolithic and ~20% Neolithic ancestry' and that the diffusion seems to be more pronounced along the Mediterranean coast than in Central Europe (*Semino et al. 2000.1157–1158*). By coalescence dating for a generation time of 27 years, they calculated the origins of these haplogroups at about 20 000–15 000 years bp (see also *Rosser et al. 2000.1526–1543*). The calculation was based on the concept of a statistical estimate of earlier and later limits for divergence times, since a population in a corresponding haplogrop region had bifurcated (*Hammer 2000.6771; Zhivotovsky 2001. 700–709; Zhivotovsky et al. 2003.1171–1186; 2004. 50–61; Rosenberg and Nordborg 2002.380–390*). Since the molecular age of mutations (Y Chromosome marker sequence) and its corresponding haplotypes must predate the demographic migratory event which it marks, the 'demic diffusion' could have happened at any *terminus post quem* and need not have been associated with farmers.

A year later Nebel and his group (*Nebel et al. 2001. 1103, 1105*) calculated by use of the mean variance of microsatellite repeats for a generation time of 25 years the start of the rapid expansion haplogroup 9, which includes both Eu9 and Eu10 haplotypes to 7492 years bp. The molecular age of haplogroup dispersals that are supposed to support the model of 'demic diffusion' thus post-dates the transition to farming in the Near East and in most of Europe.

In most recent studies of the origin, differentiation and diffusion of Y chromosome (macro)haplogroups

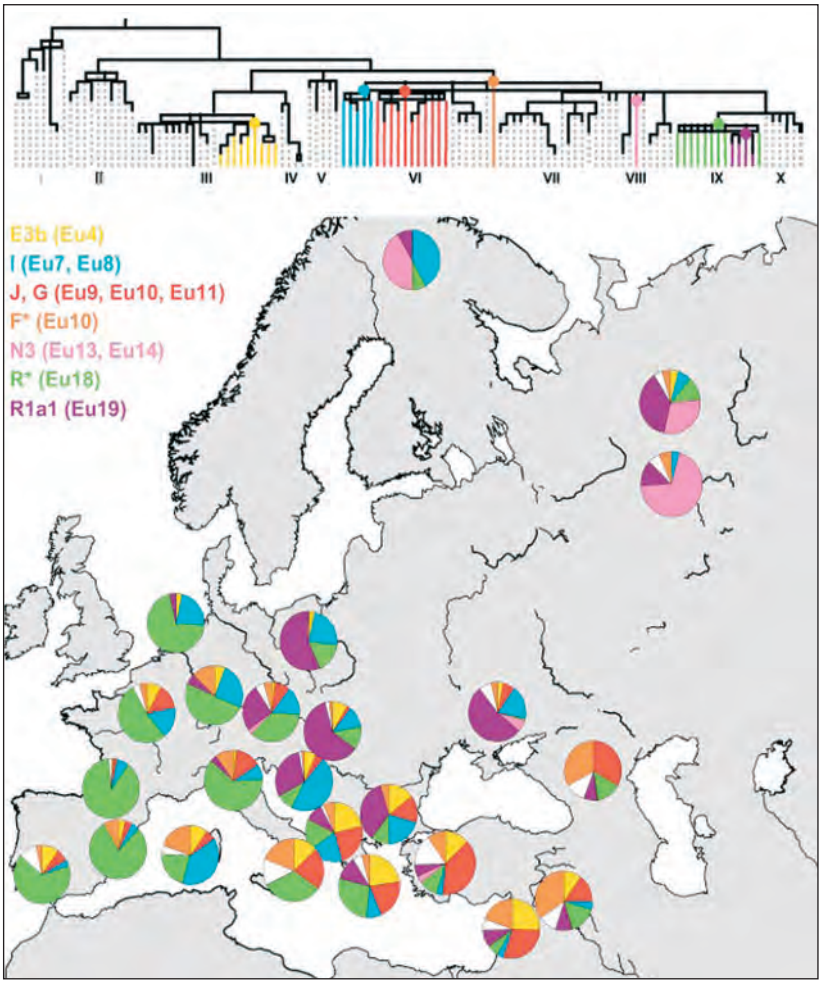

Fig. 5. Y chromosome haplogroups and their distribution in Western Eurasia (from Richards M. 2003. The Neolithic Invasion of Europe. Annual Review of Anthropology 32: Figure 6, Copyright © 2003 by Annual Review of Anthropology).

J and E[2] it becomes evident that expansions from the Middle East toward Europe, whether calculated for a generation time of 25 or 30 years 'most likely occurred during and after the Neolithic' (*Semino at al. 2004.1032; Peričić 2005.1964–1975*). The median expansion time of haplogroup J (M267* and M172*) was calculated at 8700–4300 years bp, respectively, for the earliest and the latest limits. The network of haplogroup E (M78 and M123) with dispersals in the Near East, North Africa and the Southern Balkans exclusively, has been dated by the divergence time between the Near East and European lineages to a range of 14 000–7000 year bp. Haplogroup E3b1 (M78), which typifies European lineages, however, was calculated to have a median estimation of expansion date at 4800 years bp (*Cinnioğlu et al. 2004.131, 134*).

It was suggested that a major difference in population structure between Southern Europe and the Central Mediterranean from the Near East had already been formed at the time of the spread of (macro)haplogroup J, which was considered to represent the signature of the Neolithic 'demic diffusion' associated with the spread of agriculture (*Di Giacomo et al. 2004.357–371*). The recent findings of many biallelic markers which subdivide the haplogroups J and E suggest that the large-scale clinal patterns cannot be read as a marker of a single, time limited wave of advance from the Levant, but a multi-period process of numerous small-scale, more regional population movements, replacements, and subsequent expansions overlying previous ranges (*Semino at al. 2004. 1032; Di Giacomo et al. 2004.36; Cinnioğlu et al. 2004.133–135*)

The contribution of Europe's indigenous inhabitants to European society has been underestimated ever since. The conclusion often drawn is that large regions were uninhabited during the early Postglacial, and because of a lack of evidence of Mesolithic sites in both Central and Southeast Europe the Mesolithic population must have been very sparse and, in consequence, this would have allowed farmers to expand and colonise the regions rapidly (*Pinhasi, Foley, Mirazón 2000.45–56, 50, 54; Gkiasta et al. 2003.45–62; Pinhasi and Pluciennik 2004. 69–72*). Hunter-gatherer sites are unequally distributed throughout the South-eastern Europe, but there are well-defined clusters dispersed along the Aegean coast and among the islands, in Thessaly, on the Adriatic and Ionian coasts, and Dinarides, and in the Danube in the Northern Balkans.

Within the studies of late-glacial hunter-gatherer expansions from refuge areas in Europe, haplogroup I

2 The Neolithic Eu4 and Eu9, Eu10 and Eu11 lineages have been renamed to haplogroups E3b and J an G after the introduction of Y chromosomal binary haplogroups nomenclature system (*Hammer 2002.339-348*).

(M170) was recently analysed in detail. It represents the only major clade of the Y phylogeny that is widespread over Europe, but virtually absent elsewhere, including the Near East. Thus it was suggested that it appeared in Europe, probably before the Last Glacial Maximum (se above), accounting, on average, for 18% of the total paternal lineages (*Rootsi et al. 2004.128–137*).

Previous studies of haplogroup I phylogeography revealed that it reached a frequency of ~40%–50% in two distinct regions, in Nordic populations of Scandinavia, and in the Balkan population of Southern Europe (*Semino et al. 2000.1156*). Recently performed genotyping resulted in a phylogegraphical structure of three distinct sub-haplogroup regions of postglacial expansions from refuge areas. While sub-haplogroup I1c (M223) covers a wide range in Europe, with the highest frequencies in the north-west, sub-haplogroup I1a (M253) is mostly found in Northern Europe, with the peak frequency in Scandinavia (*Rootsi et al. 2004.129–134*). Sub-haplogroup I1b* (P37) is relevant for Paleolithic, Mesolithic and Neolithic indigenous population prehistory in South-eastern Europe (*Barać et al. 2003.535–542; Rootsi et al. 2004.133–134; Marjanović 2005.757–763*) (Fig. 6). The highest frequencies were reported in the Balkans, the Adriatic and the Ionian Sea, with the highest values reaching 54–66% on the Adriatic islands of Brač, Hvar and Korčula. Paradoxically, this is exactly the place where seafaring Near Eastern farmers were supposed to have settle and began colonising the entire region in the mode of 'demic diffusion' (*Chapman and Müller 1990.127–34; Müller 1994; Forenbaher and Miracle 2005. 514–528*). We should stress, however, an opposite gene flow of sub-haplogroup I1b* from the Balkans to Anatolia due to migrations at about 9100 years bp (*Cinnioğlu et al. 2004.131, 134; Rootsi et al. 2004.134;* for mtDNA haplogroup see also *Richards et al. 2000.1263–1264*).

It is, of course, rather speculative to read a detailed demographic picture of Palaeolithic and Mesolithic hunter-gatherers and Neolithic farmers from the distribution of present-day genetic lineages. It should perhaps be stressed that any Y chromosome or mtDNA marker sequence intrinsically associates the 'demic diffusion' of Levantine and Anatolian farmers and the Neolithic way of life. It was more the continuous movements of men and women along the social networks which seemed to be more dynamic in the Eastern Balkans.

THE CERAMIC FEMALE FIGURINE PARADOX

The haplogroups become instrumentalised archaeologically by a correlation of the southeast-northwest cline of frequencies of haplogroup Eu9 in current West Asian and European populations and the geographic distribution of both Neolithic figurines and painted pottery (*King and Underhill 2002.707–714*). Authors have suggested that haplogroup Eu9 (J–M67* and J–M92 according to *Semino et al. 2004. 1030*) is the best 'genetic predictor' of 'demic diffu-

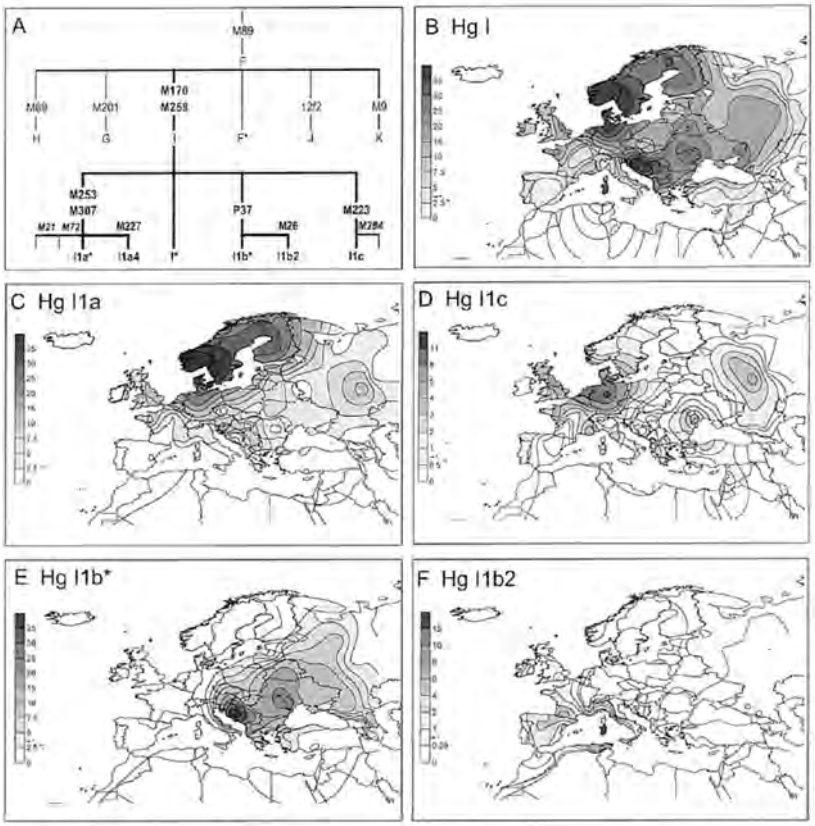

Fig. 6. Haplogroup I and sub-haplogroups I 1a, 1b*, 1b2 and 1c frequency distributions in Western Eurasia (from Rootsi Siiri et al. 2004. Phylogeography of Y-Chromosome Haplogroup I Reveals Distinct Domains of Prehistoric Gene Flow in Europe. American Journal of Human Genetics 75: Figure 1, Copyright © 2004 by The University of Chicago Press).

sion' originating from South-central Anatolia and, of the appearance of Neolithic figurines and painted pottery at various European sites. This appreciation was based on the assumption that the package carried by the males that participated in 'demic diffusion' consists of material and ideological content, and Y chromosome haplotype markers we mentioned above.

Jacques Cauvin (*1978.134; 2000.22–29, 204–205, 207–208*) indeed suggested that the use of clay as a building material, stone and baked clay figurines, and auroch skulls and horns buried in the houses were markers of the new religion and ideology – a powerful force which made possible the transition to the Neolithic and to farming way of life, which 'very quickly revealed itself to be expansionist'. He thought he had found the reason why villagers outside the Levant did not develop subsistence production for themselves. They supposedly did not adopt the 'humanisation' of art and related new divinities that could have stimulated the necessary energy to develop a new type of palaeo-economy. The Europe in this interpretative scenario thus could not become Neolithicised until the ceramic female figurines had reached the Balkans.

It is broadly accepted, indeed, that ceramic female figurines appeared along with the beginning of cereal cultivationin PPNA in the Levant, and that all the gender and the symbolic attributes were visualised at that time, and as such incorporated a millennia latter in the 'new materiality' that defines the Balkan Neolithic (*Gimbutas 1989; Biehl 1996. 153–175; Marangou 1996.176–2002; Chapman 2000; Bailey 2005; Hansen 2005.199–200*).

The introduction of ceramic female statuettes, animal figurines and structural ceramics was certainly not the domain of Levantine hunter-gatherers, and they did not appear on the 'eve of the appearance of an agricultural economy' exclusively, as Cauvin suggested (*2000.25*). We can trace them from Central Europe across the Russian Plain to Southern Siberia and back to the Levant and Northern Africa. They are well embedded in Eurasian hunter-gatherer social contexts, and chronologically clustered within a time span from 26 000 to 10 000 years BP.

Janusz Kozłowski (*2000.526*) has already pointed out that central European Gravettian Venus ceramic figurines exhibit evident similarities to those of the initial Neolithic of the Near East. We have added the notion that the principle of fragmentation as a social practice is also evident. That is, female figurines were broken intentionally, some by means of well-controlled pyrotechnic manipulation (*Vandiver et al. 1989. 1002–1008; Soffer 1993.259–275; Verpoorte 2001. 56,128; Budja 2004.59–81*).

In Central Europe more than 16 000 fragments of anthropomorphic figurines, zoomorphic statuettes, pellets, 'earplugs', flat fragments and 'structural ceramic' were found at Dolní Věstonice, Pavlov, Petřkovice, and Předmostí in Moravia. Ill–defined types of fired clay fragments have been recorded at Krems-Wachtberg, Moravany-Lopata, Jarošov, and hypothetically at Kašov and Cejkov (*Soffer and Vandiver 1997.383–402; Verpoorte 2001*). We can certainly add to the list the 'structural ceramics' deposited in Klisura cave in the Peloponnese in South-eastern Europe. The ceramics were interpreted as Aurignacian

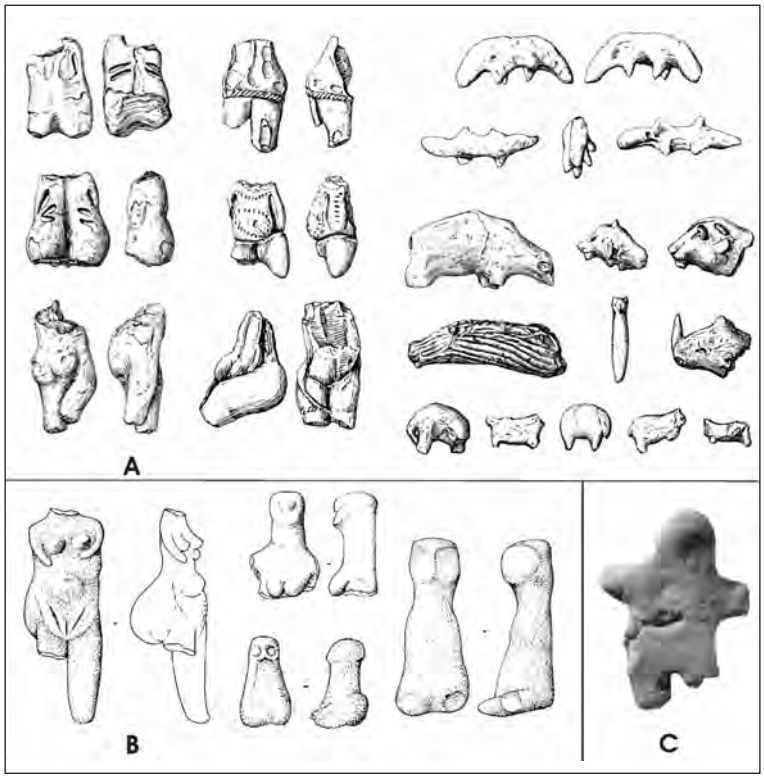

Fig. 7. Anthropomorphic and zoomorphic ceramic figurines from A: Dolní Věstonice Pavlov and Předmosti (from* Verpoorte 2001. Figs. 3. 6, 7, 8, 9, 46, 3.73, 8.1 and 54*), B: Mureybet (from* Cauvin 2000.25.Fig. 8*), C: Maininskaya (Maina) (from* Vasil'ev 1985.Fig. 2*).

***Fig. 8. Palaeolithic and Pre-Neolithic distributions of anthropomorphic and zoomorphic ceramic figurines, 'structural' ceramics and pottery in Eurasia. Sites, cultural contexts and radiocarbon dates of the first and the second are discussed in text. Pottery in South-eastern and North-eastern Asia is believed to be embedded in hunter-gatherer Initial Neolithic complexes: Osipovka and Gromatukha cultural complexes in Siberia; Odai Yamamoto I and Fukui cave sites in Japan, and Xianrendong, Miaoyan and Yuchanyan cave and open-air sites in Southern China. For ^{14}C dating and contexts see:* Derevianko and Medvedev 1995.13–14; Kurishima 1995.122– 128; Zhang 2002.1–13; Zhao and Wu 2000.236–238; Kuzmin 2002. 37–46; Keally, Taniguchi and Kuzmin 2003.3–14; Kuzmin and Shewkomud 2003.37–45.**

clay hearth structures, embedded chronologically from 34 000 to 23 000 years BP (*Karkanas et al. 2004.513–525*).

On the Russian Plain low-temperature-fired clay was reported at Zaraisk and Kostenki Gravettian sites. At the latter, located on the banks of the River Don, more than four hundred fragments were found, contextually associated with marl and ivory Venus figures, and animal statuettes (*Iakovleva 1999.125–134; Soffer, Adovasio and Hyland 2000.511–537; Soffer et al. 2000.814*). The most easterly figurine was found at an open air site at Maininskaya (Maina), on the left bank of the Yenisei River in Siberia (*Vasil'ev 1985.193–196; Maina on-line*).

The European assemblages are assigned to the Pavlovian, a local variant of the Eastern Gravettian technocomplex, and dated to about 26 000 BP (*Verpoorte 2001.86*). The ceramics at Kostenki are embedded in dates as early as 24 100 BP to as late as 18 000 BP (*Soffer et al. 2000.814*). Two dates are available for a ceramic figurine at Mayininskaya: at 16 540 ± 170 BP and 16 176 ± 180 BP (*Vasil'ev 1985.193–196; Vasil'ev et al. 2002.526, Tab. 1*). The most well known and supposedly the latest hunter-gatherer context of *chaîne opératoire* with anthropomorphic and zoomorphic ceramic figurines in Eurasia is embedded in an Early Mureybetian settlement context in Mureybet (IIIA) from the late eleventh and early tenth millennia BP. 'Female figurines in baked clay' and a 'nocturnal raptor' were associated with some in stone (*Cauvin 2000.22–28;* see also *Hansen 2005*). A lesser known ceramic fragment which was hypothesised to represent a Barbary Wild Sheep (*Ovis tragelaphus*) was found in an Ibero-maurisian context, dated to 19 800 ± 500 bp in Tamar Hat Cave in Algeria (*Saxon 1976.327–329*) (Figs. 7 and 8).

We may suggest, therefore, that ceramic technology had become 'inhabited' into the agency[3] of Eurasian hunter-gatherers long before the food production and farming social agglomeration appeared. Fired clay was a medium of artefact manufacture and manipulation which entailed active interferences in people's lives that depend on an ability to transmit or to acquire access to knowledge which obviously predates the transition to farming. We may hypothesise that it operated individually and collectively, but extended beyond the individual and their own lifespan.

The ceramic figurines in the Levant, Anatolia and the Balkans should be discussed in the contexts of hunter-gatherers' trajectories, where they were embedded in a continuum of traditions, symbolic systems and beliefs, as much as of the development and adoption of ceramic technologies. It is unlikely that they represent the materialisation of the ideological *conditio sine qua non* for the successful transition to farming, whether in the Near East or in Europe. Ceramic female figurines are 'predictors', to paraphrase King and Underhill, of the Palaeolithic hunter-gatherers' as much as the Neolithic farmers' haplogrups in Eurasia.

THE NEOLITHISATION OF SOUTH-EASTERN EUROPE AND THE TRANSMISSION OF SYMBOLS

It is worth remembering three postulates that have been casting a long shadow, to the extent that we continue to discuss the Neolithisation of Eurasia in terms of an abrupt replacement of autochthonous populations and related social structures, materiality and symbols.

Since Gordon Childe (*1951.76–77*) put forward the idea that ceramic technology and pot making are virtually universal characteristic of Neolithic communities, as well indicators of cultural identity, the appearance of pottery has been understood for decades as an exclusive marker of cultural discontinuity between the Late Mesolithic and Early Neolithic. The spatially restricted dispersals of selected ornaments attached to the pots reached paradigmatic status as the clusters of settlements comprehending painted pottery was thus believed to objectify the initial European Neolithic cultures and the confines of the region to be settled by Anatolian migrants first.

The second suggested that farmers introduce into Europe the ideology of 'domus' and related social and symbolic structures, which was based on the revolutionary process of the transformation of 'wild into cultural' (*Hodder 1990*).

The third proposed that the process was associated with 'theoretical culture utilising external memory storage' – new types of symbolic artefacts and their 'visual-symbolic' potential. In the scenario of cognitive evolution, hunter-gatherers have been hypothesised as unable to employ external symbolic storage devices (*Renfrew 1998.1–6*). This means in practice that new memory media and related material culture remain the domain of farmers who participate solely in the transition from preliterate to symbolically literate societies.

The initial elements of farming economy and 'Neolithic' materiality in the Balkans, however, were contextualised within hunter-gatherers' domestic and mortuary structures, which were believed to have been dominated by a social hierarchy that monopolised power and prestige and maintained and controlled inter-regional networks and integrative mechanisms. This was the agency, I suggested (*Budja 2001; 2003; 2004; 2004a*) which made possible the initial, almost simultaneous, distributions of domesticates and pottery, followed by the dispersals of prestigious artefacts listed in Rodden's and Renfrew's catalogue. It has to be noted that in the Western Balkans – the Adriatic Coast and the Dinaric hinterland, neither social hierarchical structures nor painted pottery, anthropomorphic and zoomorphic figurines and vessels, pintaderas, 'altars' and other prestigious artefacts have been identified in late Mesolithic and Early Neolithic site contexts. The region, although it adopted domesticates and pottery, did not enter into a network of interregional exchanges. This might have happened because the agency had not yet been articulated, and fragmented and isolated groups set up a network of economic, social and ideological barriers that stopped the circulation of goods and people over medium and long distances (*Budja 2004. 37–48;* see *Mlekuž in this volume*; for Peloponnese and Eastern Balkans see *Schubert 2005.239–253; Schwarzberg. 2005.255–273*).

In hunter-gatherer contexts in the Northern Balkans, pottery played an interactive role which was not reduced to the level of cooking pots and containers; they were multi-functional objects embedded

3 For the conceptualisation see Barrett (*2000.61-68; 2001.149*).

in both domestic and mortuary structures. They were deliberately incorporated into structures that have been hypothesised to have been related to ancestors and kinship, religious beliefs or practices, and shamanic rituals. I have already actualised paradigmatic structures embedded in trapezoidal buildings in Lepenski Vir, where pots were associated with infant burials, boulders coloured in red and black and sculpted in complex designs, figurative stone statues and deer skulls and antlers (*Budja 2004.71–75*). Almost identical pots have been reported in trapezoidal pit-dwellings in farmers' settlement contexts in Divostin, Banja and Blagotin-Poljna. The pottery in the latter was contextually associated with similar ritual structures – a new born infant skeleton and deer skull. Ceramic cereal grains, 'zoomorphic amulets' and anthropomorphic and zoomorphic figurines have been deposited in all three contexts (*Bogdanović 1986. 169–175; 1988.070; Budja 2003.118–124; Whittle at all 2002.66*) (Fig. 9).

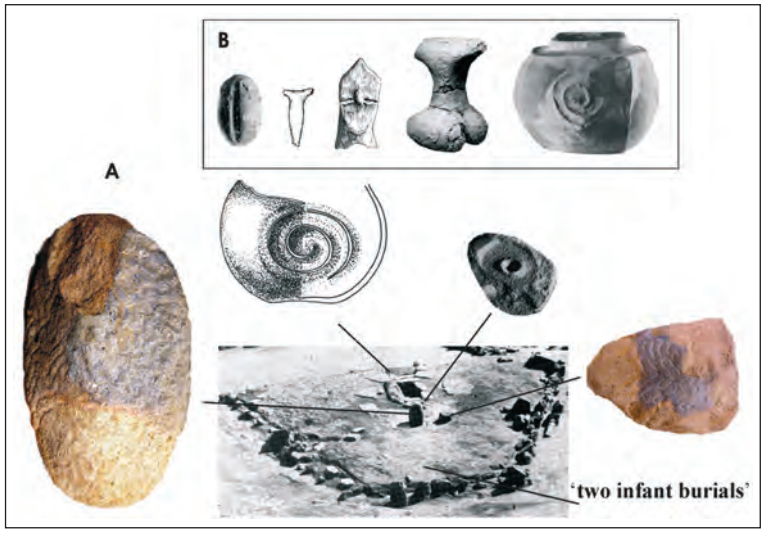

Fig. 9. Ritual structure in Lepenski Vir trapezoidal building No. 54 (A). Selected artefacts, mentioned in text from Divostin, Banja and Blagotin-Poljna (B) (from* Bogdanović 1986.169–175; 1988.070; Stanković and Leković 1993.178; McPheron et al. 1988.Fig. 11.1i, Plate I,m; Budja 2004.Fig.21*).

Also from funerary settings at Lepenski Vir, Padina and Vlasac come the burial structures which we may understand as reminiscent of the qualities or powers of particular shamanic personages. Five men, one woman and one child were buried in sitting positions with crossed legs. The body of the oldest man was burdened by the boulders, and a skull of an older man was placed beside the body of the youngest. The skull of an old woman and the skull of a large bovid were placed beside the body of a man buried in the trapezoidal building in an extended position (*Radovanović 1996.173–174, 17, 180, 209–210*) (Fig. 10). What all this indicates is that hunter-gatherer's social structures, which Jacques Cauvin relates exclusively to a new Levantine religion and ideology that make possible the transition to farming did exist in the Balkans and likewise participated in the process of Neolithisation autonomously.

It was no coincidence that along these structures a complex symbolic system was established. Symbols and construals, the basic units of ritual practices, were well visualised, whether carved and engraved on stone boulders, 'altars' and pots in domestic and funerary contexts, or painted on cave walls. By means of visualisation they became more potent storage devices, capable of storing profane knowledge and sacred principles. We have to emphasise at this point that hunter-gatherers' and farmers' cave paintings in South-eastern Europe have been overlooked and marginalised, although representing perhaps the most significant referentialities of symbols, construals and iconography, and their temporal continuity and spatial connections.

While the Climente II and Gaura Chindei caves are located within the hunter-gatherers' site distribution in the Danube Gorge, the Cervi cave is located a thousand kilometres to the south, near Porto Badisco in Lecce (the southern Apennine peninsula). Cave paintings demonstrate almost an identical canon in

Fig. 10. Lepenski Vir burial structures (from* Srejović 1969.Fig. 69 *and* Radovanović 1996.Fig 4.2*).

Fig. 11. Cave paintings in Cervi cave, near Porto Badisco (above) and petroglyphs, carved and engraved on sandstone boulders and sculptures in Lepenski Vir (below) (from* Graziosi 1996.Plate 70 *and* Srejović and Babović 1983.8, 99, 121 and 125*).

the realisation of red and black symbols and iconographies with those carved and engraved on sandstone boulders and sculptures in the Lepenski Vir culture (*Graziosi 1996; Boroneanţ 1977.23–34; 1999 on-line; Budja 2004.59–81*) (Fig. 11). In discussing the hunter-gatherers' symbols in the Balkans I suggested identifying them as 'signs of all time' and interpreting them as entoptic motifs and their construals which might have been associated with religious beliefs and practices, altered states of consciousness and shamanic rituals.

Paradigmatic was the act of attaching spirals – an old symbol on the new media – ceramic vessels – that had been incorporated into existing hunter-gatherers' ritual practices and symbolic structures (Lepenski Vir). This principle was evidently maintained in farmers' contexts, as identical pots have been embedded in similar symbolic structures or associated with prestigious artefact sets in trapezoidal pit-dwellings, mentioned above. When painted motifs appeared in the Northern Balkans and Carpathians they were attached to vessels in extremely standardised forms, patterns and colours, and their distribution was restricted to 17% of the whole cluster of the Early Neolithic (Phase I) sites in the region. They were white at first, and they correlate perfectly well with the basic list of entoptics. I pointed out already that in Gura Baciului they are contextually associated with stone sculptures similar to those we met in Lepenski Vir (*Budja 2004.74–75*).

Ceramic seals (pintaderas) are even better indicators of the transmission of an 'old symbols' to a new media embedded in farmers' social structures. It is broadly accepted the seals were an Anatolian invention, since the Çatalhüyük and Bademagaci stamps predate all the others. But it is also true that the patterns on Early Neolithic stamps in the Balkans are very different from those in Anatolia. It is indicative that motifs incised on the face sides of the Balkan stamps continued to correspond perfectly with the symbols and/or entoptics (Fig. 12)

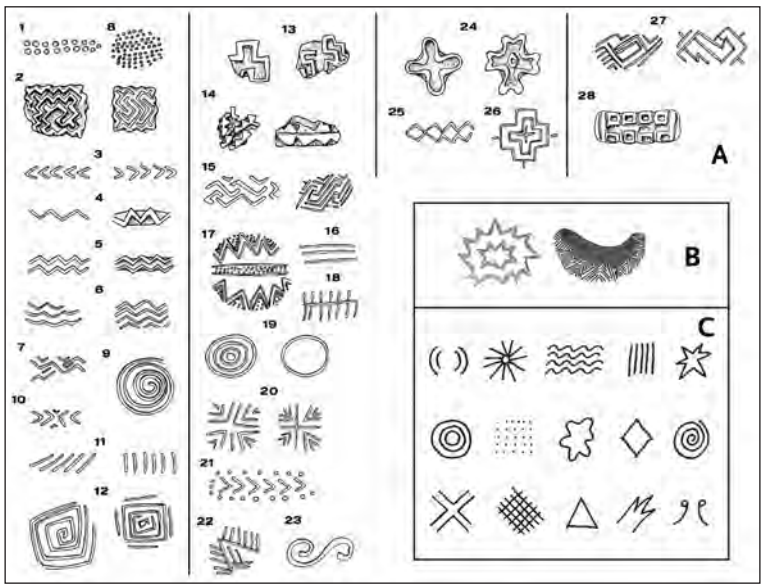

Fig. 12. Patterns on early Neolithic "stamp seals" in the Balkans (A) (from* Todorova and Vajsov 1993.Tab. 227*) and entoptic typical forms (B) (from* Oster 1970.87*).

we discussed in rituals dominated by hunter-gatherer social elites, whether visualised in funerary and domestic settlement contexts or in hardly accessible cave sites. They continued to be used in new subsistence and social arenas, where they became attached to artefacts (seals and 'altars') whose relevant functions are still not understood. In early Neolithic settlements they are contextually associated with new prestige items such as anthropomorphic and zoomorphic vessels, female figurines, 'exotic flint' and a half-metre long nephrite sceptre. Regional and inter-regional distributions of seals, I have suggested (*Budja 2003.115–130; 2004a.37–48*), they may indicate more structured and intensive patterns of social networks and the circulation of goods and people over short, medium and long-distances in the Eastern Balkans, the Peloponnese and Anatolia which followed the structural trajectories of hunter-gatherers into farmers.

CONCLUSION

The above suggestion is in agreement with the suggestions driven by population geneticists of a continuous paternal Y Chromosome gene flow, objectified in sub-haplogroup I1b* and (macro)haplogroups J and E in both directions. They are markers of neither 'demic diffusion', a slow and regular east-west spread of population from one contiguous area to the next, nor punctuated and isolated events of a long-distance pioneering migration, but of the continuous process of population dynamics in South-eastern Europe and Western Anatolia.

I believe that the dynamic of Neolithisation in South-eastern Europe was interrelated and overlapped with historical constraints, cultural inheritances and the social hierarchies of hunting and gathering communities in the regions. Early Neolithic 'agricultural frontiers' which were broadly accepted as the front lines of transferred exogenous farming populations may never have existed in the Balkans. The regional patterns of new dispersal of material culture and related spatial counters of the 'Neolithic package' distributions could have been simply archaeologically visible markers of social hierarchy and structure, the intensity of social networks and dynamics of the structural transformation of hunting and gathering communities in South-eastern Europe and Western Anatolia. There were two Neolithisation trajectories and two related, archaeologically and genetically readable, regional palimpsests in the Balkans.

Domesticates and pastoralism in the Dinarides and the Adriatic cohabited with a slow process of structural changes in subsistence, social relations and ideology within small autarchic groups. In the Eastern and Northern Balkans the process was faster, accelerated by hierarchies and maintained by dynamics in inter-regional networks of communication. It is clearly visible, I believe, in the overlapping spatial distributions of hunter-gatherers' and farmers' material culture and symbolic activity that range from entoptics to ceramic cereal grains. It is conventional to point to the power of tradition in maintaining symbols over generations, but we should not forget that it correlates with personal identities and maternal and paternal lineages in the Balkans, like everywhere in Eurasia, and with lineage clusters, the haplogroups of modern populations and their genealogical, chronological and spatial trajectories.

The Neolithisation processes in South-eastern Europe depended more on the social hierarchy of hunting and gathering communities, the intensity of social networks and the dynamics of structural transformation in the regions than on the transfer of population. Geneticists suggest that large-scale clinal patterns cannot be read as a marker of a single, time limited wave of advance from the Levant, but a multi period process of numerous small-scale, more regional population movements, replacements, and subsequent expansions overlaying previous ranges that happened during and after the Neolithic.

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