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Jezikovni pregled/English advisor: Philip James Burt

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The 14th Neolithic Studies anthology comprises selected papers, presented at the thirteen international Neolithic Seminar 'The Mesolithic and the Neolithic Cultural and Populational Trajectories in Eurasia' that took place at the Department of Archaeology, University of Ljubljana in November 2006. We also present a group of papers focussed on: Mesolithic and Neolithic settlement contexts and radiocarbon chronological sequences in Danube Gorge; chemical analysis on pigments used in Neolithic painted pottery; Neolithic stamp-seals' iconicity, indexicality and symbolism; multifaceted process of Indo-Europeanization of Europe; 8200 calBP 'climate event' and its implication for the process of transition to farming and to demographic dynamics and population trajectories in South-eastern Europe.

Bear seal, Çatalhöyük (Türkcan, in this volume).

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Reassessing the concept of the 'Neolithic' in the Jomon of Western Japan

Simon Kaner and Takeshi Ishikawa
Sainsbury Institute for the Study of Japanese Arts and Cultures, UK
s.kaner@sainsbury-institute.org
t.ishikawa@sainsbury-institute.org

ABSTRACT – *The concept of the Mesolithic/Neolithic transition is difficult to apply in the Japanese archipelago. The earliest pottery usage occurs in late Palaeolithic contexts. Holocene foragers lived in stable, permanent village settlements and constructed large scale monuments, and the first real 'agriculture' arrived as part of a cultural package which also included metallurgy. This paper will examine the use of the term 'Neolithic' in the history of Japanese archaeology, with particular emphasis on what happened in the western part of the archipelago in the latter part of the Jomon period (*c. *5000 BC –* c. *500 BC). Recent investigations in Kyushu and Western Honshu are leading to a re-assessment of the nature of Jomon culture and society in this region, traditionally considered to have 'lagged behind' the more developed societies of the eastern part of the archipelago, expressed in part through much lower population densities.*

IZVLEČEK – *Koncept mezolitsko-neolitske tranzicije je težko aplicirati na Japonski arhipelag. Prva uporaba keramike se tu pojavlja že v mlajše paleolitskih kontekstih. Holocenski nabiralci hrane so živeli v trdnih, stalno poseljenih vaseh, kjer so gradili velike spomenike. Prvo pravo »poljedelstvo« je prispelo kot del kulturnega paketa, ki je vseboval tudi metalurgijo. V članku bomo analizirali uporabo termina »neolitik« v zgodovini japonske arheologije. Poseben poudarek namenjamo dogajanju na zahodnem delu arhipelaga v mlajšem obdobju Jomon (okoli 5000 BC – okoli 500 BC). Nedavne raziskave na otokih Kiušu in zahodni Honšu vodijo k ponovni oceni narave Jomon kulture in družbe v tej pokrajini. Zanjo velja, da je zaostajala za bolj razvitimi skupnostmi na vzhodnem delu arhipelaga. Posledica je mnogo manjša gostoti poseljenosti.*

KEY WORDS – *Jomon; Western Japan; Jomon-Yayoi transition; AMS dating; Amida; Kaminabe; Shorakuji*

Introduction

The concept of the Mesolithic/Neolithic transition is difficult to apply in the Japanese archipelago. The earliest pottery usage occurs in late Paleolithic contexts. Holocene foragers lived in stable, permanent village settlements and constructed large scale monuments, and the first real 'agriculture' arrived as part of a cultural package which also included metallurgy. This paper will examine the use of the term 'Neolithic' in the history of Japanese archaeology, with particular emphasis on what happened in the western part of the archipelago in the later part of the Jomon period (*c.* 5000 BC – *c.* 500 BC). Recent investigations in Kyushu and Western Honshu are leading to a re-assessment of the nature of Jomon culture and society in this region, traditionally considered to have 'lagged behind' the more developed societies of the eastern part of the archipelago, expressed in part through much lower population densities.

The Neolithic in prehistoric Japan

In 1908, when the Scottish doctor, archaeologist and anthropologist, Neil Gordon Munro published 'Prehistoric Japan', the first English-language synthesis of Japanese archaeology, he dedicated a whole chapter to the Neolithic. He noted that "*traces of neolithic culture abound in many parts of these islands*", that "*these remains have been disinterred by agricultural operations, and bear witness that a widespread primitive population had been settled during a considerable period*" (*Munro 1908.44*). What Munro termed Neolithic, another early foreign archaeologist in Japan, the American zoologist and excavator of the Omori shell middens, Edward Sylvester Morse, termed Jomon, on the basis of the cord-marked pottery sherds he recovered from Omori (*Morse 1879*). Munro was correct in thinking that the Jomon was a long period: it is now considered to begin with the appearance of pottery in the Japanese archipelago, the earliest dates being some 16 000 years ago at Odai Yamamoto in Aomori Prefecture at the northern tip of the main island, Honshu (*Odai Yamamoto 1999*). The Jomon is usually thought to have ended towards the end of the first millennium BC, but as we will see shortly, there is now some debate as to when exactly the transition to the succeeding Yayoi period occurred (*Shoda 2007*).

Munro also noted that "*the sites are very much more numerous in the northern than in the southern half of Japan*" and that there were fewer sites in Hokkaido (the large northern island) than in Honshu, subsequently home to the aboriginal Ainu populations which Munro was to study later in his career. Munro was concerned to understand why there should be such a difference between Eastern and Western Japan, and suggested it had something to do with topography, an idea which has often been repeated in later literature on the topic. Western Japan is characterized by steep mountain slopes with little of the extensive terrace development which was traditionally thought to provide favoured habitation locations for Jomon fisher-hunter-gatherers in Eastern Japan.

One of the most influential studies of Jomon settlement densities and their relationship to subsistence practices is that published by Koyama Shuzo.[1] Koyama estimated population densities for a series of different regions within the Jomon on the basis of site numbers from different phases, which he backed up with the available radiocarbon dates (*Koyama 1979*). Koyama argued that the differences between Eastern

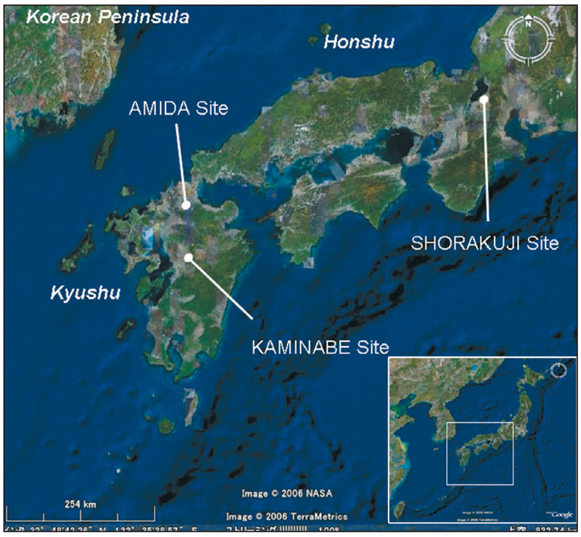

Fig. 1. Western Japan and the locations of sites mentioned in the paper.

and Western Japan were caused by different food stuffs being available, based on the ecological divide between Eastern and Western Japan that has long been recognized, with the forests of Eastern Japan being dominated by temperate deciduous forests and the western part of the archipelago characterized by warm temperate evergreen oak forests. This research was complemented by studies undertaken by Nishida Masaki and others which reconstructed the biomass available to prehistoric foragers in the archipelago (*Nishida 1983*).

In Central and Eastern Japan, in particular during the Middle Jomon period (around 3500 BC) population densities among Jomon fisher-gatherer-hunters reached some of the highest levels recorded for temperate foragers anywhere in the world. These foragers lived in relatively stable village communities containing pit dwellings, extensive storage and burial facilities and fixed dump areas, many examples of which have been excavated. These settlements tend to be located on well-drained river terraces which abound in Eastern Japan. Despite influential theories such as the Middle Jomon Farming Hypothesis proposed by Fujimori Eichi in the 1960s and 1970s, however, there is still no firm evidence for any form of established agriculture during the Jomon period, although there may have been some limited cultivation of nuts and plants used as condiments, such as perilla (*Rowley-Conwy 1984*). These foragers did make extensive use of pottery and polished stone tools. Large pit dwelling villages became

1 Japanese personal names in this paper have been given in Japanese order, *i.e.* family name before given name. Macrons have been omitted.

less common in the later part of the Jomon, however, and it seems that there was more extensive exploitation of low-lying, wetter areas. Literature on the Jomon published prior to 1990 is listed and discussed in Kaner (*1990*) and recent developments are covered in Kobayashi (*2004*).

AMS dating and the beginning of the Yayoi period

In 2003, a research team from the National Museum of Japanese History made an announcement that, based on their results of AMS dating, the beginning of the Yayoi period should be dated to the 10th century BC, although previously the Yayoi period had been thought to begin from around the 4th century BC (*Harunari et al. 2003; 2004*). Many scholars have been highly critical of this research because it contradicts what were previously accepted as well-established facts about the chronological relationships between the Japanese archipelago and mainland China and the Korean peninsula at this time (*Takakura 2003*). In this controversial situation, Kyushu University developed a new research project and sent samples of skeletal remains and deer bone for AMS dating to the Oxford University radiocarbon dating laboratory. In the presentation of their results, the Kyushu University researchers claimed that their evidence was consistent with the traditional dating based on the archaeological method, *i.e.* arguing for the later start of the Yayoi period (*Tanaka et al. 2004; 2005*). In what follows, we will briefly summarise the current situation in regard to the debate about the dating of the Yayoi period.

Firstly, we will briefly introduce the methods and results of the traditional chronology for the Yayoi period. In the northern Kyushu area, which is adjacent to the Korean peninsula and was the first region in the Japanese archipelago to accept agriculture and the other components of the cultural package from the Peninsula at the beginning of Yayoi period (which included iron metallurgy and weaving along with paddy-field agriculture), there were many bronze mirrors imported from Han dynasty China. These are mainly excavated from jar burials from after the late Middle Yayoi period. Based on the dating of these bronze materials, it was considered that the late Middle Yayoi period dates to around the 1st century BC. Subsequent archaeological phases were also dated based on the same method. In addition, archaeologists have attempted to estimate the duration of each archaeological phase with reference to these well-dated foreign materials, and it is estimated that each phase lasted approximately 70 years (*Takakura 2003*). Earlier phases such as the Initial and Early Yayoi periods, for which we do not have materials with what were considered reliable relative dates, were also dated in accordance with these estimates. In this manner, the beginning of the Yayoi period was dated to the 5th century BC (*Takakura 2003*). The AMS dating by National Museum of Japanese History research team dated carbonized remains and soot attached to the surface of pottery sherds from the end of Jomon period to the Kofun period, and included a number of samples from Korea. The results suggested that the beginning of the Yayoi should be revised to the 10th century BC, some 500 years earlier than the above mentioned previously accepted dates. But this dating was inconsistent with the established chronological relationship with neighbouring areas of mainland China and the Korean Peninsula (*Takakura 2003*). Inconsistencies include the following: Chinese bronze mirrors imported into the Japanese archipelago now become earlier than the Chinese originals; and the earliest iron artefacts excavated in Japan become earlier than the originals in China from where those iron objects were imported into the archipelago (*cf. Takakura 2003*). Although many scholars have criticized the new chronology, mainly based on these inconsistencies with the established chronological relationship with the neighbouring East Asian continent, studies based on the new chronology have started to appear.

In addition to the critique based on inconsistencies with the existing relative chronology, the research team from Kyushu University presented other results of their AMS dating programme using human bone and deer bone, the latter being used for analysis to try to exclude the marine reservoir effect. Their results indicated that the beginning of the Yayoi should indeed be dated later than that suggested by the National Museum of Japanese History, but still earlier than the previously accepted dating. The Kyushu researchers still think that some influence of the marine reservoir effect needs to be taken into consideration, although they selected samples from inland sites in order to reduce the effect. They accordingly suggested that, based on their results and taking into consideration the marine reservoir effect, the absolute dates for the each Yayoi phase must be later than the dates obtained from the skeletal remains (*Tanaka et al. 2004; 2005*).

At present, then, there are two different positions in regard to the dating of the beginning of the Yayoi period and subsequent phases of the Yayoi, and also about the later part of the preceding Jomon period. These different positions are both based on the results of the same dating method, AMS dating, but are based on the analysis of dates from different materials. So the differences of the results between the two indicate the possibility that there is some kind of systemic 'noise' caused by the nature of materials being analysed.

Some recent Late and Final Jomon period sites from Western Japan

We would now like to introduce three sites from Western Japan, one from the Kansai area to the east, and the other two from Kyushu (Fig. 1), which are indicative of our changing understanding of the nature of the later part of the Jomon period in Western Japan in the lead up to the start of the Yayoi period. All three date to the Late and Final parts of the Jomon period.

From the Kansai area, a little further to the east, the Shorakuji site is a particularly interesting example, as it reveals the spatial structure of a Late Jomon settlement. The site is located near the southern shore of Lake Biwa and was occupied during the early part of the Late Jomon period (*Notokawa Town Board of Education 1996*). During this period, the Western Japanese Jomon is considered to have experienced intensive cultural influence from Eastern Japan. The excavations at Shorakuji produced a lot of pottery from different regions, including different parts of Eastern Japan. Elements of settlement structure included a feature resembling a wooden circle in the south-western area, associated with a relict river bed (Fig. 2), and a series of storage pits dug alongside the water's edge. Further to the south-west, many post-holes which would have supported wooden pillars were excavated. Although not many pit dwellings were excavated because of the limits of the excavated area, we can discern what appears to be the structure of a planned sedentary settlement, with a distinct area for storage pits and storehouses in another part of the site (*cf. Hayashi 1997*). The wooden circle may reflect the effects from nearby regions of Eastern Japan. The function of this kind of feature remains unclear, but researchers at this site and other scholars have speculated that it might relate to certain kinds of ritual (*Notokawa Town Board of Education 1996; cf. Kaner 2007*).

From the Kyushu area, we will introduce two sites, which provide important information for understanding settlement structure. The first is the Amida site from the northern part of Kyushu (Fig. 3). Unfortunately, since it was this area where the Yayoi cultural package is first thought to have arrived from the Korean Peninsula, there are still currently no particularly good examples of Late Jomon settlements in the Fukuoka Plain from which we can derive a clear picture of settlement structure. Therefore, we have selected a site from the area adjacent to the Fukuoka Plain. This site was occupied during the middle part of the Late Jomon to the initial part of the Final Jomon period. The site comprised many pit dwellings as seen in Figure 3, and the spatial distribution of these pit dwellings seems to be divided into two parts. Some scholars have suggested that the western group of pit dwellings formed a circular structure around a central public space, reminiscent of the settlement structure familiar from Jomon settlements in Eastern Japan (*Matsumoto 2000*).

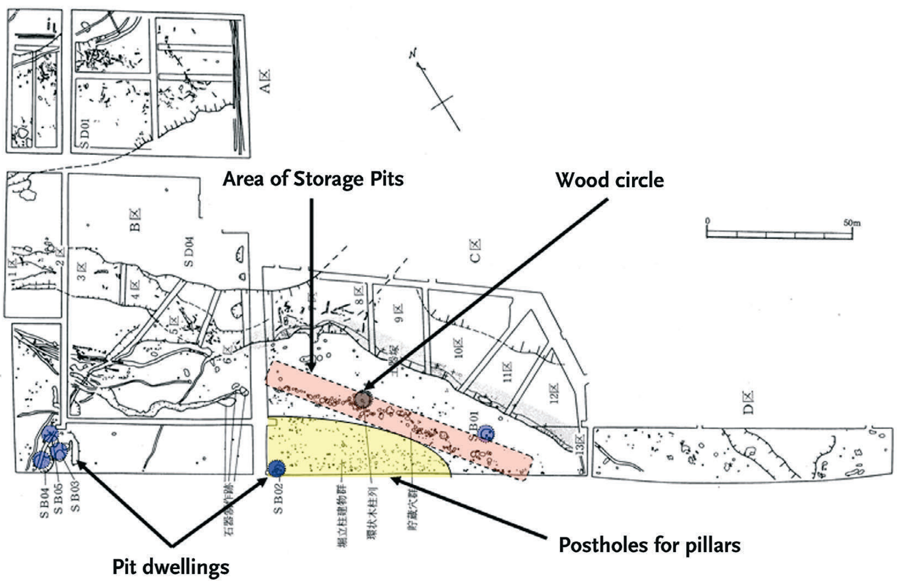

Fig. 2. Site plan of Shorakuji Site (Notokawa Town Board of Education 1996 with modifications). Source of figure: NOTOKAWA TOWN BOARD OF EDUCATION. 1996. Shorakuji iseki: Notokawa-cho maizo bunkazai chosa hokokusyo (Shorakuji Site: A report on the excavations of Notokawa Town), Vol. 40. Notokawa-cho Kyoiku Iinkai. Shiga.

Fig. 3. Site plan of Amida Site (Kaho Town Board of Education 1989). Source of figure: KAHO TOWN BOARD OF EDUCATION. 1989. Amida iseki: Fukuoka-ken Kaho-gun Kaho-machi syozai iseki no hakkutsu chosa (Amida Site: A Report on Excavations at Kaho Town, Fukuoka Prefecture – in Japanese), Vol. 10. Kaho-machi Kyoiku Iinkai. Fukuoka.

The second site from Kyushu is Kaminabe, in the central part of Kyushu (Fig. 4). This site is located at the western foot of the large volcanic massif of Mount Aso. The occupation of this site lasted from the later part of the Late Jomon to the early part of the Final Jomon. The Kaminabe site is one of the most famous Jomon sites in this region and may also have functioned as a central settlement for this region as many of clay figurines and pit dwellings and other special materials were excavated (*cf. Miyauchi 1981; Tomita 1982*). Like Amida, Kaminabe also comprised a circular structure, within which pit dwellings, pottery, and other material culture were distributed (*Tomita 1982*).

Conclusions: reassessing the concept of the Neolithic in Western Japan

In this short paper, we have considered the implications of the dating controversy currently being discussed within Japanese archaeology, and we have also introduced a series of later Jomon sites from Western Japan which are helping us to better understand the nature of the occupation of the western part of the archipelago prior to the adoption of paddy-rice farming. We began with Neil Gordon Munro's account of the Japanese 'Neolithic', formulated 100 years ago, and suggested that the term, implying a period of agriculture prior to the appearance of metallurgy, was not appropriate for the Japanese archipelago. Interestingly, one of the possible outcomes of the current debate about the chronology of Japanese prehistory may be an acceptance that there was a period in Northern Kyushu during the Jomon-Yayoi transition, when rice agriculture had been adopted, but when no metallurgy was being practiced, which might represent an Incipient Yayoi period. If this is the case, then we might have a brief period in Japanese prehistory which can be recognized as truly Neolithic in the European and Chinese sense, *i.e.* the presence of agriculture prior to metallurgy. Only further investigation and clarification of the chronological detail and the nature of the occupation of Western Japan at this critical stage will elucidate this transition further. What is clear, however, is that the Western Japanese Jomon should no longer necessarily be regarded as the 'poor relation' of the culture of the complex fisher-gatherer-

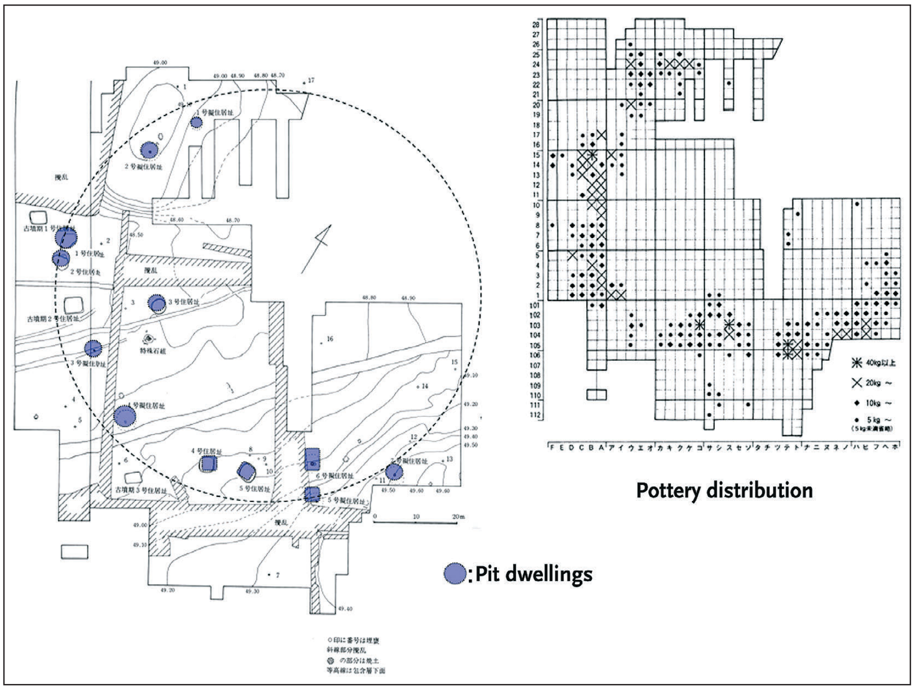

Fig. 4. Site plan of Kaminabe Site (Kumamoto City Board of Education 1981, with modifications). Source of figure: KUMAMOTO CITY BOARD OF EDUCATION. 1981. Kaminabe iseki hakkutsu chosa hokokusyo (A report on excavations at Kaminabe Site) (in Japanese). Kumamoto-shi Kyoiku Iinkai. Kumamoto.

hunters who are known from further east in the archipelago. This means that we need to rethink the role the Western Jomon in this crucial phase of the prehistory of the Japanese archipelago. Until now, models for this transition from the Jomon to Yayoi have emphasized either the adoption of agriculture by indigenous foragers, all heavily influenced by Eastern Japan, or the arrival of a Yayoi economic and cultural 'package' brought to the archipelago by immigrants from the continent (*cf. Hudson 1999; Mizoguchi 2003*). If the 'Neolithic' does exist in Western Japan, then it was a centre of creativity and innovation, drawing together new adoptions from the continent and a rich indigenous tradition.

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The earliest Neolithic complex in Siberia: the Ust-Karenga 12 site and its significance for the Neolithisation process in Eurasia

Yaroslav V. Kuzmin[1] and Viktor M. Vetrov[2]
1 *Pacific Institute of Geography, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok, Russia*
ykuzmin@tig.dvo.ru
2 *Irkutsk State Pedagogical University, Irkutsk, Russia*, a116@pochta.ru

ABSTRACT – *The discovery of Neolithic (*i.e. *pottery-containing) components at the Ust-Karenga 12 site in northern Transbaikal brought to light new data on the appearance of pottery in Siberia. Excavations and geoarchaeological studies identified the pottery complex in layer 7, ^{14}C-dated to* c. *12 180–10 750 BP (charcoal dates) and* c. *11 070–10 600 BP (pottery organics dates). The pottery is thin and plant fibre-tempered; vessels are round-bottomed and with a comb-pattern design. Ust-Karenga 12 thus preserves by far the earliest Neolithic assemblage in Siberia, and is only slightly younger than the Initial Neolithic complexes of the Amur River basin, Russian Far East (*c. *13 300–12 400 BP).*

IZVLEČEK – *Odkritje neolitskih komponent na severno transbajkalskem najdišču Ust-Karenga 12 prinaša nove podatke o pojavu keramike v Sibiriji. Z izkopavanji in geoarheološkimi študijami so določili keramični kompleks v plasti 7, ki je ^{14}C datirana na ca. 12 180–10 750 BP (datirani vzorci oglja) in na ca. 11 070–10 600 BP (datirani so organski ostanki v/na keramiki). Keramika je tanka in vsebuje vlakna rastlin, posode imajo kroglasto dno in glavnikast okras. V najdišču Ust-Karenga 12 je ohranjen najzgodnejši neolitski zbir v Sibiriji in je le neznatno mlajši od najstarejšega neolitskega kompleksa v kotlini reke Amur na ruskem daljnem vzhodu (okoli 13 300–12 400 BP).*

KEY WORDS – *Neolithic; Siberia; earliest pottery; radiocarbon dating*

Introduction

The definition of the term 'Neolithic' in Siberia and the northern and eastern parts of Asia implies first of all the presence of pottery (*e.g. Oshibkina 1996a; Barnes 1999; Kuzmin 2003, 2006; Kuzmin and Orlova 2000*). In this case, pottery is determined as containers made of fired clay (*e.g. Darvill 2002. 337–338)*. Therefore, the concept of Neolithisation for Siberia as well as East Asia means the emergence of pottery-making. In this paper, we present a systematic description of the earliest pottery assemblage from Siberia known so far, Ust-Karenga. Previously, it was published only in brief (*e.g. Vetrov 1985; Kuzmin 2002; Kuzmin and Orlova 2000.361*).

The cluster of 16 prehistoric sites in the Karenga River mouth, located on the boundary between the upper and middle courses of the Vitim River in northern Transbaikal, Siberia (Figs. 1–2), was discovered in the second half of the 1970s when a systematic survey was conducted in the Vitim River basin by researchers from Irkutsk State University (*Aksenov and Vetrov 1977; Vetrov et al. 1978*). The geographical coordinates of the Ust-Karenga cluster are: 54° 28' northern latitude and 116° 31' eastern longitude, as determined with the aid of a U.S. Operational Navigation Chart, scale 1:1 000 000 (sheet ONC E–8). The Ust-Karenga sites lie in the Vitim River valley; the water level elevation at the confluence of the Vitim and Karenga rivers is about 600 metres above sea level (asl). The Vitim River cuts through the low mountain system of the Vitim Tableland with heights of about 800–1200 m asl (*End-*

rikhinsky 1974), and the highest points in the vicinity of Ust-Karenga are about 1200–1700 m asl. The climate of the Vitim Tableland is of ultra-continental type, with hot summers and cold winters (*e.g. Suslov 1961*). The mean January temperature is -30° to -33 °C; and average July temperature is up to +20 °C. The annual amount of precipitation is about 350–400 mm (*Gvozdetsky and Mikhailov 1978.350*). The area is covered with dense conifer forests (taiga), consisting mainly of Dahurian larch [*Larix dahurica*, in some sources *Larix gmelinii* (*e.g. Shahgedanova et al. 2002*)].

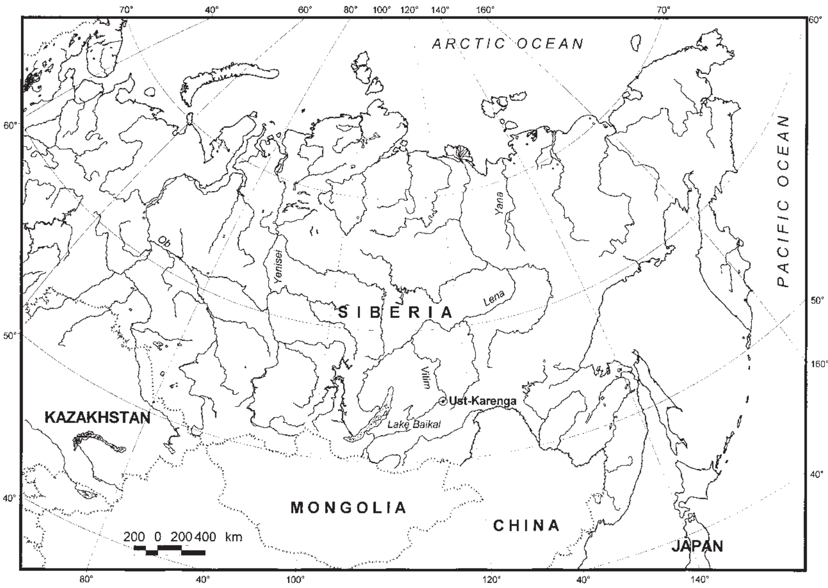

Fig. 1. General position of the Ust-Karenga cluster of prehistoric sites in Northern Asia.

Materials and Methods

The Ust-Karenga 12 site, which is the most representative for our study, was discovered in 1976. The finds in cultural layer 7 included pottery fragments, along with stone artefacts of typical final Upper Palaeolithic appearance (wedge-shaped cores, Araya type transversal burins, bifaces, and scrapers). It was separated from the underlying and overlying cultural layers by about 1 metre of sterile sediments both above and below (Figs. 3–4). Excavations of Ust-Karenga 12 were conducted in a series of periodical campaigns, from 1976 until recently. The total excavated square at Ust-Karenga 12 for layer 7 is 214 m^2. As for geoarchaeological studies, palynological data were obtained for layer 7 (*Vetrov and Kuzmin 2005*), and a series of radiocarbon (hereafter – ^{14}C) dates was generated. The first ^{14}C dates were released in the mid-1990s (*Vetrov 1995a*), and new results were produced and published in the late 1990s and the 2000s (*e.g. Vetrov and Kuzmin 2005; Vetrov et al. 2006*).

Results

The cluster of archaeological sites at the confluence of the Vitim and Karenga rivers is located on the alluvial terrace of the Karenga River, at a height of 20–25 m above the water level (Fig. 2). The general stratigraphy of the Ust-Karenga cluster, mainly derived from the Ust-Karenga 12, 14, and 16 sites, is as follows (Fig. 3):

Lithological layer	*Depth from surface, m*
1. Taiga soil	0.0 – 0.10
2. Brown sandy loam, humified	0.10 – 0.22
3. Pale-yellow fine sand	0.22 – 0.28
4. Brown fine sand (palaeosol)	0.28 – 0.38
5. Pale-yellow fine sand	0.38 – 0.44
6. Pale-yellow fine sand with greenish tint, with ice-wedge structures	0.44 – 0.52
7. Gray laminated sands (thickness is approximate)	0.52 – 3.50
8. Pebbles and rock pieces (bedrock)	3.50 – 3.70

The cultural layer 1 is situated in lithological layer 1; cultural component 2 – in layer 2; cultural layer 3 – in layer 3; and component 4 – in layer 4. Cultural layers 5 and 6 are located in lithological layer 6. The cultural components 7, 7a, 8, and 8a are incorporated into the matrix of lithological layer 7 (*Vetrov 2006*) (Fig. 3). As for the determination of cultural complexes, layer 1 dates to the time of the Iron Age (or Palaeometal) to the ethnographic period. The ^{14}C dates for this component at different locales of the Ust-Karenga cluster are from 1890 ± 40 BP (LE–2653) to 3670 ± 40 BP (LE–2650) (*Vetrov 1986*) (Fig. 3). Cultural component 2 is associated with the Late Neolithic, the so-called 'Ust-Yumurchen archaeological culture', and still has no ^{14}C dates. Components 3–7 are combined into the single 'Ust-Karenga archaeological culture' of the Early and Middle Neolithic (*Vetrov 1982; 1997; 2000*). It should be noted

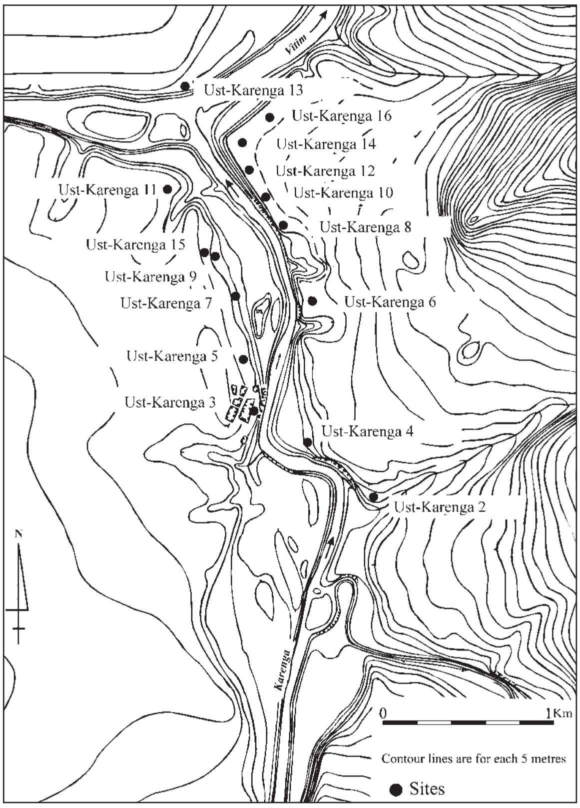

Fig. 2. Position of individual sites in the Ust-Karenga cluster.

that in Russian archaeology the term 'culture' is very similar to 'cultural complex' in Western anthropology and archaeology. The ^{14}C dates from cultural component 4 at the Ust-Karenga 3 site are 6100 ± 400 BP (IM-922) and 6890 ± 80 BP (LE-1961) (*Aksenov et al. 2000*) (Fig. 3). The ^{14}C dates for cultural component 7 are considered separately (see below). Components 8 and 8a are of final Upper Palaeolithic type (*e.g. Vetrov and Kuzmin 2005; Vetrov 2006; Aksenov et al. 2000*), and without any pottery. The charcoal ^{14}C dates from component 8 at the Ust-Karenga 12 site are 12 710 ± 380 BP (GIN-8065), 12 880 ± 130 BP (GIN-6469a), 13 560 ± 195 BP (GIN-8070), and 16 430 ± 240 BP (GIN-8668) (*e.g. Vetrov and Kuzmin 2005; Vetrov et al. 2006*) (Fig. 3). The oldest value of *c.* 16 430 BP was considered to be an outlier and rejected (*e.g. Vetrov and Kuzmin 2005.60–61*), establishing the ^{14}C age of the pre-pottery component as *c.* 12 700–13 600 BP.

Cultural layer 7 as the earliest component of the Ust-Karenga Neolithic culture is the main focus in this report. It was excavated at several sites; the most representative locale is Ust-Karenga 12 (Fig. 2), for which a major part of archaeological and palaeo-environmental information was obtained. The thickness of layer 7 is from 2 to 10 cm (Figs. 3–5). It contains several well-preserved hearths and artefact concentrations around them; these spots are up to 6 m in diameter.

The total number of stone artefacts recovered from cultural layer 7 is several thousands; the exact number remains to be determined. Cores are represented by wedge-shaped, prismatic, and subprismatic types (Fig. 6) (*Vetrov 1995b*). Major tool types include transversal (Araya) burins, scrapers, knives on blades, chisels, microblade tools, points, and bifaces (Fig. 7). Five kinds of burin were classified:

❶ burins made on blade spalls as preforms;
❷ core-like burins;
❸ burins made on wide prismatic blades;
❹ burins made on prismatic segmented microblades; and
❺ burins made on segmented blade spalls (*Vetrov 1995b*).

The predominant raw material is flint obtained from pebbles collected in the channels of the Vitim and Karenga rivers.

In terms of raw materials used for the manufacture of the stone tools, it is important to note the pre-

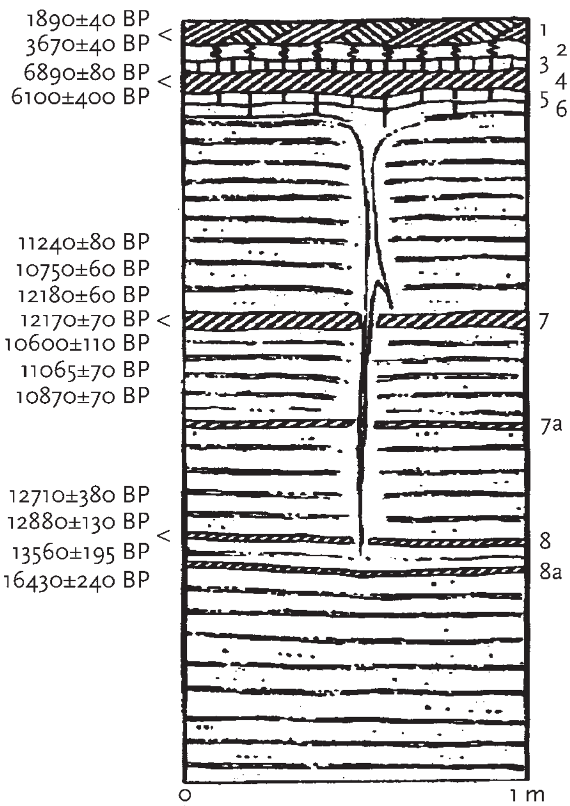

Fig. 3. General stratigraphy and ^{14}C dates at the Ust-Karenga cluster.

sence in cultural layer 4 of the Ust-Karenga 16 site of some artefacts made on rocks 'exotic' for the middle stream of the Vitim River, hyalodacite and graphitite (*Vetrov et al. 2000*). The sources of these raw materials are located downstream from the Ust-Karenga cluster, at a distance of up to 400 km. This fact demonstrates that the inhabitants of the middle course of the Vitim River had active contacts with the neighbouring territories of Eastern Siberia, with distances of 400 km and possibly up to 600 km (*Vetrov et al. 2000*).

The pottery from cultural layer 7 is unique in all Siberia. Numerous potsherds were excavated, including large fragments, and this allows the reconstruction of the size and shape of vessels. The vessels are of parabolic type, from 17–20 to 35 cm high, and from 12 to 20 cm in diameter. The sharp-based bottom looks mammiformed. The design is mainly comb-pattern (Fig. 8), and also zigzag, herringbone, and cogged stamped (Figs. 9–10) (*Vetrov 1985; Kuzmin and Orlova 2000.361*). Both external and internal sides have traces of grooves made with grass fibre or comb trail to smooth the surface of the clay during the pottery-making process (Figs. 11–12). Ornamentation was made mainly by cog-wheel (*Vetrov 2006*). The distinctive feature of the Ust-Karenga pottery is that it is plant fibre-tempered. The number of vessels used at the Ust-Karenga 12 site may be estimated as about ten. For the whole Ust-Karenga cluster, about 16–18 vessels can be reconstructed.

^{14}C dating of cultural layer 7 was conducted using two kinds of datable material – charcoal from hearths and the cultural layer in general, and pottery temper (Tab. 1). The extraction of carbon from organic-tempered pottery was performed by low temperature combustion with oxygen (*O'Malley et al. 1999; Derevianko et al. 2004; Vetrov et al. 2006*). The carbon yield of three pottery samples was about 0.8–1.0 %, which makes the ^{14}C dates on pottery temper quite reliable in terms of the origin of carbon. We assume that the ^{14}C-dated carbon comes predominantly from short-lived plant fibre temper, and not from clay carbon itself, which may be much older than the time of vessel manufacture. Calibration was done with the aid of Calib Rev. 5.0.1 software (available online: www.radiocarbon.org).

Fig. 4. Stratigraphic profile of Ust-Karenga 12 site with position of cultural layer 7 (indicated by dash line).

Fig. 5. Stratigraphic profile of Ust-Karenga 12 site.

The results of ^{14}C dating are presented in Table 1. Charcoal from cultural layer 7 at a depth of 1.00 m below the surface, found in small depressions in direct association with pottery, was dated to *c.* 12 180–12 170 BP (or *c.* 12 200–11 900 calBC). The hearth charcoal gave slightly younger ages, *c.* 11 240–10 750 BP (or *c.* 11 300–10 700 calBC). Three pottery temper ^{14}C dates, *c.* 11 070–10 600 BP (or *c.* 11 200–10 200 calBC), are similar to those on charcoal. Therefore, it is safe to say that the age of cultural layer 7 at the Ust-Karenga 12 site is about 12 200–10 600 BP (or *c.* 12 200–10 200 calBC; 14 150–12 150 calBP), and this makes the pottery from cultural component 7 the oldest in Siberia. The quite 'advanced' appearance of the Ust-Karenga pottery may mean that it originated even earlier, if we take into account that an area of only 25 m^2 of cultural layer 8 has been excavated so far. Thus, we should not exclude the possibility that pottery at the Ust-Karenga 12 site may be found in the earlier component 8, dated to *c.* 12 700–13 600 BP.

The palaeo-environmental reconstruction of cultural later 7 is based on the results of palynological analysis. An environment of cold grass steppe and open pine-larch forest, with dwarf birch, alder, and cold-adapted lycopodium moss (*Selaginella sibirica*) existed at the time of site activity at *c.* 12 200–10 600 BP. This kind of vegetation is typical of the Pleistocene-

Holocene transition in Eastern Siberia (*e.g. Krivonogov et al. 2004*).

Discussion

In the light of Late Glacial pottery in Transbaikal, we should examine the adjacent regions of Siberia to see if there are any other Neolithic complexes known with ages similar to the Ust-Karenga culture. In Transbaikal, two other sites may contain pottery of the final Pleistocene age. At the Ust-Kyakhta site, in the southernmost part of the region near the border with Mongolia, the 1978 excavation campaign of the first cultural layer revealed stone artefacts, wedge-shaped cores and scrapers, ostrich eggshell beads, and about 10 small pieces of pottery, including two rim fragments about 2 cm long (*Aseev 2003.35–37; Medvedev 1995*). The pottery is tempered with mineral particles and crushed ostrich eggshells. The diameter of the vessel was up to 10 cm. A ^{14}C date on animal bone from cultural layer 1 is 11 505 ± 100 BP (SOAN-1552). At the Studenoe 1 site in the Chikoi River basin, southern Transbaikal, the earliest pottery was found in cultural layers 9 and 8 (*Khlobystin and Konstantinov 1996.306*). It is represented by fragments of a sharp-based vessel with thin walls and string impressions. This thin-walled (0.2–0.3 cm) pottery was made using the paddle and anvil technique (*Tseitlin and Aseev 1982.110*). The overlying cultural layers 7 and 6 have similar pottery. The ^{14}C dates associated with this pottery are: 10 450 ± 300 BP (GIN-5493) for cultural layer 7b; 9620 ± 250 BP (GIN-5492) for layer 7; and 10 780 ± 150 BP (GIN-4577) for layer 6 (*e.g. Konstantinov 1994.85; Kuzmin and Orlova 2000.359*). However, Konstantinov (*1994.85*) rejected these ^{14}C values; he also stated that the reason for such an old age of the Transbaikal Neolithic remains unclear, and determined the age of the Early Neolithic in Transbaikal as *c.* 6500–5500 BP (*Konstantinov 1994.153–155*). Therefore, the situation with final Pleistocene ^{14}C dates in possible association with pottery at the Studenoe 1 is still obscure.

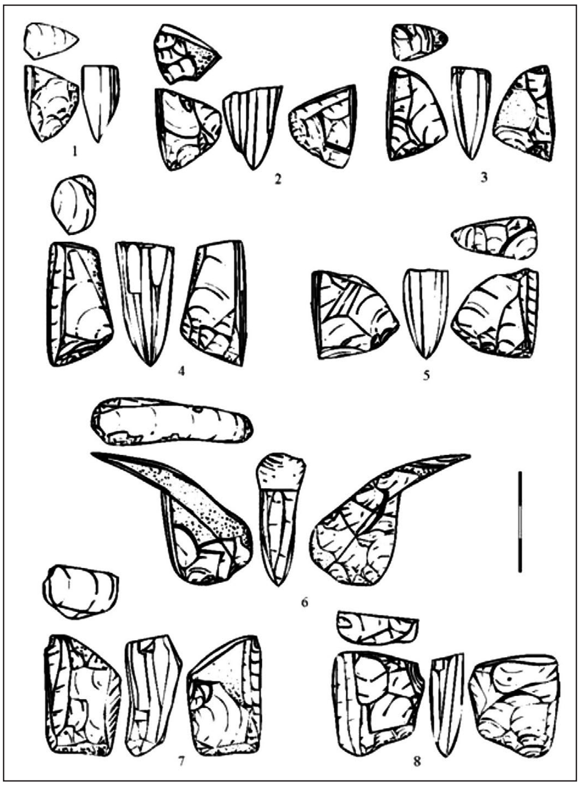

Fig. 6. Cores from the cultural layer 7 of Ust-Karenga 12 site (on Figures 6–11, each bar unit is 1 cm long).

String and cord impressed pottery became common in Siberia after *c.* 7000–6000 BP (*e.g. Kuzmin and Orlova 2000*). Nowadays, in the light of the very early ^{14}C age of the Ust-Karenga complex pottery, the question 'How old is comb-patterned pottery in Siberia?' becomes an important issue related to the Neolithisation of the region. The earliest sites with pottery decorated with a comb-pattern and incised ornamentation, besides the Ust-Karenga complex,

Material dated	^{14}C age, BP	Lab Code and No.	Calibrated age, calBC (with ± 2 sigmas)*	Reference
Charcoal from cultural layer	12 180 ± 60	AA–60210	12 140–11 920	*Vetrov and Kuzmin 2005*
Charcoal from cultural layer	12 170 ± 70	AA–60202	12 240–11 990	*Vetrov and Kuzmin 2005*
Charcoal from hearth	11 240 ± 80	GIN–8066	11 320–11 010	*Vetrov 1995a*
Charcoal from hearth	10 750 ± 60	GIN–8067	10 920–10 740	*Vetrov 1995a*
Organic temper in pottery	11 065 ± 70	AA–38101	11 160–10 930	*Kuzmin and Keally 2001*
Organic temper in pottery	10 870 ± 70	AA–60667	10 990–10 840	*Vetrov and Kuzmin 2005*
Organic temper in pottery	10 600 ± 110	AA–21378	10 890–10 220	*O'Malley et al. 1999*

* Calib Rev. 5.1.0 software was used for calibration.

Tab. 1. Radiocarbon dates for the cultural layer 7, Ust-Karenga 12 site.

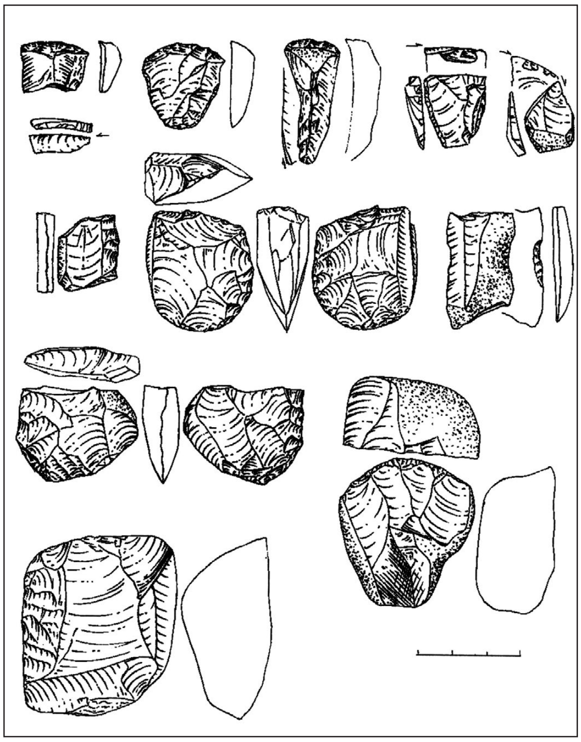

Fig. 7. Stone tools from the cultural layer 7 of Ust-Karenga 12 site.

are known now in the central West Siberian Plain. They are located in the upper reaches of the Konda River, within the larger Ob River basin, about 3000 km west of the Ust-Karenga sites (Fig. 1). A cluster of Neolithic sites was found in the 1960s on the shore of the Satyiginsky Tuman Lake, in the Sumpanya River mouth area (geographical coordinates: 59° 48' N, 64° 49' E). Pottery with both incised and comb ornamentation on the surface of sharp-bottomed vessels was determined as the 'Sumpanya' type (*Kovaleva et al. 1984; Krizhevskaya and Gadzhieva 1991*). At the Sumpanya IV site, a series of charcoal ^{14}C dates were obtained: 6850 ± 60 BP (LE–1440) from a hearth; 6520 ± 70 BP (LE–1813) from a burnt tree log; and 6590 ± 70 BP (LE–1814) from the dwelling floor. At the Sumpanya II site, charcoal collected in association with Sumpanya-type pottery was dated to 6530 ± 70 BP (LE–1818) (*Kovaleva et al. 1984.38*). At the Sumpanya VI site, three ^{14}C dates on charcoal from the cultural layer with Sumpanya pottery were generated: 6100 ± 70 BP (LE–2540); 9130 ± 80 BP (LE–2554); and 9920 ± 80 BP (LE–2772) (*Krizhevskaya and Gadzhieva 1991.85*).

Kosarev (*1996.262*) and Timofeev and Zaitseva (*1996.344*) accepted the ^{14}C dates from these sites in the range of *c.* 6850–6100 BP. However, they did not include the ^{14}C values of *c.* 9130–9920 BP from the Sumpanya VI site in their databases (*Timofeev and Zaitseva 1996; Timofeev et al. 2004*). Furthermore, ^{14}C dates for Sumpanya IV sites in excess of *c.* 10 000 BP, released after the original publication of the site's materials, *i.e.*, 10 100 ± 100 BP (LE; No. is not given); 10 910 ± 100 BP (LE–1817); and 11 970 ± 120 BP (LE–1812) (*Krizhevskaya and Gadzhieva 1991.85*), were not taken into account. Indeed, it is hard to explain such a large variation in a date series from the same site, especially in the case of Sumpanya IV. This was noted by Krizhevskaya and Gadzhieva (*1991*) due to the absence of earlier cultural complexes at the Sumpanya IV site.

New archaeological and chronological data were recently gained from other sites in central Western Siberia with the Sumpanya type of pottery. At a cluster of sites on the shore of Lake Andreevskoe near the city of Tumen (geographical coordinates: 57° 01' N, 65° 51' E), four pottery types were determined at locality VIII (*Usacheva 2001*). The earliest pottery of Sumpanya appearance with incised and comb ornamentation from dwelling 7 is associated with a ^{14}C date of 9140 ± 60 BP (LE–2296).

Therefore, it is possible to correlate tentatively the Sumpanya pottery type from Western Siberia with ^{14}C dates of *c.* 9900-6100 BP; more research is needed to explain the older values of *c.* 10 100–12 000 BP. Currently, it is safer to accept the 'conservative' opinion on the Holocene age of the Sumpanya pottery (*e.g. Kosarev 1996; Usacheva 2001*).

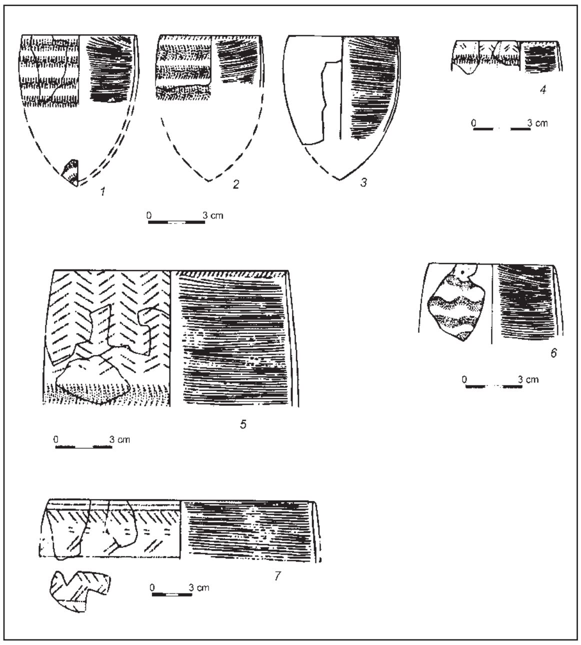

Fig. 8. Reconstruction of pottery vessels from the cultural layer 7 of Ust-Karenga 12 site (after* Vetrov 1985*).

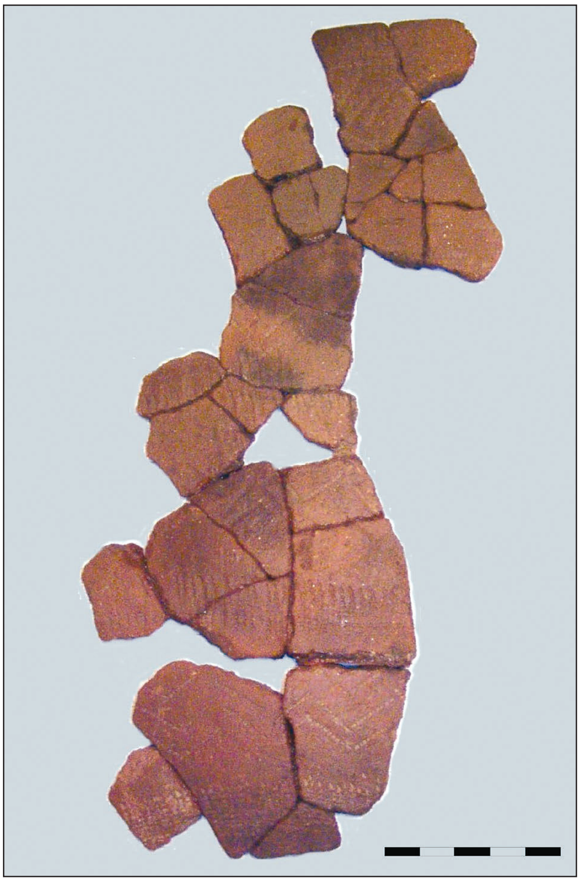

Fig. 9. Pottery from the cultural layer 7 of Ust-Karenga 12 site.

As was recently highlighted, the discrepancy between the ^{14}C and archeological ages in West Siberian prehistoric complexes is most commonly connected with uncertain taphonomic situations, when carbon material which could not be related to human occupation was ^{14}C-dated (*Kosintsev et al. 2004.21*).

Another important issue is the search for the 'roots' of the Ust-Karenga culture. Based on the most recent results, final Pleistocene pottery is known from East Asia, including the southern part of China, the Japanese Archipelago, and the Russian Far East (Amur River basin) (*e.g. Derevianko and Medvedev 1995; Barnes 1999; Lapshina 1999; Keally et al. 2004; Kuzmin 2006; Nesterov et al. 2006*). Pottery seems to appear almost simultaneously in these three different regions of East Asia, at *c.* 13 700–13 300 BP, and in each case pottery-making technology was most probably invented independently (*e.g. Kuzmin 2006.368–369*). There are some similarities and differences between the pottery from the Ust-Karenga complex, the Incipient Jomon of Japan, and the Initial Neolithic of the Amur River basin. For example, plant fibre tempering is common in the Initial Neolithic complexes of Osipovka and Gromatukha in the Amur River basin (*e.g. Kuzmin 2006; Derevianko and Medvedev 2006.130*), although some plant-tempered pottery is known in the Incipient Jomon (*e.g. Jomon Jidai Sosoki 1996.46, 63; Keally et al. 2003.5*). On the other hand, pottery from the Amur River basin is flat-based, while most of the Incipient Jomon vessels are sharp-based. Therefore, the possible source of pottery origins for the Ust-Karenga complex may be provisionally suggested in the Amur River basin. This does not exclude the possibility of the independent invention of pottery-making in northern Transbaikal at the end of the Pleistocene, *c.* 12 200–10 700 BP. At the modern stage of research, the final answer to the question 'What is the origin of the Ust-Karenga pottery?' remains open to discussion.

As for the implications of the Ust-Karenga pottery to the broader Eurasian aspect of the emergence of the Neolithic (*sensu Chard 1974; Barnes 1999; Kuzmin 2006.362*), it is important to keep in mind the very early emergence of pottery-making in remote northern Transbaikal, far from traditional 'centres' of the origin and spread of prehistoric technological innovations such as East Asia and the Near East (*e.g. Sherratt 1980*). Based on the results of archaeological studies in East Asia, Siberia, and Europe in the last few decades, it becomes clear that the process of Neolithisation was very 'unlinear' (*e.g. Budja 2005; 2006*), and there is no direct correlation between environmental conditions and the appearance of pot-

Fig. 10. Pottery from the cultural layer 7 of Ust-Karenga 12 site (closer view).

Fig. 11. Internal side of potsherd from the cultural layer 7 of Ust-Karenga 12 site (with grooves).

tery. The general vector of Neolithisation from the eastern part of Asia to the west – proposed about ten years ago (*van Berg 1997; van Berg and Cauwe 1998*) – remains valid today. However, no clear trend has been observed in terms of the time-progressive emergence of pottery from East Asia toward Europe. The possible movement of populations with a pottery-making tradition in Eurasia from the east to the west can not be proved, because of the absence of any scientific evidence of contacts and migrations, such as the exchange of raw materials between East Asia and Siberia. It is quite possible that in several places in Siberia the tradition of pottery-making appeared independently.

On the other hand, some authors (*Dolukhanov 2004. 231–235; Dolukhanov et al. 2005.1456–1457*) have accepted early ^{14}C dates from the pottery sites in East Asia and Siberia, and suggested the spread of pottery-making from the east to the west, reaching the southeastern periphery of Eastern Europe at *c.* 7000 calBC, which roughly corresponds to *c.* 8000 BP (*Reimer et al. 2004.1054*). This conclusion remains quite debatable, and more research is needed in order to understand the spatial-temporal patterns of the Neolithisation of Eurasia.

Fig. 12. Internal side of potsherd from the cultural layer 7 of Ust-Karenga 12 site (with grooves).

It is feasible to see two main trajectories of the Neolithisation process in Eurasia: the 'agricultural' route from the Levant towards Europe (*e.g. Mellaart 1994*), and the 'hunter-gatherer' route from East Asia towards Siberia and Europe (*e.g. van Berg 1997*). They represent two fundamentally different processes: the emergence of food production and the appearance of food containers, and should be treated separately in terms of the meaning of the term 'Neolithisation'. In this case, extreme caution should be taken when one is trying to model the spread of the Neolithic in Eurasia. A recent attempt by Davison et al. (*2006*) (see also *Timofeev et al. 2004.36, 63, 70–72*) seems to mix 'apples and oranges', by determining the Neolithic as an agricultural phenomenon which emerged in the Near East. However, their model (*Davison et al. 2006.648*) shows the spread of the 'Neolithic' from the Levant, where it is dated to *c.* 10 300 BP at Jericho (*e.g. Kuijt and Bar-Yosef 1994*), to the southern and central parts of Eastern Europe about 3000 years after its emergence, *i.e.*, at

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c. 7000 BP, while agriculture was unknown in these regions until at least the beginning of the Bronze Age, *c.* 4500–4000 BP (*e.g. Merpert 1994; Oshibkina 1996b*). This is due to combining two different phenomena, the Levantine-derived 'agricultural' Neolithic and the pottery complexes of 'hunter-gatherer' type originating somewhere in East Asia.

Conclusion

The discovery and excavations of the Ust-Karenga cluster in northern Transbaikal brought to light new data on the emergence of the Neolithic in Siberia. It is evident that cultural layer 7 at the Ust-Karenga 12 site contains the oldest pottery west of the Amur River basin, and it is also one of the earliest ceramic complexes in northern Eurasia, dated to *c.* 12 200–10 700 BP (*c.* 12 200–10 200 calBC). The modelling of the Neolithisation process in Eurasia should be conducted with a more complete understanding of the nature of this phenomenon. In East Asia and Siberia, the origin of the Neolithic is related to the appearance of pottery vessels for storing and processing food in hunter-gatherer communities long before the invention or adoption of agriculture and/or animal husbandry.

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Jomon pottery: cord-imitating decoration

Irina Zhushchikhovskaya
Institute of History, Archaeology and Ethnology of Peoples of the Far East, Russian Academy of Sciences, Vladivostok, RU
irinazh@mail.primorye.ru

ABSTRACT – *The paper discusses the decoration of pottery of the Neolithic Jomon culture (Japanese Archipelago, 13 600–900 BC). The comb-impressed pattern produced by various kinds of cord or rope stamps is considered as the 'calling card' of Jomon pottery from the earliest cultural periods to the latest. Another kind of decoration recognized recently uses the cord not as a patterning tool, but as an essential motif of decorative composition. High relief elements imitate cordage forms and structures – knots, loops, hanging cord, net, etc. This kind of decoration corresponds to the pottery of Middle Jomon period (3500–2500 BC) sites located in northern and north-eastern Honshu and southern Hokkaido. It is supposed that the introduction of images of real material object into the field of decorative art was reasoned by the meaning of cord and cordage as cultural signs during the Middle Jomon period. Interesting parallels to some cordage structures reconstructed on Middle Jomon pottery decoration are well known in traditional Japanese culture of VI–XX cc. Analytical interpretation of this resemblance may became the subject of special research.*

IZVLEČEK – *V članku se ukvarjamo z okraševanjem keramike v neolitski kulturi Jomon (japonsko otočje, 13 600–900 BC). Glavnikasto vtisnjen vzorec, narejen z različnimi vrstami vtisov vrvi, velja za 'vizitko' jomonske keramike od najzgodnejših do najkasnejših kulturnih obdobij. Pred kratkim prepoznana vrsta okraševanja kaže, da se vrv ne uporablja le kot orodje za izdelavo vzorcev, temveč kot bistven motiv v kompoziciji okrasa. Elementi visokega reliefa posnemajo obliko in strukturo vrvi – vozle, zanke, visečo nit, mrežo, itd. Ta okras je pogost na keramiki v najdiščih iz obdobja srednje Jomon (3500–2500 BC), ki se nahajajo na severnem in severovzhodnem Honšuju in južnem Hokkaidu. Domnevamo, da je bilo uvajanje podob iz resničnega materialnega sveta na področje dekorativne umetnost, povezano s pomenom vrvi in vrvja kot kulturnih simbolov v času srednjega obdobja Jomon. Zanimive vzporednice nekaterim vrvnim strukturam, rekonstruiranim na okrasju keramike iz srednje Jomon, so dobro poznane v tradicionalni japonski kulturi iz VI.–XX. stoletja. Analitična interpretacija te podobnosti mora postati predmet posebne raziskave.*

KEY WORDS – *Japanese Archipelago; Jomon culture; Middle Jomon period; pottery; relief cord-imitating decoration*

Introduction

An outstanding phenomenon of the East Asian Neolithic is Jomon culture, which existed in the isolation in the Japanese Archipelago for more than ten thousands years and produced many thousands of archaeological sites from Hokkaido in the north to Kyushu in the south. At present, some researchers suppose on the basis of carbon dating that Jomon culture began as long ago as 13 600 BC (*Kobayashi 2004.5*)[1]. Pottery is most abundant and a significant category of the artifacts together with stone assemblages on each site beginning from the Initial Jomon period, about 9200–5300 BC. A distinctive feature, or 'calling card', of Jomon pottery is cord-impressed decoration. It passed through time from the earliest

1 Here and below the chronology of Jomon culture is referenced after *T. Kobayashi 2004*.

cultural stages to latest. The name 'Jomon' (a term coined by Edward S. Morse who discovered cord ware at the Omori site in 1867) means 'cord mark' in Japanese (*Harris 1997*). Cord-impressed design in its technological and stylistic variety has been a special and very carefully investigated subject in Japanese archaeology since the 1930's. It is argued that the diversity of cord twisting methods and the manner of cord stamping on clay surface caused all the visual variations in impressed design (*Hurley 1979; Kobayashi 2004.23–25; Sugiyama 1942; Yamanouchi 1964*). So the cord, or rope, may be called a basic tool of Jomon pottery decoration. At the same time, within the rich and long-lived Jomon pottery tradition, cases when the cord (rope) appears not as a tool, but as a substantial motif of decoration may be distinguished. They seem to be most significant in the relief design of Middle Jomon pottery assemblages.

Fig. 1. Map of research area. Tohoku and southern Hokkaido region are marked with circle.

The Middle Jomon period (3500–2500 BC) is considered a time of cultural flourishing in various aspects – the economy, social relationships, religion, artistic life (*Aikens, Higuchi 1982; Kobayashi 2004; Pearson 1992; Takahashi et al. 1997*). In particularly, the stylistic variety of pottery appearing mainly in vessel decoration increased greatly in comparison with the preceding Early Jomon stage. According to T. Kobayashi, more than 20 local pottery styles existed during the Middle Jomon, correlating with different areas of Japanese archipelago. For some areas the co-existence of two or three different styles is supposed (*Kobayashi 2004.30–31*). A common trait of most Middle Jomon pottery styles was the significant role of relief decorative elements and motifs. In many cases, relief pattern appearing like a central part of the design composition was combined with a cord-impressed pattern serving as unobtrusive 'phonewire' covering the vessel's walls. Sometimes the relief decoration was used without cord-impressed accompaniment. The most refined, sophisticated and diverse variants of relief decoration are characteristic of the Katsusaka, Atamadai, Flame (Kaen), and Karakusamon pottery styles found in Chubu and Kanto regions, *i.e.* in central and eastern Honshu. Intricate high-relief and deep-relief compositions formed mainly of curve-lined elements are the subjects of especially steadfast attention in Japanese archaeology. S-shaped, wave-shaped, spiral motifs, zoomorphic and anthropomorphic figures are interpreted as symbolic pictures in the context of Middle Jomon spiritual life (*Aikens 1995; Harris 1997; Kobayashi 2004.19–50*).

This paper is focused on the Middle Jomon pottery of Tohoku region and southern Hokkaido region (Fig. 1). Tohoku is the traditional name of northern and north-eastern parts of Honshu Island, including the prefectures of Aomori, Akita, and Yamagata. The coastal areas of Tohoku and southern Hokkaido regions are rich in Jomon sites presenting cultural remains from the Early to the Final stage (*Aikens and Higuchi 1982.95–186; Illustrated Catalogue 2001*). Pottery assemblages of the Middle Jomon stage are interesting because of the occurrence of relief decoration imitating the cord and/or rope.

Research data

The basic research source is the pottery collection from Ookubo site located in Aomori prefecture, at the coastal area of Mitsu-bay. The collection consists of ceramic vessels from Early, Middle, Late and Final Jomon horizons excavated in the 1920s and 30s and typologically arranged later. The pottery collection is stored in the National Museum of Japanese History[2]. The Middle Jomon pottery assemblage that is the subject of our investigation may be attributed to the Upper Ento and Middle Daigi pottery styles, based on Kobayashi's systematization of local stylistic variation (*Kobayashi 2004.30–31*).

Fig. 2. Ookubo site. The Middle Jomon horizon. The ceramic vessel with cord-impressed decoration.

The Middle Jomon pottery group from the Ookubo site, including 61 complete vessels, is characterized by technological uniformity. The vessels are made of clay with natural or in some cases artificial sand temper, and grog inclusions. The throwing method consisted of hand building clay rolls transformed into narrow bands. The outer and inner surfaces are slipped and smoothed, but not very carefully. The firing was executed in an oxidizing regime, at low temperatures, about 600–700°C. Ceramic vessels are of simple shape, with unrestricted or slightly restricted orifices, straight or concave smooth walls, and flat bottoms. The vessels' heights vary from 8 to 38 cm, usually 16–25 cm. In some cases the rims are designed with several – from 3 to 6 – wave-like, triangle-like or rectangular-like vertical protrusions typical of Jomon pottery of the late Early to Middle periods.

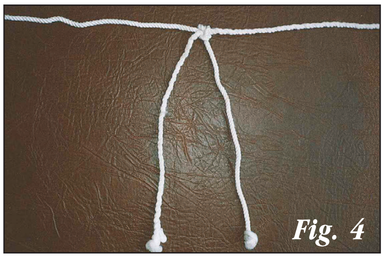
All vessels are decorated. It is possible to distinguish two main kinds of decoration: cord-impressed decoration, and monotonous rows of cord imprints or more complicated compositions including geometric motifs formed by cord impressions (Fig. 2) The second kind of decoration is most common and presents a combination of a 'phonewire' cord-impressed pattern occupying almost all the vessel's surface, and relief decoration on the upper part of the vessel. In the context of this paper, the second kind of decoration is especially worth considering.

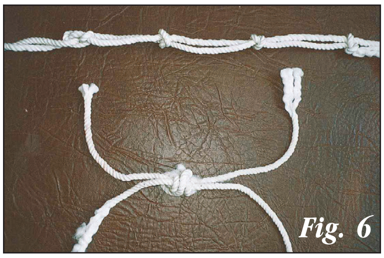
Deep relief and high relief decoration types may be identified. Only 3 vessels have deep relief decoration formed from grooves incised on the wall. The object of our attention is the high relief decoration on most of the vessels (38 samples). Decorative compositions are formed of fine narrow or coarse thick clay rolls, or bands applied on vessel's wall. In some cases it may be observed that clay rolls were applied over the cord impressions 'phonewire' decoration. The prevailing tendency was the covering of clay rolls by transverse cord impressions or incised stretches. The upper border of the high relief decoration area always is orifice line. The width of the decorated area varies from one quarter to one third or one half of the vessel's height. It is interesting to note that every vessel with high relief decoration bears an original composition which is not replicated on other pots. Nevertheless, this variety may be divided into some general compositional groups according to decorative elements or motifs.

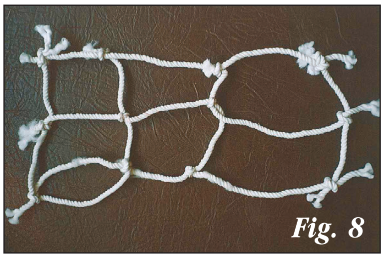
The first group includes 16 vessels. The high relief decoration is composed exclusively of straight linear

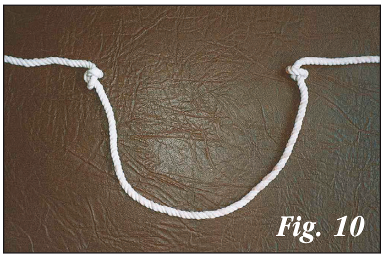
Fig. 3. Ookubo site. The Middle Jomon horizon. The ceramic vessels with relief decoration, imitating the hanging cord.

2 The author researched the pottery collection of Ookubo-site in National Museum of Japanese History in 2003.









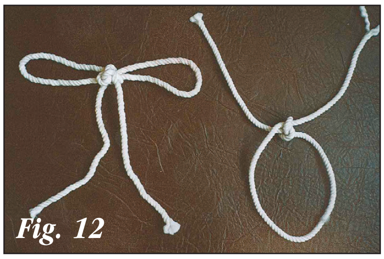


Fig. 4. The experimental model of hanging cord. Fig. 6. The experimental models if tied cord. Fig. 8. The experimental model of net-like (lacy) cordage. Fig. 10. The experimental model of suspended cord. Fig. 12. The experimental models of the bow-shaped knotted cord and the looped cord.

elements made of clay rolls. This composition group includes various combinations of horizontal, vertical, inclined lines, angular-shaped and zigzag-shaped figures. The second group, of 19 vessels, has decorative compositions formed from linear (horizontal, vertical, inclined) and curvilinear elements. The third group, comprising only 3 vessels, has decorative compositions formed mostly of curvilinear elements – the arc-shaped or wave-shaped figures.

Not considering in detail the nuances of decorative compositions it would be important to fix certain traits common to all three groups. Each group includes examples of decorative elements or motifs which may be interpreted as relief imitations of realistic plastic structures of the cord, or rope. Certain variants of cord-imitating images on Middle Jomon pottery from Ookubo are detailed below. Experimental models of cord structures are applied to illustrate the probable prototypes of decorative images.

Hanging cord (rope). This straight-line decorative element observed on vessels NN A-14-2-28, A-14-3-29, A-14-4-27[3] presents the idea of hanging cords or ropes (Fig. 3). This looks like two cords (ropes) tied and hanging loosely, or a single cord entwined so that its ropes (ends) are hanging down. It is an interesting detail that the lower ends of the clay 'hanging cords' are completed by relief thickening looking like a bunch at the end of real cord or rope (Fig. 4).

Tied cord (rope). The series of relief elements imitates various methods of joining, fastening or tying. These are on vessels NN A-14-1-57, A-14-1-61, A-14-3-36, A-14-1-93, A-14-1-97, A-14-3-45 (Fig. 5). It may be supposed that realistic prototypes of such decorative images were plastic structures formed of tied, fastened or knotted cords (Fig. 6).

Cordage net structure (lacy cordage). Some vessels (A-14-1-62, A-14-1-93, A-14-1-98) have decorative compositions looking similar to lacy or net-like structure formed by crossing, interlacing or tying cords. The elements comprising this design may be straight or curved lines. (Figs. 7 and 8).

Suspended cord (rope). This arc-lined element oriented with its concave side down appears in decorative compositions on vessels NN A-14-87, A-14-3-52, A-14-1-86 (Fig. 9). It looks like a horizontally suspended cord (Fig. 10).

Some vessels combine different elements imitating cord structures. Thus, vessel N A-14-1-93 has a combination of 'cordage net' and 'tied cord' (Fig. 7); vessel N A-14-1-87 is an example of the 'suspended cord' combining with the 'tied cord' (Fig. 9). It may be noted that in all cases the impression of the cord image is composed not only by the imitation of various plastic patterns in appliqué rolls, but in significant measure by the covering of these rolls by transverse stretches or imprints to replicate the texture of real cord.

Other cases of relief decoration imitating cordage structures are seen in the materials of archaeological publications. Middle Jomon pottery of the Tohoku and southern Hokkaido regions is presented in detail in photographic and graphic illustrations of the books 'The Comprehensive Book of Jomon Pottery' edited by T. Kobayashi (*1989*) and 'Jomon Pottery' edited by S. Yamanouchi (*1964*). Here we can observe the series of interesting decorative elements which may be interpreted as clay relief images of

3 Here and below, are noted the Museum's inventory numbers for vessels from the pottery collection of the Ookubo site.

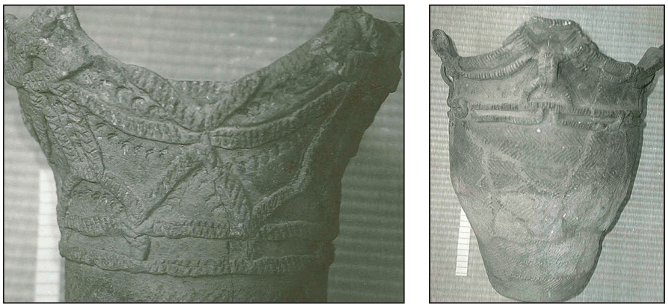


Fig. 5. Ookubo site. Middle Jomon horizon. Ceramic vessels with relief decoration, imitating tied cord.

cordage structures. Some of them are described below.

Bow-shaped cord (rope) knot. The most expressive case of this element is recognized in the decorative composition on a ceramic vessel from the Middle Jomon horizon of Tsokinoki 1 site in Aomori prefecture (*Kobayashi 1989.185, fig. 708*) (Fig. 11.1). A decorative figure replicates the configuration of a bow-shaped knot that is very popular among known kinds of knot structure (Fig. 12).

Cord (rope) loops. A decorative element imitating the loop made by a cord or rope is detected on vessels from the Middle Jomon horizons of sites at Hinohama and Hamanasuno in southern Hokkaido (*Kobayashi 1989.184, fig.705, 193, fig. 748*) (Figs. 11.2 and 12). In all cases this element is used with other decorative elements (figures) to form a general composition.

Hanging cord (rope). This element is similar to the images of hanging cord recognized in the Ookubo pottery finds. Relief imitations of cords or ropes hanging loosely and completed by bunches at the lower ends are fixed in decorative compositions on vessels from the Middle Jomon horizons of sites at Kayakarizawa in Akita prefecture, Sannai in Aomori prefecture, and Usujiri in southern Hokkaido prefecture (*Kobayashi 1989.192, fig. 742, 184, fig. 702, 190, fig. 735*) (Fig. 13.1).

Cordage net structure (Lacy cordage). Decorative compositions on vessels from some Middle Jomon sites in northern Honshu and southern Hokkaido look like the lacy cordage formed by crossing or interweaving cords (*Kobayashi 1989.190, figs. 733–735; 191, fig. 737, 738; Yamanouchi 1964.fig. 68–70, 76*). This is the same kind of relief imitation seen on pottery from the Ookubo site (Fig. 13.2).

Also, it is possible to recognize the decorative element of the 'suspended cord' (*Kobayashi 1989.191, fig. 740*), and imitations of different kinds of cord tying (*Kobayashi 1989. 190, fig. 735, 184, fig. 703; Yamanouchi 1964.fig. 71*). Some compositions may be explained as images of complicated cord structures, and various elements: 'cordage net', loops, cord tying, or binding, and others (*Kobayashi 1989. 192, fig. 738, 190, fig. 733, 734, 735; Yamanouchi 1964.fig. 68, 69*).

Discussion

Archaeological records reflect the important role and high development of basketry and cordage as crafts among the Jomon population from the earliest times. The remains of artifacts made of plant and fiber materials are direct evidence of this. Significant sources indicating advanced cordage technology are the multifarious cord impressions on the walls of Jomon vessels (*Kobayashi 2004.24–27; Sugiyama 1942; Yamanouchi 1964*). Besides the great variation in the twisted and plaited cord imprints, traces of cord knots and loops are detected (*Hurley 1979. 68–79*). Undoubtedly, Jomon peoples were surrounded by an abundance of basketry and cordage utensils of various functional destinies. It seems to be likely that the morphological diversity and plasticity of size cord structures could have inspired the idea of introducing some cordage forms into pottery de-

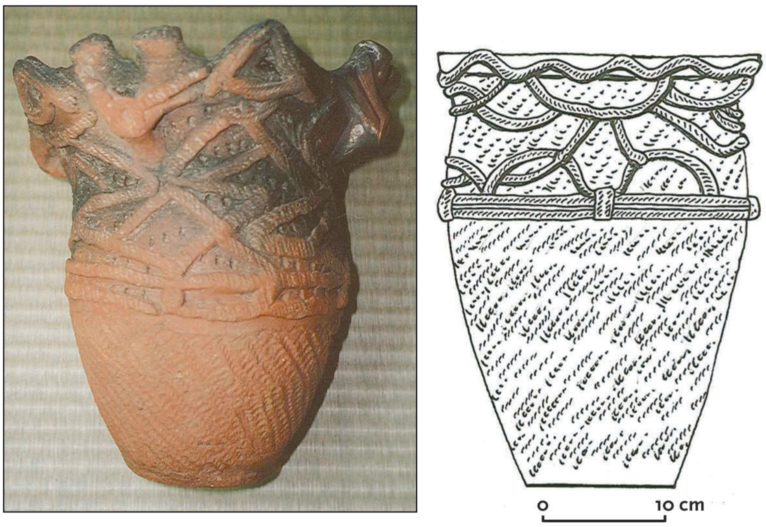


Fig. 7. Ookubo site. Middle Jomon horizon. Ceramic vessels with relief decoration, imitating net-like (lacy) cordage.

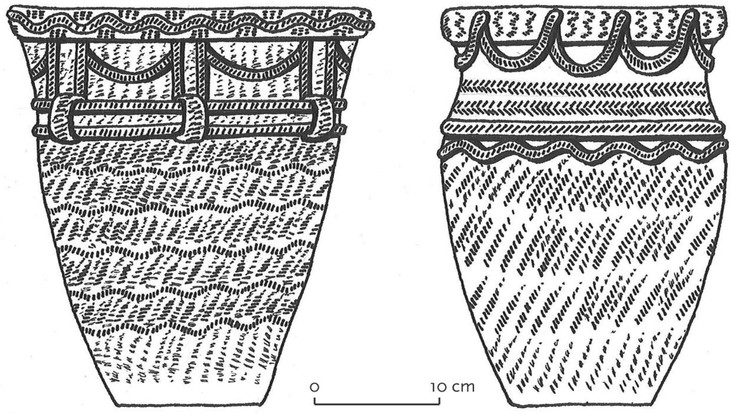


Fig. 9. Ookubo site. The middle Jomon horizon. Ceramic vessels with the relief decoration, imitating suspended cord.

Looking at pottery-making traditions of the Late and Final Jomon periods, 2500–900 BC, we can not detect significant cases of relief cord-imitating decoration. In general, after the Middle Jomon period, in the pottery-making of various regions of the Japanese Archipelago high relief design became extinct and was replaced by another standard of decoration, mainly combinations of incised patterns and local areas of cord-impressed patterns (*Aikens and Higuchi 1982.164–179; Pearson 1992. 73–74*).

coration. The clay as a plastic and compliant raw material allowed the replication of the lines, curves and interlaced patterns of flexible cords or ropes.

It may be supposed that the earliest relief cord imitation in pottery design seems to appear in the Incipient Jomon period, before 10 000 BC. Some researchers distinguish a relief 'raised-cord' pattern on the oldest Japanese ceramics. This pattern is usually in the form of horizontal appliqué bands decorated with various kinds of imprints, sometimes cord impressions. It has some similarity to the image of a cord (*Kobayashi 1993*). However, only Middle Jomon archaeological records give us obvious appearances of cord-imitating decoration in its variable and expressive forms. It is important to emphasize that decorative, cord-imitating relief elements or motifs are associated with the Middle Jomon pottery-making traditions of certain territories – Tohoku region, *i.e.* northern and north-eastern Honshu, and southern Hokkaido. Some researchers believe that these regions share features of pottery-making development, beginning with the Early Jomon period (*Aikens 1995; Kobayashi 2004.51–56*). In the light of data presented in this paper it may be supposed that the introducion of relief decorative elements imitating various kinds of cordage structure was a distinctive cultural item of the local population.

It is quite important to emphasize that the Middle Jomon pottery of Tohoku in southern Hokkaido area demonstrates the unique situation of introducing of a real object of material culture (cord structure) into the sphere of decorative art. Prehistoric potters created metaphorical images of such ordinary, at first glance, things as cords or rope. What reasons caused this phenomenon besides the external decorative attractiveness of cord structures imitation? It was noted above that researchers suppose symbolic meanings for some kinds of Middle Jomon relief decoration, including sophisticated curvilinear elements and motifs. Thus, Kobayashi considers decorative compositions on ceramic vessels of Flame-like and some other styles as probable 'codes' of ethnic, or tribal, identity. It seems likely that the areas of certain pottery styles corresponded to territories of different Jomon groups (*Kobayashi 2004.42–71*). In the light of this conception, it may be supposed that high-relief cord-imitating decoration on Middle Jomon pottery from Tohoku and southern Hokkaido region played for the local population the role of a cultural mark, or sign. The essential meaning of this sign probably derived from the functional context of real cord, or rope, as one of the most necessary items of everyday life. Supposedly, the cord in its various forms and structures may be associated with such ideas as 'linking', 'defending', 'protection', etc. Obvi-

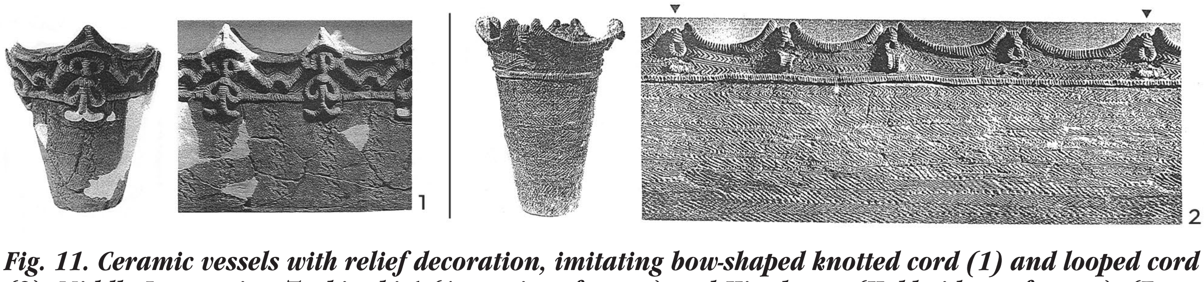


Fig. 11. Ceramic vessels with relief decoration, imitating bow-shaped knotted cord (1) and looped cord (2). Middle Jomon sites Tsukinoki 1 (Aomori prefecture) and Hinohama (Hokkaido prefecture). (From **Kobayashi 1989.184–185*).***

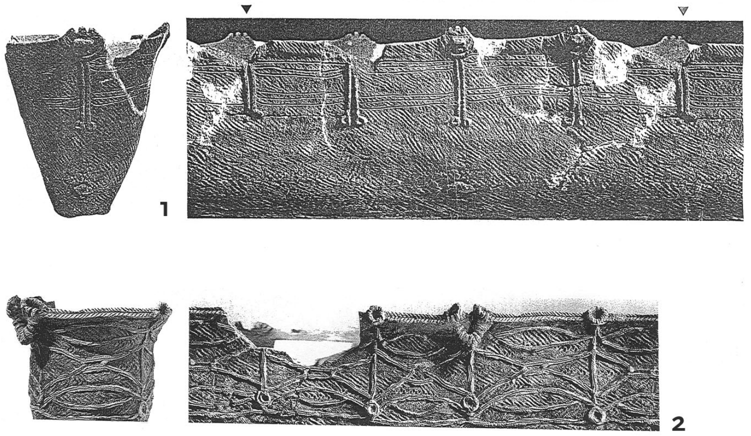


Fig. 13. Ceramic vessels with relief decoration imitating hanging cord (1) and net-like (lacy) cordage (2). Middle Jomon sites Kayakarizawa (Akita prefecture) and Usujiri (Hokkaido prefecture). (From* Kobayashi 1989.190, 192*).

ously, all these abstract concepts had positive connotations in the mentality of prehistoric peoples.

Considering 'the cord theme' in the records of the oldest stages of Japanese history, it would be interesting to look at the latest evidence of traditional culture. One can note the wide usage of the cord, or rope, in various spheres of material and spiritual life. These are traditional costume, sacred ceremonies, package technology, and some others (*Cort 1982; Cort and Nakamura 1994; Shigeru 1978; Yamamoto 1998.454–537; 1999.138–239*). The cord appears as an objective sign or symbol with a positive meaning. Thus, in the context of Shinto religion, which originated in the pre-state period of Japanese history, a special cord made of rice straw has its own name, shimenawa, and is associated with ideas of protection and defense (*Nakortchevsky 2003.46–48, 183, 188; Takai 1985.53–54*). In old Japan, during traditional New Year festive ceremonies, the cord was used as a necessary attribute symbolizing wishes for happiness, and the warding off of disasters (*Markova 1991. 374–375; Saikaku 1981.277*).

It seems to be important to emphasize that certain traditional cordage structures are very similar to some cordage forms imitated in the decoration of Middle Jomon pottery. These are the hanging cord, suspended cord, and bow-shaped knot. We can meet

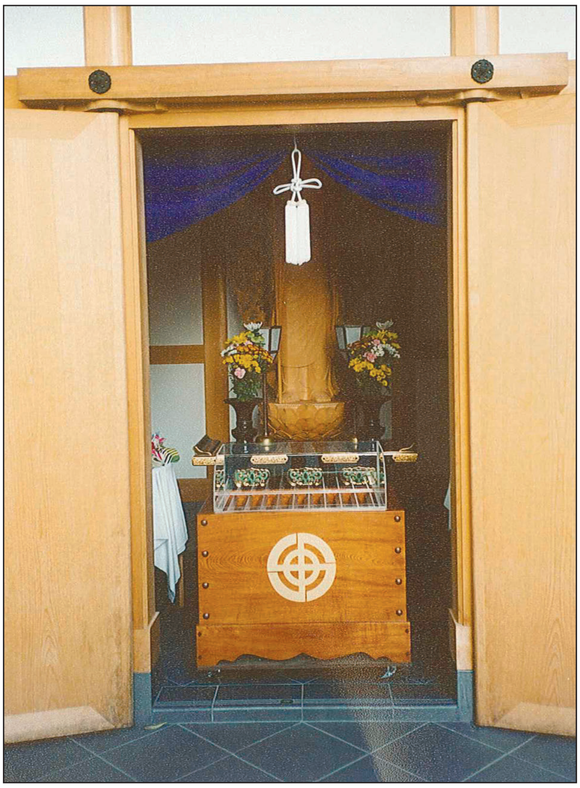


Fig. 14 (left). The sacral cord 'Shimenawa' at the enter of Shinto-Buddhist shrine of Edo period (17–19 centuries). The surroundings of Sakura-city, Honshu Island.
Fig. 15 (right). The bow-shaped knotted rope with bunches at the entrance of traditional Shinto-Buddhist shrine. Kamakura-city. Honshu Island.

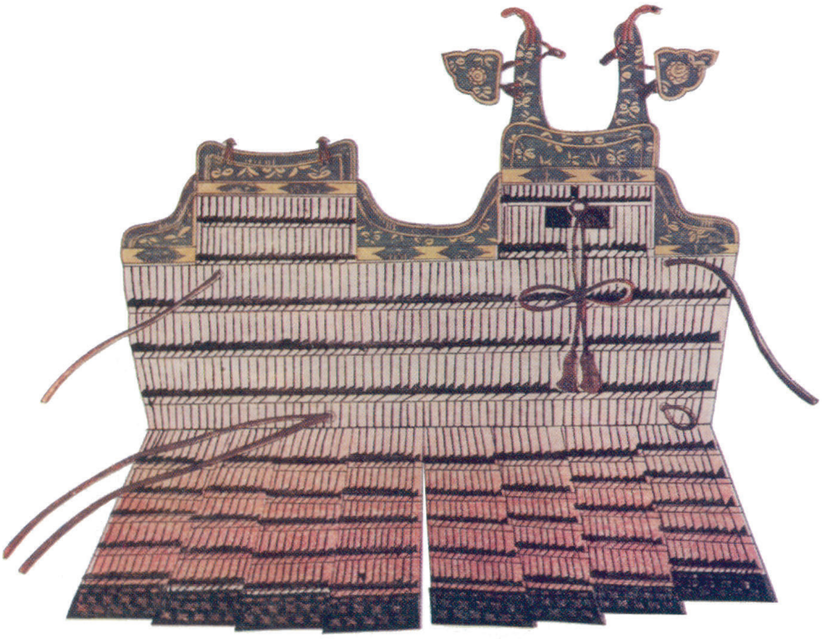


Fig. 16 (left). The Middle-aged samurai armour and helmet with knotted cordage details.

Fig. 17 (up). The Middle-aged samurai armour with bow-shaped knotted cord.

them among the attributes of Shinto cult (Figs. 14 and 15), the details of traditional dress and gear (Figs. 16 and 17), and traditional package arrangements (Fig. 18). Here we can not suggest the explanation of the parallels between the models of prehistoric cord structures and cordage forms in traditional Japanese culture need an especially oriented investigation. It seems likely that this subject is in close relation to the problem of the origin of Japanese ethnicity and culture. One of most disputable and unclear questions in the context of this problem is the role of the Jomon population in the process of forming the Japanese ethnic community at around the end of 1st millennium BC and beginning of 1st millennium AD (*Aikens and Higuchi 1982.187–322; Pearson 1992; Taksami and Kosarev 1990*). So, any resemblances in the material and spiritual culture of prehistoric inhabitants of the Japanese Archipelago and historical population are of great interest and value for detecting probable links between the ancient past and the present.

Fig. 18. Traditional Japanese boxes 'inro' for the packing small things with knotted rope.

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The Mesolithic at the Danube's Iron Gates: new radiocarbon dates and old stratigraphies

Alexandru Dinu[1], Andrei Soficaru[2], Doru Miritoiu[3]
1 *University of Wisconsin, Madison, USA*, adinu@facstaff.wisc.edu
2 *The Center for Anthropological Research 'Francisc I. Rainer', Bucharest, Romania*, asoficaru@yahoo.com
3 *The Center for Anthropological Research 'Francisc I. Rainer', Bucharest, Romania*

ABSTRACT – *In this paper we present 31 new AMS radiocarbon dates from the Mesolithic Iron Gates sites. The new dates allowed for a total reconsideration of the chronological sequences, and offer new insights for a reinterpretation of both Upper Paleolithic-Mesolithic and Mesolithic-Neolithic developments in the region.*

IZVLEČEK – *V tem članku predstavljamo 31 novih AMS radiokarbonskih datumov iz mezolitskih najdišč na območju Železnih vrat na romunski obali Donave. Novi datumi so omogočili v celoti ponovno pretehtati kronološke sekvence in ponujajo nove vpoglede za ponovno interpretacijo tako mlajšepaleolitsko-mezolitskega kot mezolitsko-neolitskega razvoja v regiji.*

KEY WORDS – *Tardigravettian; Mesolithic; Neolithic; site stratigraphy*

Introduction*

The construction during the 1960's of the Iron Gates dam across the Danube triggered an intense archaeological survey of the region, which resulted in the discovery of a number of archaeological sites on both sides of the river. The remains uncovered at some of these sites were later associated with a Mesolithic culture called Lepenski Vir in Serbia, and Schela Cladovei in Romania (Fig. 1). Presently all the sites are under water or destroyed by subsequent construction projects, except for the eponymous site of Schela Cladovei.

Although numerous radiocarbon dates are available for the sites on the southern shore of the Danube (*Bonsall 1997; Bonsall, Boroneanţ and Srejović 1996; Bonsall et al. 2000; Bonsall et al. 2004; Bonsall et al. 2002/3; Borić 2001; 2002; 2005; Borić and Miracle 2004; Cook et al. 2002; Radovanović 1996a; Srejović 1965; 1990*) the understanding of the evolutionary trajectory of Lepenski Vir-Schela Cladovei culture has been much restricted by an acute absence of dates from the sites uncovered on the northern shore, for which before 1990 only some 18 dates were available (*Paunescu 2000; Radovanović 1996a; 1996b*).

After 1990, archaeological excavation restarted at Schela Cladovei, and more dates were published for this site (*Bonsall 1997; Bonsall, Boroneanţ and Srejović 1996; Bonsall et al. 2004; Bonsall et al. 2002/3; Cook et al. 2002*).

In this paper we present 31 new AMS radiocarbon dates from the Schela Cladovei culture sites of Razvrata, Icoana, Ostrovul Banului, Ostrovul Mare, and Schela Cladovei (Tab. 1). The implication of these new dates will be discussed in reference to the published stratigraphic information, older dates availa-

* It has been acknowledged to us (*A. Boroneanţ, pers. comm.*) that additional stratigraphic profiles and a great volume of information about excavations at the sites presented here exist in an unpublished format. This work considers only the published material, and we only hope that in the near future the additional material will be made available in printed form.

ble for the Romanian sites (Tab. 2), and some of the radiocarbon dates from the Serbian sites.

Although some authors (*Boroneanţ 1973a; 1973c; 1980; 1990a; 1990b; 2000b; Boroneanţ et al. 1995; Boroneanţ and Boroneat 1983; Boroneanţ, Craciunescu, and Stinga 1979; Boroneanţ and Nicolaescu-Plopsor 1990; Voytek and Tringham 1990*) have emphasized similarities among the Serbian and Romanian sites, others (*Borić 2001; Paunescu 2000; Radovanović 1996a; 1996b; 1999*) have made evident a number of differences. It is generally agreed, however, that all Iron Gates Mesolithic sites represent one culture.

It must be underlined that in most previously published maps of the Iron Gates sites, the geographical location of sites at Razvrata and Icoana have been reversed (*Bonsall 1997; Bonsall, Boroneanţ and Srejović 1996; Bonsall et al. 2002/3; Borić 1999; 2001; 2002; 2004; Boroneanţ 1970; 1990b; Prinz 1987; Radovanović 1996a; 1999; Radovanović and Voytek 1997; Tringham 2000; Voytek and Tringham 1990*). Razvrata was located on a small alluvial fan at the left of Mraconia River mouth, right across the site of Hajdučka Vodenica. Icoana was located about 700–800 m downstream (*Boroneanţ 1973c; Paunescu 2000*). The exact location of these sites is presented in Figure 2.

Site New Dates	Depth (–) m	AA #	^{14}C Age BP	Cal. BC range (1σ)	Sample
Icoana	1.4	AA65564	9403±93	8820–8540 (67.2%)	*Sus scrofa*
Icoana	0.6	AA67748	9247±89	8570–8330 (68.2%)	*Sus scrofa*
Icoana	0.9	AA65558	9196±89	8490–8300 (61.3%)	*Sus scrofa*
Icoana	1.55	AA66586	9101±87	8450–8240 (68.2%)	*Sus scrofa*
Icoana	1.3	AA67750	9044±88	8350–8180 (53.9%)	*Sus scrofa*
Icoana	1.6	AA65565	8989±88	8290–8160 (38.1%)	*Sus scrofa*
Icoana	1.9	AA65556	8966±87	8120–7970 (35.4%)	*Sus scrofa*
Icoana	1.1	AA65560	8955±73	8120–7980 (36.2%)	*Sus scrofa*
Icoana	1.65	AA65566	8952±88	8130–7970 (39.0%)	*Sus scrofa*
Icoana	1.7	AA65554	8913±87	8240–7960 (68.2%)	*Sus scrofa*
Icoana	1.2	AA65562	8907±98	8250–7940 (68.2%)	*Sus scrofa*
Icoana	2.1	AA66377	8855±93	8210–8030 (35.3%)	*Sus scrofa*
Icoana	1	AA65559	8840±86	8010–7810 (38.5%)	*Sus scrofa*
Icoana	1.15	AA65561	8729±79	7840–7600 (61.7%)	*Sus scrofa*
Icoana	0.4	AA66369	8702±86	7830–7590 (65.6%)	*Sus scrofa*
Icoana	0.5	AA65547	8648±83	7760–7580 (67.5%)	*Sus scrofa*
Icoana	1.95	AA65551	8575±83	7680–7530 (68.2%)	*Sus scrofa*
Icoana	0.3	AA66368	7604±76	6530–6390 (63.5%)	human
Icoana	1.25	AA65563	7245±62	6210–6130 (35.8%)	*Sus scrofa*
Ostrovul Banului	0.4	AA66370	8219±87	7350–7080 (68.2%)	*Sus scrofa*
Ostrovul Mare	1.7	AA66379	7890±78	6830–6640 (52.7%)	*Sus scrofa*
Razvrata	2.1	AA66378	8971±86	8280–8160 (34.3%)	*Sus scrofa*
Razvrata	1.8	AA65555	8891±87	8240–7930 (68.2%)	*Sus scrofa*
Schela Cladovei	1.67	AA66376	8192±79	7310–7070 (62.2%)	*Sus scrofa*
Schela Cladovei	1.42	AA66374	8128±90	7310–7030 (68.2%)	*Sus scrofa*
Schela Cladovei	0.82–0.87	AA67749	8065±79	7150–6900 (54.7%)	*Sus scrofa*
Schela Cladovei	1.17	AA66372	8056±80	7090–6820 (61.8%)	*Sus scrofa*
Schela Cladovei	0.77	AA66371	7975±80	7050–6770 (68.2%)	*Sus scrofa*
Schela Cladovei	1.37	AA66373	7956±78	7030–6750 (68.2%)	*Sus scrofa*
Schela Cladovei	1.62	AA66375	7921±78	6840–6680 (42.4%)	*Sus scrofa*
Schela Cladovei	0.45–0.53	AA67751	6773±70	5725–5625 (65.2%)	*Sus scrofa*

Tab. 1. New AMS radiocarbon dates for Iron Gates Mesolithic, Schela Cladovei culture. All samples ran by the Accelerator Mass Spectrometry Laboratory, University of Arizona, Tucson. BC calibration using OxCal. The status of S. scrofa was established in conformity with the DNA analysis results (**Dinu 2006; Larson et al. 2007*****) and compared metrics and morphology (*****Dinu 2006; Dinu et al. 2006*****).***

General site characteristics

Except for Ostrovul Corbului and Schela Cladovei, all Mesolithic sites on the Romanian shore of the Danube were discovered and excavated by Boroneanţ (*Boroneanţ 1970; 1973a; 1973b; 1973c; 1980; 1990a; 1990b; 2000a; 2000b; Boroneanţ and Nicolaescu-Plopsor 1990*). The Schela Cladovei site was excavated also by British archaeologists between 1990–1994 (*Bartosiewicz et al. 1995; Bartosiewicz et al. 2001; Bonsall 1997; Bonsall, Boroneanţ and Srejović 1996; Bonsall et al. 2000; Bonsall et al. 2004; Bonsall et al. 2002/3; Cook et al. 2002*).

Ostrovul Corbului at Botul Cliuciului was surveyed in 1933 by a team led by Dumitru Berciu; the actual site was discovered by Marin Nica in 1970, and excavated between 1970–1984 by Petre Roman, Alexandru Paunescu and Florea Mogoseanu (*Mogosea-*

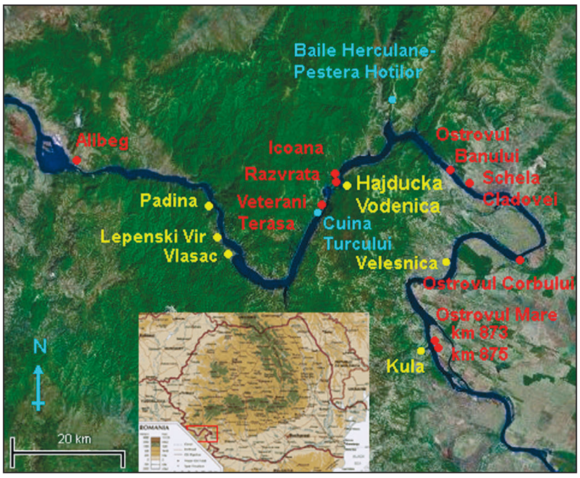


Fig. 1. Iron Gates sites associated with Mesolithic remains. Red: Schela Cladovei culture. Yellow: Lepenski Vir culture. Blue: other sites on the Romanian shore not associated with the Mesolithic Iron Gates, but mentioned in this paper.

Site Old Dates	Depth	AA#	^{14}C Age BP	Cal. BC range (1σ)	Sample
Alibeg	NA	NA	NA	8410±100 BC	
Alibeg	NA	Bln-1193	7195±100	6120-5980 (46.7%)	charcoal
Icoana	0.5	Bln-1078	8605±250	8200-7350 (68.2%)	charcoal
Icoana	2.1	Bln-1077	8265±100	7460-7170 (68.2%)	charcoal
Icoana	NA	Bonn 2	8070±130	7190-6770 (66.7%)	charcoal
Icoana	NA	Bonn 3	8010±120	7070-6740 (64.4%)	charcoal
Icoana	NA	Bonn 4	7660±110	6610-6420 (65.9%)	charcoal
Icoana	NA	Bln-1056	7445±80	6400-6230 (68.2%)	charcoal
Icoana	NA	Bonn 1	5830±120	4840-4540 (68.2%)	charcoal
Ostrovul Banului	NA	Bln-1080	8040±160	7180-6690 (68.2%)	charcoal
Ostrovul Banului	NA	Bln-1079	7565±100	6510-6340 (56.2%)	charcoal
Ostrovul Corbului	4.50-4.53	SMU-587	8093±237	7350-6650 (68.2%)	charcoal
Ostrovul Corbului	4.02-412	SMU-588	7827±237	7050-6450 (68.2%)	charcoal
Ostrovul Corbului	4.20-4.38	Bln-2135	7710±80	6610-6460 (68.2%)	charcoal
Ostrovul Corbului	4.20-4.39	Bln-2135A	7695±80	6600-6460 (68.2%)	charcoal
Ostrovul Corbului	4.23	GrN-12675	7640±80	6570-6430 (65.5%)	charcoal
Razvrata	NA	Bln-1057	7690±70	6590-6460 (68.2%)	charcoal
Schela Cladovei	NA	OxA-4384	8570±105	7691-7496 NA	Human
Schela Cladovei	NA	OxA-4379	8550±105	7588-7490 NA	Human
Schela Cladovei	NA	OxA-4385	8510±105	7577-7443 NA	Human
Schela Cladovei	NA	OxA-4382	8490±110	7573-7434 NA	Human
Schela Cladovei	NA	OxA-4380	8460±110	7547-7425 NA	Human
Schela Cladovei	NA	OxA-4378	8415±100	7535-7319 NA	Human
Schela Cladovei	NA	OxA-4381	8400±115	7535-7303 NA	Human
Schela Cladovei	NA	Poz-5206	8300±50	7480-7300 (68.2%)	Human
Schela Cladovei	NA	OxA-4383	8290±105	7479-7093 NA	Human
Cuina Turcului	NA	Bln-802		8175±200 BC	charcoal
Cuina Turcului	NA	Bln-803		10650±120 BC	charcoal
Cuina Turcului	NA	Bln-804		10100±120 BC	charcoal

Tab. 2. Old radiocarbon dates for Iron Gates Mesolithic, Schela Cladovei culture. BC calibration using OxCal (The date was offered in this form by V. Boroneant (**Boroneant 2000b.86*****).***

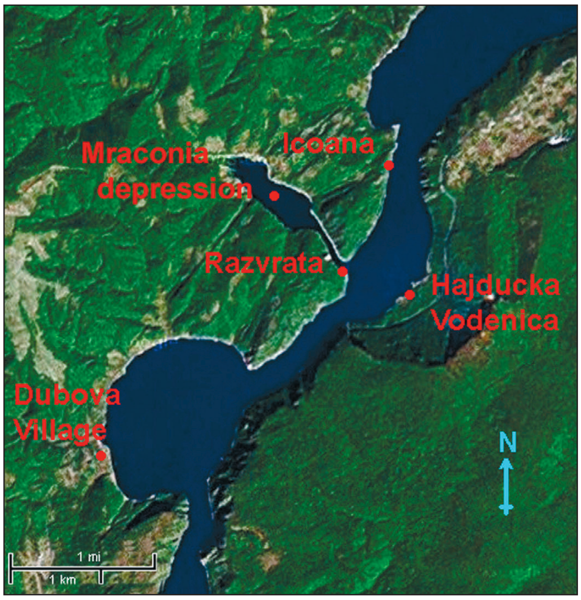


Fig. 2. Exact location of Icoana and Razvrata sites.

nu 1978; Necrasov and Botezatu 1981; Paunescu 1990; 2000; Roman 1987).

Schela Cladovei was discovered by Misu Davidescu, who excavated a portion of the Neolithic Starčevo area of the site (*Davidescu 1965*).

There are a number of characteristics common to all Mesolithic Schela Cladovei sites. As a general pattern, Schela Cladovei sites can be divided into two categories: those located within the Gorge: Alibeg-Pescari, Veterani Terasa, Razvrata, and Icoana; and a second group located downstream from the Gorges: Ostrovul Banului-Gura Vaii, Schela Cladovei, Ostrovul Corbului, and Ostrovul Mare.

All of the excavated Schela Cladovei culture sites located in the canyon were found in places where the limestone mountain wall sandwiches through basalt directly into the Danube's waters, forming extensive karstic phenomena. There are a good number of grottos and cave formations right on the Danube shore or no farther than 10–60 m from the water: Gaura Livaditei, Pazariste, Liubcova, Gaura Chindiei I, Gaura Chindiei II, Proluca lui Climente, Gaura cu Musca, Ponicova, Cuina Turcului, Pestera Fluturilor, Pestera lui Caramfil, and Pestera Veterani. None of the Mesolithic sites, however, were located in caves (*Boroneanţ 2000a*). Without exception, the sites were found only in the open air, on the Danube shore, next to the water, in most cases below the modern flood level on very low land, sandy and humid, even swampy. According to geological and hydrological studies of the region, it appears that flooding of the Danube shore was equally frequent by the time of the Mesolithic occupation (*C.S.A. 1967; Grupul de Cercetari Complexe 1976; I.G.G.A.R.S.R. 1969*).

The sites belonging to the second group outside the Gorge are located on islands, with the exception of Schela Cladovei itself. Before the formation of the lake, however, these islands had always been divided by the Danube's northern shore by a very narrow secondary river branch. These branches were rather easy to cross, and the fishing was exceptionally good. Generally, the channels were not very deep, the water flowed slowly, and during some less rainy years the water drained off almost entirely.

One other characteristic of all the sites is that their location was such as to permit easy access to the nearest best fishing and hunting sites regardless the nature of the terrain surrounding the site within a radius of a 30–190 minute walk. This would allow the inhabitants immediate and easy access to terrestrial resources, raw material and, in all cases, better defence.

Sites, stratigraphies, and problems

Regrettably, Boroneanţ did not publish excavation maps for any of the sites except Schela Cladovei (*Boroneanţ 2000b.277*). As a consequence, at present it is impossible to determine the relationship between artefacts uncovered in different excavation sections, other than considering the depth inscribed on them. Because the stratigraphic information is also scant and a datum was never used except at Ostrovul Corbului (*Paunescu 1990*), presently, comparing artefacts from the same site and excavation depth, but different excavation sections becomes nonsense, a problem signalled also by others (*Paunescu 2000*). The new radiocarbon dates presented here were selected and therefore considered only according to the depth inscribed on them.

Due to the inconsistent terminology used for stratigraphic description and analysis, the overall picture of cultural sequences at all sites is confusing. Some authors (*Prinz 1987; Radovanović 1996a; Tringham 2000*) advanced periodization models of the northern Danube shore sites relying mostly on information offered by Boroneanţ, who appears to have been strongly influenced by the periodization of the site at Lepenski Vir, and attempted to apply it indiscriminately to the Romanian sites (*Boroneanţ 1973c; 1990b*). Others (*Tringham 2000*), including some

Romanian authors (*Lazarovici 1979*), mainly specialized in the Neolithic period.

Some (*Paunescu 2000*) based their hypothesis on their own lithic analysis, almost excluding any other available material. Finally, some archaeologists presented models based on their own excavations and a synthesis of the previously published material (*Lazarovici 1979; Mogoseanu 1978*).

The inconsistency in using the same archaeological terms by all the Romanian authors is extremely confusing and it has deep theoretical roots (*Boroneanţ and Dinu 2007*), but it was accentuated by a paper published in the mid 1960's by the one of the most influential Romanian archaeologists (*Nicolaescu-Plopsor 1965*). Following the opinions expressed in this publication, Boroneanţ uses indiscriminately the term 'Epipaleolithic' in reference to both the actual Epipalaeolithic and the Mesolithic periods at Iron Gates. Fortunately, some authors attempted to rectify this problem (*Mogoseanu 1978; Paunescu 1990; 2000*). The most notable attempt in this direction comes from Paunescu:

"*Faza evoluata a culturii gravetiene apartinind epiapaleoliticului, cunoscuta sub denumirea de tardigravetian de tip mediteranean, este representata prin cele 9 puncte descoperite numai in zona Portilor de Fier.*

∴

Mezoliticul din teritoriul cuprins intre Carpati si Dunare este cunoscut prin cele doua culturi care au evoluat parallel sau partial parallel, in doua zone diferite. Prima – cea tardenoasiana – este atestata in nord-estul si nordul Munteniei ... Cea de-a doua cultura mezolitica – cultura Schela Cladovei – este representata de cele 8 puncte descoperite prin sapaturi sistematice in zona Portilor de Fier ..." (*Paunescu 2000.40*)

(The evolved phase of the Gravettian culture belonging to the Epipaleolithic, and known as Tardigravettian of Mediterranean type is represented by the 9 sites discovered only in the Iron Gates area.

∴

The Mesolithic of the territory enclosed by the Carpathian Mountains and the Danube River is known by the cultures that evolved in parallel or partly in parallel, in two different areas. The first – the Tardenoisian – is attested in the northern and north-eastern Muntenia ... The second Mesolithic culture – Schela Cladovei culture – is represented by the 8 sites uncovered by systematic excavations in the Iron Gates region...) (Our translation)

Therefore, Paunescu makes a clear distinction between the Epipalaeolithic as the final stage of the Upper Palaeolithic, and the Mesolithic period at Iron Gates, but mostly as terminology, and less as a concept (*Boroneanţ and Dinu 2007*). The general image is further complicated by the use of alternative names for the cultural sequences at Iron Gates (*Boroneanţ 1999*):

❶ Final Epi-Gravettian – or Proto-Clisurean, or Proto-Romanellian at site Climente I Cave.
❷ Late Epi-Gravettian – Clisurean or Romanellian, or Tardigravettian (*Paunescu 1970; Paunescu 1987*) Romanello- Azilian at Climente II, Cuina Turcului I and II, Ostrovul Banului I–IIIa, comprising four stages of development.
❸ Mesolithic Schela Cladovei, comprising four stages of development (*Boroneanţ 1973c*).

In relation to the above classification, it is interesting to notice that logically, the late phase of Epi-Gravettian would sequentially occur before, not after the final phase of the same period, as the Proto-Clisurean occurs before the Clisurean. No further details were published by Boroneanţ, so it is not possible to know if the stratigraphies published by him follow the same rational. For instance, the first phase of his periodization of Schela Cladovei culture is characterize as the oldest phase at both Veterani Terrace and Veterani Cave, and associated with "*la phase finale du romanellien*" (*Boroneanţ 1973c.15*). On the other hand, no remains associated with Schela Cladovei culture were uncovered at Cave Veterani (*Boroneanţ 2000a; 2000b; Paunescu 2000*), although Boroneanţ lists the stratigraphic sequence of the cave as Palaeolithic, Epipalaeolithic (Clisurean), Mesolithic, Neolithic (*Boroneanţ 2000a.90*) with no further explanations.

For a better understanding of the problems related to site stratigraphy, terminology, as well as to the implications of the new radiocarbon dates presented in this paper it is therefore necessary to offer a brief presentation of the sites and their stratigraphies.

Pescari-Alibeg

This is the most western Schela Cladovei culture site on the northern shore of the Danube. According to Paunescu (*Boroneanţ 1973c; 2000b; Paunescu 2001*) the site was located on the south-eastern end of the village of Pescari (Coronini), at the base of Redut Hill, on Alibeg Creek. Paunescu also states that it was located on a portion subject to Danube flooding, and that a good part of the site was destroyed by the river prior to and during excavations. There was a small alluvial peninsula at the mouth of Alibeg Creek, where this site was located (*Boroneanţ 2000b*).

Boroneanţ discovered the site in 1968, but excavations did not started until 1971 when the water level was already covering part of it. There are no published general maps of the area or site distribution maps. Excavation information is scant, and very little material was recovered. Excavations comprised eight sections of an unspecified area. The results of

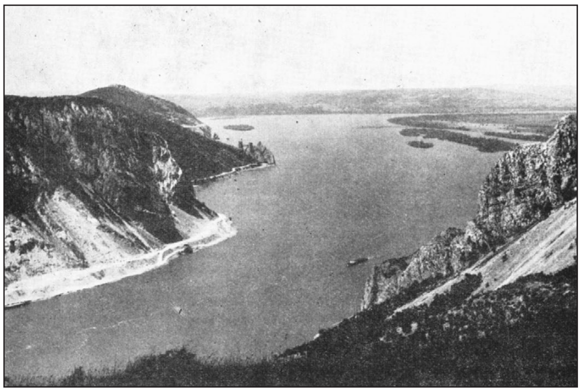


Fig. 3. Old photo of the Danube at the entrance to Pescari-Alibeg Canyon, seen from the Romanian shore. The river flows right to left. Photo courtesy of the Institute of Geography, Bucharest.

excavation were briefly mentioned over the years by Boroneanţ (*Boroneanţ 1973a; 1973c; 1980*), and to a larger degree at a more recent date (*Boroneanţ 2000b; Paunescu 2000*).

Boroneanţ suggests that there was one level of habitation, belonging to a late phase of Schela Cladovei culture varying between 0.60 m to 1.00 m in thickness (*Boroneanţ 2000b; Paunescu 2001*). He associates the Mesolithic at Alibeg with:

"*... une phase finale d'Icoana, horizon I, qui poursuit son évolution jusqu'au commencement de l'habitat d'Alibeg.*" (*Boroneanţ 1973a. 22*)

Paunescu (*Paunescu 2001*) advanced the hypothesis that this level had to be associated with two cultural layers: one belonging to late Mesolithic Schela Cladovei, and an Early Neolithic Starčevo-Criş just above it, with no archaeological sterile in between. Paunescu was, however, very cautious in advancing this hypothesis, due to the fact that Boroneanţ did not separate the findings for each cultural layer.

Veterani Terasa

The problems posed by this site are presently extremely difficult to address. It was located precisely in front of Veterani Cave, at the base of Ciucarul Mare Mountain. There was a small alluvial deposit, suggesting that at one time a small stream probably flowed from the cave (*Paunescu 2000*). Boroneanţ discovered the site in 1968, but excavations started only in 1969. Although earlier and later cultural layers were uncovered in the cave, Mesolithic material was not found; moreover, all the cultural strata were extremely disturbed and mixed up.

According to some accounts (*Paunescu 2000.376*) excavations of the Veterani Cave yielded remains associated with the Medieval period, the Roman period, Neolithic Cotofeni and Starčevo-Criş, and Tardigravettian (*Boroneanţ 2000a; Paunescu 2000*); no Mesolithic remains were found, and the stratigraphy appears to have been extremely disturbed.

A contrasting image is offered elsewhere; the cultural sequences identified in the cave are listed as Palaeolithic, Epipalaeolithic (Clisurean), Mesolithic, Neolithic Starčevo-Criş, Neolithic Cotofeni, Hallstatt (Basarabi), Dacian, Daco-Roman, Byzantine and Medieval, modern (*Boroneat 2000a.90*). The stratigraphy is also presented as extremely disturbed.

Logically it is impossible to understand why a group of people would chose to face meteorological discom-

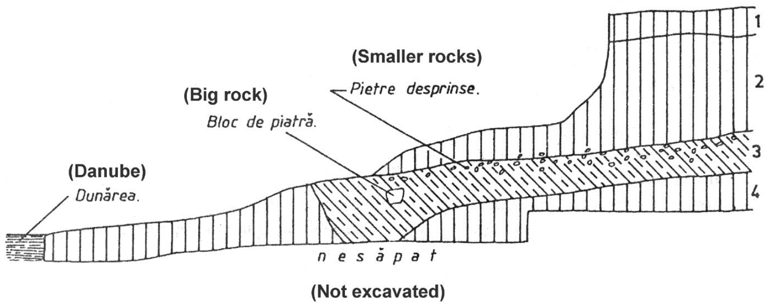


Fig. 4. Profile of Section II –NW at Alibeg (**Boroneanţ 1973c; 2000b; Paunescu 2001*****): 1. recent humus of about 0.40m; 2. sandy yellowish soil, sterile archaeological of about 0.40–1.65m; 3. black-brown soil, Mesolithic occupation of about 0.60–1.00m; 4. yellow soil with lime stone penetration 0.60–0.90m; Boroneanţ (*****1973c.7*****) uses neither Epipalaeolithic or Mesolithic in defining level 3. Instead, he simply named it 'couche culturelle'. A scale was not originally published by (*****Boroneanţ 1973c*****), but added by Paunescu (*****Paunescu 2001*****).***

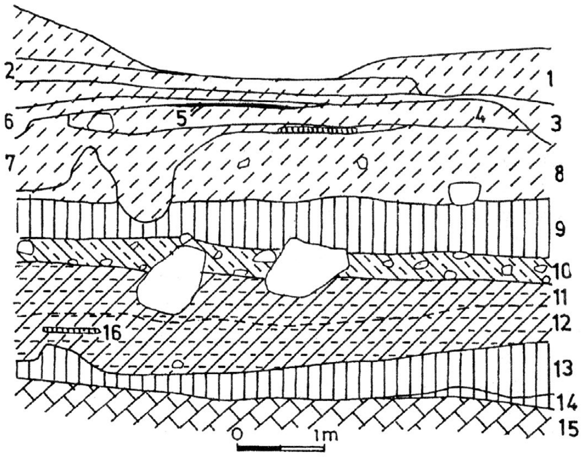


Fig. 5. North profile, Section IV, Veterani Terasa (*Boroneanţ 1973c; 2000b; Paunescu 2000*). Paunescu (*2000.376–377*) identifies the following strata: 1. debris of about 0.05–0.40m; 2. ashes of about 0.05–0.12m; 3. sandy yellow soil of about 0.03–0.05m; 4. ashy yellow soil of about 0.20–0.30m; 5. black soil of about 0.05–1.00m; 6. yellow-grey soil of about 0.05–0.90m; 7. yellow soil of about 0.45–0.65m; 8. yellow soil, Salcuta culture of about 0.25–0.35m; 9. dark brown soil of about 0.30–0.65m – archaeologically sterile; 10. light brown soil of about 0.40–0.65m – Mesolithic Schela Cladovei culture; 11. gravel and sand of about 0.15–0.60m – Level II of Tardigravettian of Mediterranean type; 12. sand lens of about 0.03–0.05m – Level I Tardigravettian of Mediterranean type; 13. limestone bed. Paunescu offers no information for layers 14 and 15; however, level 15 is defined as bedrock, levels 13 and 14 as archaeologically sterile, and levels 1–8 as post – Paleolithic deposition (*Paunescu 2000.377*). Scale was offered by V. Boroneanţ (*1973c*).

fort living in the open, in front of the cave, if a natural shelter was available only a few steps away. On the other hand, it is more likely that earlier and later inhabitants of the cave did throw a great quantity of refuse at and below the entrance. A great part of this refuse washed away by rain, as well as other refuse from inside the cave carried by the ancient stream, would have naturally ended on the terrace. It appears that the excavator may have not been aware of this problem. Moreover, the stratigraphic sequence of the terrace (*Boroneanţ 1973c; 2000b; Paunescu 2000*) is unclear.

No perforated antler tools characteristic of Mesolithic Schela Cladovei culture were found at this site.

In Paunescu's interpretation (*2000.377*), there appears to be two Epipalaeolithic- Tardigravettian excavation levels 11 and 12, and a Mesolithic Schela Cladovei excavation level 10. He mentions the remains of a hearth, which is associated with the Tardigravettian period, excavation level 12.

Boroneanţ describes excavation level 10 at Veterani Terasa as "*terre jaune comportant des rares traces épipaleolithiques*" and does not mention any cultural remains for excavation levels 11 and 12 (*Boroneanţ 2000b.271*). There are no radiocarbon dates from this site.

Razvrata

Before it flows into the Danube, the Mraconia River forms a bassinet (a small semi-enclosure) named Mraconia Depression, of about 1.5 km long and 400 m wide behind Ciucarul Mic Mountain. It then bores through the mountain through a short defile of about 500 m long and, before the formation of the lake of the hydroelectric plant, diverted into the Danube, bringing a great amount of alluvium with it. This alluvium built up two fenny peninsulas at each side of the river mouth. It was on the smaller peninsula that the site of Razvrata was located.

The site was already in great part destroyed by the Danube by the time Boroneanţ (*1973a*) located it 1967. Excavations took place in 1967 and 1968. Five trenches were dug. There are no details of the area excavated, no excavation plans, or site distribution maps. Two layers of Schela Cladovei culture were re-

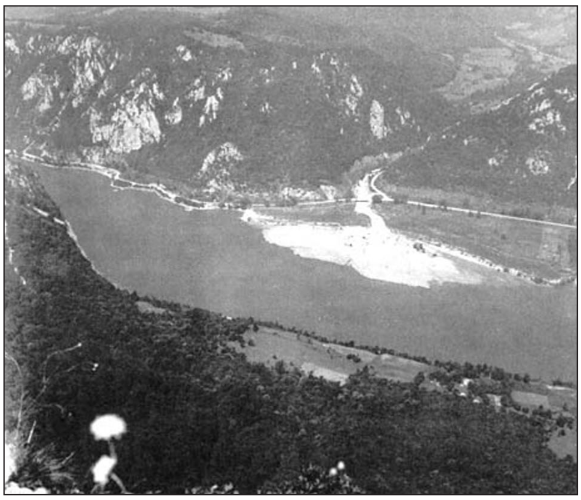


Fig. 6. Photo of Mraconia River alluvial deposits in the Danube, before the building of the dam. The Razvrata site was located on the left (of the photo) alluvial section. Hajdučka Vodenica was located just opposite the Mraconia River mouth. The Danube flows left to right. Upper right: Mraconia Depression, a possible location of a base-site for Icoana-Razvrata outpost sites. (Courtesy of Ivana Radovanović)

vealed. There is one published stratigraphy of the SE wall of section S I.

At Razvrata it is not clear if the explanation offered by the published stratigraphy refers to the second phase of Schela Cladovei culture, or generally to the second cultural level of the site. Boroneanţ (*1973c. 9*) simply refers to the two cultural levels as 'Epipaleolithic I and II'. Paunescu (*2000.393*) defines the lower cultural level as 'Level I Epipaleolithic Tardigravettian', and the upper cultural level as 'Level II Mesolithic'.

Icoana

The site was located on a narrow strip of the Danube bank at the foot of Ciucarul Mic. It appears that the width of this strip was only of about 6 m (*V. Boroneanţ, personal communication*). Information about the exact location of the site varies. Paunescu (*2000. 394*) gives a distance of 600 m east of Razvrata; Radovanović (*1996a.324*) thinks that this distance is about 200 m; Boroneanţ (*1973c.8*) refers to "*quelques centaines de mètres*". In any case, the exact location of the site is known due to a landmark: an icon mounted in the wall of the mountain after the formation of the artificial lake.

According to Boroneanţ (*personal communication*), there was a feeble stream of water springing from the mountain wall. The site produced a large amount of archaeological material, especially faunal remains (*Bolomey 1973*).

According to the published stratigraphy of Section II (*Boroneanţ 1973c; 2000b; Paunescu 2000*), there are two Mesolithic Schela Cladovei cultural levels.

Archaeologically, from upper to lower it was possible to distinguish the following levels of site occupation:

Very little can be said about the cultural evolution of the site. As seen in Table 1, there is a sharp discrepancy between the depth inscribed on the samples and the results obtained by the dating of the samples. The situation is not new: the only old dates for which depths were mentioned showed an age of 7460–7170 BC for a depth of 2.1 m, and 8200–7350 BC for a depth of 0.5 m (*Paunescu 2000.407*). It may be that at the time, Boroneanţ may have not noticed the difference, and therefore did not offer any details about the samples' cultural levels of provenance. Also, according to Boroneanţ's published stratigraphy, at a depth of -0.30 m there should

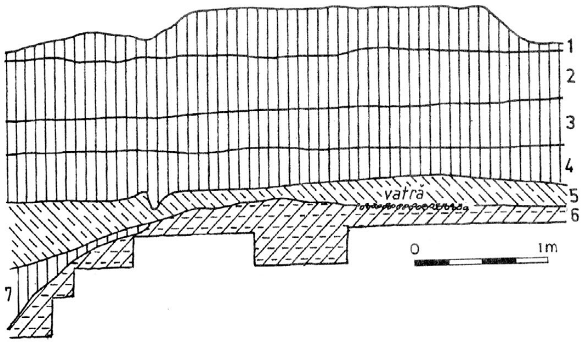


Fig. 7. Southeast profile of Section I, Razvrata (*Boroneanţ 1973c; 2000b; Paunescu 2000*): 1. alluvial sand of about 0.05–0.30m; 2. brown-black humus of about 0.35–0.40m; 3. soil light yellow of about 0.20–0.30m; 4. black soil of about 0.17–0.35; 5. light-grey soil, Level II Mesolithic Schela Cladovei Culture of about 0.14–0.34m; 6. yellow sandy soil – Level I Tardigravettian of Mediterranean type of about 0.35m; 7. brown-yellow soil. Levels 1–4 are listed as archaeologically sterile. V. Boroneanţ refers to layer 5 as 'epipaleolithique II' and layer 6 as 'epipaleolithique I' (*Boroneanţ 1973c.5*). No scale is offered originally by Boroneanţ (*Boroneanţ 1973c*), but Paunescu adds one (*Paunescu 2000*).

have been a layer associated with Neolithic Starčevo-Criş culture, separated by the Mesolithic layers by some 1.00 m of deposition. The stratum was extremely disturbed (*Boroneanţ, personal communication; Boroneanţ field notes*). However, the human sample AA66368 (Tab. 1) inscribed by Boroneanţ as IC. 1969 SVII -0.30 m produced a date undoubtedly associated with the Mesolithic Schela Cladovei culture occupation of the site, also confirmed by the morphological and metrical analysis comparative to other Mesolithic Schela Cladovei human remains held

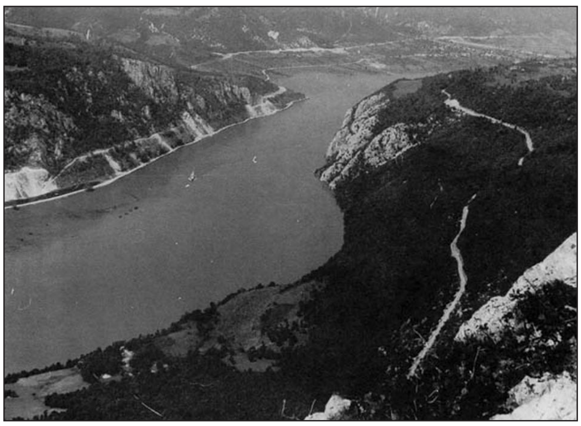


Fig. 8. Old photo of the Danube's left bank at Icoana before the construction of the dam, seen from the Serbian bank. The Hajdučka Vodenica location was in the lower left corner of the picture. The Danube flows left to right. Courtesy of Ivana Radovanović.

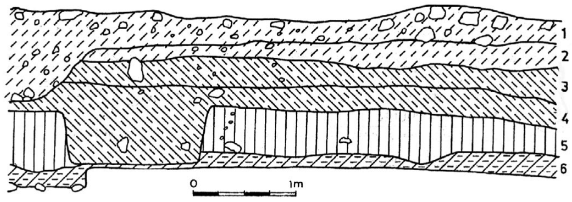


Fig. 9. The West profile of Section I, Icoana (*Boroneanţ 1973c; 2000b; Paunescu 2000*): 1. mass of recently fallen rocks of about 020–0.87m; 2. light-brown soil, Starčevo-Criş of about 0.10–0.28m; 3. grayish-black soil of about 0.17–0.33m – Level IIb Mesolithic Schela Cladovei; 4. grey yellow soil of about 0.18–0.75m Level IIa Mesolithic Schela Cladovei; 5. yellow soil, sterile of about 0.25–0.57m; 6. grey soil of about 0.15m – Level I Tardigravettian of Mediterranean type. Boroneanţ (*1973c.9*) only refers to layers 3 and 6 simply as Epipalaeolithic. A scale was not originally offered by Boroneanţ (*Boroneanţ 1973c*), but Paunescu (*2000*) adds one.

at the Institute of Anthropology 'Rainer' (*Miritoiu, personal communication*) in Bucharest (*Miritoiu, Sultana and Soficaru 2004*) (Tab. 3).

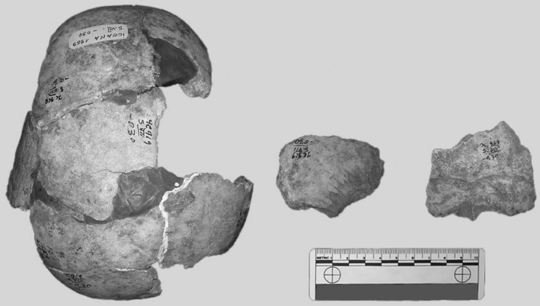
This discrepancy may suggest that levels of occupations at the same depth on different excavation sections belong to different phases of site evolution. If this were true, it may be that the periodization and chronologies offered by Boroneanţ may be subject to reinterpretation. The circumstances are aggravated by the fact that no datum was used, and that the excavation depth was measured individually for each section from the ground level down; according to pictures taken by the excavator (*Boroneanţ 1970*), the terrain was far from horizontally levelled, and such a method of depth measurement would offer strongly inaccurate premises for comparison. Most regrettably, at this point it is simply impossible to advance any speculations regarding the stratigraphy of the excavated sections.

Boroneanţ (*2000b.275*) only mentions two layers of Epipalaeolithic and one layer of Neolithic Starčevo. On the same stratigraphic profile, Paunescu (*2000.395*) notes a cultural level I Tardigravettian, a cultural level IIa Schela Cladovei, and a level IIb Schela Cladovei.

Ostrovul Banului – Gura Vaii

The site was located on the island of Ostrovul Banului, precisely vis-à-vis the village of Gura Vaii. There was actually a group of three islands, of which only Ostrovul Banului belonged to Romania. Not mentioned in the literature previously published is the fact that, at this point, directly across the Danube, the small River Jidostita disperses its waters. Before the formation of the hydroelectric plant, the Jidostita formed an alluvial fen advancing far into the river and considerably narrowing the distance to the island, making it easily accessible.

The site was located on the south end of the island, which was flooded 2 or 3 months of the year. Presently only a small portion of the island remains



Bones	Frontal – 2 fragments	Parietal – 6 fragments	Occipital – 1 fragment
Description	Frontal squama and eminences, left coronal suture and small one on the right side.	Left parietal has almost entire sagital suture, the parietal tuber, and a small portion of parietal striae. The right parietal was fused to the left parietal in the second half region of sagital suture. There is another fragent of right parietal with striae region.	Piece with external protuberance.
Thickness of bones	Metopion right (12.00mm) and left (10.5mm); on left bregma (8.7mm) and limits of first and second coronal suture (11.4mm)	11–12.5mm	13.5mm
Estimated sex	The nuchal crest shows a little development, and sexually diagnostic features are ambiguousč but the thickness might indicate a male.		
Estimated age	Using the cranial suture, the age at death could be 30–35 years.		

BUIKSTRA J. E. & UBELAKER D. H. (eds.), 1994. *Standards for Data Collection from Human Skeletal Remains*. Arkansas Archaeological Survey Research Series, no. 44.
WHITE T. D. 1991. Human Osteology. San Diego.

Tab. 3. Icoana. Human skull and related morphological data.

above the water level. The excavations were begun in 1966, and performed by Petre Roman for the upper, post Mesolithic period, and by Boroneanţ for the Mesolithic and earlier periods (*A. Boroneanţ, V. Boroneanţ, personal communication*). Boroneanţ excavated six trenches of an unknown area. No site distribution map has been published.

Paunescu advances the hypothesis that the Mesolithic Schela Cladovei found at Ostrovul Banului represents a very late phase of this culture, but some doubts may arise from the reliability of the ^{14}C dates (*2000.391*). Concerning the archaeological stratigraphy, Paunescu (*2001.381*) identifies the following cultural levels from upper to lower. The stratigraphy at Ostrovul Banului is problematic as a result of the fact that there are two strata associated, according to lithic typologies, with pre-Mesolithic cultures (*Boroneanţ 2000b; Mogoseanu 1978; Paunescu 2000*).

Some authors (*Boroneanţ 1973c.8*) simply noted the stratigraphy at Ostrovul Banului as 'Epipaleolithic I' (the oldest), 'Epipaleolithic II', 'Epipaleolithic IIIa' (oldest Mesolithic Schela Cladovei?), and 'Epipaleolithic IIIb' (youngest Mesolithic Schela Cladovei?). Others (*Paunescu 2000.382*) describe the stratigraphic sequence at Ostrovul Banului as cultural levels I (the oldest) and II Tardigravettian of Mediterranean type, and level III and IV as Mesolithic Schela Cladovei. Yet others (*Mogoseanu 1978*), referring only to the pre-Mesolithic layers, use the term 'Romanello-Azilian'.

Typologically, the stone tools from the pre-Mesolithic levels at Ostrovul Banului were thought to be identical with those at Cuina Turcului (*Paunescu 1970; 2000*), a cave situated on the Romanian Shore of the Danube Canyon, less than 200 m from Veterani Terasa (Fig. 2). The confusion is accentuated by the radiocarbon dates for the tool assemblages from Cuina Turcului, of 10 650±120 BC, 10 100±120 BC, and one date of 8175±200 BC (*Mogoseanu 1978.339*) and a possible relation with the proximate site of Baile Herculane-Pestera Hotilor on the Danube's tributary Cerna River (Fig. 1), dated 11 460–11 310 BC (1σ) (*Paunescu 2000a.146*). Mogoseanu cautiously underlines the estimated 2000 year difference between these dates, if Ostrovul Banului is to be considered one of the most recent pre-Mesolithic Schela Cladovei culture sites; at Iron Gates sites, dates of about 8000 BC are associated with Mesolithic Schela Cladovei assemblages. The dates from Ostrovul Banului and Cuina Turcului will be discussed in more detail in a subsequent section of this paper.

Fig. 10. The Island of Ostrovul Banului, median-left. In the background the 'Iron Gates I' dam.

Samples associated with Mesolithic Schela Cladovei culture remains at Ostrovul Banului yielded dates between 6300–7300 BC (Tabs. 1, 2). As a consequence, according to our present state of knowledge, it is almost impossible to outline a temporal framework for the ending of Tardigravettian and the beginning of the Mesolithic Schela Cladovei at Ostrovul Banului; on the other hand, it seems unlikely that a Tardigravettian group would have survived that late only at Ostrovul Banului, surrounded by Mesolithic Schela Cladovei groups. Attempts to parallel pre-Mesolithic Schela Cladovei developments with other Iron Gates sites like Cuina Turcului and Baile Herculane – Pestera Hotilor (*Boroneanţ 1973a; 1973c; 2000a; 2000b; Prinz 1987; Radovanović 1996a; 1996b; Tringham 2000*) remain problematic (*Mogoseanu 1978; Paunescu 2000*).

As a parenthesis, it must be noted that no Mesolithic Schela Cladovei remains have been uncovered at Baile Herculane-Pestera Hotilor (*Bitiri 1959; Nicolaescu-Plopsor 1959; Nicolaescu-Plopsor and Comsa 1957; Nicolaescu-Plopsor et al. 1957; Nicolaescu-Plopsor and Paunescu 1961; Paunescu 2001a*) or at Cuina Turcului (*Paunescu 1970; 2000*).

Schela Cladovei

Given the archaeological material uncovered, this is the most important Schela Cladovei culture site. The site is located in Turnu Severin, at the SW end of the city. Although located directly on the bank of the Danube, prior and after the construction of the dam it was less affected by river flooding and increases in the water level compared to any of the other sites because the bank was higher. Technically, the location is still part of the Iron Gates, but in fact it is placed downstream of Gura Vaii point, where the river valley widens and the current slows. There was rela-

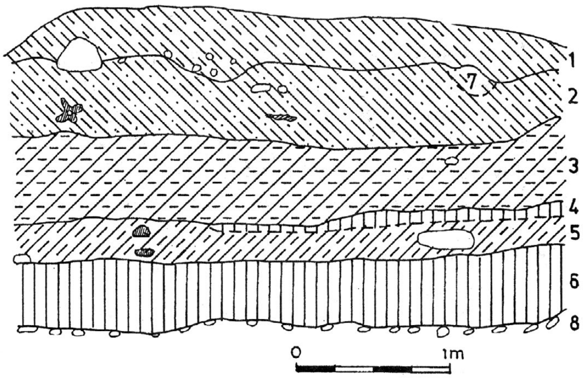


Fig. 11. South profile of the test pit Nr. 3 at Ostrovul Banului (*Boroneanţ 1973c; Paunescu 2000*): 1. brown-reddish soil of about 0.15–0.48 m – Level IV Mesolithic Schela Cladovei (*Boroneanţ 1973c.8 *refers to 'Epipaleolithic IIIb'); 2. yellow-grey compacted soil of about 0.28–0.50 m – Level III Mesolithic Schela Cladovei (*Boroneanţ 1973c.8 *refers to 'Epipaleolithic IIIa'); 3. yellow-grey sandy soil of about 0.37–0.52 m – Level II Tardigravettian of Mediterranean type (*Boroneanţ 1973c.8 *refers to 'Epipaleolithic II'); 4. clay sediment of about 0.05–0.12 m; 5. light-yellow sandy soil of about 0.20–0.25 m – Level I Tardigravettian of Mediterranean type (*Boroneanţ 1973c.8 *refers to 'Epipaleolithic I'); 6. dark-yellow soil of about 0.37–0.48 m, sterile; 7. gravel. Boroneanţ did not originally offer a scale (*Boroneanţ 1973c*), but Paunescu added one (*Paunescu 2000*).

tively reduced shore erosion, although it was obvious that the water had destroyed part of the site.

Archaeological work was begun in 1965 under Boroneanţ, and continued in 1967, 1968, and 1982. A second campaign was undertaken from 1991 to 1996 by a British team (*Bonsall et al. 1997; Bonsall 2004; Bonsall et al. 1996b; Bonsall et al. 2000a; Bonsall et al. 2002*). During the summer of 2002 the local authorities reinforced the shore, in an attempt to prevent its further erosion. Presently there is left an area about twice the size of a football field, which gradually has been occupied by the local people and used for gardens and small corn fields. The site is in great danger of being totally destroyed by the locals.

Schela Cladovei offers a number of advantages as a location. It is placed right on the river bank, which gently rises into a forested hill. At about 300 m up the hill there is a small spring that flows in seven smaller streams down into the Danube around and across the site, insuring fresh, clean water. Being placed at the eastern extremity of the Gorge, the site inhabitants could practically control access to and from the canyon. The surroundings consist of very low hills covered by rich, mixed vegetation offering food for humans and animals. The hills are very easy to cross by foot.

There are no pictures of the site before excavations began, but Paunescu mentions that it covered an area of about 2 km between the naval dock and a border patrol post (*Boroneanţ 1990a; Paunescu 2000*). The site was continuously affected by different construction projects such as installations of water abduction pipes, the transformation of the beach into a gravel and sand quarry, and other smaller or larger, and recently more or less permanent structures were built.

According to Boroneanţ (*2000b*), the site is divided into two sections, east ('Sector A') and west ('Sector B'), of the small creek that flows into the Danube. Although scant Mesolithic traces were found west of the creek, the actual Mesolithic habitation was found only on the area east of the creek, up to the proximity of a railway check point. A map of the excavations was published (*Boroneanţ 2000b.277*): in 'Sector B', during 1967–1968, excavations extended for about 140 m and a width of about 1.80 m–4 m, depending of the sinuosity of the shore. During 1982–1989, apparently on the same 140 m, excavations were extended into the shore to a depth of 4.50 m. In 1990, excavations were performed west of the1968 area, on both sides of an access road from a closed gravel quarry. The total of area uncovered during this episode appears to be of about 30 m in length and 1.80 m to 6 m in width (*V. Boroneanţ and A. Boroneanţ, personal communication*).

Paunescu (*2000.449*) inserts the observation that at least part of the faunal osteological material identified by Bartosiewicz (*Bartosiewicz et al. 1995*) has its provenance in amalgamated remains that strati-

Fig. 12. The Schela Cladovei site, partly covered by vegetable gardens and corn plantations.

graphycally have been almost impossible to separate by levels, and is therefore unsure.

Although comparable in importance with Lepenski Vir, before 1990 there were no radiocarbon dates for this site. Some dates were offered after 1990 (*Bonsall 1997; Bonsall et al. 1996; Bonsall et al. 2004; Bonsall et al. 2000; Cook et al. 2002*).

Stratigraphycally, there appears to be a level defined by Boroneanţ (*1973c; 2000b*) Epipalaeolithic II (the oldest), and one Epipalaeolithic I. The same author uses 'Schela Cladovei' (*Boroneanţ 1973c.8*) and 'Schela Cladovei II' (*Boroneanţ 1973c.9*), but it is impossible to determine if the former means Epipalaeolithic I and the latter Epipalaeolithic II, or *vice versa*. In the periodization offered by the same author, the Schela Cladovei site appears under Schela Cladovei culture phases II and III (*Boroneanţ 1973c. 15*). According to the fact the phase I of the periodization is the oldest, it may only be assumed that phase II is associated with Schela Cladovei II, or, Epipalaeolithic I, and phase II with Schela Cladovei I, or, Epipalaeolithic II. thers (*Paunescu 2000*) identify an oldest Tardigravettian level, and a second upper level of Mesolithic Schela Cladovei. There is no mention of an archaeological sterile dividing these two levels. In Paunescu's (*2000.439*) opinion, enumerating from upper to lower the cultural levels at Schela Cladovei, he notes level II, Mesolithic Schela Cladovei, the only level associated with this culture (according to Boroneanţ the Epipaaleolithic I, in other words Mesolithic II Schela Cladovei culture) and level I Epipalaeolithic Tardigravettian of Mediterranean type (according to Boroneanţ the Epipalaeolithic II, in other words Mesolithic I Schela Cladovei culture).

Ostrovul Corbului

The island of Ostrovul Corbului is 16 km upstream from Schela Cladovei on the Danube, between fluvial Km 911 and 916. At the point where the Danube waters separate embracing the island, is Hinova village, and the point is called 'Botul Piscului'; again where the two branches of the Danube reunite there is the village of Baloti and the point is called 'Botul Cliuciului'. The excavations at Botul Cliuciului were conducted in two areas: A1, right at the point where the Great Danube (the main branch) and the Lesser Danube (the smaller branch) reunite, and A2, about 120 m upstream on the Greater Danube bank. Only in area A1 have Mesolithic Schela Cladovei remains been uncovered.

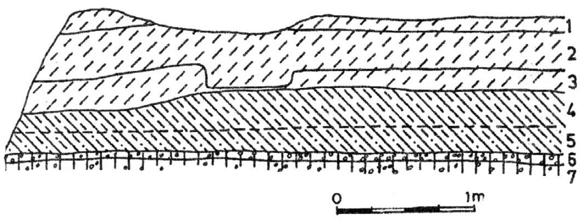


Fig. 13.The west profile of Section B1 at Schela Cladovei (*Boroneanţ 1973c; 2000b; Paunescu 2000*): 1. Humus, XVII–XIX cent. of about 0.12–0.16 m; 2. light-brown soil of about 0.25–0.38 m – Starčevo-Criş; 3. dusty dark yellow soil of about 0.15–0.25 m – Starčevo-Criş; 4. dark yellow dusty soil of about 0.12–0.30 m, Mesolithic Schela Cladovei (*V. Boroneanţ 1973c.4* refers to 'Epipalaeolithic I'); 5. dusty light-yellow soil 0.16–0.20 m – Tardigravettian; 6. mud and stones layer of about 0.05–0.08 m; 7. gravel (*V. Boroneanţ 1973c.4* refers to 'Epipalaeolithic II'). A scale was not originally offered by Boroneanţ (*1973c*), but added by Paunescu (*2000*).

The excavators conducted a more careful and detailed excavation. As a result, the nature and the volume of information available from Ostrovul Corbului is far superior compared to any of the other Schela Cladovei sites.

One particular event occurred during excavations (*Petre Roman, personal communication*) not mentioned in any publications about this site. The management of the hydroelectric plant announced that a stop was going to be put on the water drainage for 4 hours. The excavation team took advantage of the lowering water level and were able to extend the excavation for almost 7 m into the riverbed, uncovering Mesolithic Schela Cladovei artefacts to a depth of about –2 m. The excavation map included the area (*Paunescu 1996.71*), but explanations were never offered in print.

There are a number of available stratigraphies for the Mesolithic sections. Here we will be present the ones most discussed by the excavators (*Mogoseanu 1978; Paunescu 2000*). According to all stratigraphic profiles (*Mogoseanu 1978; Paunescu 1990; 2000; Roman 1987*) there are two Mesolithic Schela Cladovei culture strata, not separated by archaeological sterile, and not preceded by an Epipalaeolithic layer. It appears that for archaeologists unfamiliar with the Romanian language, there is a recurring misunderstanding of one particular characteristic of Section XI (A–B). The section was excavated by Mogoseanu (*1978*), who uncovered seven fire hearths within the two Mesolithic Schela Cladovei levels. Four of these hearths, representing three superimposed levels of Mesolithic occupation, were uncovered in the

Fig. 14. Ostrovul Corbului at Botul Cliuciului. Excavations were covered by the dam and the road from where the picture was taken. On the right the Lesser Danube can be seen.

shelter or hut marked with a red X in Fig. 15. There is one hearth at the bottom of the hut, one at a median level, and two at the upper level, separated by alluvial sediment suggesting powerful floods. Mogoseanu suggests that one and the same group of people built and rebuilt the first two levels of hearths, and a second group built the third, upper level of hearths. As a total, however, for the entire cultural deposition associated with Mesolithic Schela Cladovei culture, Mogoseanu specifies:

"*In total, stratul de cultura Schela Cladovei, gros de circa 0.70 m (din care este exclusa adincimea locuintei) numara 7 nivele de locuire, fiecare nivel fiind marcat printr-o noua constructie de vatra de foc.*" [As a total, Schela Cladovei cultural level, about 0.70 m thick (from which the depth of the shelter is excluded) contains 7 levels of habitation, each being marked by a new construction of fire hearths.] (*Mogoseanu 1978.339*)

The three fire hearth levels associated with the shelter are considered to be two levels of occupation: the bottom two hearths one level, as constructed by the same group of people, and the upper hearths another level, built by a different group of people. The total of 7 levels of habitation consists of these two, plus 5 other fire hearths uncovered only on level I (phase I) Mesolithic Schela Cladovei (Fig. 15, excavation level 7; Fig. 16, excavation level 11), as explained by Paunescu (*1996. 134–135*). For the second phase of Mesolithic Schela Cladovei culture, only 3 hearths were uncovered, all in Section I (Fig. 16, excavation level 10). Fortunately, the excavators made available both the depths of the hearths and their association with phase I or II of Mesolithic Schela Cladovei, and the depths of the radiocarbon samples and their association with the phase I or II of this culture. Due to this fact, Ostrovul Corbului is the only site where it is possible to obtain a better evolutionary image of Schela Cladovei culture.

Ostrovul Mare

The island of Ostrovul Mare is the easternmost Mesolithic Schela Cladovei culture site. The island is engulfed by the Danube proper and a lesser branch of the river, called Dunarea Mica (Lesser Danube). It is 14.5 km long, and has a width varying between 3.2 km at Bivolari-Schela and 0.800 km at Padurea Mica.

The island has been excavated since the beginning of the century by numerous archaeologists, revealing remains belonging to the Neolithic, Bronze Age, Iron Age, Roman, and Medieval periods (*Paunescu 2000*). In 1978 Boroneanţ began to excavate at Danube Km 873 and 875. Most unfortunately, the excavator never published articles dedicated entirely to this site, except for a preliminary report (*Boroneanţ et al. 1979*). Scant information and vague references were inserted in texts on the Schela Cladovei culture, providing a general description (*Boroneanţ 1990; 1982; 1980; 1979*).

The excavations were performed in two locations: Point Km. 873, and Point Km. 875. Information is tangential and extremely brief. There is no stratigraphic chart or specification on the depth of the strata. At both points there are two levels of Mesolithic Schela Cladovei culture, not separated by archaeological sterile (*Paunescu 2000*). According to the infor-

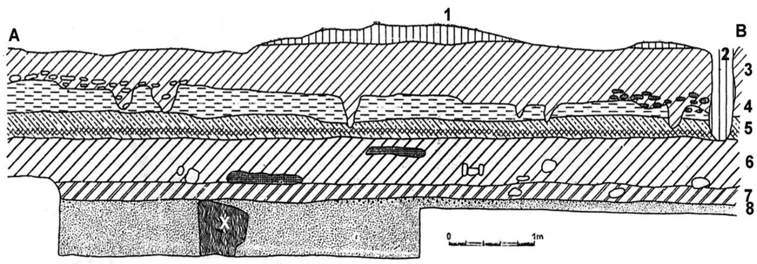


Fig. 15. South profile of Section XI (A–B) (**Mogoseanu 1978; Paunescu 1990; 2000*****). 1. archaeologically sterile. 2. Neolithic Cotofeni hole; 3. grey yellow soil of about 2.63m – Neolithic Salcuta; 4. Light brown layer of about 0.35m, archaeologically sterile; 5. dark brown soil of about 0.25m – Neolithic Starčevo-Criş; 6. black clay of about 0.45m – Level II Mesolithic Schela Cladovei; 7. Light brown soil of about 0.20m – Level I Mesolithic Schela Cladovei; 8. Alluvial material. White X: hut.***

mation offered in this section, it is only possible to assume that by 'Paleolithique Supérieur' (*Boroneanţ 2000b*) Boroneanţ generally meant Epipalaeolithic; by Epipalaeolithic he generally meant Mesolithic; by 'Epipaleolithic I' he meant 'Mesolithic I'; and by 'Epipalaeolithic II' was meant 'Mesolithic II'. Considering also the fact that at some sites there were actual Epipalaeolithic I and II levels, this would translate chronologically as Epipalaeolithic, Mesolithic I, and Mesolithic II. According to other sources, 'Paleolithicque Supérieur' meant the Aurignacian from Baile Herculane-Pestera Hotilor, and by Epipalaeolithic is meant both the Tardigravettian and the Mesolithic as one cultural phenomenon (*Boroneanţ, personal communication*).

It has been suggested that at most Schela Cladovei sites there are two phases of occupation for Schela Cladovei Culture (*Boroneanţ, personal communication*) generally divided by an archaeological sterile layer. However, as shown in the published stratigraphies (*Boroneanţ 1973c; 2000b; Paunescu 2000*), it is not possible to distinguish an archaeologically sterile between the Mesolithic levels. Instead, in some cases there is such a stratum between an Epipalaeolithic level, sometimes called Tardigravettian of Mediterranean type, and the layers associated with Mesolithic Schela Cladovei culture. As can be seen, there is a major problem regarding stratigraphic explanations residing from a total lack of differentiation between such concepts as excavated layer, cultural layer, cultural phase. For instance, while Boroneanţ (*1973a*) refers to the Mesolithic deposits at Ostrovul Banului as 'Epipaleolithic IIIa' and 'Epipaleolithic IIIb', Paunescu (*2000*) refers to the same deposits as 'Ostrovul Banului level III' and 'Ostrovul Banului level IV'. Subsequently, in the same publication, Paunescu (*2000.386*) uses 'Ostrovul Banului IIIa' and 'Ostrovul Banului IIIb', and only one page further on (*2000.387*) refers only to 'Ostrovul Banului III'. Also Paunescu informs us that the samples for radiocarbon dating were collected by Boroneanţ from 'level III' (*Paunescu 2000.67*). The unanswered question: does 'level III' and 'Epipaleolithic IIIb' refer to the same cultural phase of Mesolithic Schela Cladovei culture at Ostrovul Banului?

The 'tell' of the new radiocarbon dates

All samples for the new AMS dates presented here (Tab.1) were obtained from strata associated with the remains of Mesolithic Schela Cladovei culture such as antler tools (*Boroneanţ 1970; 1990b; 2000b*) (Fig. 17) or lithics (*Paunescu 2000*).

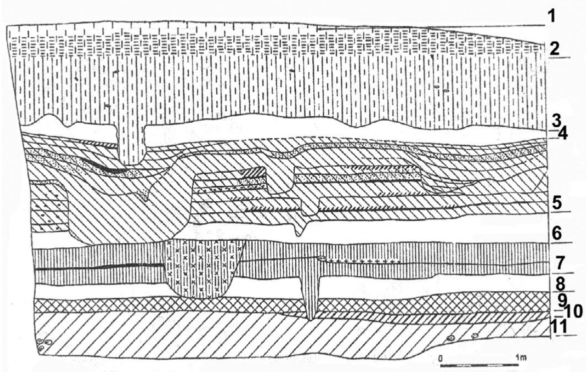


Fig. 16. Segment of the West profile of Section I (central) (**Paunescu 1990; 2000*****): 1. modern deposition of unspecified depth; 2. unspecified soil of about 0.30m – Doco-Roman; 3. unspecified soil of about 0.90m – Bronze Age; 4. unspecified soil and depth – archaeologically sterile; 5. unspecified soil of about 1.24m – Neolithic Cotofeni; 6. unspecified soil and depth – archaeologically sterile; 7. unspecified soil of about 0.60m – Neolithic Salcuta; 8. unspecified soil and depth – archaeologically sterile; 9. unspecified soil of about 0.42m – Starčevo-Criş; 10. unspecified soil of about 0.34m – Level II Mesolithic Schela Cladovei; 11. light yellow clay of about 0.29m – Level I Mesolithic Schela Cladovei.***

These dates confirm some of the facts suggested by the old dates obtained from Icoana (Tab. 2): the depth of the samples is not always in accordance with the age. This situation was signalled at an early stage of site analysis by the samples Bln–1078 and Bln–1077 at Icoana, as explained in the preceding section. The new dates put a particular accent on this site, suggesting that it may represent the oldest Mesolithic in the Iron Gates region, at least for the northern bank of the Danube; there is one date later than 8800 BC, twelve dates older than 8000 BC. In assigning two levels of Mesolithic at Icoana, Boroneanţ considered the fact that there were antler and wild boar canine tools in both levels, and that these tools were identical to those from the site at Schela Cladovei. No such tools were found in the Tardigravettian levels at Cuina Turcului or other Mesolithic Iron Gates sites, such as Ostrovul Banului.

As a consequence, if Boroneanţ was right in his judgment and there are indeed two Mesolithic levels at Icoana, it means that:

❶ a Mesolithic population showed up in the Danube Gorge immediately after 9000 BC, with an already well-defined antler and bone tool-making technology;

❷ these people were already adapted to an economy consisting of both intensive fishing and hunting;

Fig. 17. Mesolithic Schela Cladovei antler tools from Razvrata, Icoana, Alibeg, and Ostrovul Corbului.

❸ the antler and bone tool, and stone tool technologies were therefore not rooted in the previous Tardigravettian;

❹ by the time these people settled the Danube bank there may have been Tardigravettian groups inhabiting the river's defile, and these two cultures coexisted in parallel for some time. One of the three radiocarbon dates from the Tardigravettian layers (*Mogoseanu 1978; Paunescu 2000*) at Cuina Turcului (Fig. 1), a cave site where no remains associated with Mesolithic Schela Cladovei were uncovered (*Paunescu 1970; 2000*), shows a time range of 8175±200 BC (*Mogoseanu 1978.339*). There are six date at Icoana older that 8200 BC. It is also possible that late Tardigravettian groups were present at Ostrovul Banului (*Mogoseanu 1978*).

Paunescu (*2000.394–400*) considers the lowest level at Icoana to be Tardigravettian, on the basis of the lithic technology of some 100 identifiable pieces. It has to be noted that, generally, the cultural remains of this level are scarce. However, there is one huge problem regarding the dates from Cuina Turcului. As shown above, Mogoseanu lists the date Bln-802 as 8175±200 BC. The same sample is presented by Paunescu (*2000.342*) as being dated 10 125±200 BP. If OxCal calibrated for one sigma, it shows a range of 10 150–9350 BC (68.2 %), or, about 9750±400 BC, a time period far earlier than the one presented by Mogoseanu. There are no details offered by the Mogoseanu, therefore it is impossible to comment on his source for the calibration of this date. If the oldest date of about 8800 BC is compared to the late date of about 9700 BC from Cuina Turcului, there is a difference of about 900 years. Such a time span may be long enough, but all the same, short enough to leave room for speculation on the relationship between the final Tardigravettian and the early Mesolithic at Iron Gates.

One other significant fact revealed by the corroboration of the new and old dates from Icoana is the longevity of the site occupation from about 8800 BC to perhaps 6000 BC. The long sequence of radiocarbon dates offers a most needed reference point for a comparison among all the Mesolithic sites on both sides of the Danube. There is one old radiocarbon date of about 4800 BC, which doubtlessly should not be associated with the Mesolithic period. Unfortunately, there are no details about the sample, but it appears that the cultural layer of its provenance should be associated with the Neolithic Starčevo-Criş.

It is impossible at this point to speculate on the nature of the site's occupation. It is more likely, however, that the site was not occupied permanently all year round. Considering its location and proximity to the site at Razvrata, it has been suggested that these were probably twin sites, probably outposts of a base-site located in the Mraconia River Depression (Fig.2) (*Bolomey 1973*) which is at present mostly under water. There are two new dates from Razvrata, both showing a time range of about 8100 BC, and an old one of about 6500 BC. The new dates make Razvrata one of the oldest Mesolithic sites on the northern shore of the Danube, and strongly suggest either a parallel, or an alternate coexistence with Icoana. It is simply impossible to say if people were moving back and forth between the two locations, or if they were actually living at the two locations at the same time, or both. It is clear, however, that the sites were contemporary, and that human activity at Razvrata lasted for a very long time. The stratigraphy of the site is identical to the one at Icoana, generating the same controversial interpretations. Probably the most interesting thing about the cultural development in the vicinity of the River Mraconia is the possibility that Icoana and Razvrata on the northern side of the Danube, and Hajdučka Vodenica (Fig. 2) on the southern side represent in fact a related cultural evolution. There are only a few dates from Hajdučka (*Borić and Miracle 2004*) ranging about 7400–8200 BC; the three sites appear to have been contemporary for some time. Again, according to the available data, it may not be possible yet to speculate if same group of people settled on both sides of the Danube at the mouth of the Mraconia, but according to the location of the sites, it is hard to believe that if inhabited at the same time, these people would have ignored each other. Also, according to some stable isotope results of human, animal, and snail shell, it appears that the Mesolithic people of Iron Gates did move up and down the defile at least to some degree. One great exception appears to be the inhabitants of the Schela Cladovei site. The values obtained from these individuals may be interpreted in a two ways: either people from along the Danube defile came over and settled at Schela Cladovei, or inhabitants of Schela Cladovei travelled intensively on the river (*Dinu 2006*). Hopefully, future research related to the human DNA of individuals uncovered on the both sides of the Danube (*present authors; Dusan Borić, personal communication*) will shed some light in this direction.

From Ostrovul Banului there is only one new radiocarbon date ranging around 7300 BC, which is somehow close to one of the old dates ranging around 7100 BC. A second old sample produced a date of about 6500 BC. Comparing these dates with the sequence from Icoana, it appears that at least at one point in time this site also represented a cultural development contemporary with the one present at the mouth of the Mraconia River. The new radiocarbon date is almost identical to one of the old dates from Ostrovul Corbului, and comparing all the dates from the two sites, they appear to cover the same period.

Considering also the four dates available from both Mesolithic levels at Ostrovul Corbului, it appears that these sites represent a later Mesolithic development at Iron Gates; and comparing them to the dates from Ostrovul Banului, it may be that the Mesolithic at the later site also represent a late phase in the defile. Ostrovul Banului is a site that, in corroboration with the information from Cuina Turcului and Icoana, may offer crucial information on the cultural sequences at Iron Gates. The Tardigravettian and the Mesolithic layers are well defined, allowing for a clear differentiation between the cultural layers and phases. However, the lack of more precise stratigraphic information does have an effect on the interpretation of the radiocarbon dates. The new date of about 7300 BC was generated by a sample whose provenance context was surely Mesolithic, but whose depth was relatively low: only –0.40 m. According to the stratigraphic profile and the scale (Fig. 11) such a depth must be somewhere on the border between the first and the second phases of the Mesolithic. No details are available about the other two samples from Ostrovul Banului for a comparison. The new date of about 6800 BC from Ostrovul Mare is currently the only one available, making any chronological speculation about this site impossible, other than that at one point it was contemporary with Icoana-Razvrata, Ostrovul Banului, Ostrovul Corbului, Schela Cladovei.

Interestingly, the eight new radiocarbon dates from Schela Cladovei, comprising a time span from about 7300 BC to about 5700 BC represent a perfect continuation of the dates offered previously (*Cook et al. 2002*) covering a range from about 7600 BC to about 7400 BC, and offering a comparative reference for some 2000 years of cultural development. None of these 8 dates is older than about 7300 BC, which may confer some degree of confidence in considering Schela Cladovei a site that formed and developed at a much later time than Icoana, Razvrata, or the very little understood site of Alibeg. Equally important, the date of 5725–5625 BC generated by a sample from –0.45–0.53 m, may reflect the last period in the existence of the Mesolithic at Iron Gates. It has been suggested that the Neolithic Starčevo elements appeared in the region by 6070–5720 BC (*Bonsall et al. 2004*). Considering some of the older dates, it has to be noted that offered more recently (*Boroneanţ 2000.85–86*) for Alibeg (Pescari-Coronini), of about 8410±100 BC, that appears to be less known to scholars interested in the Mesolithic and Mesolithic-Neolithic transition in Europe. Besides this date, there is another of about 6100–5980 BC (*Paunescu 2000*) according to which Alibeg was considered a very late site (*Paunescu 2000; Prinz 1987; Radovanović 1996a;1996b; Tringham 2000*). The date of about 8400 BC drastically changes this status, matching some of the oldest dates for Icoana, and making Alibeg one of the earliest Mesolithic sites at Iron Gates.

In summarizing the above information, a few ideas can be outlined. First, the chronological sequence at Icoana seems to cover most, if not the entire evolution of the Mesolithic at Iron Gates. It provides a comparative timetable for all the other sites on both banks of the Danube. Second, the new radiocarbon dates reshape the entire chronological sequence for the Mesolithic at Iron Gates. The sites at Icoana, Razvrata, and Alibeg appear to be much earlier than previously thought, substantially pushing back the time range for the appearance of the Mesolithic groups in the region. Third, the situation at Icoana-Razvrata and the early date from Alibeg raises some questions about the cultural sequence for all the Iron Gates Mesolithic sites:

❶ if there was a cultural continuity from Tardigravettian to Mesolithic, why would an abrupt change in the antler tools technologies occur by 8800 BC, and

❷ comparing the radiocarbon dates from Icoana, Alibeg and Cuina Turcului, it is very difficult to explain why perforated antler tools were present at Icoana by 8800 BC, but not present only a few hundred meters upstream at Cuina Turcului by about the same time. It must be underlined that no perforated antler tools were found in the level diagnosed as Mesolithic at Veterani Terasa. Of course, the discrepancy between the dates for the final Tardigravettian at Cuina Turcului must be also considered.

Fourth, the corroboration of the new and old dates raises some questions on the validity of the relative chronology on which previous periodization models were constructed, and the stratigraphic considerations on which these relative chronologies were based. There is an obvious discrepancy between some of the depths inscribed on the radiocarbon samples and the results. Although at present it is extremely difficult to reevaluate the stratigraphy at some of these sites, it is not impossible, and hopefully, future research will at least in part clarify this problem.

Periodization: absolute and relative chronology

Due to the fact that at present the archaeological material at most of the sites presented above, can only be analyzed according to the depth inscribed on it, and that the scale offered for each stratigraphic profile appears to be rather approximate and in some cases totally wrong, it is extremely challenging to determine where one particular sample actually came from. Moreover, in cases such as Icoana, early signs that the relative and absolute chronology were in total contrast as confirmed by Bln–1078 and Bln–1077 were ignored. As a consequence, items found at a particular depth may have been interpreted as they belong to an earlier or later level of occupation, but generally the logic according to which, the upper-younger, and the lower-older, seems not to have been always true for a site like Icoana. Such being the situation at one site, questions may be raised about others excavated by the same archaeologist.

This situation is perpetuated mainly due to the periodization advanced by some Romanian archaeologists (*Boroneanţ 1973c; Paunescu 2000*) as a reflection of their views of the cultural evolution at Iron Gates. Some even advanced the hypothesis that there was an uninterrupted evolution from the Upper Paleolithic to Neolithic:

"*If the Neolithic was introduced from outside, where did it come from? The present author believes that it did not come from outside ... The present author believes that the discovery of clay baking and processing towards the end of the Epi-Paleolithic in this particular zone led to the abandonment of the processing of river boulders into artistic forms in favour of the processing of clay into pottery and idols.*" (*Boroneanţ 1990b.479*)

Such models, in which the evolution of Mesolithic Schela Cladovei culture is seen as a smooth linear evolution from local Tardigravettian developments and a basis for a locally evolving Neolithic (*Boroneanţ 1973.15–16*) were based on the interpretation of an earlier and a later phase of the Mesolithic at Iron Gates. Although similar in results, such models are in total contrast with those advancing the idea that in most cases the earlier Mesolithic level was in fact Tardigravettian (*Paunescu 2000.40, 49, 52*). Other authors are critical of these views (*Mogoseanu 1978.345–346*), considering the absence of some raw material as quartzite, art, and portable artefacts, and stratigraphy at sites such as Ostrovul Corbului. Such authors advanced hypotheses according to which the Mesolithic at Schela Cladovei could have originated rather the very late echoes of a Mousterian found at Baile Herculane-Pestera Hotilor (Fig. 1).

The absence of radiocarbon dating meant that these models had to be constructed mainly, and in some cases solely, on a parallel analysis of the archaeological material. Of all periodizations, the most influential is that offered by Boroneanţ (*1973c*), who explains that:

"*La periodization de la culture Schela Cladovei procède des données fournies par sa structure matérielle et des modifications que cette-dernière a subies*." (*Boroneanţ 1973c.15*)

According to such changes in the material culture, four stages of evolution were identified (*Boroneanţ 1973.15*):

1st stage and the oldest at Veterani Terasa; 2nd stage at Icoana I, Razvrata, Schela Cladovei, Ostrovul Corbului IIIa; 3rd stage at Icoana II, Schela Cladovei, Razvrata, Ostrovul Corbului IIIb; 4th stage at Alibeg.

In the absence of radiocarbon dates from Veterani Terasa, it is not possible to make any references to this site. Considering only the absolute chronology offered by the new and old dates from the rest of the sites, it is possible, however, to offer a Mesolithic absolute chronology (Fig. 18), on approximately 500 year periods:

1st stage, about 8800–8300 BC: Icoana, Alibeg, (Veterani Terasa?);
2nd stage, about 8300–7800 BC: Icoana, Razvrata;
3rd stage, about 7800–7300 BC: Icoana, Schela Cladovei, Ostrovul Banului, Ostrovul Corbului;
4th stage, about 7300–6800 BC: Icoana, Ostrovul Banului, Schela Cladovei, Ostrovul Corbului, Ostrovul Mare;
5th stage, about 6800–6300 BC: Icoana, Ostrovul Corbului, Ostrovul Banului;
6th stage, about 6300–6100 BC: Icoana, Alibeg;
7th stage, about 5700–4800 BC: Schela Cladovei, Icoana.

The cultural phases of the Mesolithic layer were not noted for reasons related to discrepancies between sample depth, dating results, and stratigraphic interpretations as explained earlier in this paper.

Paunescu's identification of a Tardigravettian layer at sites as Alibeg, Razvrata, Icoana, was based solely on lithic analysis, sometimes the entire sample consisting of a rather small number of pieces being accepted as reliable; at Razvrata, for instance, the lower Mesolithic level labeled as Tardigravettian yielded a total of 90 pieces (*Paunescu 2000.393*). All other cultural elements were largely disregarded. As a consequence, we have considered this interpretation as unreliable.

Considering the fact that the new radiocarbon samples were collected from depths associated with Mesolithic cultural remains, among which signature Schela Cladovei antler tools represent a noticeable reference point, the fact that such tools were not found in pre-Mesolithic cultural levels at any of the sites at Iron Gates, and that Boroneanţ constructed his judgments on the presence of Mesolithic cultural evidence, we tend to agree with his identification of two Mesolithic cultural layers at the sites presented in this paper. On the other hand, we tend to disagree with the Boroneanţ model of a local cultural and demographic continuity from the Upper Palaeolithic to the Neolithic. Rather, based on the data presented in this paper, we suggest that the Upper Palaeolithic, the Mesolithic, and the Neolithic at Iron Gates represent separate stages of cultural development, and that the human populations associated with these stages were not related in any way.

It is interesting to notice that the earliest Neolithic remains at Iron Gates were uncovered at none of the sites associated with the Mesolithic, but at Cuina Turcului Cave, and, contrary to what may be expected, that is not the earliest Neolithic Starčevo in Romania. The two known Early Neolithic sites north of the Danube appeared at Circea (*Bolomey 1976; Nica 1976; 1977; 1993*), and Gura Baciului (*Biagi, Shennan and Spataro 2005; Biagi and Spataro 2005*), rather far from the Iron Gates. There are no dates for Circea, but Gura Baciului produced a date of about 7140±45 BP (*Biagi et al. 2005.46*). Calibrated OxCal (1σ, 68.2%) the date ranges from 6055–5985 BC. Although there are no radiocarbon dates for the lowest Neolithic Starčevo levels at Cuina Turcului, the

Starčevo ceramic appears to be clearly of a later Starčevo phase, associated by some with Starčevo-Criş IIA–IIB (*Nica 1979.22*).

Also contrary to expectations, the only Neolithic human remains, consisting of very few bones and skulls (*Paunescu 1996.146*) uncovered on the northern bank of the Iron Gates, came from Ostrovul Corbului (*Necrasov and Botezatu 1981; Paunescu 1996*), and not from large, complex Mesolithic sites such as Schela Cladovei. Unfortunately, the Neolithic human remains from Ostrovul Corbului have been not dated.

Comparing the radiocarbon date from Gura Baciului with the new and old dates listed in this paper, it is not difficult to see that there is only a date from Schela Cladovei, of about 5725–5625 BC (Tab. 1), and one from Icoana later than 5000 BC, that may be associated with the appearance of the Starčevo culture on the northern shore of the Danube at Iron Gates. Also, considering the ceramic typology and its association with a later phase of Starčevo, the date of 6120–5980 BC from Alibeg may still be too early to be connected in any way with possible Mesolithic-Neolithic contacts in the region. It may be said, therefore, with a fair degree of confidence, that the radiocarbon dates presented in this study rather infirm the hypothesis of Mesolithic-Neolithic contacts at Iron Gates.

Conclusions

The data presented in this paper is of dual importance: it reconfigures the absolute chronology for the Mesolithic at Iron Gates, and it raises some questions about the stratigraphic interpretation of the sites discussed here.

Although the new radiocarbon dates shed new light on the evolution of the Mesolithic on the northern bank of the Danube, there are still numerous gaps that may produce surprises. More dates are needed from sites at Ostrovul Mare, Ostrovul Banului, and Veterani Terasa in order to better understand the evolutionary trajectory of the Mesolithic at Iron Gates. The dates presented in this paper shed some light on the Mesolithic cultural trajectory at Iron Gates, but also raise questions about the beginning and the end of this period. For these questions to be answered at least in part, it is absolutely necessary for more radiocarbon dates to be obtained from the Tardigravettian levels at Ostrovul Banului, and the Neolithic site of Circea, the Neolithic human remains from Ostrovul Corbului, and from samples stratigraphically associated with the Starčevo ceramic at Cuina Turcului.

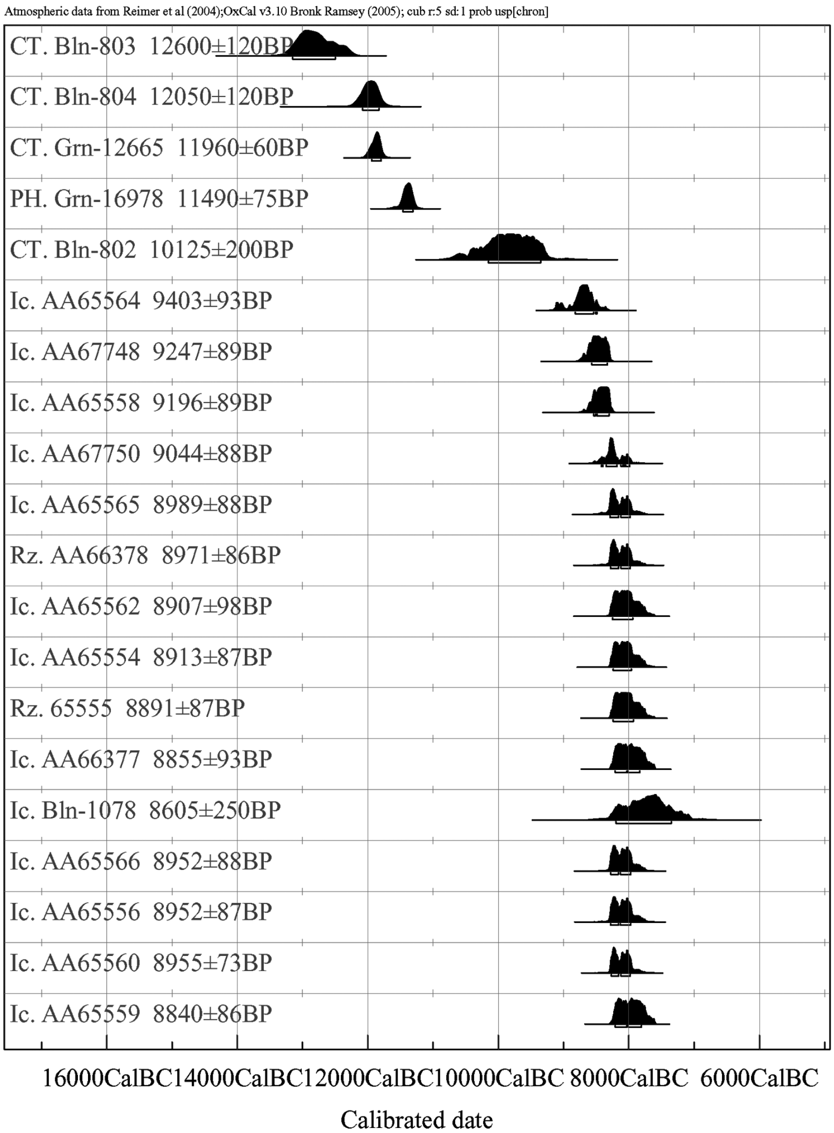


Fig. 18. Radiocarbon dates from sites discussed in this paper: CT, Cuina Turcului; PH, Pestera Hotilor – Baile Herculane; Rz, Razvrata; Ic, Icoana; SC, Schela Cladovei; OB, Ostrovul Banului; OC, Ostrovul Corbului; OM, Ostrovul Mare; Al, Alibeg; GB, Gura Baciului.

Fortunately, the site at Schela Cladovei is still accessible for future archaeological excavation. It appears, however, that the huge importance of this site in the general context of the European Mesolithic and Mesolithic-Neolithic transition is either not understood, or absolutely ignored by the Romanian forums; if no drastic measures for salvaging it are taken soon, it may be lost forever. Whereas it is not excluded that more Mesolithic sites are waiting to be discovered in places like Ostrovul Corbului and Ostrovul Mare, the complexity of Schela Cladovei, comparable only with Lepenski Vir, makes it unique among all the Mesolithic sites in Southeastern Europe and beyond.

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When did the 'Neolithic package' reach Lepenski Vir? Radiometric and faunal evidence

Dušan Borić[1] and Vesna Dimitrijević[2]
1 *University of Cambridge, UK,* db231@cam.ac.uk
2 *University of Belgrade, Serbia,* vesnadim@beotel.yu

ABSTRACT – *A recent dating program on animal bone samples from Lepenski Vir, along with faunal and various archaeometric analyses, allows us to suggest a new stratigraphic and chronological sequence for the Mesolithic-Neolithic site of Lepenski Vir in the north-central Balkans. In this paper, we particularly focus on the question of the introduction of domesticates to this site. By directly dating bones of domestic animals from the preserved faunal assemblage of Lepenski Vir, we show when the full 'Neolithic package' reached the site and interpret the character of this transformation.*

IZVLEČEK – *Program datiranja živalskih kosti iz Lepenskega Vira nam skupaj s favnističnimi in različnimi arheometričnimi analizami omogoča, da predstavimo novo stratigrafsko in kronološko sekvenco mezolitsko-neolitskega najdišča Lepenski Vir na severnem delu centralnega Balkana. V članku se osredotočamo na vprašanje uvajanja domestikatov na to najdišče. Z direktnim datiranjem kosti domačih živali iz ohranjenega zbira favne iz Lepenskega Vira prikažemo, kdaj je najdišče doseglo popoln »neolitski paket« in interpretiramo značaj paleoekonomske transformacije.*

KEY WORDS – Lepenski Vir; domesticates; Mesolithic; Neolithic; AMS; Danube Gorges

Introduction

The site of Lepenski Vir is one of the most important sites for studying processes involved in the transformation of pre-Neolithic Europe. Situated in the Danube Gorges of the north-central Balkans (Fig. 1), the site is considered the type-site of a regional group that encompassed at least 20 known, and probably many presently unknown, settlements along some 150 km of the riverine landscape on both banks of the Danube (*e.g. Radovanović 1996a; Srejović 1969; 1972*). Yet, despite the richness of the existing data, the site has not been published in a detailed way and there remains ambiguity and factual inconsistencies in the original reports and subsequent data published from this site. Such a situation requires rigorous scrutiny when treating the existing evidence, in order to overcome the interpretive conundrums that have accumulated since its excavation (*Borić 1999; 2002a*). In particular, there have been numerous problems relating to the stratigraphic sequence of this site and the dating of its most ubiquitous features: buildings with trapezoidal limestone floors (Fig. 2). There are more than 70 such structures at the site, and in the early days of research these features were dated with around 20 dates from charcoal (*Quitta 1975; Borić & Dimitrijević 2005*) which indicated the contemporaneity of the sequence with known Early Neolithic settlements across the Balkans from around 6300 to 5500 calBC (*e.g. Gimbutas 1976; Milisauskas 1978; Whittle et al. 2002; 2005*).

Yet many researchers of the site have been reluctant to accept this sequence of dates, and there has been some debate as to the reliability of the dates from

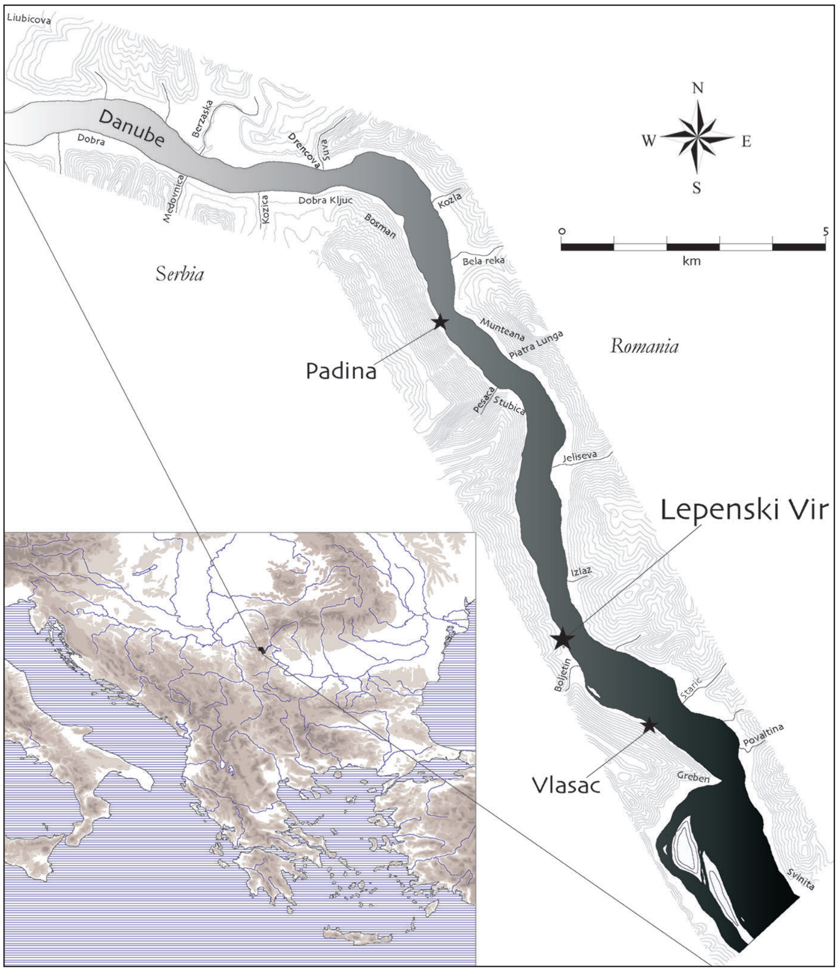

Fig. 1. Map of the Upper Gorge of the Danube Gorges.

Lepenski Vir (*e.g. Tasić 1992; Radovanović 1996a*). These reservations were to some extent due to the fact that such a chronological framework for the site did not correspond to the excavator Srejović's understanding of the phase with trapezoidal buildings as Mesolithic and his insistence on a radical break between the Mesolithic and the Early Neolithic occupations of the site (*Srejović 1969.161; 1972*). However, more recently, three new dates associated with the occupation/abandonment of trapezoidal buildings of Lepenski Vir suggest an overall agreement between charcoal conventional ^{14}C dates and new AMS (Accelerator Mass Spectrometry) dates from animal bones (*Borić 2002a; Borić & Dimitrijević 2005; Whittle et al. 2002*). Such dating is also in agreement with the idea that there are important similarities between the phase with trapezoidal buildings at Lepenski Vir and very similar buildings at the neighbouring site of Padina (*Borić 1999, 2002a; Jovanović 1969*), where the excavator (*Jovanović 1987*) found Early Neolithic pottery associated with the occupation of at least some, if not all the trapezoidal buildings at this site. Also, the publication of known, but previously unpublished, photographs showing Early Neolithic pottery on the floor of Houses 54 and 4 from Lepenski Vir (*Garašanin & Radovanović 2001*) supports a growing consensus that the phase of trapezoidal buildings at Lepenski Vir must have been confined to the Early Neolithic historical context (*Borić 1999; 2002a*).

In order to remove any doubts as to the absolute date of the trapezoidal features at Lepenski Vir, as well as to provide a more precise chronology for the complete stratigraphic sequence of Lepenski Vir, we have absolutely dated a number of contexts from this site that can elucidate these research questions. In this paper, we provide some of these new results and in particular discuss the question of when all elements of the 'Neolithic package', including domesticates, reached Lepenski Vir.

Fig. 2. Lepenski Vir, trapezoidal buildings (photo).

The research context of the dating program and results

The AMS dating programme was made possible through the Oxford Radiocarbon Accelerator Dating Service and was funded by the Arts and Humanities Research Council (AHRC) and the Natural Environmental Research Council (NERC) of the UK, which allowed us to successfully date 34 samples from Lepenski Vir of which 30 samples were taken from animal and 4 from human bones. The emphasis on dating non-canid animal bones in particular stemmed from the fact that it has been shown that the dating of human and dog bones in the Danube Gorges introduces a larger standard deviation due to the necessity for correcting these dates for the aquatic (freshwater?) reservoir effect.[1] Hence we chose to concentrate on the dating of animal bones from well-defined contexts and the four AMS dates of the human bones come from burials well-stratified within trapezoidal buildings, and the dates obtained are of comparative value.

However, dating animal bones is not without its share of possible problems. That is, dating animal bones even from well-defined contexts does not remove the possibility of dating residual remains in such contexts, *i.e.* that particular dated animal bones found in well-stratified contexts come from, older, disturbed contexts. The best solution for this is to date articulated or partly articulated animal carcases, on the assumption that the deposition of such a skeleton or its parts took place soon after the death of the animal, and that the dated context is the primary context of deposition. For instance, in our case, the dating of red deer skulls with antlers, which in several buildings at Lepenski Vir were left on the floor as (ritual?) acts of building abandonment, should be a good indicator about the abandonment of these features, although a possibility must be recognized that these might have been curated over a period of time. Details of all new AMS dates are published elsewhere (*Borić & Dimitrijević in press*), and here we provide a graph with the calibrated ranges of these dates (Fig. 3), which indicate that trapezoidal buildings cover the period from around 6200 to 5900 calBC.[2] It now seems that after around 5900 calBC most of the trapezoidal buildings at Lepenski Vir were abandoned and some of those that remained in use were primarily used for burial purposes (see footnote 2). The results of our dating program have necessitated a revision of the current phasing of this site and a reconsideration of stratigraphic relations.

To summarize these findings for the purposes of this paper, it suffices to say that the new dates indicate a very long duration of the Mesolithic period, from around 9400 to around 7500 calBC (Fig. 3). These early dates are concentrated in two particular periods that may point to two separate phases within these two millennia, with settlement discontinuities. It remains possible that there were many more occupation episodes that these dates do not encompass, and more AMS dates may indicate whether these two groupings with three dates per grouping are meaningful and representative of two separate and defined phases of occupation at this locale. This early period would correspond with the phase that the excavator Srejović (*1969.28–30, 42–47; 1972*) defined as Proto-Lepenski Vir, although his ideas about the spatial distribution of this phase, its interpretation, duration and relation to the later phase of trapezoidal buildings must be revised in the light of new AMS dates and other available data (*Borić & Dimitrijević in press*).

The phase with trapezoidal buildings probably starts only around 6300/6200 calBC, and most of the trapezoidal buildings might have been abandoned by

1 Aquatic reservoir age phenomenon is frequently found in food webs that are dependent on marine, but also freshwater sources due to the gradual deposition of 'old carbon' in living organisms in such ecosystems. It is signalled in stable isotope measurements by higher $\delta^{15}N$ and $\delta^{13}C$ values (see *e.g. Lanting and van der Plicht 1998*). A suggestion has been made that due to the limestone composition of geological strata in the Danube Gorges, ground and river water may have lower $^{14}C/^{12}C$ ratios than the atmosphere. In such environments, aquatic animal and plant species exhibit lower ^{14}C than terrestrial organisms (*Bonsall et al. 1997.84*). Such processes affect radiocarbon measurements from samples of animal species living in marine or freshwater ecosystems, rendering the obtained radiocarbon measurements older. Consequently, humans and some other terrestrial species (*e.g.* otter, domesticated dog, etc.) that feed substantially on organisms rich in these protein components are also affected by the reservoir effect (for stable isotope studies in the Mesolithic-Neolithic Danube Gorges, see *Bonsall et al. 1997; 2000; 2004; Grupe et al. 2003; Borić et al. 2004*).

2 Only one new date from a trapezoidal building falls into the period after 5900 cal BC: OxA-16537 dates a red deer skull found as a grave offering in Burial 7/I in House 21 in the range 5888-5728 at 95 per cent probability (see Fig. 3). It will be necessary to date another sample from this context in order to confirm this significantly late date. However, it is possible that certain trapezoidal buildings were used in the post-5900 cal BC period for burial purposes. If so, this context would importantly suggest the contemporaneity of two different burial traditions at Lepenski Vir during this period: extended and crouched inhumations (for more details see *Borić & Dimitrijević in press*).

around 5900 calBC. The absolute span of only two or three hundred years for the flourishing of building activity related to the trapezoidal structures significantly compresses Srejović's phase I. Thus, it is difficult to maintain the excavator's five subphases, which, similarly to Ivana Radovanović's more recent re-phasing of Lepenski Vir into I–1–3 (*Radovanović 1996a; 2000*), remain largely guesses before more extensive and systematic dating of each building is accomplished, along with statistical modeling in order to narrow the magnitude of error. On the whole, new dates from these contexts better correspond with Srejović's stratigraphic logic of sequencing buildings to particular phases on the basis of their superimposing and overcutting than with Radovanović's stylistic logic, *i.e.* her typology of hearth forms, ash-places, entrance platforms, and presence/absence of ∀-supports around rectangular hearths as reliable chronological indicators (*Borić & Dimitrijević 2005.45–46; in press; Borić 2002b*).

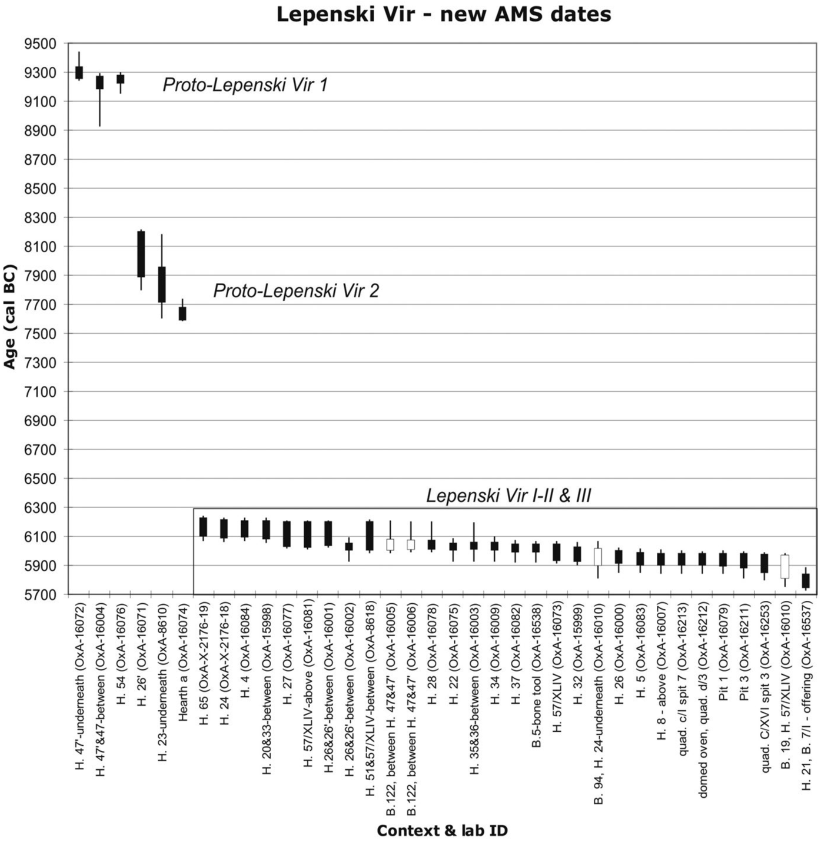

Fig. 3. Calibrated ranges of new AMS dates from Lepenski Vir. Ages of human burials 94 and 19 are corrected for the aquatic reservoir effect using Method 2 as suggested by Cook et al. (**2002*****). The $\delta^{15}N$ values used to estimate percentages of aquatic diet (for details see* **Borić & Dimitrijević in press*****). Dates are calibrated with OxCal v. 4.0 (*****Bronk Ramsey 1995; 2001*****). Bars: 1 standard deviation; line: 2 standard deviations; black bars: animal bone samples; white bars: human bone samples.***

The short chronological span for phase I also suggests that phase II is not stratigraphically realistic. This has already been shown by overlapping plans of the phase I buildings and stone outlines that the excavator of the site attributed to this phase. According to Srejović, his phase II was characterized by buildings with stone walls in the shape of trapezes, repeating the outline of supposedly earlier limestone floors of his phase I. However, the trapezoidal buildings must be envisioned as dug-in features[3], with their rear, narrow side dug deep into the slope, as has previously been shown (*Borić 2002a.Figs. 7–9*), since these features were dug into the sloping terrace where the site is situated. It is more likely that these stone constructions assigned to a separate phase were part of the same trapezoidal buildings with limestone floors assigned by the excavator to phase I. Thus, on the level above limestone floors there were vertical stone walls built in dry wall technique around buildings' floors and cuts. The visual overlap of phases I and II clearly shows the match between these stone constructions and the trapezoidal limestone floors (see Fig. 4; *Borić 2002a.Fig. 9*). Even at the published section of the western part of the settlement, which runs through the backs of buildings Houses 43, 34, 27, 20, 33 and 32 (*Srejović 1969.Fig. 6*), phase II is not marked, which might further support our conclusion about its elusive character. Furthermore, no activity areas were reported with regard to the 'floor' level of these structures,

3 On the existing photographs of Lepenski Vir, one sees terraced areas with pedestalled building floors. This situation is due to digging the site largely in arbitrary levels by which features, such as trapezoidal buildings, were not excavated by emptying the fill of a building as one would do if excavating stratigraphically. Trapezoidal building floors were exposed by excavating spits across a particular level, which exposed the area of sterile soil adjacent to the building floor and which occasionally contained older Mesolithic deposits. Such an excavation strategy created this misleading, largely two-dimensional perspective of trapezoidal buildings (see *Borić 1999; 2002a*).

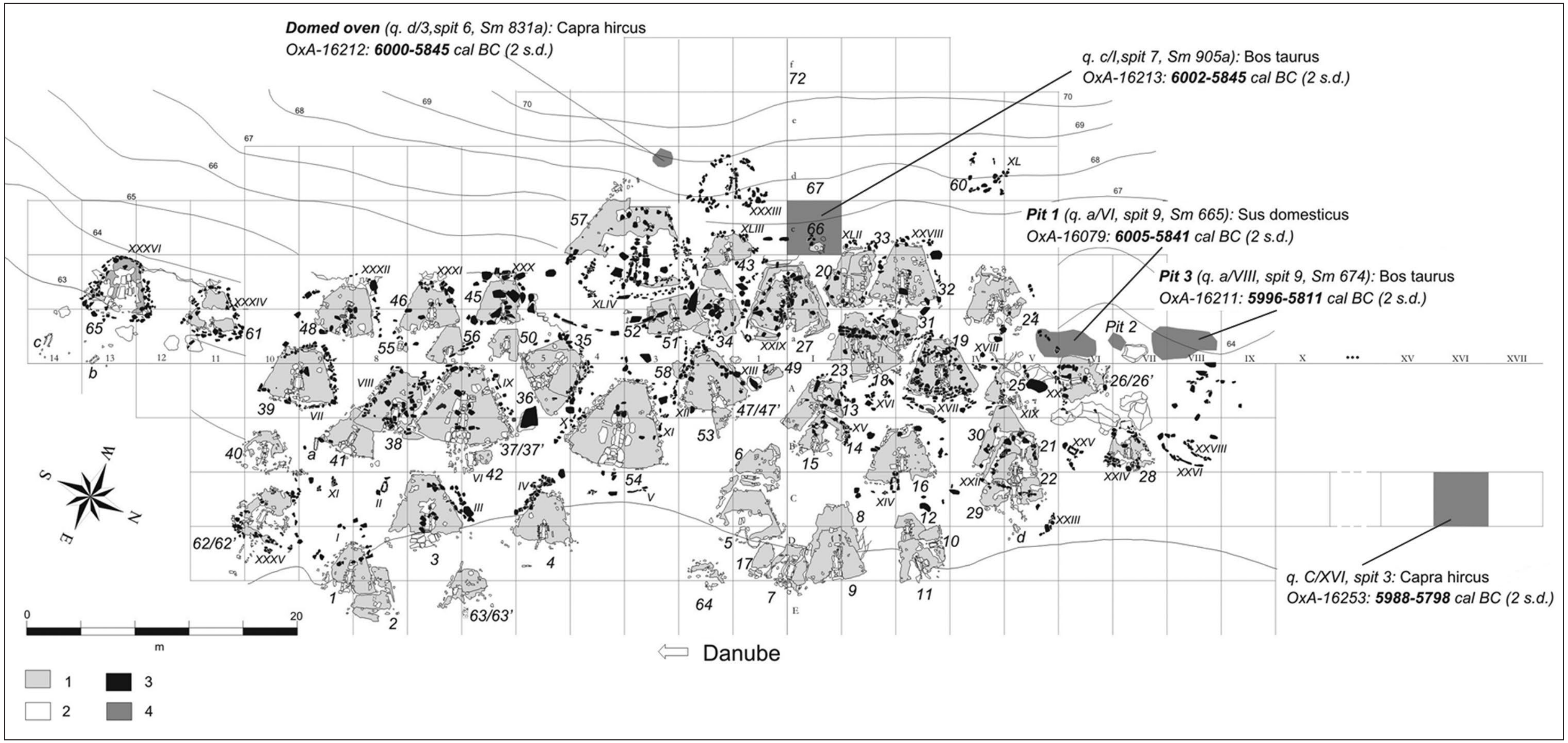

Fig. 4. Lepenski Vir – site plan of phase I–II, with some shaded features of phase III from where the AMS dated domestic bones originate. Overlapping trapezoidal buildings of Srejović's phase I (labelled with Arabic numerals) and construction stones of his phase II (labelled with Roman numerals) (after **Srejović 1981. 20–1*****). 1 – limestone floors; 2 – construction stones attributed to phase I (acc. to Srejović); 3 – construction stones attributed to phase II (acc. to Srejović); 4 – Early Neolithic, phase III AMS dated contexts with remains of domestic animals.***

with the exception of the largest building at the site, House XLIV[4]. Therefore, the trapezoidal stone walls previously attributed to phase II were part of the same phase I buildings. Henceforth we suggest treating Srejović's phases I and II as a single phase and we refer to this building horizon as Lepenski Vir I–II (*Borić & Dimitrijević in press*).

The new dating program also suggests no temporal break between phases Lepenski Vir I–II and phase III (contra *Srejović 1969.161; 1972.139*). The dates indicate that Srejović was right to separate the latter, as it seems that most of the trapezoidal buildings were abandoned by 5900 calBC and that a new and different occupation pattern commenced at the site in the period following 5900 calBC. Yet some of the dates indicate that at the current resolution of the chronological scale, there could have been some overlapping between the use of some trapezoidal buildings, perhaps primarily for the interment of human burials (*e.g.* House 21 and Burials 7/I and II, see Fig. 4 and footnote 2), and the new types of contexts that appear around 5900 calBC. These new contexts included a number of pits, dug primarily in the rear area of the site, outside of the zone with trapezoidal buildings. There are also several domed ovens whose function remains unclear (see below). Also, crouched inhumations became the dominant burial type (of possibly migrant individuals, see *Price & Borić forthcoming*) during this phase. Some of these crouched burials were found lying on the floors of trapezoidal buildings (*Srejović 1969.Fig. 63*). This seems to be a time of significant changes in patterns of habitation of the community. The bones of domestic animals were also found in those features assigned to phase III, suggesting that the domestic animals must have been introduced in the post-5900 calBC period. In the following, we discuss in detail five AMS dates made on the bones of domestic animals from contexts outside of trapezoidal buildings.

Dating the introduction of domesticates

Apart from dating trapezoidal buildings and their use, our dating programme explicitly focused on direct dating of domestic animals. In this paper we discuss and focus on this issue in particular. On the basis of our previous analyses of faunal contexts associated with the trapezoidal buildings (*Borić & Dimitrijević 2005; Dimitrijević 2000 in press*), there were no positively identified bones of domestic animals lying directly on the floors. However, this conclusion requires some caution. As we showed in previous reports, the faunal assemblage of Lepenski Vir available for our analyses is only a portion of the original assemblage that survived initial analyses of this material. Hence, there remains a possibility that some domestic animals existed in those faunal units from the trapezoidal building floors that were not preserved. However, Hungarian zoo-archaeologist Sándor Bökönyi (*1969; 1972*), who was the first to analyze this assemblage, did not report any domestic animal apart from dog in the context of Srejović's phases I–II, and it would be safe to assume that this reflects a real and unbiased patterning. He reported a relatively large number of domestic animals (cattle, sheep/goat and pig) from phase IIIa–b at the site, and, as we mentioned above, this younger phase can primarily be related to several pits and layers associated with a couple of domed ovens found at this site. It also seems that Bökönyi never analysed faunal units that were excavated in the course of the final excavation campaign in 1970 (for discussion see *Borić & Dimitrijević 2005*). Some of this material is preserved and available for analysis. The publication of the whole faunal assemblage with all contextual details is forthcoming.

The remains of domestic animals come only from phase III contexts (see above) and were found in association with pits and a domed oven, while some deposits from this site were not in association with trapezoidal buildings (Fig. 4). We dated 5 specimens of domestic animal from Lepenski Vir. Two dates were established for domestic goat *Capra hircus*, two specimens of domestic cattle *Bos taurus*, and one specimen of domestic pig *Sus domesticus* (see Tab. 1). In Table 1 we provide details of five dated bones of domestic animals (sample number, Oxford laboratory reference number OxA–, contextual de-

4 House XLIV is the largest structure found in the rear of the site (Fig. 4). It also contained the largest number of representationalist boulders at Lepenski Vir placed around the building's large stone-lined rectangular hearth. This building might have had some communal and ceremonial usage (*e.g.* as 'men's house' or similar). No limestone floor was found in the area around the hearth of this building and for this reason it was assigned by the excavator to phase II. However, limestone flooring was found in the rear of House XLIV. This flooring was by the excavator assigned to phase I and named House 57. This might have been an earlier building structure at this place with the same building outline as House XLIV or part of the same structure that was used over a long period of time, possibly resulting in the damage of the floor around the hearth area. This hearth area, also, might have been rearranged several times in the course of the history of this structure. OxA-16010 dates crouched headless Burial 19 found at the floor level of House XLIV/57. This burial belongs to phase III and is dated in the range 5984-5752 at 95 per cent probability (Fig. 3) and likely postdates the use of this building.

Sample ref.	OxA–	Context, unit no. & exc. date	date (BP)	error	δ13C (‰)	δ15N (‰)	*species*	element	cal BC
S#35	16079	Pit 1, quad. a/VI, spit 9 (665) (12/07/1968)	7037	39	–20.2	9.3	*Sus domesticus*	scapula	68.2 % probability 5984BC (68.2 %) 5893BC 95.4 % probability 6005BC (95.4 %) 5841BC
S#36	16211	Pit 3, quad. a/VIII, spit 9 (674) (15/07/1968)	7021	36	–21.1	6.7	*Bos taurus*	horncore	68.2 % probability 5982BC (31.6 %) 5942BC 5928BC (36.6 %) 5880BC 95.4 % probability 5996BC (93.9 %) 5836BC 5824BC (1.5 %) 5811BC
S#37	16212	Domed oven, quad. d/3, spit 6 (831a) (26/07/1968)	7041	35	–19.8	6.8	*Capra hircus*	metacarpus proximal	68.2 % probability 5983BC (38.6 %) 5938BC 5932BC (29.6 %) 5898BC 95.4 % probability 6000BC (95.4 %) 5845BC
S#38	16253	quad. C/XVI, spit 3 (16/08/1968)	7008	38	–20.7	7.1	*Capra hircus*	mandible	68.2 % probability 5977BC (21.0 %) 5948BC 5920BC (35.5 %) 5870BC 5865BC (11.7 %) 5846BC 95.4 % probability 5988BC (95.4 %) 5798BC
S#39	16213	quad. c/I, spit 7 (unit 905a) (01/08/1968)	7043	37	–21.5	8.3	*Bos taurus*	metatarsus proximal	68.2 % probability 5984BC (68.2 %) 5899BC 95.4 % probability 6002BC (95.4 %) 5845BC

Tab. 1. New AMS dates of domestic animal bones from Lepenski Vir. All dates calibrated with OxCal v. 4.0 (**Bronk Ramsey 1995; 2001*****).***

tails of each sample, laboratory result expressed as BP, magnitude of error, stable isotope ^{13}C and ^{15}N values for palaeodietary inferences, species, skeletal element, as well as probability spans of calibrated dates at 1 and 2 standard deviations). In the following, we discuss each of the dated contexts separately with regard to their provenance and sample associations as well as the composition of the faunal units from which these samples originate.

Pit 1: 6005–5841 calBC (OxA–16079)

Context description

This pit was noticed while digging the rear, western part of the settlement in quadrants a/V–VI.[5] There were three adjacent pits in this part of the settlement, marked as Pits 1–3 (Figs. 4–5). Pit 1 is a large pit feature, over 4 m in diameter. It was excavated in the course of the 1968 excavation season and was noticed from the 5th excavation spit in quadrant a/VI (July 10th 1968, field diary). Yet, the available plans of this pit suggest that it was partly excavated in 1967, as the limit of excavations from the 1967 season cuts off the front part of this pit. There is no mention in the field diary of a pit feature for the front area excavated in 1967, which, among other reasons, could be due to slope erosion in this part of the settlement that could have eroded the part of the pit closer to the Danube. The field diary entry from Lepenski Vir dated on July 12th, 1968 records the following:

"*The bottom level of the 7th excavation spit was planned. In quadrants ab/V, VI, VII from the level of the 7th excavation spit, Pits 1, 2 and 3 belonging to pit horizon IIIa were planned. (...) Since one can see clear boundaries of zones [with pits] on the whole surface of these quadrants, these zones and pits will be excavated separately. Pits are located in quadrants a/VI and VII, and are marked as 1, 2 and 3. Pit 1 in quadrant a/VI was noticed as a cut from previous [upper] levels. (...) We*

5 Site grid that we refer to in the following context descriptions was established at the start of the 1967 excavation campaign at Lepenski Vir and it differs from the site grid used in 1965 and 1966 excavation campaigns (see *Perić & Nikolić 2005*). The site grid has two main axes: axis x, approximately running NW-SE and axis y, approximately running NE-SW (Fig. 4). Quadrants (4 by 4 m) run from the central point across the four established fields, and are marked with the combination of a letter, capital (A, B, C, etc.) and small (a, b, c, etc.), that divide the x axis, and a numeral, Arabic (1, 2, 3, etc.) and Roman (I, II, III, etc.), that divide the y axis.

began excavating Pit 1 in spits, following its outline on the basis of soil differences. In Pit 1, the 8th spit was excavated. The soil is black and loose, similar to the previous spit, and is significantly different from the sediment with yellow sandy soil surrounding it. In the 8th excavation spit [of the pit fill], there are fragments of pottery and bones and 2 flint artefacts [p. 19–20]."

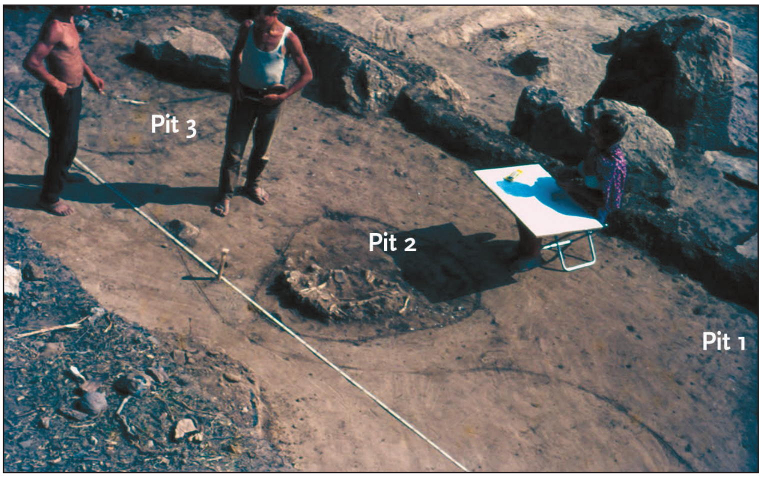

Fig. 5. Excavation of adjacent Pits 1–3, Lepenski Vir, 1968.

The excavation of the 8th and the 9th spits was finished on July 13th, 1968, when yellow virgin soil was reached. The bottom spit of this pit, from which comes the domestic bone we dated, contained pottery and animal bone [p. 23]. If one assumes that the backfilling of this pit took place over a period of time in the use of the site during phase III, the material we dated, found at its bottom, could be seen as a relatively early indication for the presence of domesticates.

Faunal description

OxA–16079 dates the right scapula of a domestic pig *Sus domesticus* (Fig. 6). The coracoid process is broken and the glenoid cavity eroded at the rim. Porous structure of the bone indicates young animal – coracoid process was probably fusing or close to fusing. A neck diameter (SLC after *Driesch 1976*) of 19.1 mm can be assigned to a rather large domestic animal if compared to the Late Neolithic sites such as Opovo (minimum breadth of neck in the range 15–20 mm for domestic and 25–40 for wild pig, *Russel 1993. Fig. 6.34*) or Vinča–Belo Brdo (15.1–19.8 mm in domestic pig and 30.1–34.8 in wild pig; *Dimitrijević forthcoming*). Still, it is undoubtedly domestic, as wild pigs are more massive at this stage of growth.

Fig. 6. AMS dated right scapula of a domestic pig* Sus domesticus *(OxA–16079) from Pit 1, Lepenski Vir.

Only one more bone is preserved in the available faunal assemblage from this pit: a left proximal metatarsal from an auroch, identified as wild cattle on the basis of its size (medio-lateral breadth = 67.7 mm, anterio-posterior breadth = 64.9 mm). Judging from the marked robustness of muscle insertions, it comes from a mature if not an old animal. Several rows of parallel cut marks are observable on the cranial, medial and lateral side of the bone: transverse cut marks are found next to the articular surface, and inclined cut marks a few centimetres below it.

Both bones are slightly weathered and there are plant root marks in some places on the bone surface.

Pit 3: 5996–5811 calBC (OxA–16211)

Context description

Pit 3 was noticed in the line of quadrants where Pits 1 and 2 were found (Fig. 5). It encompassed parts of quadrants a/VII–VIII. Here is the field diary description of this pit feature:

"*[12/07/1968] In quadrant a/VII, Pit 3 was noticed next to the section, and spreads across almost half of the surface of this quadrant. In fact, it continues in the direction of the Danube and joins up with a concentration of stones and pots found in the previous excavation spit. The exposed area at the 7th spit was photographed with Burial 31, which was lifted [p. 20].*

[15/07/1968] Pit 3 – the 8th spit contained a lot of pottery and animal bones. Next to the section, a globular pot was found in a concentration of stones. The 9th spit was also excavated, and it contained pottery and animal bones [material from this unit was stored under 674 from which the AMS da-

ted animal bone comes]. The 10th spit contained similar materials. (...) The 11th spit was also removed, and it is characterized by soil with stone [intrusions]. Larger, deeper buried stones were left [in situ]. Pit 3 – in the 7th spit there were 2 human femora marked as Burial 33. Apart from these femora, there was one clavicle, 1 phalanx and a fragmented vertebra [p. 24].

[17/07/1968] In quadrant a/VII, the12th spit was excavated in Pit 3 following the outline of the pit, i.e. *by emptying the dark soil from the surrounding yellow sediment. After the excavation of the 12th spit, the whole area had been cleaned, and it was determined that the virgin soil had been reached over the whole surface. There were still some finds of pottery in the 12th excavation spit. [The cut of] Pit 3 was planned [p. 27].*"

The described mix of animal bones, pottery and disarticulated human remains (Burials 31 and 33) is of little help in discerning the character and significance of this pit fill, or whether its infill was rapid or slow. It should be mentioned that Burial 31 found in Pit 2 was directly AMS dated, in the range 6361 to 5902 at 95 per cent probability, after correcting for the reservoir effect (OxA-5827, *Bonsall et al. 1997*). Due to the necessary correction of this date for the reservoir effect, its standard error is too large for a more precise chronological determination. Such disarticulated human remains (possibly consisting of several individuals) found in the fill of Pit 2 (Fig. 5) possibly come from earlier, disturbed burials at this location. For the moment, it remains unclear whether these disarticulated human bones were intentionally deposited in these pit features, or older burials were indeed disturbed by pit digging. The chronologically earlier date obtained for Burial 31 may suggest that digging for Pit 3 might have disturbed the bones of this individual. However, a taphonomic examination of this burial is necessary in order to test this.

Fig. 7. AMS dated of domestic cattle* Bos taurus *horncore (OxA–16211) found in Pit 3, Lepenski Vir.

Faunal description

OxA–16211 dates fragments of a domestic cattle's (*Bos taurus*) horncore with two fragments of the skull with basal portions of horncore (Fig. 7). It was possible to join some fragments and approximate the maximal basal circumference to 5–6 cm. According to this estimate, as well as the thickness of the skull and horncore fragments, it is safe to assume that this fragmented horncore belonged to a breed of domestic cattle.

An otter (*Lutra lutra*) bone was found in the same faunal unit: a left distal humerus (medio-lateral breadth = 26.5 mm, anterio-posterior breadth = 11.0 mm). The distal articulation is fused. It is not weathered. This is the only known otter bone from the site, and the only one from the whole of the Danube Gorges Mesolithic-Neolithic sites.

The domed oven: 6000–5845 calBC (OxA–16212)

Context description

This dated context relates to the domed oven found in quadrant d/3 (Figs. 4, 8). On the basis of a field diary entry dated on July 26th, 1968, this domed oven was at first recognized as a contour of red burned soil in the 2nd excavation spit in quadrant d/3, and this situation was planned. The field diary entry dated on July 30th, 1968, mentions that during the excavation of the 8th spit in quadrants d/2–4, the soil was yellow and sandy in the part closer to the d line of the site grid, while only next to the c line of the site grid and around the oven (which the excavator in the diary characterizes as 'pottery kiln'), the soil was grey and contains pottery. This soil difference was investigated on July 31th, 1968. Here is a translation of the original diary entry for this day on this context:

"*In quadrants d/2–4 the level with stones belonging to LV IIIa horizon and Burial 48 were planned at the 8th spit. The 9th spit is being excavated. All quadrants and the area with grey soil are being dug, while the area with yellow soil is left at the level of the 8th spit. The line dividing the grey and yellow soils runs approximately through the middle of these quadrants [along x axis]. In the 9th spit, in the same soil, there were numerous finds of pottery and bones. A [whole] pot was removed from the 8th spit on the western side of the pottery kiln, while on the eastern side of the kiln one fragmented globular pot was found in the 9th spit. A ceramic altar leg with a fragmented part of a recep-*

tacle was found in quadrant d/4. The pottery kiln with its dome was left [in situ] and was photographed [p. 57–58]."

Here is also a detailed description of this feature from the field diary entry of August 2nd, 1968, which clarifies its construction details:

"*In quadrant d/3, a zone with red soil was first noticed in the 2nd spit. Later, in the following spits, it was determined that there was a large Neolithic domed oven here. While excavating this feature, it was noticed that it consists of red layered burned soil,* i.e. *the oven dome. Finally, it was determined that there were 3 layered domes, which means that the top of the oven was not covered with one dome, but with three layered domes. This oven was constructed by first digging an oval hole. Its bottom (floor) was polished,* i.e. *specially prepared. This horizontal surface was polished and hardened, while the largest [outer] dome connected to the edges of this floor was left unpolished and without special treatment. On the basis of the remains of the inner, smaller domes, it is possible to say that these were prepared and placed within the already formed [area of the] floor and the outer dome. This was done by applying them to the inner walls of the outer dome, while at the entrance of the oven these were smoothed with the outer dome, and partly layered over it. The points of contact between the floor and the domes (two inner ones) are then smoothed/polished, leaving the impression of a new floor (visible at the edges of the floor). On the basis of the position of the collapsed domes and the lack of an opening on the outer dome on all of the preserved sides of the oven, it is possible to assume that the opening would have been at the north-eastern side of the oven, probably facing the Danube. While excavating the oven, [disarticulated] human bones (Burial 52) were found on the oven floor. Between the inner domes, closer to the outer dome, there were two pottery fragments which were highly burned. Between domes, two zones with stones were found, one with smaller and the other with larger stones. The oven is shaped like a shoe-last. The diameter of the floor is 1.5 by 1.4 m. The height of the [preserved] outer dome is 0.52 m, the thickness of the dome walls is 2–3 cm and the thickness of the oven floor is 6–7 cm. The thickness of all domes is similar [p. 66–68].*"

This domed oven is one of the most striking features at Lepenski Vir when it comes to the appearance of Early Neolithic material culture in the Danube Gorges.

Fig. 8. Domed oven found in quadrant d/3 at Lepenski Vir. The two largest buildings at Lepenski Vir, Houses 57/XLIV and 54 are visible in the background.

It is the most obvious example of a very different material culture tradition from the trapezoidal buildings. It was found outside the area of trapezoidal buildings, at a higher terrace, and almost in the line with the trapezoidal buildings Houses 54 and 57/XLIV (Fig. 8). There are at least another two features that can be characterized as domed ovens. While for two of these features (one that we describe here and one more) no association with dwelling structures was recognized or reported during excavation, one such possible oven was also recognized in the transformation of the hearth area on the floor of House 5, where an abandoned trapezoidal building was probably reused during phase III from around 5900–5700 (or later?) calBC (*Srejović 1969.162–163; Perić & Nikolić 2005*). One should also note that such ovens are relatively rarely found in the Early Neolithic central and northern Balkans, and it remains unclear what might have been the exact function of such features. In Greece, Perlès (*2001. 194–196*) acknowledges the possibility that the remains of some ovens found at Achelleion might have been the earliest fully domed ovens in Europe. At most of the sites where these features appear in south-east Europe, they are found rather outside of buildings and it seems that at Lepenski Vir, the same was the case. Keeping in mind the technological characteristics of the Early and Middle Neolithic Starčevo pottery, such as the low firing at temperatures up to 800 °C that might have been achieved in open bonfires or pits (*Szakmány et al. 2005;* see also *Perlès 2001.213* for Greece), one could assume that domed ovens were unnecessary for the production of typical Starčevo pottery.

On the basis of the diary description, it seems that the oven was used over a longer period, with several, or at least two episodes of renewal, unless it was normal to build several layers of a dome in order to keep it stable. Be that as it may, this feature hints at a very particular type of knowledge and a very different construction technique from that used in the construction of the Lepenski Vir limestone floors. Such technical knowledge must have come from elsewhere, *i.e.* it must have been either learned by the local population in contact with farming groups, or this knowledge relates to incomers who were picked up in the strontium signal of several analyzed individuals dated to this period, *i.e.* phase Lepenski Vir III (*Price & Borić forthcoming*). The relatively early AMS date for domestic goat associated with this feature may indicate that the oven might have been placed here very soon after the abandonment of most of the trapezoidal buildings, which further indicates that the beginnings of phase III could have either coincided with the process of the abandonment of trapezoidal building of phase I–II, or followed it closely, probably without a break in the stratigraphic/temporal sequence.

It is also very intriguing that disarticulated human bones (two fragmented femura, two clavicles and rib fragments, marked as Burial 52) were found on the floor of this feature. Unfortunately, there is no mention in the field diary about whether these bones were burned, or whether and in what way the soil within the feature was burned to give some clues as to the character of this deposition and the nature of the abandonment and infilling of this feature. For a future AMS dating programme it would be desirable to date these human remains in order to attempt a dating of the backfilling event with regard to the oven. However, there is a possibility that in this way one would date residual remains rather than the act of backfilling itself, and a prior taphonomic examination of these bones would be the best way to proceed.

Fig. 9. AMS dated right proximal metacarpal of domestic goat* Capra hircus *(OxA-16212) found in association with a domed oven at Lepenski Vir.

Faunal description

OxA-16212 dates a right proximal metacarpal of domestic goat *Carpa hircus* (medio-lateral breadth = 28.9, anterio-posterior width = 20.4 mm) (Fig. 9). The bone belonged to an old animal, probably male, according to its large size and accentuated muscle insertions. Its size, in fact, exceeds all finds of Neolithic goats in Serbia. However, a goat metacarpal with a medio-lateral width of 28.5 mm and anterio-posterior breadth of 20 mm is found at the Late Neolithic site of Berettyóújfalu-Herpály, and a metacarpal with medio-lateral width of 29 mm and anterio-posterior width of 19 mm at the Bronze Age site of Tiszaluc-Dankadomb in Hungary (*Bökönyi 1974.518*). Such a large size makes it comparable to wild bovines, like chamois (*Rupicapra rupicapra*) (maximal proximal breadth both in females and males = 23.0–27.0, proximal depth 17.0–19.0, in males 17.0–20.0, after *Bosold 1968.tabelle 5*) or ibex *Capra ibex* (maximal proximal breadth in females = 27.0–32.0, and 30.0–36.0 in males, proximal depth in females 18.0–23.0, and 20.0–24.0 in males, after *Bosold 1968.Tab. 6*). Chamois is regularly present at the Lepenski Vir culture sites (Lepenski Vir, Padina, Vlasac), while ibex is not, although its presence should not be excluded, as the Danube Gorges should be its ideal habitat and its presence is confirmed in the Upper Pleistocene of the region, in the Tabula Traiana Cave, excavated in 2005 (*Dimitrijević 2005*). Fortunately, the morphology is helpful in this instance. The specimen from the domed oven differs from chamois, since it lacks the incision on the caudal side of the proximal articulation, which is oriented towards the ridge between medial and lateral articular facet (*Prat 1966.Pl. 61*). Another difference is in the relationship between width and depth of the proximal articulation, *i.e.* the bone is more elongated in the medio-lateral direction than in chamois. In addition, its medial articular facet is markedly lower than in chamois and ibex (as well as in domestic sheep). Traces of red burned clay and ash are present on the bone surface, but also on the diaphysis break, indicating that the bone was broken prior to its deposition in this context.

The north-western part of the settlement: 5988–5798 calBC (OxA–16253)

Context description

This context relates to a long transact excavated across the northern spread of the settlement in quadrants C/X–XVII along the lower reaches of the river terrace (Fig. 4). No trapezoidal buildings with limestone floors were found here. There was at least one clear Early Neolithic burial (Burial 66 in quadrant C/XII) in this area, as well as possibly much earlier Mesolithic occupation residues and a burial (Burial 67 in quadrant C/XIII). In the upper levels, the remains of Early Neolithic Starčevo pottery were found.

Excavations in this area commenced on August 7th, 1968. According to the field diary, on August 8th, 1968, the upper layers of hill wash were being removed, and in quadrant C/XVII first fragments of Starčevo pottery were found in yellow soil mixed with scree. It was noted that this level was taken as the 1st excavation spit in this quadrant [p. 76]. The excavation of quadrant C/XVI, from which the sample we dated originates, took place on August 9th, 1968 [p. 79]. It was noted that in these quadrants, the layers slope towards the south-east, *i.e.* from the periphery of the settlement toward the central part of the terrace. In the 2nd excavation spit with dark soil in quadrant C/XVI, there was a concentration of larger stones that might have been part of a stone construction. On August 10th, 1968, the 3rd spit was removed in quadrant C/XVI. From this comes the dated sample. It was noted that the soil was dark, loose and with very little gravel. Three large rocks were found in this quadrant at this level next to grid line C, *i.e.* closer to the river. There were numerous finds of pottery at this level, the largest concentration being encountered in this quadrant.

In the neighbouring quadrant, C/XV, the concentration of larger stones continues deeper, and two boulders were also found here [p. 82]. In the 4th spit several flint artefacts were found in quadrants C/XV and C/XVI, along with Early Neolithic pottery, as well as a large stone axe (*Antonović 2006.96, catalogue number 123*). In the 6th spit the soil is loose and sandy, with some animal bones and no pottery [p. 83]. It is possible that in this quadrant, older, Mesolithic occupation residues were already reached at this level as the consequence of the previously mentioned sloping from the NW toward SE. In quadrants C/XIV–XVI the number of pottery finds decreases in the 5th and 6th spits [p. 88]. Also, in the 7th spit, a large rock (bedrock?) was already reached in quadrant C/XVII. In C/XVI and XV, there were more construction stones in the same spit. Next to grid line B (upslope), the soil is yellow (sterile) and closer to grid line C (closer to the river) it is dark around these stones. In the 8th spit in quadrant C/XV, a small rectangular stone-lined hearth was found with an associated concentration of gravel and animal bones [p. 91]. It was temporarily marked as 'House 68' [p. 96]. This feature confirms the Late Mesolithic occupation of this area. At this level, Burial 68 was also found in quadrant C/XVI [p. 92]. In the 9th spit in this quadrant, the soil is dark around the hearth, while the bedrock or sterile soil were reached around it and in the neighbouring quadrants. There was also a layer of gravel behind the hearth. After lifting this layer of gravel, a thin layer of burned wood was found [p. 98].

This stratigraphic sequence from quadrant C/XVI and the surrounding quadrants helps to understand the complexity of the occupational sequence at Lepenski Vir. It would be helpful to date the Mesolithic layer with the hearth and Burial 68, as it may be the case that in this (probably peripheral) part of the settlement, one encounters a discontinuous sequence encompassing the Late Mesolithic (Proto-Lepenski Vir phases) and the Early Neolithic (Lepenski Vir III phase), without the presence of the transformational I–II phase between these two. In quadrants C/X–XII, two Early Neolithic pits were also found, as well as a crouched Early Neolithic Burial 66 in quadrant C/XII in the 5th excavation spit.

Faunal description

OxA–16253 dates the fragmented left mandible of a domestic goat *Capra hircus* (Fig. 10). The last premolar and all three molars are in alveoli. This was a young adult, on the basis of its teeth wear stage. The mandible surface shows traces of weathering from plant root marks.

Backfill of trapezoidal buildings or pits? Rear, western area of the settlement: 6002–5845 calBC (OxA–16213)

Context description

According to the field diary, the excavations in this area commenced on July 7th, 1968, encompassing quadrants cd/2, 1, I–IV (sector 2), although the halves of quadrants cd/2 were excavated in the previous season in 1967. There is a note in the diary that in this part of the Lepenski Vir terrace the slope is significantly steeper than in the area closer to the Danube [p. 6–7]. Upper levels consisting of sterile deposits of hill wash were first removed in the line of d quadrants in order to facilitate digging in quadrants in line c. The first pottery finds in the line of c quadrants were encountered on July 10th, 1968. Here, among animal bones and pottery fragments, 4 fragments of fine pottery with a black painted ornament on the red surface were found in the 1st spit [p.14–15]. In quadrants c/II–III a stone construction with associated Early Neolithic pottery was found immediately beneath the layer of hillwash, while in quadrant c/2 there was a concentration of pots with two large stone axes (*Antonović 2006.93, catalogue number 115, catalogue number 124*). In the 2nd spit in c/1, I–II, the number of pottery fragments increases, some with *impresso* and others with incised ornamentation. There was also one black painted fragment [p. 18]. It seems that a part of the stone construction found in c/I extends back into quadrant d/I, where a large number of pottery fragments were found, among which were fragments with a painted black rectilinear design [p. 21–22]. Two whole pots were found in quadrant c/1 in the 4th spit. In quadrant c/I, one interesting object resembling a hook made of bone was found in the same spit (*Srejović 1969.Fig. VIII*), as well as a stone weight with a groove from a rope and a stone bead [p. 34].

From the 3rd excavation level in quadrant c/1, the remains of Burial 32 were encountered lying on top of a large rock that slanted towards the Danube. This burial was found along the line c/y–c/1. The burial was excavated within the 5th spit. The burial consisted of several individuals placed in crouched positions. There was another crouched, but headless burial near-by in quadrant c/1: Burial 42 [p. 50]. Skull fragments of this burial were found in the 4th spit, while the rest of the body was found in the 6th spit [p. 52], which may indicate that there was a practice of secondary burial, *i.e.* a post-depositional removal of the skull, which resembles various other instances of such practices in the Danube Gorges Mesolithic-Neolithic sites.

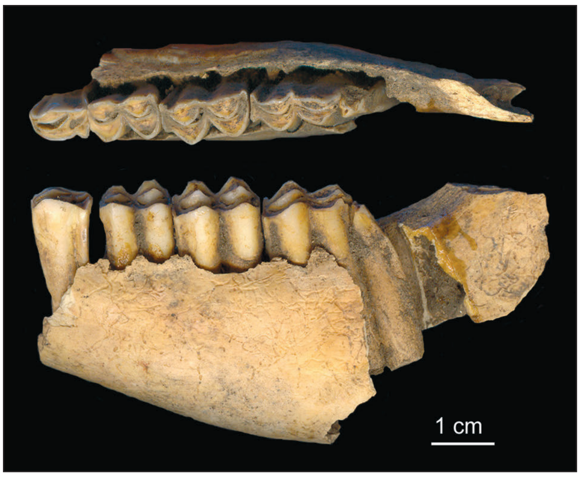

Fig. 10. AMS dated fragment of the left mandible of a domestic goat* Capra hircus *(OxA-16253) found in quad. C/XVI, spit 3 at Lepenski Vir.

In quadrant c/I, from which our dated sample originates, an Early Neolithic fire installation was recognized in the 5th excavation spit. This circular installation had its floor renewed three times. The base of the hearth is made of small stones 6–10 cm in diameter. Only a piece of the first floor was preserved, which was 2.5 cm thick. The second floor is 3 cm thick, is well-baked and polished, and slants to the side. The third floor is directly laid over the second, and slightly displaced toward section b of the site grid. This last floor layer was 2.5 cm thick and was polished, well-baked and coarse-tempered. On the surface, the floor is yellow-grey, while it is red-burned at the bottom of the feature [p. 74]. This fire installation was removed in the 8th spit. Pottery was found beneath the hearth [p. 75].

In the 6th excavation spit, the soil difference between yellowish soil on the one hand, and dark 'sticky' soil, on the other, indicated to the excavator the existence of a feature that seems to have been spreading in the front portions of quadrants c/1, I–III. If this were true, it would have been one large pit of some 20 m diameter. However, as becomes obvious on the basis of later field diary entries for this area, this soil change probably relates to zones of backfilling in the rear of the dug-in, *i.e.* semi-subterranean trapezoidal buildings (Houses 43, 27, 20, 33 and 32; see Fig. 4). Since these were dug from a level that is higher than the level on which the floor would be found (*Borić 1999; 2002a*), these deposits, which were very loosely referred to as Early Neolithic pit infills in the field diary, must have been in fact rear sides and infills of the cuts for the aforementioned trapezoidal buildings. Hence these deposits, consisting of pottery and other finds, accumulated here after the abandonment of trapezoidal buildings (see Fig. 3). In these fill deposits, numerous remains of river molluscs, tiny fish bones and Early Neolithic pottery were found. One bone hook was found here in quadrant c/II [p. 52]. In the 7th spit, the 'pit' is visible along line b, where one encounters grey soil with numerous pottery finds [p. 62]. The dated sample of domestic cattle horncore comes from this spit in quadrant c/I. In the next excavation spit the zone of this large 'pit' next to line b (closer to the river) is more visible in contrast with the yellow, sterile soil upslope. Child burial 53 was found in this spit in quadrant c/II [p. 65]. In this type of pit deposit, there were two more disarticulated burials – 56 and 57 – found in quadrants c/IV and c/1 respectively.

One could assume that the previously mentioned Burial 32 is stratigraphically younger (5th excavation spit) than our dated domestic cattle horncore (7th excavation spit). This burial was directly AMS dated in the range 6076 to 5731 calBC at 95 per cent probability, after correcting for the reservoir effect (OxA-5828, *Bonsall et al. 1997*). As with some of the dates of human bones discussed above, there is a necessary correction of this date for the reservoir effect, and, therefore, its standard error is larger than desirable for more refined chronological nuances. However, this range agrees broadly with the range we obtained on the domestic animal. If judged on the basis of their stratigraphic positions and by comparison to the more confined range of the domestic animal bone, it is possible that Burial 32 is in fact slightly younger than the freshwater corrected value indicates.

In the 10th spit in quadrants c/2, 1, I–IV, one finds the continuation of the zone of dark soil next to line b mixed with charcoal. This zone ends in quadrant c/III. In quadrants c/2 and c/1, the remains of a trapezoidal building (House 43) are visible at this level [p. 75]. There are large stone plaques at this level in quadrants c/I and c/III. In c/I, close to line b, there were remains of a limestone floor, probaly belonging to Lepenski Vir I [p. 76], as well as zones of red burned soil and associated pottery [p. 77]. These floor remains were marked as House 66 (Fig. 4). In the 11th spit, stone construction belonging to House 32 was recognized in quadrants c/II–III. Below this level in most of these quadrants, there was sterile soil, in which these trapezoidal buildings were interred [p. 78].

On the basis of the field diary descriptions of this area of the site, its stratigraphy and finds, one may suggest that the rear parts of the buried and abandoned trapezoidal buildings in this row must still have been visible and appropriated at a time when all the elements of the Early Neolithic reached Lepenski Vir. During phase III, this area was extensively used, and it seems that no clear Early Neolithic pit features can be recognized, as is the case with the previously described row of Pits 1–3. OxA-16213 on domestic cattle bone may confirm this point and overlaps the range of occupation of trapezoidal buildings. Hence there must have been no large chronological gap separating the two phases, despite dramatic changes in the type of occupation. On the other hand, it remains of interest to try to date animal bone samples from the same area which come from the upper levels/spits, where black-painted rectilinear ornaments appear on pottery. Such ornaments are a typological characteristic of a later phase in the Starčevo pottery sequence (see discussion in *Whittle et al. 2002*) that can be characterized as the Middle Neolithic of the north-central Balkans, and it remains important to define the time of the final Neolithic abandonment of Lepenski Vir.

Faunal description

OxA-16213 dates a right proximal metatarsal of a domestic cattle *Bos taurus* (Fig. 11). Its size (mediolateral breadth = 53.6 mm, antero-posterior breadth = 53.5 mm) indicates a domestic animal. Although distal articulation, which fuses later in metapodials, is broken, it is safe to conclude that the bone belonged to an adult, if not an old animal, according to the compactness of the bone structure and strong muscle attachments. Two other domestic cattle bones are preserved in this unit; one of them, a centrotarsal from the same animal as it joins the metatarsal proximal articulation dated by OxA-16213. The third bone is an astragalus. This astragalus is probably from the same animal, since it belonged to a right leg, and given its size and bone structure, would fit two other described specimens.

There are butchering marks on all three bones: a single inclined elongated cut-mark on the metatarsal diaphysis, some four centimeters below the proximal articulation, and several rows of cut-marks both on the centrotarsal and astragalus. Three short and deep transverse parallel cuts are found on the medial side of the centrotarsal, and three additional subhorizontal cut-marks are found next to the proximal articulation on the cranial side of the same bone. There are many short transverse cuts on the cranial side of the astragalus: three on the medial ridge of the proximal trochlea, two at the distal end of the lateral ridge of the proximal trochlea, one medially between the proximal and distal trochlea, and three more at the lateral incision between the proximal and distal trochlea. The position of these cut-marks indicates that they were made in the process of dismemberment. Their large number may support our conclusion that it was an old animal. Furthermore, there are osteoporotic changes in two places on the astragalus: cranially in the base of the lateral ridge of the proximal trochlea, and caudally at the lateral half of the distal trochlea.

Fig. 11. AMS dated right proximal metatarsal of domestic cattle* Bos taurus *(OxA-16213) found in quad. c/I, spit 7 at Lepenski Vir.

Apart from these three domestic cattle bones, one more bone is preserved from this unit, a sheep's right shoulder blade. It bears cut marks – a longitudinal cut at the base of the *spina scapulae* – from filleting.

Discussion

According to Srejović's stratigrahic phasing, Lepenski Vir III with subphases a and b represents an Early Neolithic settlement at this location clearly separated from the Mesolithic development at the site as represented by the Proto-Lepenski Vir, Lepenski Vir I and II phases. This conclusion was based on the new material culture that appears at the site with the start of the Neolithic, as well as on the basis of Srejović's understanding of the site's chronological and stratigraphic sequence: "*Lepenski Vir II was neither burnt nor destroyed; the hearths, the stone sculptures and the household implements are covered by a fine layer of dark sand, giving the impression that the settlement was suddenly abandoned and, for some time, lay desolate.*" (*Srejović 1972.139*).

As mentioned previously, new AMS dates force us to reconsider a number of aspects of the site's stratigraphy, and a more detailed discussion of some specific aspects of these results is provided elsewhere (*Borić & Dimitrijević in press*). Here we primarily focus on the transformational (Lepenski Vir I–II) and Early Neolithic (Lepenski Vir III) phases. The Lepenski Vir II phase cannot really be sustained as a separate phase, given recent stratigraphic observations (see above; *Borić 2002a*) and new AMS dates. Our dating results indicate that the span of five dates (6005–5798 calBC at 95 per cent probability) from domestic animals as a secure indication of the arrival of the full 'Neolithic package' found in various features outside of the area of trapezoidal buildings is only slightly younger than the range of dates for the occupation of the trapezoidal structures (6240–5845 calBC at 95 per cent probability). The range of dates obtained by dating domestic animals associated with Early Neolithic features such as pits or ovens also partly overlaps with the range of occupation and abandonment of the trapezoidal buildings, suggesting that we should probably exclude a major stratigraphic and temporal hiatus between these different patterns of occupation.

However, changes at Lepenski Vir seem to be considerable, both in the material culture, where all elements of the 'Neolithic package' are included, and in burial practices with the appearance of crouched inhumations. Sometimes these inhumations were found on the floors of trapezoidal buildings (Burials 8 and 9 in House 24, and Burial 19 in House XLIV/57), which might already have been abandoned at the time of the interment, and/or buildings were transformed into burial sites with an awareness and memory of their existence, if not always of particular meanings associated with these structures, then at least of their physical presence (contra *Srejović 1969.161*). We have dated one of theses burials, a headless crouched inhumation (Burial 19; see footnote 4, Fig. 3) found close to the large rectangular stone-lined hearth of House XLIV/57. The hearth was surrounded by a concentration of most striking representational boulders showing human-fish hybrids (see *Borić 2005c*).

It is very relevant to mention that new strontium isotope analyses show that several Early Neolithic crouched inhumations from Lepenski Vir might have been of non-local origin (*Price & Borić forthcoming*). It remains open to speculation whether these newcomers to Lepenski Vir could be considered as a representative sample of a new population wave that overtakes the region and is solely responsible for the specifically Early Neolithic features such as pits and ovens.[6] Such a view would partly be in accord with the proponents of the demic diffusion scenario for the Neolithization of Europe (*e.g. van Andel & Runnels 1995; Perlès 2001*), apart from the fact that the change in the Danube Gorges took place over several centuries (from around 6300 BC) with the slow, phased adoption of parts of the Neolithic package (pottery, polished stone axes and *Spondylus* beads) and only later (after 5900 calBC) acceptance of the full 'Neolithic package', including domestica-

6 Spaces of trapezoidal buildings Houses 5 and 8 were transformed in this period and adopted to new needs by constructing new domed ovens (*Srejović 1969.162–163*).

tes. Also, there is no clear sign of the violent destruction of the forager community at this and other sites at this time that would suggest a violent intrusion of Early Neolithic populations, although one cannot rule out the possibility of small-scale conflicts.[7]

Another scenario would be that the local population mixed with, it seems now, surprisingly mobile Early Neolithic groups that themselves might have adopted farming and new social and ideological frameworks not that long before their intensive interactions with the Danube Gorges foragers. The latter scenario could account with a staged, but voluntary conversion of the Danube foragers into Neolithic ways of life (see discussions in *Borić 2005a; 2005b; 2006; 2007; Chapman 1994; 2000; Radovanović 2006; Tringham 2000; Whittle 1998; etc.*). Such a scenario seems to be more at ease with the current evidence. It accounts with the continuation of specific local ways of life based on fishing and other everyday practices involved in the occupation of what were already very old and probably important locales on the banks of the Danube. There must have been at least partial recognition of previous building features at these places (see above). Such a scenario also accommodates the evidence of dramatic changes in the type of occupation and new objects (pots, polished stone axes, large blades of yellow white-spotted flint, *Spondylus* beads, etc.) that were being introduced into the Danube Gorges.

In order to achieve an even finer-grained resolution of the chronological scale, still more AMS dates will be required, along with the statistical Bayesian modelling of the probability ranges in order to narrow down the duration of specific events we are trying to date. One question that also needs to be addressed in the light of the new data is the upper limit of the Neolithic occupation of Lepenski Vir. While previous charcoal dates suggested that the site was in use up until *c.* 5400 BC, our results based on samples of animal bone indicate that the upper limit is currently around 5750 BC (see Fig. 3). A few AMS dated human burials belonging to phase III at Lepenski Vir may extend this upper limit to *c.* 5500 BC (see Tab. 2; *Bonsall et al. 1997; 2004; Price & Borić forthcoming*). Existing AMS dates from the contemporaneous site of Padina suggest that some trapezoidal buildings at this site (House 15 and 18, see *Jovanović 1987*) were used until *c.* 5500 BC (*Borić & Miracle 2004; Whittle et al. 2002*). It is possible that future dates would firmly establish the upper limit for the occupation of Lepenski Vir *c.* 5500 BC. This conclusion can also be related to the appearance of black painted rectilinear designs on Starčevo red pottery, as in the case of the previously discussed sequence in quadrants c/2, 1, I–IV from which one of the dated samples originate (see above). Such painted pottery is characteristic of the late Starčevo pottery style (for a review of such typological discussions see *Whittle et al. 2002*). The appearance of such pottery in the uppermost levels of Lepenski Vir in certain parts of the settlement was the main reason that Srejović suggested two subphases, a and b, within phase III. However, more new dates from the uppermost levels of the site, or from well-defined features with a distinct material culture, are necessary in order to accept the existence of these separate subphases. The publication of all pottery finds from this site with all contextual details would be a step in this direction.

It appears that after *c.* 5500 BC, the region of the Danube Gorges was abandoned for a whole millennium. No early Vinča culture settlements are known from this area. Why this happened remains an important and interesting, if very difficult, question to answer. The first indication of the later reuse of Lepenski Vir can be connected with the Eneolithic period, when a female adult, Burial 2, was buried in a crouched position in quadrant A/II in the 1st excavation spit (see Fig. 4). The burial pit was cut through the Early Neolithic levels, and the skeleton was found at 80 cm below the surface. It was accompanied by several whole pots that belong to the Salkuţa culture group (*Letica 1970*). The burial is also now dated in the range 4237–3974 calBC at 95 per cent probability after correcting for the freshwater reservoir effect (*Bonsall et al. 2004.299, Tab. 1*).

On the basis of the discussion so far, largely based on the new dating results coupled with a new understanding of stratigraphic relations at Lepenski Vir, we suggest a somewhat revised phasing of this key site of the Mesolithic-Neolithic sequence in the Danube Gorges (Tab. 2, see also *Borić & Dimitrijević in press*).

This revised phasing largely keeps the old nomenclature of the excavator. We would like to avoid confusions and complications of suggesting completely new labels for particular phases when there is no need for such a radical break from the original understanding of the site's stratigraphy. Although there

7 Evidence of body traumas from violent conflicts in the Danube Gorges is abundant for the Late Mesolithic (*c.* 7200–6600 BC) period (*Boroneanţ 1993; Cook et al. 2002; Roksandić 2004*).

Borić & Dimitrijević				Srejović	
Period	**LV phase**	**cal BC @ 2 s.d.**	**Material culture**	**Period**	**LV phase**
Middle Neolithic (c. 5900–5500 BC)	III	**6002–5752** (A) (6 dates) **6076–5478** (H) (6 dates)	Pits, domed ovens, domesticates, cultigens (?), Middle Neolithic Starčevo style pottery, polished stone axes, 'Balkan' flint; crouched, disarticulated & some extended (?) burials, *Spondylus* beads.	Middle Neolithic	IIIb
				Early Neolithic	IIIa
Transformational/ Early Neolithic (c. 6300–5900 BC)	I–II	**6240–5845** (A) (20 dates) **6216–5746** (H) (9 dates)	Trapezoidal buildings, sculpted boulders, extended burials parallel to the river, neonate burials, Early Neolithic Starčevo style pottery, polished stone axes, 'Balkan' flint	Mesolithic	II Ia–e
Late Mesolithic (c. 7500–6300 BC)	–	–	Non-existent at LV?		
Early Mesolithic (c. 9500–7500 BC)	Proto–LV 2	**7580–7190** (H) (1 date) **8218–7587** (A) (3 dates)	Stone-lined hearths, extended & disarticulated burials, seated burials w/crossed legs		Proto-LV
	Proto-LV 1	**9441–9150** (A) (3 dates)	Occupation residues, hearths (?), burials (?)		

Tab. 2. Comparative chronological table for the phasing of the stratigraphic sequence at Lepenski Vir; A – animal bone samples; H – human bone samples (for details of new AMS dates see Fig. 3, **Borić & Dimitrijević in press*****; other published dates of human bones from Lepenski Vir after*** **Bonsall et al. 1997; Price & Borić forthcoming*****).***

is no clear chronological continuity between the Early Mesolithic phases and the transformational phase, we think that it is appropriate to keep the original name of this phase 'Proto-Lepenski Vir', as it hints at the general regional continuity of occupying the same locales for several millennia, probably by the same cultural tradition (see *Borić & Miracle 2004*). Such a conclusion is in particular valid for phase Proto-LV 2, when stone-lined hearths, as striking features of continuity with the later period, might have appeared for the first time. However, one should emphasize that granting such regional continuity does not imply that the meanings and significance of certain practices from these early phases of occupation of the site and its later re-use remained the same and unaltered.

Conclusion

New AMS dates show a long duration of the early Mesolithic phase, from around 9300 to 7200 calBC, with dates clustering in two main subphases. These dates can be associated with the excavator's original phase of Proto-Lepenski Vir. At present, there is no dating evidence for the occupation of the site in the Late Mesolithic, *i.e.* from around 7200 to 6300 calBC. The Lepenski Vir I phase, associated with the construction and occupation of trapezoidal buildings with limestone floors, begins around 6250 calBC and lasts only several centuries. It seems that by 5900 calBC most of the buildings of phase I were abandoned as habitation features. In the light of new dates, it seems difficult to sustain the chronological as well as stratigraphic existence of phase II, and we suggest merging this phase with phase I. Subphases of phase I, representing building phases, must be revised too, and only with a future controlled dating and the application of statistical modelling might it be possible to narrow down the magnitude of error and suggest a more realistic chronological framework for the occupation and abandonment of particular (groups of) structures.

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Also, it is unlikely that there was a hiatus between what we consider Lepenski Vir I–II and III phases. Phase III followed the abandonment of most of the trapezoidal buildings, introducing a very different occupation pattern (notably the construction of domed ovens and the digging of oval pits, as well as the introduction of domesticates). It seems that some trapezoidal buildings of phase I–II were recognized and appropriated, mostly for burial purposes, during phase III. This might have been a phase lasting several centuries, with evidence of repair of old features (*e.g.* transformations of rectangular hearths into ovens or the renewal of oven floors and domes). Domestic animals, which were not present during phase I–II, make their appearance at the site in the period after 6000/5900 calBC, when all the other elements of the Early Neolithic habitation pattern also became established. The introduction of domestic animals was the final element of the 'Neolithic package' that became available and accepted by the inhabitants of the site. At that time, Lepenski Vir had for several centuries been accepting slowly both various aspects of the new, Early Neolithic material culture, as well as the living and the dead bodies of foreign human beings.

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Social aspects of the transition to farming in the Balkans

Dušan Mihailović
Department of Archaeology, Faculty of Philosophy, Belgrade, Serbia
dmihailo@f.bg.ac.yu

ABSTRACT – *The Neolithization of the Balkans could be considered as a very complex social phenomenon. In this work we study the causes for the cultural and social integration of hunter-gatherer communities in the Late Glacial and Early Holocene, social networks and contacts in the Iron Gates Mesolithic, and also factors having an impact on the spread of the Neolithic in the Balkans. It has been perceived that the evolution of culture in the Balkans was simultaneously influenced by internal and external factors, and this contributed to the very rapid acceptance of Neolithic values and the Neolithic way of life in the period from 6500 to 6200 calBC.*

IZVLEČEK – *Neolitizacijo Balkana lahko ocenimo kot zelo kompleksen socialni fenomen. V tem delu proučujemo razloge za kulturne in socialne integracije skupnosti lovcev in nabiralcev v času poznega glaciala in zgodnjega holocena na območju Železnih vrat na Donavi. Analiziramo mezolitske socialne mreže in kontakte in tudi faktorje, ki so vplivali na razširitev neolitika na Balkanu. Opazili smo, da so na evolucijo kulture na Balkanu sočasno vplivali notranji in zunanji faktorji, kar je prispevalo k hitremu sprejemanju neolitskih vrednot in neolitskega načina življenja v času od 6500 do 6200 calBC.*

KEY WORDS – *Neolithisation; Balkans; Mesolithic; hunter-gatherers; acculturation*

Introduction

In explanations of the Neolithization of the Balkans most attention has been paid so far to the chronology of the emergence of the Neolithic and the directions of distribution of Neolithic cultures from the territory of Anatolia and the Near East. For a rather long time attempts to suggest a greater role for the local communities have not been accepted, being accused of advocating anachronous (also nationalistic) viewpoints connected with the idea of the autochthonous evolution of cultures in this area (*Ammerman 2003.13–15*). Yet, it seems that there are at least two reasons for examining the Mesolithic-Neolithic transition in the Balkans within wider geographical and chronological frameworks. On the one hand, there is a real possibility that local components participated at least partially in establishing Neolithic cultures, and that the introduction of agriculture was marked by intensive interaction between the Mesolithic and Neolithic communities. On the other hand, it is becoming obvious that the distribution of the Neolithic in the Balkans is a spatially, chronologically and culturally defined phenomenon, which is reflected in the fact that the Neolithic spread over the entire area of western Anatolia and southeast Europe in a very short time, from 6500 to 6200 calBC. Therefore, two conclusions could be drawn: first, that studying the Neolithization of the Balkans includes examining the role of local populations; and second that the emergence of the Neolithic in the Balkans could not be perceived partially, without insight into events on a wider regional level. The solution to this problem certainly does not lie in the automatic acceptance of the colonization theory, which includes in recent times the study of almost all newly acquired data. If the Mesolithic communities played any part at all in this process, Neolithization should be considered as a complex social phenomenon, which resulted in the complete transformation of the culture, economy and society of the local population (*Budja 2005.66*).

Cultural regionalization and social homogenization in the Final Palaeolithic

If we want to answer the question whether the Neolithization of the Balkans should be understood as a social and cultural transformation of the Mesolithic communities or as a 'Neolithic invasion' of uninhabited areas, we should first examine the situation preceding the emergence of the Neolithic. When, particularly, the Final Palaeolithic is concerned the following questions could be asked: a – whether there is a parallel between cultural and economic changes in the final Palaeolithic in southwest Asia and southeast Europe; and b – which factors influenced the occurrence of semi-sedentary communities in the Iron Gates Mesolithic?

Regarding the final Palaeolithic in southeast Europe, so far, precisely the phenomena registered at sites in Greece have been connected with the emergence of agriculture. The greatest attention has been devoted to the discovery of wild cereals in the Late Pleistocene and Early Holocene deposits in Franchthi Cave. Nevertheless, neither these observations nor the assumptions that in the south Balkans conditions were favourable for the local development of wild cereals have been confirmed (*Perlès 1999*). Only in recent times was this assumption actualized, after the discovery of wild wheat and barley in the Mesolithic layers of Theopetra (*Kyparissi-Apostolika 2003; Vlachos 2003*). The initial phase of the domestication process was at one time also related to the evidence for the broad spectrum economy, but more recent investigations by Miracle (*1995*) reveal that this type of economy (from the traditional point of view) was not practiced in the Final Palaeolithic on the eastern Adriatic coast.

What is then that something which distinctively marks the economic and social changes in the final Palaeolithic in the Balkans, indirectly indicating the foundations on which the complex hunter-gatherer communities emerged in the Iron Gates as well as other manifestations characteristic of the Balkan Mesolithic? By the end of the Late Glacial in the southwestern Balkans an increased intensity of settlements in caves and rock-shelters, as well as the distinctive colonization of mountainous zones could be noticed (*Mihailović 1999a*). It could not be ruled out that this situation is a consequence of better preservation, visibility or investigations of the sites from this period. Nevertheless, the evidence for the settlement of mountainous regions is more than convincing. Therefore, the possibility must be considered that more intensive settlement in this area was influenced by various factors: palaeogeographic changes (resulting from the rise in sea level), the seasonal distribution of resources, and increase in total population, but also technological progress, which made possible the exploitation of new ecological niches. A certain role in these processes could also have been played by the fact that the organized system of settling where every habitation had a distinct role was introduced in this very period (*Mihailović in press a*).

That habitations had identical or similar functions over rather long periods of time is confirmed by the

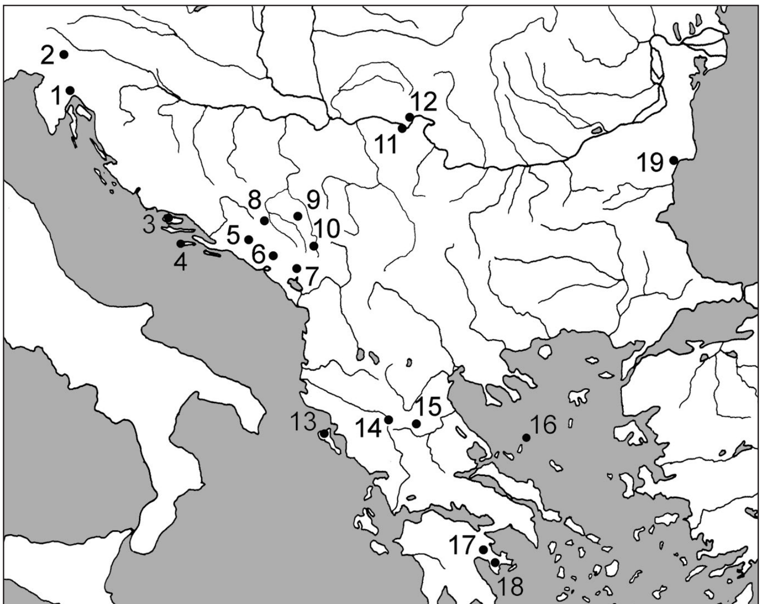

Fig. 1. Late Upper Palaeolithic and Mesolithic sites in the Balkans, mentioned in the text: 1 – Pupičina Pećina, Šebrn, 2 – Zalog near Verd, 3 – Kopačina Pećina, 4 – Vela Špilja, 5 – Badanj, 6 – Crvena Stijena, 7 – Vruća Pećina, 8 – Odmut, 9 – Medena Stijena, 10 – Trebački Krš, 11 – Padina, Lepenski Vir, Vlasac, 12 – Cuina Turcului and other sites in Lower Gorges, 13 – Sidari, 14 – Boila, 15 – Theopetra, 16 – Cyclope Cave, 17 – Klisoura, 18 – Franchthi, 19 – Dekilitazh.

quantity and structure of the remains encountered at these sites. There are different opinions about the duration and character of settlement within certain habitations. It is essential, however, that the structure of the fauna and chipped stone artefacts is generally uniform during all phases of settlement, and at Medena Stijena the overlapping of zones of activity was even registered (*Mihailović 2004a*). Of course, it could be objected that the geomorphologic characteristics of the terrain and the position and appearance of the caves and rock-shelters had a decisive impact on the function of the settlement and that a greater quantity of finds could be explained as a result of the better preservation of layers from this period. Naturally, we are not claiming that these factors had no impact, nor that an apparently so organized model of settlement appeared for the first time only in the Late Upper Palaeolithic. The settlements from this period are, however, definitely distinguished by the fact that this evidence in the Late Upper Palaeolithic appears for the first time at sites in mountainous regions, and also that at those sites a somewhat different repertoire of faunal remains in comparison with settlements from earlier periods was encountered.

Most of the remains at the sites from Early Upper Palaeolithic generally originate from large or medium fauna from open (rarely also forest) biomes. In the Late Glacial their quantity decreases at the expense of the remains of medium and even small fauna, in certain regions (*Stiner and Munro 2002*). Hunting for certain species, *e.g.* the ibex that was an exception in earlier times, now became regular even at a site in the Balkan interior (Cuina Turcului I–II, *Bolomey 1970; 1973; Mihailović in press b*). The elements of specialization are still not very prominent (except at sites dating from the very end of the Pleistocene) and at most sites the remains of 2–3 animal species predominate. The alternative resources were not present in considerable quantity, except at Franchthi, where fishing and mollusc and wild cereal gathering were confirmed (*Perlès 1999*).

The question could be raised as to what influenced the occurrence of such a settlement system: whether it was economizing on resources in the relatively barren Late Glacial environment (for which there are certain indications), population increase (*Stiner and Munro 2002*), or merely the pronounced seasonality of the resources. We think that latter possibility is the most probable reason. Nevertheless, in contrast to the Epipalaeolithic of the Near East, very few base camps in the open dating from the Final Palaeolithic have been discovered in the Balkans and the northern Mediterranean, so it is very difficult to draw reliable conclusion about the settlement system in this period. The results of recent investigations in south Epirus indicate that settlements could have been logistically organized (*Sinclair 1999*).

The fact that frequent settlement in the same habitations, which had identical or similar functions, was practiced during rather long periods of time certainly indicates the important role of tradition, which in a diachronic context confirms that hunter-gatherer communities had already established a certain level of social integration at the end of Pleistocene (*Mihailović 1999a; in press a*). A high degree of integration is suggested also by more and more prominent cultural regionalization, which was going to intensify in the ensuing periods. The point is, in fact, that the industries characterized by the distinct flaking technology and distinctive style in the production of certain tool categories appeared within limited regional level by the end of the Pleistocene. It has already been established that at a wider regional level there are differences between the Epigravettian industries of the northern Mediterranean, (including Öküzini in the Antalya region) and the Epipalaeolithic industries of Upper Mesopotamia and the south Levant (*Kozłowski 2005.531*). On the other hand, more recent investigations clearly indicate the cultural differentiation of Epigravettian industries in the hinterland and in the coastal regions of the central and southwest Balkans (*Mihailović 1998*). The level of Azilianization in the industries along the coast is more prominent (*Monet-White and Kozłowski 1983*), the bipolar technology is better represented, bladelet technology is not so well developed, and the standardization of microliths is less prominent than in the industries in the hinterland (*Mihailović 1998; 1999b*).

Despite stylistic and typological conservatism (conspicuous only in some elements), it is confirmed that an identical rhythm of technological changes synchronized with the general tendencies of development in the final Palaeolithic in the wider area of the Mediterranean in both regions. All this bears witness to the fact that the social closure of the hunter-gatherer communities in this period was accompanied by a cultural openness to influences from neighbouring regions. Whether this kind of openness was also reflected in the economic sphere, taking into account the expansion of gathering activities (molluscs, vegetable food), it is not possible to determine so far, first of all because this phenomenon could have been influenced by climatic as well as ecological factors. The phenomenon of 'Mesolithization' that was documented in the economy of Franchthi (*Perlès 1999. 314*) is confirmed in the Adriatic-Ionian region only in technology as the occurrence of Sauvetterian elements in the industries of chipped stone artefacts (for example, at Medena Stijena V, Boila IV, *Mihailović 1996.44; Kotjaboupoulou et al. 1999.206*).

Here, the question could be asked, what is at the root of cultural and social changes in the Final Palaeolithic, and how much are these changes relevant for an understanding of later events. In this connection it should be emphasized that Late Upper Palaeolithic of the Balkans and neighbouring areas is characterized by: a – the operationalization of actions and activities within clearly defined standards and operative sequences; b – diversification in the procurement of mineral and food resources (directed towards providing the alternative sources); and c – an intensification in the exploitation of resources on the spatial level (regarding the orientation to certain kinds of resources within a given territory) and also on the level of their maximum exploitation (*Miracle 1995.490; Mihailović in press b*). The multifarious specializations aimed at mastering the various skills and knowledge is documented in technology, but it also could be, by all appearances, observed in other fields of human activity: first of all, in the economy and the settlement system. There is a great possibility that this phenomenon contributed considerably to the establishment of an entirely new economic model based on an intensification of the procurement of r-selected resources.

It is well known that an intensification of the procurement of r-selected resources is one of the main factors of sedentarization and transition to the Neolithic in general. Taking into account the expansion and duration of this phenomenon, we are certain that the crucial question to be asked is not how domestication took place, but how the intensification took place. The importance of this question is still more prominent if we accept the possibility that the gathering of wild cereals had been practiced in the Near East over a rather long period, and that it was the basis of sedentarization, disregarding whether it played a key or marginal role in the economies of Epipalaeolithic communities. The fact that intensification in the procurement of vegetable foods suitable for domestication and storage took place in the Near East determined the role of this area in the ensuing millennia. From this perspective it is probably not so crucial when and how domestication took place, as it could have happened at any moment because of any of the reasons. The first results of the domestication of plants and animals did not change abruptly and essentially the economic and social organization of the human communities in that area. It is known, however, that advanced agriculture and stockbreeding did not appear in the Near East before the advanced phase of the Pre-Pottery Neolithic.

Degree of cultural openness			
high and very high			**Late Upper Palaeolithic-early phase** ● high degree of mobility inside large territory ● cultural unity over the large territory ● social differentiation ● long-range exchange networks (raw material, marine shells etc.) (*Soffer 1985; Kozłowski 1999*)
low		**Late Upper Palaeolithic – final phase** ● high degree of mobility over the limited territory ● cultural regionalization ● social homogenization ● middle-range exchange networks	
very low	**Early Mesolithic** ● restricted mobility and territoriality ● cultural disintegration and isolation ● social integration ● short-range exchange networks		
	very low	low	high and very high
	Degree of social openness		

Tab. 1. Cultural and social openness and closure in the Late Upper Palaeolithic of the Balkans – based on Eriksen's model (**Eriksen 2005*****).***

Cultural and social integration in the Early Mesolithic

At the beginning of Holocene, profound changes occurred in the way of life and in the material culture of the hunter-gatherer communities, but they happened gradually. There are, unfortunately, scarce data about sites from this period. They were investigated in considerable numbers only in Greece (*Galanidou and Perlès 2003*), Montenegro (*Mihailović 1998; 1999b*), Serbia (sites at the Iron Gates, *Radovanović 1996*) and more recently in Croatia (*Miracle et al. 2000; Miracle 2001*), while only one site has been discovered in Slovenia (*Gaspari 2006*) and Bulgaria, respectively (*Gatsov 1982*). Differences in material culture between the final Palaeolithic and Early Mesolithic horizons on many sites could not be clearly perceived. Such is the case, for instance, with Crvena Stijena and Trebački Krš in Montenegro (*Mihailović 1999b; Đuričić 1996*), Badanj (upper layers) in Herzegovina (*Miracle 1995; Whallon 1999*), Cuina Turcului I–II in the Iron Gates (*Păunescu 1978*) and Dikili Tash in the western Black Sea region (*Gatsov 1982*). Only in a somewhat later period does the character of finds change substantially and settlements in the open appear for the first time in the Iron Gates and in Slovenia.

The settlements in the open were probably widely distributed, but the systematic site surveying of the littoral regions have not been conducted in the Balkans even in regions where these sites could be easily identified (*e.g.* in caves and open localities in the high mountainous region). The Mesolithic sites have not been registered in the lowlands, or on river banks (except in the Iron Gates) where they could be expected. The lowest river terraces are flooded nowadays under alluvial deposits, uncultivated, or covered by vegetation, so the layers with Mesolithic finds are inaccessible. In such a situation the absence of evidence certainly does not mean evidence of absence.

The character of settlement of the earliest Mesolithic habitations in the open has not been sufficiently studied. In the earliest phase of settlement (at the end of the 9th millennium calBC) the Padina site in the Iron Gates was by all appearances a base camp where the habitation remains, working floors and even burials in addition to a huge quantity of artefacts and animal bones were documented (*Jovanović 1974; Radovanović 1981; Borić and Miracle 2004*). The remains of very early settlements have been documented also at Lepenski Vir and Vlasac, Ostrovul Banului (I–II) and Terasa Veterani (*Radovanović 1996; 2006; Boroneanţ 1999; Borić 2002; Bonsall et al. 2004*) On the whole, the evidence from the settlement in the open, together with the data acquired by investigation of the caves indicates the prolonged stay of people in the habitations and settlements, reduced mobility and prominent territoriality. However, the proof of sedentarization has increased in quantity in the course of time. In the second half of the 8th and in the first half of the 7th millennium in the Iron Gates there appeared linearly organized settlements where the remains of habitations, many artefacts and burials have been found. Nevertheless, the stratigraphic confusions arising because these are investigations of an earlier date make impossible a precise understanding of the seasonality and duration of settlement at these sites.

Regarding the economy, the system of resource procurement in the Balkan Peninsula at the beginning of the Holocene is highly eclectic. Most of the sites showed the hunting of medium forest fauna (deer, wild boar, roe deer, beaver, hare), to be confirmed to a greater or lesser extent. Mollusc gathering was confirmed at sites in the coastal region and in the immediate hinterland, while fishing was documented in the Iron Gates (*Radovanović 1996*) and in Greece (*Pickard and Bonsall 2004*). Only in the south of the Balkans was a somewhat greater role for vegetable resources in the diet registered. It is confirmed by grains of wild cereals from Theopetra (*Kyparissi-Apostolika 2003; Vlachos 2003*) and the macro-botanic remains from Franchti (*Perlès 1999*). However, in the Balkans as in some other regions it is also impossible to confirm with certainty the proportional presence of alternative and r-selected resources in the diet (*Bonsall et al. 1997; 2004; Cook et al. 2002*). Sedentarization in the Iron Gates Mesolithic was almost certainly connected with fishing, as is suggested by the remains of fish bones and the results of isotopic analyses (*Bonsall et al. 1997; Radovanović 2006*). It is still an open question whether fishing was the main economic activity or as Radovanović suggested (*1996.37*) it just "*played the role of vital resource*" for the survival of the community, and as such was the main integrative factor among the Mesolithic groups in the Iron Gates.

Social, cultural and economic changes in the early Holocene are very clearly indicated also by changes in the Mesolithic industries of chipped stone artefacts. The fact is that a decline on all three technological levels: a – in the selection of raw materials, b – in the chipping technology, and c – in the repertoire and style of tool production could be encountered in the Balkans at the beginning of Holocene (*Mihailović 2001*). At sites in all three well investigated regions, in Montenegro, Greece and in the Iron Gates, low-quality raw materials of local origin prevail, and the Iron Gates Mesolithic industries in the Lower Gorge acquired an almost entirely quartz character (*Radovanović 1996; Boroneanţ 1999*). The blade technology was in decline, while among the tools denticulated and retouched flakes and other tools for temporary use predominate. This expedient technology is not such a rare phenomenon in the European Mesolithic and it is usually connected with a decline in mobility. The reasons for its occurrence should be looked for as much in functions (that is, in the new activities, which required different tools) as in the disintegration of the cultural system from the preceding period.

Despite the fact that technological decline occurred in most early Holocene industries in the Balkans and even at the site at Zalog near Verd in Slovenia, where finds greatly resembling those from the Iron Gates have been made (*Kavur 2006*), there are many elements indicating the diachronic changes and cultural (and perhaps also ecological) differentiation of the chipped stone industries in this period. At present they are identifiable only in general outlines.

In the early phase in the Balkans, which is very difficult to distinguish chronologically and culturally from the Final Palaeolithic, there were industries with an Epigravettian component still prominent, but the repertoire of the Epigravettian types of tool is restricted to backed bladelets and scarce microliths. It seems that the Romanellian elements (in particular, circular microlithic endscrapers) appeared in larger quantity at sites in coastal regions such as in Montenegro (Crvena Stijena) and also on the Black Sea coast (*Mihailović 1999b; Gatsov 1982*). This phase, besides the mentioned sites, is also represented by the finds from Cuina Turcului II (*Păunescu 1978*). In the next phase from which most of the sites could date (and which probably date from the end of 9th and from the 8th millennium calBC) the expedient technology was at its peak (sites in the Iron Gates, Padina in particular; Franchthi – lithic phase VII, Theopetra) (*Mihailović 2001*). In the last phase, at the end of 8th and the beginning of the 7th millennium calBC bladelet technology reappeared (Vlasac, Franchthi, *Kozłowski and Kozłowski 1982; Perlès 1990*) and in some regions (*e.g.* at Crvena Stijena in Montenegro) tools appeared which could be described as prototypes or imitations of the implements produced by using bladelet technology, which would be the main characteristic of the local Castelnovian in the Late Mesolithic (*Kozłowski et al. 1994; Mihailović 1999a; 1999b*). At this moment there are no elements which indicate a strict chronological distinction between these phases (for instance, the quartz industries in the Iron Gates survived until the middle of the 7th millennium calBC). These are, therefore, general tendencies, which, however, should not be ignored.

It is difficult to establish at this moment to what extent the changes in the chipping technology and in the style of tool production ensued because of foreign influences and to what extent they are the reflection of the economic and technological needs of the local communities. That the needs of the population could have had the decisive role is indicated, for instance, by the fact that at least in two regions (in Montenegro and the Iron Gates) the decrease in quantity of microliths and backed tools could be related to the occurrence of bone projectiles.

When the cultural influences and contacts with neighbouring areas are concerned, it should be emphasized first of all that the Iron Gates Early Holocene industries were related at one time to influences from the Black Sea region (Cuina Turcului-Belolesye-Shan Koba complex, *Radovanović 1981; Kozłowski 1989*). In recent times, however, it has been held that the decrease in quantity of high quality raw materials confirms that the Balkans was isolated in this period (*Kozłowski 2005.536*). Although technological decline basically confirms the successful technological adaptation to the newly created circumstances in the natural environment, it seems that there are grounds for the claim that just in this period contacts with the neighbouring communities deteriorated. This is not surprising as the process of social integration (which had started in the Final Palaeolithic) reached its peak during the Mesolithic. Within that context it could be concluded that just the social closing, in the last resort, actually resulted in distinct cultural isolation.

All this, however, is valid only until the beginning and the middle of the 7th millennium calBC, when the new phase in the evolution of the Mesolithic in the Balkans had started. In that period cultural, conditions stabilized and communities with recognizable cultural identities were established. Semi-permanent settlements with dwelling structures did occur; there is evidence for intensive hunting and fishing, and even for dog domestication (in the Iron Gates – *Bö-*

könyi 1978). Many proofs of horizontal and vertical social stratification, the establishing of regional groups and the first conflicts were encountered at the sites in the Iron Gates (*Boroneanţ 1973; Roksandić et al. 2006*). There is a great possibility that a complex system of beliefs, evident in the funerary ritual among other things, was already established in that period (*Radovanović 1996; 1997*). All this could be characterized as a consequence of the internal dynamics of evolution of the Iron Gates population, but for the fact that the first elements, which indicate connections with Anatolia and the Near East, occurred in the Balkans at just about that time (end of 8th and beginning of 7th millennium calBC). To what extent they could have contributed to the cultural changes documented in the final Mesolithic in the Balkans we discuss below.

Cultural opening and social tensions in the Late Mesolithic

Although Late Mesolithic sites have been encountered only in Slovenia, Montenegro, Serbia and Greece, there is a great possibility as we said before that the level of investigation does not accurately reflect the population density in the Balkans in this period. The registered sites include cave sites in the coastal region and in its immediate hinterland, but also settlements in the open that are confirmed, in addition to the Iron Gates, also in Greece (*Merkyte 2003*). The stratigraphic continuity of the Early and Late Mesolithic has been reliably confirmed in Serbia, Montenegro and Greece (Franchthi), but it should be emphasized that the borderline between Early and Late Mesolithic in the Iron Gates could not be established in a conventional manner. This borderline is marked in addition to the presence of the characteristic microliths and bladelet tools by the general changes in culture that happened around 6300 calBC (and perhaps slightly earlier) in the Mesolithic of this area. Distinguishing the Late Mesolithic is additionally complicated by the fact that the first Neolithic elements did occur in the Iron Gates at approximately the same time (*Radovanović 2006*).

The changes in the settlement system in the Late Mesolithic are insignificant. The cave habitations still bear witness to the intensive settlement of mountainous zones and littoral regions, while evidence of settlement in river valleys is still lacking. The sites in Greece confirm in the best way the settlement of coastal regions. Regarding cave habitations, the impression remains that most of the investigated settlements were actually ephemeral camps which do not offer sufficient insight in the settlement system of this period.

The faunal remains also indicate close a relationship between settlements and the distribution of resources. The remains of deer, wild boar and roe deer still prevail at sites in the mountainous zone, and the changes are visible in the expansion of the range of resources and the increased intensity of fishing and the gathering of molluscs. Of particular importance is the fact that fishing for big fish (bluefin tuna in Franchthi, Cyclope Cave and Vela Špilja, and beluga in the Iron Gates) was practiced in the previous and this period not because of the actual share they had in the diet, but because this type of fishing must have assumed a high degree of labour organization, which included the wider community (*Radovanović 1996. 55–56; Pickard and Bonsall 2004*).

This combined strategy in obtaining resources has been confirmed in all areas. The most exhaustive evidence in Montenegro comes from Crvena Stijena and Odmut. In layer IV at Crvena Stijena three horizons with many hearths, snail shells and animal bones, bone projectiles and antler tools were found (*Benac 1975; Mihailović 1998*). It is surprising to a certain extent that the remains of ibex are prevalent at Odmut (*Bökönyi 1973*), but it merely bears witness to the fact that hunting for caprines in the high mountainous zone was practiced in this area, as well as in the Mesolithic of northeastern Italy. Remains of fish and birds (*ibid.*), as well as a rather large number of harpoons of a distinct type were found at the same site (*Srejović 1974a*). In the Iron Gates, at Padina and Lepenski Vir, except hunting for forest game, fishing was also practiced and bird hunting was also registered (*Radovanović 1996*). Bone projectiles and antler tools were also encountered in this region and at some sites in rather large quantities. In addition to fishing, hunting and gathering, Greece turned up very little evidence of vegetable resources (*Perlès 1999.316; Trantalidou 2001.417–418*), while in Croatia and Slovenia in the earlier period the gathering of molluscs already had a very important, even social function – as indicated by the remains of a 'feast' in Pupičina Pećina (*Miracle 2001*).

Nevertheless, the most conspicuous changes in the Late Mesolithic are in technology. At sites in the coastal region and also in the Aegean not only microliths, but also bladelet technology based on the flaking of cores of high quality raw materials appeared together with artefacts characteristic of the previous period (*Perlès 1990; 1999; Mihailović 1998; 1999b*).

A similar process took place in the Iron Gates (*Radovanović 1996*). Although the flint from the Pre-Balkan platform, wide blades and trapezes, occur already at Vlasac (*Kozłowski and Kozłowski 1982*), it is obvious that the emergence of ground stone tools and pottery at Padina B and Lepenski Vir could be related to the emergence of the Neolithic in neighbouring areas (*Jovanović 1987; Garašanin and Radovanović 2001; Antonović 2006*).

But there are many reasons the cultural position of these sites could not be precisely defined. First, it is obvious that the Late Mesolithic developed in continuity with the previous period. The elements of continuity and distinction of the Iron Gates Mesolithic are visible in the settlement system and in the organization of settlements and habitations, in the manner of obtaining the resources, and in mortuary practices, art and the belief system. Regardless of the high proportion of terrestrial resources (which is related to the introduction of stock-breeding and agriculture – *Bonsall et al. 1997; Radovanović 2006*) more recent analyses of fauna have revealed that there is no evidence that domesticated animals were used for food before the beginning of the 6th millennium, *i.e.* when completely established Neolithic cultures appeared in this area (*Radovanović 2006*).

How, then, could the cultural and social changes in the Late Mesolithic in the Balkans be explained? The establishment of Late Mesolithic cultures probably took place during the 7th millennium calBC. In this period Lepenski Vir culture reached its climax, Castelnovian spread along the Adriatic coast, and the bladelet industries of the Upper and Late/Final Mesolithic appeared (even earlier) in Greece. Regarding the local Castelnovian, which is characterized by the absence of the technique of microburins, it is evident that it developed and spread gradually. It could be best perceived in Montenegro. The initial phase was registered at Crvena Stijena IVb2, where only stylistic and typological changes were encountered; the second phase (Crvena Stijena IVb1) is characterized by microbladelet technology and a broad repertoire of microlithic tools on the bladelets (truncations, notched and denticulated tools, trapezes); while the third phase (Crvena Stijena IVa) is characterized by a restriction of the repertoire of tools on bladelets and the appearance of wide blades (*Mihailović 1998; 1999b*). The quantity of the Castelnovian elements and microbladelet technology at the Late Mesolithic sites in this area decreases from the coastal area (Crvena Stijena, Vruća Pećina, *Mihailović 1999b; Đuričić 1997*) towards the hinterland (Odmut, Medena Stijena, *Kozłowski et al. 1994; Mihailović 1996*).

The social complexity of hunter-gatherer communities has been studied in the Late Mesolithic mostly in the Iron Gates. In the Lepenski Vir culture it was confirmed in the first place by architectural remains, stone sculpture and the funerary ritual (*Srejović 1969; Srejović and Babović 1983; Chapman 1993; Radovanović and Voytek 1997; Borić 1999*). However, we would like here to draw attention to phenomena which could be followed in the wider geographic area. Namely, it is obvious that in the Late Mesolithic there was a cultural and social opening, *i.e.* the connecting of hunter-gatherer communities at a wider regional level. Rather surprisingly, it happened in a period when there is evidence for the establishment of cultural identity and at approximately the same time that in some regions (*e.g.* in the Iron Gates) the degree of social integration reached its peak. The cultural opening is indicated by intercultural trends in flaking technology, the repertoire and style of tool production and by the fact that the distinct Late Mesolithic cultures appeared in this very period. Social openness is also indicated by evidence that the exchange of raw materials, artefacts and goods was more frequent in the Later Mesolithic than before. On the other hand, the internal integration of the Iron Gates communities is best reflected in the phenomena documented at Lepenski Vir itself.

The integration of the Iron Gates Mesolithic communities could have been influenced by various internal and external factors. It is apparent, among other things, in the distinct hierarchization, which is evident in different domains: in the parallel use of two technological concepts (blade/bladelet and expedient technology), in the synchronized practice of a highly specialized and broad spectrum economy, in the regional settlement system and in the organization of settlements, as well as in the funerary ritual. Basically, it is characterized by a tendency to distinguish specialized activities, prestigious objects and goods and structures of special importance and purpose, as well as groups and individuals having special status. This phenomenon had already been evident in the Near East since the Pre-Pottery Neolithic and in the Balkans since the establishment of complex hunter-gatherer communities in the Iron Gates. All this suggests a certain level of social complexity and alteration of values, either cardinal ones (aesthetic, sacred, ethical, economic, spiritual, social), but also those which individuals and groups have chosen between the traditional and the modern, humanism and materialism, loyalty and pragmatism (*Zetterberg 1997*). Many of the changes which took place in this period could be explained as a result of the internal transformation of Mesolithic society. Nevertheless, simply the fact that the opposing tendencies occurred in this period, the tendency to create social identity and the tendency to open up to the outside world, indicate the existence of social conflict in the closing phases of the Mesolithic. The external factor which had the decisive impact on the intensification of this conflict must have been connected to the process of Neolithization.

Cultural and social interactions in the Mesolithic-Neolithic transition

The more recent dates obtained for Neolithic sites reveal unambiguously that the ceramic Neolithic in western Turkey and southeast Europe spread very rapidly, between 6500 and 6200 calBC. Within this short interval the tendency of the Neolithic to progress from the southeast towards the northwest that was often recognized as evidence of continuous colonization is hardly discernible, and it could actually be followed only if the entire process is considered over a very large area and chronological framework, and if the emergence of the Pre-Ceramic Neolithic in Greece is also ascribed to it. It is obvious, however, that other factors influenced the expansion of the Pre-Ceramic Neolithic.

The chronology of the emergence of the ceramic Neolithic is well known. The Neolithic settlements in western Turkey are dated to the period from 6500 to 6300 calBC (*Özdoğan 1999; Reingruber and Thissen 2005*) and similar and even earlier dates have been obtained for the sites in Greece (*Reingruber and Thissen 2005*). The Neolithic occurred in Bulgaria around 6300 calBC (*Todorova and Vaisov 1993*) and slightly later dates were recently obtained for

Degree of cultural openness	very low	low	high and very high
very high			
high		**Late Mesolithic – late phase (after 6300 calBC)** ● substitution phase (Lepenski Vir, Padina): Neolithic elements in technology + Mesolithic economy, beliefs and funeral practice ● availability phase (Vlasac): flint from Pre-Balkan plateau; blade technology (*Kozłowski and Kozłowski 1982*), *Spondylus* beads (*Borić 2006*) ● cultural and social openness is enforced by the influence of external factors	**Early Neolithic** ● sedentism, farming economy ● cultural and social integration and differentiation ● population mobility inside large territory ←
low		**Late Mesolithic – early phase (7000–6300 calBC)** ● settlement of littoral and mountain regions ● cultural stabilization and differentiation ● technological, economical and social hierarchization ● possible connections with distant regions: *Cyclope* beads at Vlasac (*Borić 2006*); Near Eastern elements in the Iron Gates Mesolithic	
very low	**Early Mesolithic** ● restricted mobility and territoriality ● cultural disintegration and isolation ● social integration ● short-range exchange networks		
	Degree of social openness		

Tab. 2. Cultural and social openness and closure in the Iron Gates Mesolithic – based on Eriksen's model (*Eriksen 2005*).

the sites in the central Balkans (*Whittle et al. 2002*). It is, therefore, absolutely clear that the more recent dates do not speak in favour of assumptions about the continuous emergence of the Neolithic and that they could not be explained either as a consequence of long-lasting processes (such as increase in population or the search for fertile soil) or general theories of acculturation.

Such a tempo of expansion was probably the consequence of some distinct event, and there are different opinions concerning this issue, but we shall discuss here only the assumptions about the spread of the Neolithic in the southeast Europe. There are, as it were, just two possibilities, which could explain the speed of its expansion: either there ensued a mass population movement through scarcely inhabited areas, or the Mesolithic communities in the Balkans were already prepared to a great extent to accept the Neolithic way of life and Neolithic values.

Taking into account the evident discontinuity in the material culture, economy, settlements, burial practices, art and system of beliefs and almost complete absence of chronological overlapping of the Mesolithic and Neolithic, it seems at first glance that the former possibility is more plausible. After all, all essentially diffusionistic theories of earlier or later date are based on the assumption of discontinuity. Here we would like to draw attention to just a few facts, some of which we have already mentioned.

❶ Despite the small number of investigated sites and on the basis of the distribution of sites in Montenegro and in the Iron Gates it could be assumed that the Mesolithic in the Balkans was widely distributed in the littoral and mountainous areas.

❷ The elements of continuity are barely visible in the proto-Starčevo and Starčevo culture (microlithic and quartz components in the chipped stone industry), but they are, on the other hand, very conspicuous in the Neolithic of the south Adriatic and its immediate hinterland. For example, the changes in the settlement system, economy and material culture in the Early Neolithic in Montenegro are almost insignificant in comparison with the Mesolithic (*Mihailović 1998; 1999b*).

❸ The illusion of discontinuity in the central and eastern Balkans could be the consequence of the fact that conclusions were drawn in the past on the basis of comparison between the Neolithic agricultural settlements in the open and Mesolithic settlements in caves and rock-shelters. On all sites where there is a stratification of the Mesolithic and Neolithic horizons (and where the character of settling was similar) in the Iron Gates, as well as in Montenegro, the elements of continuity are much more conspicuous.

Nevertheless, even if we start from the assumption that the Mesolithic population was widely distributed, there is still the question of acculturation. We will examine this question from the aspect of social connections between the Balkans, Anatolia and the Near East, and from the aspect of cultural and social interactions of the Mesolithic and Neolithic communities at the very moment of transition from the Mesolithic to the Neolithic.

The Near Eastern elements were first studied within the context of the phenomena registered in the Iron Gates Mesolithic. The parallels with Natufian and Pre-Ceramic Neolithic in the Near East were established already at that time, first of all in the field of mortuary practice (*Srejović 1974b; Garašanin 1997*). But because of the chronological interval and geographical distance, the similarities were explained from the beginning as a result of convergent tendencies in cultural evolution. In recent times, the evidence has increased in quantity and new theories have appeared that opened up the field to different interpretations.

On a general level, the parallels between the Iron Gates Mesolithic and the Epipalaeolithic and the Pre-Pottery Neolithic of Anatolia and the Near East could be encountered in the funerary ritual, *i.e.* the burial of skulls and burial under house floors, in settlement organization (the existence of a central structure), in rectilinear architecture based on the precise measuring of ground plans, in the making of mortar floors and the use of pyrotechnology, and even in art, if we take into account the position, technique and style of manufacture of the sculptures at Lepenski Vir, as well as the syncretism in depicting human and animal figures (see parallels with Nevali Cori and other sites – *Hauptmann 1999*). The question could be raised as to whether all this is an accident, even more so as similar phenomena have not been recorded (at least not in that form and scope) in Mesolithic cultures in other parts of Europe.

When the chronology of these phenomena is concerned, it should be said that partial interment and the emergence of rectilinear architecture had already appeared in the early phases at Vlasac, while most of the other manifestations appeared in later period (at Lepenski Vir itself). Within that context it could not be ruled out that at the end of 8th and the beginning of the 7th millennium there could have been a limited intrusion of populations or influences from the Near East, most probably from the Lower Danube basin and the Black Sea region. Despite the fact that there is no reliable proof of this (the partial interment of skulls is registered in the Mesolithic in Ukraine – *Radovanović 1996.306*), it should be taken into account that the importance of the Danube direction was confirmed also in earlier periods: in the emergence of the Upper Palaeolithic, in establishing the cultural complex Cuina Turcului-Belolesye-Shan Koba (*Kozłowski 1989; Radovanović 1996*) and even in the Neolithic, considering that the earliest Neolithic settlements in Bulgaria were confirmed only in the Danube basin (*Todorova and Vaisov 1993*). On the other hand, the occurrence of elements of Pre-Pottery Neolithic at Lepenski Vir, if we put aside the possibility of the convergent tendencies, does not bear witness to anything else but the continuity of cultural evolution in the Upper Gorge in the Iron Gates from the establishment of the Mesolithic settlement at Vlasac to the advanced phase of Lepenski Vir culture. It is not very probable that Mesolithic communities from Lepenski Vir took over these elements from the Neolithic surroundings, as they are mostly absent there and they never occur together like a package deal.

The delay and incompatibility of the phenomena encountered in the Mesolithic in the Balkans (first of all in the Iron Gates), in comparison with similar manifestations in Anatolia and in the Near East, are logical if we take into account the distance between these two regions. Also, some other facts must be taken into consideration: a – still insufficiently investigated Mesolithic and Neolithic sites in the areas between these two regions, b – local environmental conditions, and c – some social factors. In the last case it concerns the fact that investigations of the early phase of the Pre-Pottery Neolithic in Cyprus (*Simmons 1998; Cauvin 2000; Guialine et al. 2000*) convincingly confirm that colonizing communities made every effort to develop an authentic culture and to adapt to the new environment, abandoning not only traditional resources, but also the 'advanced' technologies (laminar technology, specific projectiles and stockbreeding). Except for practical reasons, the fact that the connection between the Cyprus communities and their home territory became less and less strong as time passed certainly contributed to this situation.

In all this, it should be borne in mind that the culture of the Pre-Pottery Neolithic should not be perceived within a concept of cultural groups (which makes the comprehension of cultural phenomena rather more difficult than easy – even when the Neolithic is concerned), but as a cultural *koine*, which is evident in the fact that communities which inhabited large geographical areas shared the same culture and values, and where communication evidently existed, meaning the exchange of ideas, objects and goods. At its climax, the Near Eastern *koine* spread over very large areas. In this period areas very far from the home territories were settled in the process of so-called leap frog colonization (*Cauvin 2000*), but whether this also happened when the Iron Gates is concerned could not be established with certainty. It is almost certain, however, that the presence of Near Eastern manifestations in the Balkans (and consequently in the Iron Gates Mesolithic) could be best explained by Srejović's assumption that the Balkans and the entire Black Sea and Caspian region belonged to 'the extended branch of the fertile crescent' (*Srejović 1974b; 2001*), perhaps not so much in ecological and economic, but in the spiritual sphere.

The possibility that the emergence of the Neolithic in the Balkans was largely preceded by influences from Anatolia and the Near East change to a certain extent the perspective of understanding the Neolithization process in this area. If this proves to be correct, it would mean that the Mesolithic communities were acquainted with the Neolithic innovations, that some of them even tried to apply them, but that they could not or did not feel the need to adopt them, either because of the restrictions of the environment, or because of social factors. It is obvious, however, that it was not enough to know about the innovations, nor even to have the 'know-how', but their acceptance had to suppose the complete reorientation of the social and economic system. The Mesolithic communities were not guided so much by pragmatic needs, as it seems they tried to maintain the social networks and system of values within the restricted regional level. The conditions for economic transformation were fulfilled only then when changes in social values took place, so it is small wonder that the emergence of the first Neolithic elements was related to the exchange of raw materials, the imitation of tools and use of the objects which had not just economic, but also status value, indicating openness and a tendency to modernity.

Concluding remarks: the transition to farming

On the basis of everything said above we are more inclined to consider the process of Neolithization from the aspect of acculturation than from the aspect of colonization, regardless of the fact that authors of the model support the opinion that an availability model (*Zvelebil 1986*) could not be applied to the Balkans. One of the problems related to this model lies in the fact that the phase of availability is inadequately documented and that it is still assumed that the presence of Neolithic elements (pottery, bones of domestic animals) at Mesolithic sites could be the consequence of stratigraphic disturbances. That is, for instance, the case with a small amount of bones and pottery found in layer IV at Crvena Stijena (*Malez 1975; Mihailović 1998*) and the pottery finds on the sites in the Iron Gates (*Garašanin and Radovanović 2001*). But, it must be emphasized that the substitution phase (which is paradoxical to a certain extent, considering the duration) was reliably documented in the Balkans. It concerns the fact that to the availability phase in the Iron Gates could be ascribed only the finds from Vlasac: flint from the Pre-Balkan platform, laminar technology (*Kozłowski and Kozłowski 1982*) and recently found beads of *Spondylus* shells (*Borić 2006*). On the other hand, a large quantity of pottery and typical Neolithic chipped stone tools has been documented in the Mesolithic context (trapezoidal dwellings) at Padina B (*Jovanović 1987; Mihailović 2004b*).

We agree with authors who recognize the Neolithic elements on the Mesolithic sites in the Iron Gates as an influence from the Neolithic surroundings (*Radovanović 2006*). Also we are not inclined to date Padina and Lepenski Vir in the Neolithic (*Jovanović 1987; Borić 2002*). It means that the Neolithic horizons at the sites in the Iron Gates, despite the stratigraphic doubts, are clearly distinguished from the Mesolithic horizons on the basis of the cultural contents. There have been encountered not only the bones of domestic animals, but also many other elements characteristic of the Neolithic in the central Balkans. The Iron Gates sites, after being included in the Neolithic settlement network, lost their importance, and Lepenski Vir lost entirely its sacred character. But even then, in the Neolithic, the Mesolithic elements were present, but in the very small measure (*Mihailović 2004b*).

However, not only social values and striving for integration in social networks impeded the transition of the Mesolithic communities to the farming economy. There were some practical reasons. The Mesolithic groups were not able to employ this activity, first of all because of the environment and seasonal settlements directed towards the exploitation of water resources. There are only a few settlements on the banks that provided conditions for both activities (like Starčevo and Vinča in the later period). Therefore, it should not be ruled out that at some moment satellite agricultural settlements were established and that they took the main role in the course of time, and all that could have resulted in the marginalization of the settlements where fishing was the main activity. The fact that some of the earliest Neolithic settlements in Bulgaria were encountered on river banks could speak in favour of this assumption.

We wish to mention still another phenomenon worth examining. The rapid expansion of the Neolithic, as well as the genetic and anthropological evidence for the appearance of the foreign population and its mixing with local people (*Roksandić 2000; Zoffmann 2000; Richards 2003; Jackes et al. 2000*) could perhaps be best explained by the fact that precisely the integration of local communities (now in the Neolithic *koine*) could have considerably facilitated the flow of people, objects and goods and thus resulted in the rapid unification of culture in the entire territory of the central Balkans. The pockets of Mesolithic population, like those in the Iron Gates could have survived for a couple of hundred years, during most of the period of Early and Middle Neolithic (*Radovanović 2006*). Finally, we would like to say, risking a generalization that a similar rhythm of cultural and social transformation marked the next period. The way these transformations happened and the questions arising from their study lead to the conclusion that the reasons which encouraged them were similar. The more recent investigations of these phenomena clearly indicate that in these transformations (and probably in the transition from the Mesolithic to the Neolithic) the colonizing component played only a secondary role.

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Middle and Late Holocene hunter-gatherers in East Central Europe: changing paradigms of the 'non-Neolithic' way of life

Marek Nowak
Institute of Archaeology, Jagiellonian University, Kraków, Poland
mniauj@interia.pl

ABSTRACT – *According to traditional views, the main reason for 'demesolithisation' in East Central Europe was the spread of the Neolithic oecumene, particularly from* c. *4000 BC. Simultaneously, the disintegrated Late Mesolithic world gradually underwent typological unification, and finally reached the stage that is sometimes described as pre-Neolithic. However, we definitely have to bear in mind that as a matter of fact we deal only with the 'history' of archaeological artefacts that are treated as typical attributes of hunter-gatherers. The analyses of chronological, technological, settlement, economic, and social data referring to foragers of East Central Europe demonstrate that the quantitative decrease and changes of their archaeological attributes in the fifth, fourth, and third millennia were not connected with a profound reorientation of their spatial and ideological existence. It was rather a continuation of previous patterns, even though territories settled by farming societies were steadily growing in size. The final disappearance of Central European hunter-gatherers – but only in a strictly typological dimension – took place in the Late Neolithic and Early Bronze Age.*

IZVLEČEK – *Glede na tradicionalne poglede je bil glavni razlog 'de-mezolitizacije' v vzhodni srednji Evropi širitev neolitske ekumene, predvsem od c. 4000 BC dalje. Istočasno je mlajši mezolitski svet postopoma doživel tipološko zedinjenje in končno dosegel stopnjo, ki je včasih opisana kot pred-neolitska. Vendar moramo jasno vedeti, da se dejansko ukvarjamo le z zgodovino arheoloških artefaktov, ki jih obravnavamo kot tipične atribute lovcev in nabiralcev. Analize kronoloških, tehnoloških, poselitvenih, ekonomskih in socialnih podatkov, ki se nanašajo na nabiralce vzhodne srednje Evrope dokazujejo, da kvantitativni upad in spremembe njihovih arheoloških atributov v petem, četrtem in tretjem tisočletju niso bili povezani s temeljito, novo usmeritvijo prostorske in ideološke eksistence. Šlo je večinoma za nadaljevanje prejšnjih vzorcev, čeprav so se območja, ki so jih poselili kmetovalci, stalno povečevala. Končno izginotje srednjeevropskih lovcev in nabiralcev – vendar v striktno tipološki razsežnosti – se je dogodilo v mlajšem neolitiku in v začetku bronaste dobe.*

KEY WORDS – *East Central Europe; late hunter-gatherers; Late/Final Mesolithic; para-Neolithic*

Introduction

In reference to western regions of Central Europe, the Early Atlantic part of Mesolithic development is usually described as its late, final or terminal phase (*Arts 1989; Cupillard, Perrenoud-Cupillard 2003; De Roever 2004; Gronenborn 1999; Jochim 1998; Kind 1997; Louve-Kooijmans 2003; Raemakers 1999; Taute 1974*). It seems that indeed this was the last stage of the existence of foraging populations there, as opposed to eastern regions of Central Europe, as well as southern Scandinavia. In the latter, for instance, the Late Mesolithic survived until the turn of the fifth and fourth millennia BC (*Larsson 1990*). The chronology of the final disappearance of the Mesolithic in the former regions (Fig. 1) has so far remained controversial. According to some views, this could have taken place as late as the third millennium BC (*Bagniewski 1998; 1999; 2001a; Galiński 1991; 2002; Kobusiewicz 1999; Kozłowski 1989*). Regardless of the exact dates of its disappearance, the condition of late hunter-gatherers in this territory is often described as 'demesolithisation', disintegration, or even as regression, decline, and degeneration (*Galiński 1991; Kozłowski 1989*).

On the other hand, when late hunter-gatherers, as living within the described territories, are considered, it is often ignored that several specific communities which cannot be strictly classified either as Neolithic or Mesolithic in accordance with classic archaeological categorisation did inhabit vast regions of Eastern and East Central Europe in the Early and Middle Holocene. The economy of these communities was based mainly on hunting and gathering, but in some areas there was some limited familiarity with agriculture (*Dolukhanov et al. 2005; Gumiński 1998; 2003a; Gumiński, Michniewicz 2003; Kalečyc 2001*). For archaeologists, perhaps the most characteristic feature of the material culture of these communities is the widespread production and use of pottery. These vessels have a distinctive technology, morphology and decoration – quite different from the strictly Neolithic ceramics made by farming communities (*Kempisty 1983*). The flint industries in question also have their own unique features, yet tend to resemble those of the typical Mesolithic (*Kempisty, Sulgostowska 1991; Kempisty, Więckowska 1983; Schild 1989; Sulgostowska 1998*). Such communities appeared along the southern borders of Eastern Europe in the early eighth millennium BC at the very latest, and subsequently spread over the territory of Eastern and East Central Europe (*Antanaitis 1999; Dolukhanov et al. 2005; Józwiak 2003; Rimantiene 1992; 1994; Timofieev 1998*). They remained in the region for several millennia and were only eclipsed in the Bronze Age by the transition to the new type of material culture, and to to greater

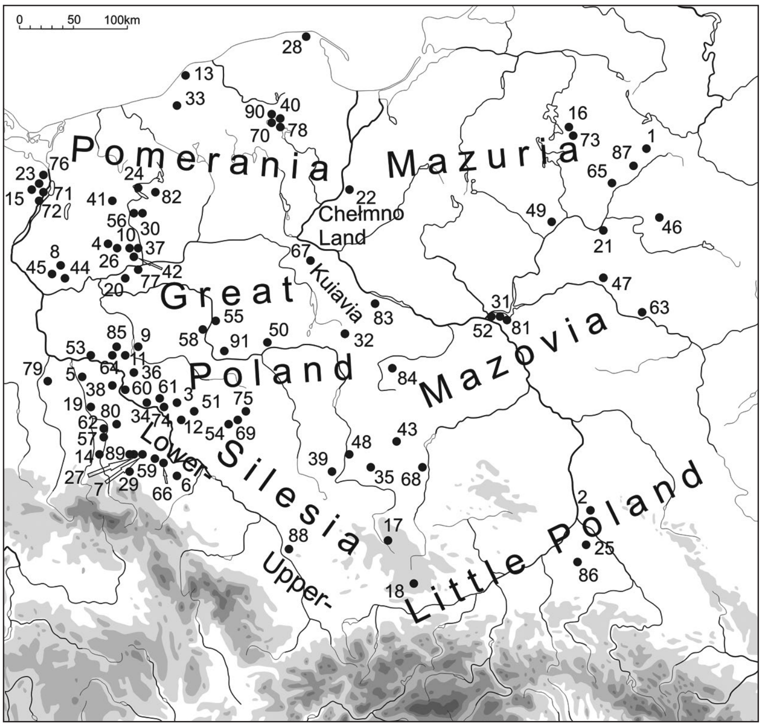

Fig. 1. Territory and sites discussed in the text.
1 – Augustów-Wójtowskie Włóki; 2 – Baraki Stare 13; 3 –Bartków 7; 4 – Bierzwnik 19; 5 – Bobrowice; 6 – Brodno E; Brodno 3; 7 – Bukówna 5; 8 – Buszów; 9 – Chobienice 8; 10 – Chrapów 17; 11 – Chwalim 1; 12 – Czeladź Wielka I; Czeladź Wielka II; 13 – Dąbki 9; 14 – Dąbrowa Krępnica 5; 15 – Dobra 53, I/83; Dobra 53, III/83; Dobra 53, IV/84; 16 – Dudka; 17 – Dzierżno 3; 18 – Glanów 3; 19 – Gorzupia Dolna 2; 20 – Gościm 23; 21 – Grądy Woniecko; 22 – Grudziądz-Mniszek; 23 – Grzepnica 7, sk. E; Grzepnica 7, I/84; 24 – Gudowo 3; 25 – Gwoździec; 26 – Jaglisko 1; 27 – Jaroszówka-Kolonia 10; 28 – Jastrzębia Góra 4; 29 – Jastrzębnik 5; 30 – Kalisz Pomorski 33; 31 – Komornica I; 32 – Korzecznik 6/7; 33 – Koszalin-Dzierżęcino 7; 34 – Krzekotówek 8; 35 – Kuców; 36 – Lubiatów II; Lubiatów III; 37 – Łęczyn 12; Łęczyn 13; Łęczyn 22; Łęczyn 23; Łęczyn 25; 38 – Ługi E; 39 – Łykowe; 40 – Męcikał 6; Męcikał 7a; Męcikał 7b; Męcikał 11; 41 – Miałka 4; 42 – Mierzęcin 65; 43 – Mokracz; 44 – Mosina 10; 45 – Mostno 15; Mostno 16; 46 – Nowodworce 1; 47 – Nur-Kolonia 1; 48 – Osjaków; 49 – Pianki I; Pianki II; 50 – Pietrzyków „g"; 51 – Pobiel 9; Pobiel 10; 52 – Poddębe I; 53 – Pomorsko 1; 54 – Potasznia 1; 55 – Poznań-Starołęka 1; 56 – Prostynia 16; 57 – Pstrąże; 58 – Puszczykowo 21; 59 – Rzeszotary 17; 60 – Siedlisko 16; 61 – Siedlnica 6; 62 – Sieraków 4; 63 – Słochy Annopolskie; 64 – Smolno Wielkie 1; Smolno Wielkie 2; 65 – Sośnia I; 66 – Spalona 12, I, Ia/85; 67 – Stara Wieś 9a; 68 – Stobnica-Trzymorgi; 69 – Sułów 1; 70 – Swornegacie 3; Swornegacie 6; 71 – Szczecin-Jezierzyce 19; 72 – Szczecin-Śmierdnica; 73 – Szczepanki; 74 – Świerczów; 75 – Świętoszyn 1; Świętoszyn II; Świętoszyn III; 76 – Tanowo 2, I/82 (sk. 2); Tanowo 3; 77 – Trzebicz Młyn 1; Trzebicz Młyn 2; 78 – Turowiec 1; Turowiec 3; 79 – Węgliny 12; 80 – Wiechlice I; 81 – Wieliszew 12 (XIV/1960); Wieliszew I, sk. II; Wieliszew III, sk. XVI; Wieliszew VIB, wykop XVIIc; Wieliszew VIII, wykop IX; Wieliszew XIII/1960/62; Wieliszew XII–XI; 82 – Wierzchowo 1; Wierzchowo 2; 83 – Wistka Szlachecka I/1963; Wistka Szlachecka V/1960; Wistka Szlachecka VI/19660; 84 – Witów 1; 85 – Wojnowo 1; 86 – Wola Raniżowska; 87 – Woźna Wieś 1; Woźna Wieś 2; 88 – Zakrzów 6; 89 – Zamienice 10; 90 – Zbrzyca 2; Zbrzyca 5; 91 – Zwola 2.

significance of agricultural economy. It was mainly the use of pottery by these hunter-gatherers that undermined the classic distinction between the Mesolithic and Neolithic, and spawned a series of adapted terms such as the para-Neolithic, proto-Neolithic, sub-Neolithic, Forest Neolithic, Comb-Pitted Pottery Complex, and the Ceramic Mesolithic, Hyperborean Horizon, not to mention less popular ones (*Gronenborn 2003; Janik 1998; Kobusiewicz 2001; Werbart 1998*). It should also be remembered that East European archaeologists usually consider this phenomenon as simply Neolithic (*e.g. Čarniauski 2004; Rimantiene 1998*), which complicates the matter even further. In this paper I am going to use either the neutral term 'pottery-using hunter-gatherers', or the word 'para-Neolithic', introduced by the late Elżbieta Kempisty over twenty years ago (*Kempisty 1982*).

It is a very common approach in the archaeological literature to make a clear distinction between Mesolithic and para-Neolithic populations. For example, in Polish and Belarusian territories we have, on the one hand, Mesolithic groupings, and on the other hand, the Neman Culture and the so-called Linin Horizon, both belonging to the para-Neolithic or, if we use 'eastern' terminology, the Neolithic. The difference lies in the relation between these terms. In Belarus, as typically in East European approaches, the relation is linear; that is, the Mesolithic is viewed as replaced by consecutive developmental stages of the para-Neolithic (or, in East European terminology, the Neolithic) (*Čarniauski 2004*). What is stressed in some approaches in reference to Polish territories, however, is the rather long co-existence of the Mesolithic and the para-Neolithic (*Józwiak 2003*).

Terminological problems arise also in connection with those 'Polish' sites where Ertebølle-type pottery was found, which indeed bears some resemblance to para-Neolithic pottery. Flint inventories from these sites are typically Mesolithic, of the post-Maglemosian tradition, with either no or only token occurrences of features that are characteristic of Ertebølle flint industries (*Ilkiewicz 1989; Kabaciński 2001*). Again, the picture is blurred, as at some sites (*e.g.* Dąbki) the bones of domesticated animals were found (*Ilikiewicz 1989*). The phenomenon then, in my opinion, is actually of the same dimension as the para-Neolithic. Therefore, whenever applying the term, I am going to refer to the above-mentioned sites containing Ertebølle pottery.

In my paper I will argue that neither i) negative connotations of the Late Mesolithic in East Central Europe, nor ii) the distinction between the Mesolithic and para-Neolithic in this territory can be justified. Both stem from a traditional methodology which: i) considers the archaeological past as a roughly linear set of units and stages, and ii) takes the appearance of elements of the so-called Neolithic package at their face value only (which in a measure is connected with the general conviction that a hunting-gathering mode of existence is inferior to agriculture, and that even sporadic and scarce Neolithic attributes brought about significant changes in the economic, social and ideological spheres).

Chronology of late hunter-gatherers

First of all, we should address chronology issues and remember that radiometric data referring to, generally speaking, non-Neolithic phenomena in East Central Europe (Fig. 1) suggest a very long history of hunter-gatherers. If we considered all the ^{14}C dates available, later than 6000 BP (Figs. 2a, 2b), it would turn out that these phenomena came to an end only in the Early Bronze Age. What is more important, at least in theory, is that there would be no significant difference between radiocarbon dates from pottery and non-pottery contexts, or in other words, from more or less para-Neolithic and Mesolithic contexts (Fig. 3). The real value of these dates has been the subject of many debates, regretfully surrounding only the question of the Late Mesolithic in Poland (*Bagniewski 1979; 1982; 1987; 1998; Czerniak 1994.9–10; Galiński 1991; Kabaciński 1992; Kobusiewicz 1999; Kozłowski 1989; Kukawka 1997. 82, 129–135; Schild 1998*). One major problem is the apparent homogeneity of many sites containing Mesolithic and para-Neolithic materials, caused by geological and geomorphological factors that at most sites considerably interfere with the sequence of deposition of natural and anthropogenic sediments, as well as archaeological artefacts (*Schild 1989*). Thus, probably a large proportion or even the majority of the quoted radiocarbon dates come from mixed contexts, embracing both Mesolithic and para-Neolithic remains. In such cases we are unable to determine whether samples used for ^{14}C dating are connected with a Mesolithic or para-Neolithic milieu. Yet if we assume, as I will strive to demonstrate, that in view of cultural development the distinction between the Mesolithic and the para-Neolithic is not paramount, the perspective is slightly altered. Since the similarities in the material culture and the modes of settlement and economy are significant, as indicated below, then the dates, all in all, refer to phenomena relating to hunter-gatherers, and so existing, culturally,

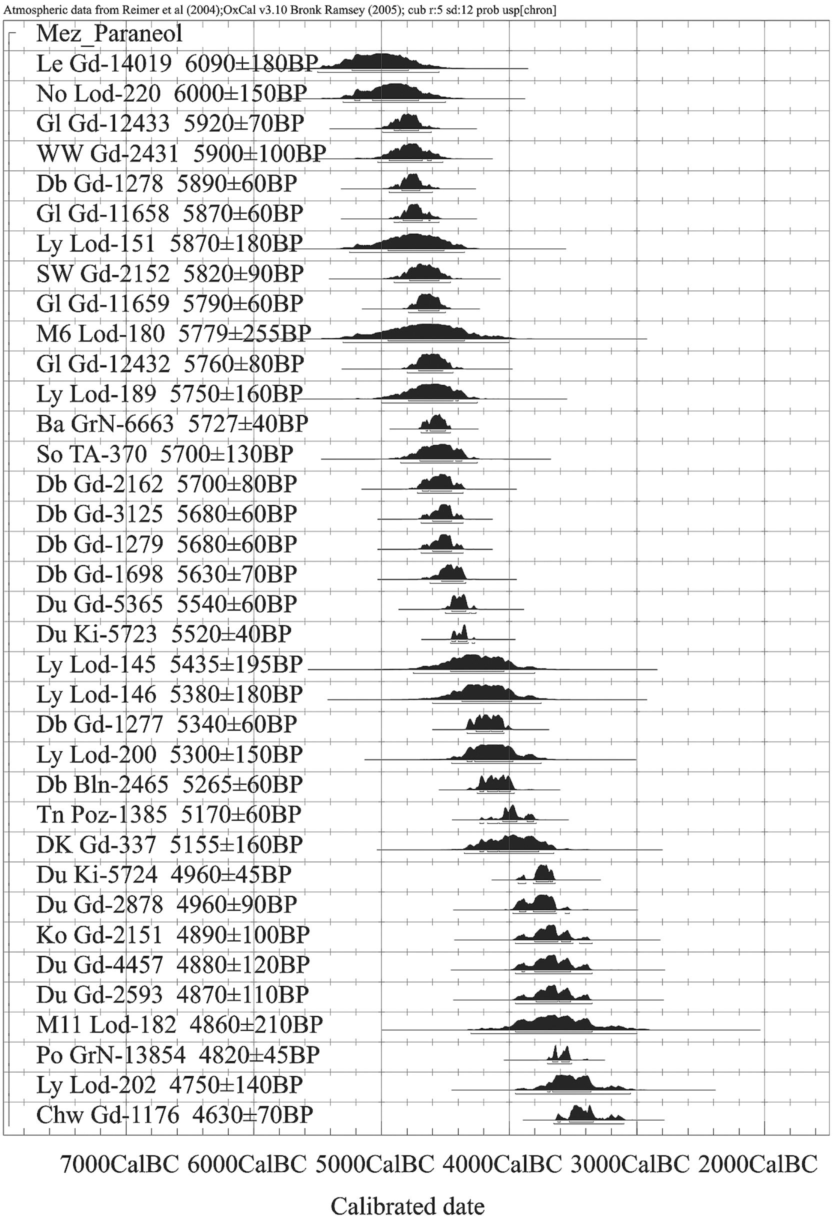

Fig. 2a. Radiocarbon dates later than 6000 BP from Poland, obtained outside of the Neolithic context; part 1. Ba – Bartków 7 (*Bagniewski 1979.76; 1982.83*), Br – Brodno E (*Bagniewski 1991. 12*), Chw – Chwalim 1 (*Kobusiewicz, Kabaciński 1993*), Db – Dąbki 9 (*Ilkiewicz 1989. 18–21, Figs. 4, 5; Pazdur 1991*), DK – Dąbrowa Krępnica 5 (*Bagniewski 1982. 107*), Du – Dudka (*Gumiński, Fiedorczuk 1988.116–7; Gumiński 1999*), Gl – Glanów 3 (*Pazdur et al. 2004. 815*), GM – Grudziądz-Mniszek (*Bokiniec, Marciniak 1987; Kanwiszer, Trzeciak 1991.119*), KP – Kalisz Pomorski 33 (*Bagniewski 1996. 137*), Ko – Korzecznik 6/7 (*Olszewski 1987.53*), Le – Łęczyn 22 (*Bagniewski 1999.133–4*), Ly – Łykowe (*Cyrek 1990; Kanwiszer, Trzeciak 1991.119–20*), M6 – Męcikał 6 (*Bagniewski 1987.114*), M11 – Męcikał 11 (*Bagniewski 1987.114*), Mo – Mokracz (*Niesiołowska-Śreniowska 1990a.309; 1998.69–73*), No – Nowodworce 1 (*Cyrek et al. 1985. 12–3; Nowak 1980.18–19; Kanwiszer, Trzeciak 1991. 115*), Os – Osjaków (*Kanwiszer, Trzeciak 1991.120–121*), Po – Pobiel 10 (*Bagniewski 1990*), Pr – Prostynia 16 (Bagniewski 1996. 137), Si – Siedlnica 6 (*Bagniewski 1979; 1987.115*), So – Sośnia I (*Kempisty, Więckowska 1983.13, 81*), SW – Stara Wieś 9a (*Pazdur et al. 1994.263*), Sw6 – Swornegacie 6 (*Bagniewski 1987.114*), Tn – Tanowo 3 (*Galiński 2005. 87*), Tu1 – Turowiec 1 (*Bagniewski 1987.114*), Tu3 – Turowiec 3 (*Bagniewski 1987. 114*), WW – Woźna Wieś 1 (*Kempisty, Sulgostowska 1991.16, 84; Pazdur et al. 1994.260–261*), Zb – Zbrzyca 5 (*Bagniewski 1987.114*).

outside the Neolithic proper. Summing up, despite the aforesaid difficulties in demarcating compact archaeological complexes on foraging sites, I would like to argue that lands outside the densely settled early agricultural enclaves were occupied by populations of hunter-gatherers until at least the end of the third millennium BC, and possibly even longer; in other words, farmers lived alongside hunter-gatherers for at least 3500 years (see also *Kośko, Szmyt 2004; Czebreszuk 2004*). Cartographic analyses show that these Late Mesolithic settlements concentrated mainly in lowland areas, including the Pomeranian and Mazurian Lake Districts, some areas of north-eastern Mazovia, Great Poland, Lower Silesia and central Poland (Fig. 1) (*Nowak 2001.586*).

Material culture, settlements and the economy of late hunter-gatherers

Beginning from the first half of the seventh millennium BC, the tool inventory of the European Mesolithic underwent typological and technological transformations which consisted in the ongoing standardisation of flint industries. With time, the process

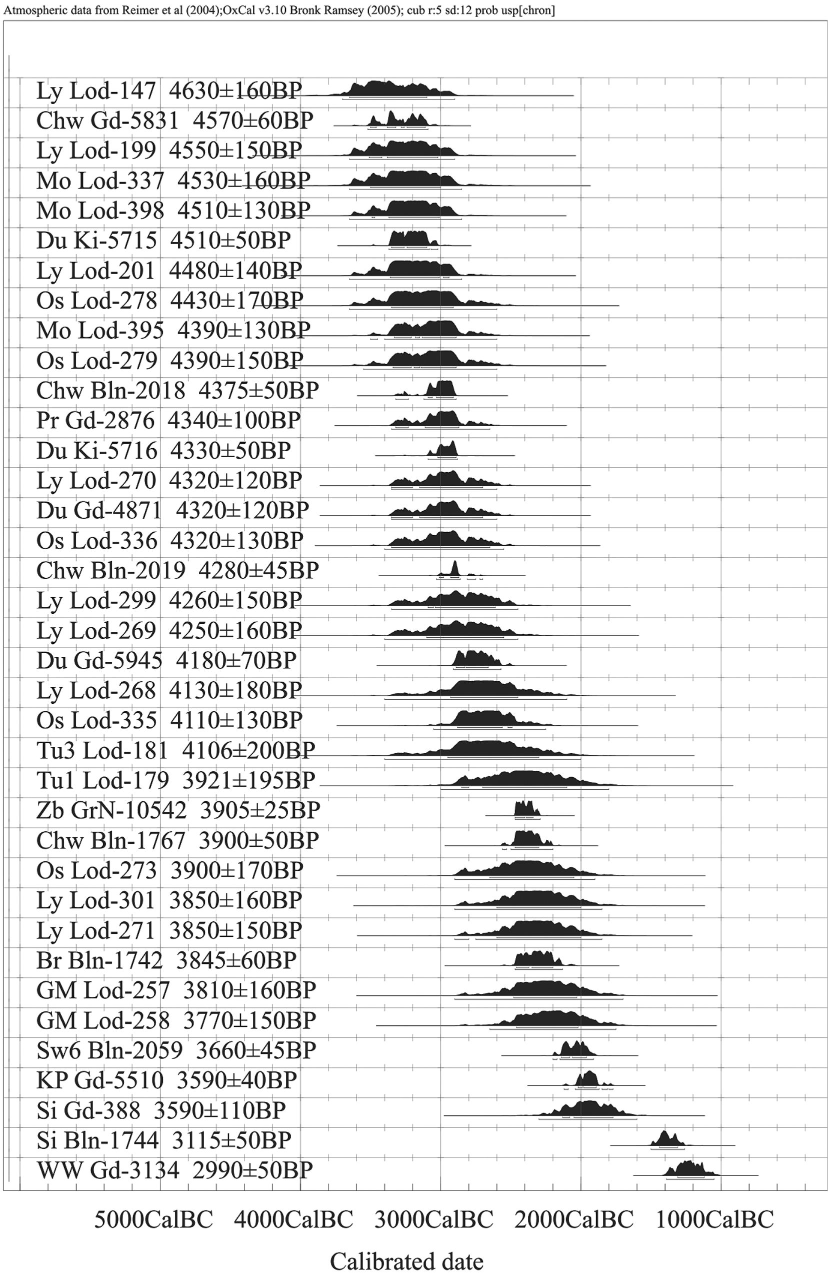

Fig. 2b. Radiocarbon dates later than 6000 BP from Poland, obtained outside of the Neolithic context; part 2. Site captions as in Figure 2a.

was reinforced, and it either obliterated or diminished the hitherto typological diversity of Mesolithic inventories. Common attributes of this convergence process are mainly trapezes and truncations made of regular blade blanks, as well as end-scrapers and side-scrapers (Figs. 4, 5). The increasing frequency of the chipped technology aimed at receiving relatively long and regular blade blanks, called usually Montbani blades, is also typical of this process (*Galiński 2002.69–72; Gronenborn 1999.126, 137; Kobusiewicz 1999.92; Kozłowski 1987; 1989; Wąs 2005; Więckowska 1985.102*). According to S. K. Kozłowski (*1987; 1989.115–117; 2001*), such highly standardised industries are quite similar to Early Neolithic ones, both in the Mediterranean zone and in Central Europe. Therefore he labeled them as pre-Neolithic. Although it remains an open question how to interpret this term, particularly in reference to the Neolithisation processes, the main value of the notion lies in the emphasis on the difference between 'classical' and later Mesolithic flint industries. Therefore, the traditional term 'Mesolithic', in the case of the most standardised industries, actually may not be appropriate at all, as suggested by some authors (*Galiński 1994; Kozłowski 1989*).

In East Central Europe these typological transformations are considered to be an indication of the aforementioned negative processes, which are generally called 'demesolithisation'. I am convinced this attitude should be challenged for at least two reasons. Firstly, there are no practical premises for such typological standardizations as degeneration or disintegration. It is possible that the situation was quite the reverse. A highly unified industry was actually the final product of a developmental trajectory aimed at the most efficient use of the chipped industry in a hunting-gathering economy in temperate and boreal zones. It was simply the most optimal stage of such development. An interpretation of this kind was proposed, for example, by Fischer (*1989*). Secondly, the unification was not as complete and widespread as many authors have suggested. The analysis of the typological situation within supposedly late hunter-gatherer lithic assemblages in Poland proves that we encounter many regional differences and variations. In reference to Figure 6, we should emphasize that the most numerous group, 3c, has a moderate number of attributes of late chronology, whereas sites belonging to groups 1 and 2 (with the highest rate of late chronology features) are not so frequent. Besides, there are sites with either a very small number of late chronology features or none at all.

If we look at East Central Europe between roughly 6000 and 2000 BC (*Galiński 2002; Kobusiewicz 1999; Kozłowski 1989; Kozłowski, Kozłowski 1986*), we will certainly perceive the decreasing number of sites and the shrinking territorial span of hunter-gatherer settlement (while keeping in mind that general maps, which show only basic spatial arrangements, may be misleading). Certainly, the main reason was the spread of the Neolithic oecumene, particularly from circa 4000 BC onwards (Fig. 7). However, we have to remember that we are dealing only with the 'history' of archaeological artefacts that are treated as typical attributes of hunter-gatherers. Their gradual disappearance, with concomitant unification and growing congruency with features of Neolithic farmers, does not necessary reflect the same story of the people who witnessed (either consciously or unconsciously) these material transformations. I think that a substantial part of the hunter-gatherer groups underwent Neolithisation in the fourth millennium BC: their material attributes were replaced by new ones, but the genetic pool of the population remained essentially the same. These new attributes belong to Neolithic units, first of all to the Funnel Beaker Culture (TRB). A good example of this process is the site of Tanowo, where we have an inventory of an absolutely rudimentary, perhaps transitional, character, judging from the TRB point of view (*Galiński 2005*). As a matter of fact, this inventory comprises Mesolithic, and para-Neolithic, as well as early TRB elements. The genetic process of the TRB, observed here, is very similar to the one in the Lower Elbe area, southern Scandinavia and the Netherlands. It has to be underlined that the foregoing scenarios are in no way sufficient as regards the origin of the entire Funnel Beaker Culture in East Central Europe. Surely, both Mesolithic and earlier Neolithic populations contributed to this phenomenon, but their share varied in different TRB territories. For instance, in southern groups of the TRB, the share of the Mesolithic background was negligible.

Despite the considerable expansion of the TRB and other Middle Neolithic cultures, they never encompassed all the territory of Poland, bypassing many areas where, in traditional terms, communities of Mesolithic and para-Neolithic hunter-gatherers existed alongside neighbouring farming groups in the

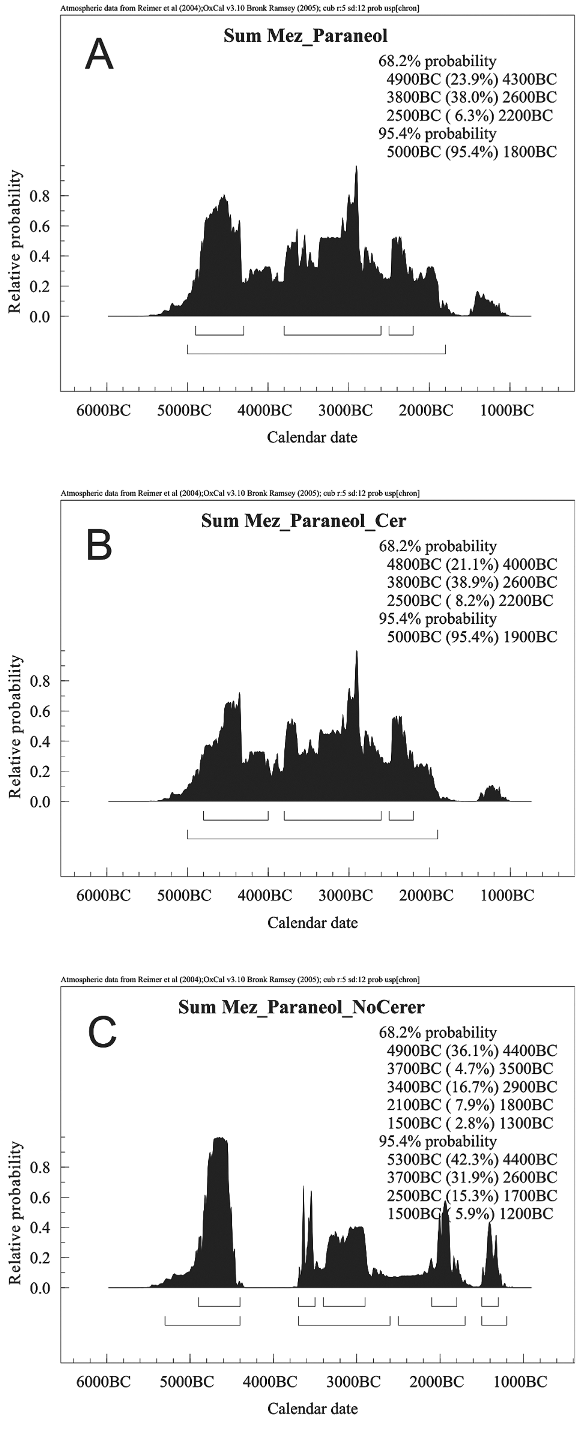

Fig. 3. Simple sums of probability of radiocarbon dates later than 6000 BP, from: i) all non-Neolithic sites (A), ii) non-Neolithic sites with pottery (B), iii) non-Neolithic sites without pottery (C).

fourth and third millennium BC (Fig. 7). Most of these late hunter-gatherer groups appear to have both made and used ceramics. This is particularly interesting, because their ceramic technology appears to have been inherited from East European para-Neolithic pottery traditions rather than adopted from the expanding Neolithic groups. This distinctive pot-

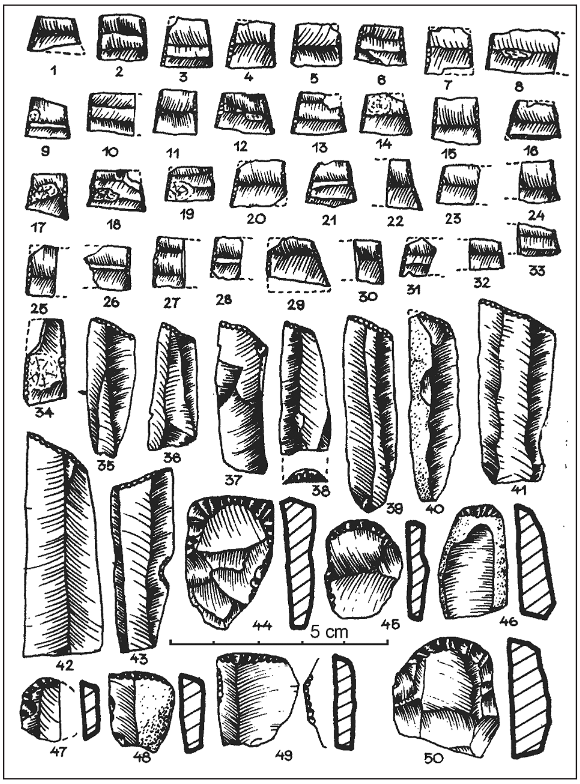

Fig. 4. Selection of flint tools from the site of Dąbrowa Krępnica 5. An example of the standardized flint industry of late hunter-gatherers (after* Bagniewski 1982.94, Fig. 32*). Trapezes: 1–34, blade truncations: 35–43, end-scrapers: 44–50.

tery is mainly concentrated in the north-eastern areas of Poland, but has been found in many other areas.

However, there is also specific type of ceramics used by late hunter-gatherers that bears some resemblance to the pottery made by the Neolithic farming communities who inhabited the eastern regions of Central Europe. Kempisty (*1972; 1973; 1983*) defined this pottery as 'Linin Type', although more recently Józwiak (*2003*) included it in the Neman Culture as an 'unusual' element which forms the 'Linin horizon' within this culture. These ceramic traditions persisted for a considerably long period, from the second half of the fourth millennium BC to the early second millennium BC, and included the adoption of several forms similar to those of subsequent Neolithic archaeological units. As a result of this borrowing and blending of pottery traditions, we can observe ceramics whose form is reminiscent of i) the TRB; ii) the Globular Amphora Culture; iii) the Corded Ware Culture; iv) the early Bronze Iwno Culture, with elements of the Bell Beaker Culture (these styles are designated, respectively, as Linin horizon A, B, C, and D according to Kempisty).

On the whole, distributions of para-Neolithic pottery proper and Linin style pottery are commonly interpreted as a reflection of the westward expansion of pottery-using East European hunter-gatherer communities into ecologically similar enclaves, and the ceramics have been argued to represent mainly part of the Neman and Zedmar Cultures (*Gumiński 2001; 2003b; Józwiak 2003; Kempisty 1983*). Nonetheless, it should be noted such an image is quite hard to grasp when other archaeological evidence, and not exclusively pottery, is considered. I think it should be emphasised that there is a clear continuity in the flint industries preceding and following the adoption of pottery (trapezes, blade truncations, side-scrapers), which only sometimes were supplemented with 'para-Neolithic', eastern elements (points, retouched inserts, stone axes, bi-facial flat retouches, lamellar retouches) (*Kempisty, Sulgostowska 1991; Kempisty, Więckowska 1983; Kobusiewicz 1999*). Consequently, the distinction between the Late/Final Mesolithic and para-Neolithic episodes, from the 'flint perspective', is in practice rather difficult and in most cases impossible to delineate (*Bokiniec, Marciniak 1987; Galiński 1991.*

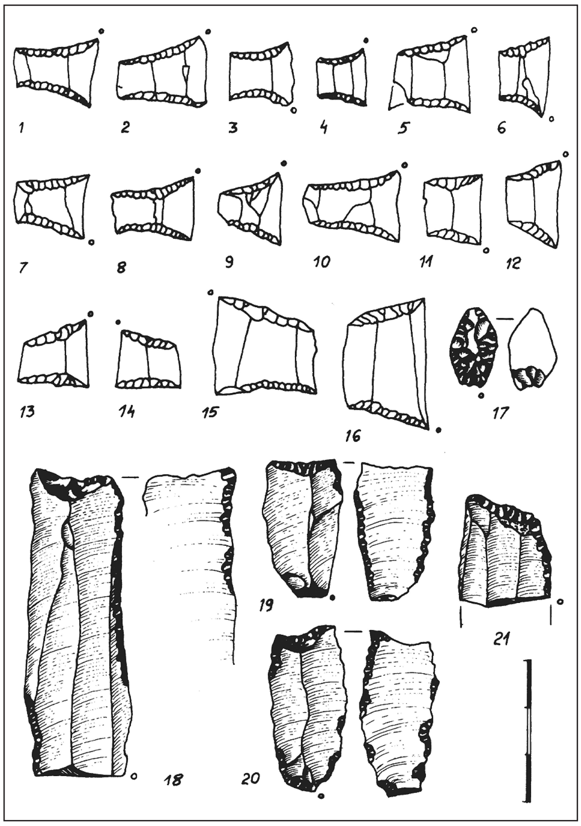

Fig. 5. Selection of flint tools from the site of Tanowo 3, trench II/1999–2002. The standardized industry of late hunter-gatherers (after* Galiński 2005.75, Fig. 2*). Trapezes: 1–16; arrowhead with surface retouch: 17; blade truncations: 18–21.

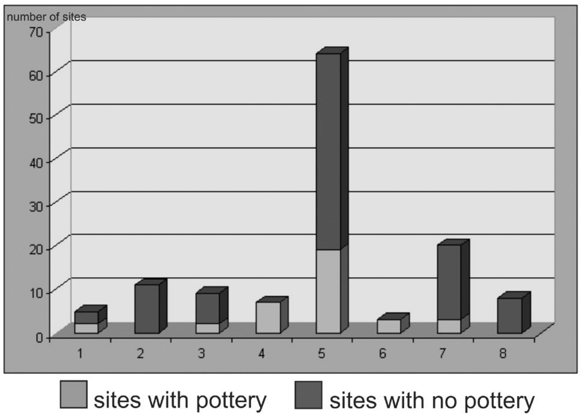

Fig. 6. Division of selected Mesolithic and Para-Neolithic sites, commonly ascribed either to Atlantic or to Subboreal period, according to typological structure of the lithic attributes of late chronology.
1 – Group 1: trapezes and blade truncations occur exclusively within 'geometric' tools; side-scrapers and end-scrapers prevail within remaining tools; lack of micro-burin technique. Bobrowice (Bagniewski 1981; 1982; 2001a); Dąbrowa-Krępnica 5 (Bagniewski 1982); Gorzupia Dolna 2 (Bagniewski 1982; 2001a); Sieraków 4 (Bagniewski 1982; 2001a); Tanowo 3 (Galiński 1992; 2005).
2 – Group 2: only trapezes occur within 'geometric' tools; side-scrapers and end-scrapers prevail within remaining tools; frequent micro-burin technique. Baraki Stare 13 (Libera, Tymczak 1990); Komornica I (Więckowska 1985); Wieliszew I, sk. II; III, sk. XVI; VIB, wykop XVIIc; 12 (XIV/1960); VIII, wykop IX (Więckowska 1985); Wistka Szlachecka VI/19660; V/1960; I/1963 (Schild et al. 1975); Poddębe I (Więckowska 1985).
3 – Group 3a: c. 30–50 % of trapezes and blade truncations occur within 'geometric tols'; c. 40–60% of side-scrapers and end-scrapers occur within remaining tools. Dąbki 9 (Ilkiewicz 1989); Dobra 53, IV/84 (Galiński 1992; 2002); Gościm 23 (Bagniewski 2001b; 2002); Łęczyn 12 (Bagniewski 1999); Męcikał 6 (Bagniewski 1987; 2001a; Kabaciński 2001); Mierzęcin 65 (Bagniewski 2000); Szczecin-Śmierdnica (Galiński 1992); Tanowo 2, I/82 (sk. 2) (Galiński 1992); Wieliszew XIII/1960/62 (Schild et al. 1975).
4 – Group 3b: c. 30–40 % of trapezes and blade truncations occur within 'geometric tools'; c. 40–50% of side-scrapers and end-scrapers occur within remaining tools; retouched inserts, points, points with flat and lamellar retouches occur also in tool group. Augustów-Wójtowskie Włóki (Sulgostowska 1978); Dudka (Gumiński, Fiedorczuk 1988; 1990; Fiedorczuk 1995); Grudziądz-Mniszek (Bokiniec, Marciniak 1987); Sośnia 1 (wyk. II) (Kempisty, Więckowska 1983); Szczepanki (Gumiński 2003b); Woźna Wieś 1; 2 (Kempisty, Sulgostowska 1991).
5 – Group 3c: c. 10–20 % of trapezes and blade truncations occur within 'geometric' tools; c. 30–40% of side-scrapers and end-scrapers occur within remaining tools. Brodno E (Bagniewski 1982; 1991); Bukówna 5 (Masojć 2004); Buszów (Kendelewicz 2000b); Chrapów 17 (Bagniewski 1999); Chwalim 1 (Kobusiewicz, Kabaciński 1993); Czeladź Wielka I; II (Bagniewski 1976); Dobra 53, I/83; 53, III/83 (Galiński 1992); Dzierżno 3 (Ginter 1972); Glanów 3 (Pazdur et al. 2004; Zając 2001); Grądy Woniecko (Kempisty, Więckowska 1983; Kempisty 1983); Grzepnica 7, sk. E (Galiński 1992); Gwoździec (Libera, Talar 1990); Jastrzębia Góra 4 (Domańska 1983; 1992; Ruta 1997); Korzecznik 6/7 (Olszewski 1987); Koszalin-Dzierżęcino 7 (Ilkiewicz 1997); Krzekotówek 8 (Bagniewski 1982; 1991); Lubiatów II; III (Bagniewski 1976); Łęczyn 13; 22; 23; 25 (Bagniewski 1999); Łykowe 1 (Cyrek 1990); Męcikał 7a; 7b; 11 (Bagniewski 1987; 1998); Mokracz (Niesiołowska-Śreniowska 1990a; 1998); Mosina 10 (Bagniewski 1995); Mostno 15; 16 (Kendelewicz 2000a); Nowodworce (Nowak 1980); Osjaków (Niesiołowska-Śreniowska 1971; 1973); Pobiel 9; 10 (Bagniewski 1976; 1990); Potasznia 1 (Bagniewski 1976); Prostynia 16 (Bagniewski 1996); Pstrąże (Bagniewski 1982); Puszczykowo 21 (Krzyszowski 1997); Siedlisko 16 (Bagniewski 1982); Spalona 12, I, Ia/85 (Masojć 2004); Sułów 1 (Bagniewski 1976); Swornegacie 3; 6 (Bagniewski 1987; 1998); Szczecin-Jezierzyce 19 (Galiński 1992); Świerczów (Bagniewski 1982); Świętoszyn 1; II (Bagniewski 1976; 2001a); Tanowo 3, wyk. VII/91 (Galiński 1992); Trzebicz Młyn 1; 2 (Bagniewski 2001c; 2001d); Turowiec 1; 3 (Bagniewski 1987; 1998); Węgliny 12 (Bagniewski 1995); Wiechlice I (Bagniewski 1982); Wieliszew XII–XI (Więckowska 1985); Wierzchowo 1; 2 (Bagniewski 1996); Zakrzów 6 (Bronowicki, Masojć 2001); Zbrzyca 2 (Bagniewski 1987); Zwola 2 (Fojud, Kobusiewicz 1978).
6 – Group 4; lack of 'geometric' tools; small number of side-scrapers and end-scrapers; high frequency of flake blanks (c. 50%); splintered technique. Kuców (Krzyszowski 1995); Stobnica-Trzymorgi (Cyrek et al. 1985; Niesiołowska-Śreniowska 1990b; Wiklak 1990); Wola Raniżowska (Mitura 1994).
7 – Group 5; only single typological attributes of late dating occur; other 'late' elements (pottery, ^{14}C dates) decided on late chronology. Bierzwnik 19 (Bagniewski 1994); Chobienice 8 (Kobusiewicz, Kabaciński 1998); Grzepnica 7, I/84 (Galiński 1992); Gudowo 3 (Bagniewski 1996); Jaglisko 1 (Bagniewski 1994); Jaroszówka-Kolonia 10 (Masojć 2004); Jastrzębnik 5 (Masojć 2004); Kalisz Pomorski 33 (Bagniewski 1996); Ługi E (Bagniewski 1982); Miałka 4 (Bagniewski 2001e); Pianki I, II (Kozłowski 1989); Pietrzyków "g" (Kobusiewicz 1963; 1999); Pomorsko 1 (Kobusiewicz, Kabaciński 1991); Poznań-Starołęka 1 (Kobusiewicz 1961; 1999); Rzeszotary 17 (Masojć 1999; 2004); Smolno Wielkie 1; 2 (Kobusiewicz 1999); Wojnowo 1 (Kobusiewicz 1999); Zamienice 10 (Masojć 1999; 2004); Zbrzyca 5 (Bagniewski 1987).
8 – Group 6; lack of any typological attributes of late dating; other 'late' elements (pottery, ^{14}C dates) decided on late chronology. Bartków 7 (Bagniewski 1976; 1982); Brodno 3 (Bagniewski 1982); Nur-Kolonia 1 (Kozłowski 1989); Siedlnica 6 (Bagniewski 1979); Słochy Annopolskie (Kozłowski 1989); Świętoszyn III (Bagniewski 1976); Witów 1 (Chmielewska 1978; Cyrek et al. 1985).

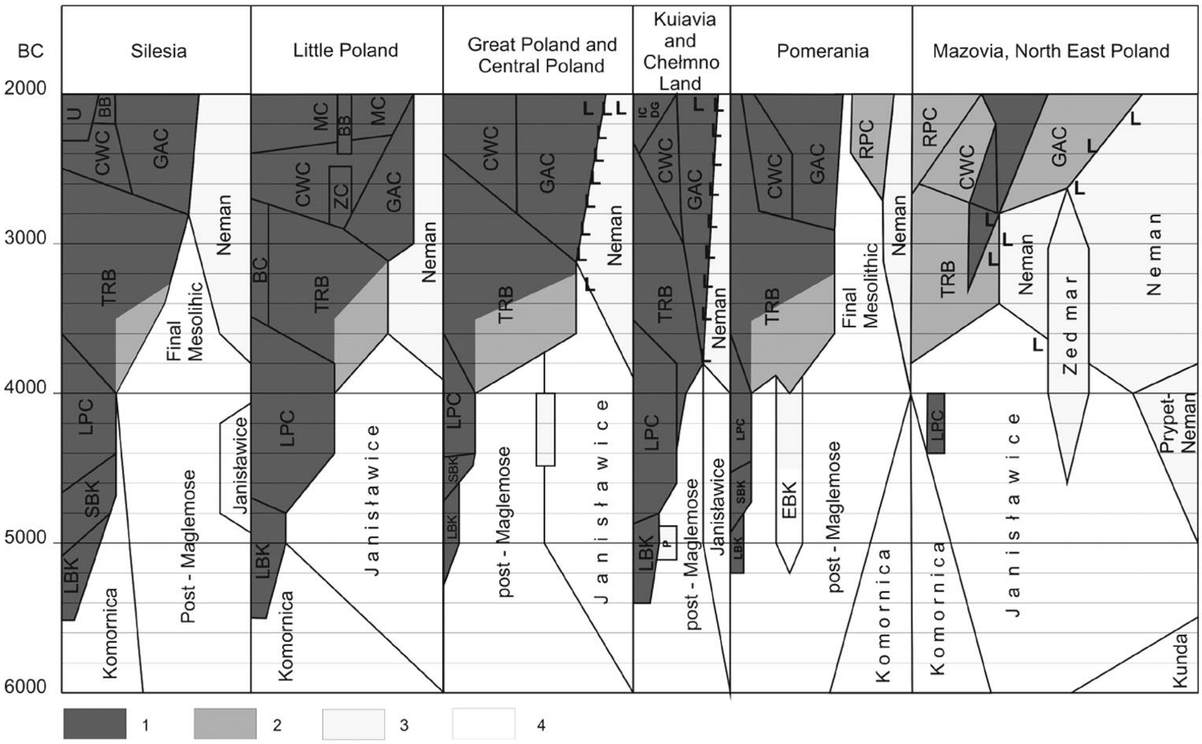

Fig. 7. Archaeological cultures and related main socio-economic formations in Polish territories between 6000 and 2000 BC. 1 – agro-pastoral and pastoral Neolithic, 2 – agro-pastoral Neolithic with significant contribution of hunting and gathering, 3 – pottery-using hunter-gatherers (para-Neolithic), 4 – hunter-gatherers (Late and Final Mesolithic). LBK – Linear Band Pottery Culture; SBK – Stroke Band Pottery Culture; LPC – Lengyel-Polgar Complex; TRB – Funnel Beaker Culture; GAC – Globular Amphorae Culture; CWC – Corded Ware Culture; U – Únětice Culture; BB – Bell Beakers; BC – Baden Culture; ZC – Złota Culture; MC – Mierzanowice Culture; P – sites of Podgaj 32 type; IC – Iwno Culture; DG – Dobre Group; RPC – Rzucewo/Pamariu Culture; L – pottery of Linin type.

23–25; Gumiński 2003b.81–82; Gumiński, Fiedorczuk 1988.140, 143).

Therefore, contrary to the previously quoted allochtonous views, regional variations of the para-Neolithic cultures in East Central Europe do appear to have been a continuation of older indigenous Mesolithic groups, the implementation of pottery being the only cultural tradition adopted from the East. I dare say again that the genetic pool of para-Neolithic populations was basically the same as that of Mesolithic populations. Some specific features of para-Neolithic pottery which were not derived from the East may seem to confirm such a suggestion. Also, settlement and economic data can support this view.

As regards settlement patterns, we can speak of long-lasting settlement in at least several regions. The site Dudka in the Mazurian Lakeland may serve here as an example (*Gumiński 1998; 2003a; 2005; Gumiński, Michniewicz 2003*). The remains of succeeding camps, from the Alleröd to mid Subboreal, were detected here. It is symptomatic that a pure hunter-gatherer economy predominated within these groups. Another representative example of such a pattern is the Chwalim site in western Great Poland (*Kobusiewicz, Kabaciński 1993*). The so-called upper layer is dated to the late fourth millennium BC. This layer contained pottery of Linin type B (according to Szmyt). But the main point is that a collection of animal bones found in the layer is completely devoid of bones of domesticated animals. And this is rather surprising as the site is located right within the range of Neolithic cultures.

Conclusions

In my opinion we are entitled to put forward the following conclusions (see also Fig. 7):

❶ The 'history' of hunter-gatherers in East Central Europe was very long and lasted until the Early Bronze Age.

❷ Some Mesolithic hunting-gathering groups changed their material culture, economy and settlement pattern in the fourth millennium BC, *i.e.* became Neolithic farmers (mainly of the Funnel Beaker Culture).

❸ Certainly no regression is discernible within the remaining hunter-gatherer populations. Previous patterns seem to have continued, even though the territories settled by farming societies were steadily growing in size.

❹ On the other hand, hypotheses about the growing complexity of Late Mesolithic communities, as posed in relation to other territories – regardless of the validity of such hypotheses for the mid-Holocene in Central Europe – are not corroborated by finds from the territory of Poland (no large settlements, permanent burial sites, or signs of settlement stability).

❺ Notably, throughout their existence, we observe no increase in importance of agriculture and breeding among these populations. At the same time, an element that formally looked forward to the Neolithic was vessel ceramics.

❻ The distinction between the Late/Final Mesolithic and para-Neolithic in East Central Europe is overestimated. What is meant in both cases is hunter-gatherer groups, which to a large extent had preserved settlement, economic, social and ideological patterns of the classic Mesolithic. The most significant factor here is the continuation of a very efficient adaptation of settlement and economy to the Holocene, forest environments in the temperate and boreal zones. However, taking into account the status of their lithic industries, relatively far from the classical Mesolithic, the exclusive employment of the term 'para-Neolithic' (both for the 'pure' Late/Final Mesolithic and 'pottery using hunter-gatherers') should be considered.

❼ In terms of Availability Model (*Zvelebil, Rowley-Conwy 1984; 1986*), we should ascertain that hunter-gatherer populations remained on the level of availability all the time, *i.e.* from *c.* 5500 BC. It is difficult to construct the situation that could be referred to as Substitution Phase. Consequently, it seems that transitions to the Consolidation Phase in the period between 5500 and 2300 BC were relatively quick and decisive.

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Bridging the gap. The Mesolithic-Neolithic transition in a frontier zone

Bart Vanmontfort
Faculty of Archaeology, Leiden University, The Netherlands
bart.vanmontfort@geo.kuleuven.be

ABSTRACT – *This paper deals with the chronological hiatus in the Neolithic sequence of the southern part of the Low Countries. It can at present only be bridged indirectly, by a detailed analysis of the situation prior to and after the gap. The focus in this paper is on the nature of the Neolithic and its relationship with possible native non-Neolithic populations. The results of this analysis show the transition process to have been more than a simple and unidirectional 'Neolithisation'.*

IZVLEČEK – *Članek obravnava kronološki hiatus v neolitski sekvenci južnega dela na nižinskem puhličnem področju severozahodne Evrope. Tega trenutno lahko premostimo le s podrobno analizo situacije pred in po vrzeli. V članku se ukvarjamo z neolitikom in razmerjem med neolitskimi in morebitnim avtohtonim, ne-neolitskim prebivalstvom. Rezultati analize kažejo, da je bil proces tranzicije več kot preprosta in enosmerna neolitizacija.*

KEY WORDS – *Mesolithic-Neolithic transition; Linearbandkeramik; Chasséen and Michelsberg Culture; Contact finds; Settlement patterns*

Introduction

The past decade of research on the Mesolithic/Neolithic transition in Europe has shown this transition to have been a 'mosaic' of processes and interactions rather than a single and clear-cut transition process (*e.g. Tringham 2000*). It varies greatly in different parts of Europe with regard to its timing, contact situations and the transition processes at work. A leading thread is the local impact of the Neolithic and the archaeological result entailing the end of traditional hunter-gatherer communities. This is the case all over Europe, including Scandinavia, the British Isles and Ireland (Fig. 1). Apparently, the advent of the Neolithic signified the start of a new way of life, no matter what transitional processes or temporal delays involved.

The loess belt of the Low Countries forms a remarkable exception. It is the westernmost region settled by Linearbandkeramik (LBK) communities and their cousins of the Groupe de Blicquy (BQY) during the late 6th and early 5th millennium calBC. With the sudden disappearance of these communities, however, the Neolithic as a whole seems to have vanished as well. The region was not occupied by Hinkelstein/Grossgartach and Roessen, the post-LBK Danubian cultures that can be found to the east and south, nor by a local Neolithic similar to the Cerny in Northern France. Only during the last centuries of the 5th millennium calBC, at the beginning of the 'Michelsberg Culture phase', does the Neolithic take up its thread (Fig. 1).

The existence of such hiatus is of importance for understanding the regional transition process, and implicitly also for understanding the relationship between local hunter-gatherers and the incoming Neolithic in general. This paper focuses on the gap and the explanation of its existence. After presenting the archaeological cultural sequence in the region, the relationship of the Neolithic with local non-Neolithic communities is explored. This is done by analysing the indications of contact on the one hand and the nature of the Neolithic compared to the local Mesolithic on the other.

The Neolithisation process in the southern part of the Low Countries

The local Mesolithic during the late 6th millennium calBC remains poorly understood. This is due to a general decrease in the number of sites and to problems with the taphonomy and post-depositional formation of the archaeological record. In the Low Countries, many Mesolithic sites are known as surface sites from the coversand region in Northern Belgium and the Netherlands. These sites are often palimpsests and even if they are excavated, their absolute dating is confronted with major problems. Bad or doubtful spatial associations between dated samples and archaeological assemblages, dislocation of artefacts and samples caused by bioturbation, and problems related to the nature of samples are frequently mentioned obstructing factors (see *Crombé 1999; Schild 1998; Vermeersch 2006*). Crombé et al. (*1999*) claim that dates obtained on hazelnut shells are more reliable than those on charcoal samples, but even short-lived samples do not escape the palimpsest and bioturbation problems. As a consequence and in contrast to the Rhine/Meuse river delta (*Louwe Kooijmans 2003*), there are no well characterised and well dated sites that can be used as a reference to relatively date the later Mesolithic.

The most diagnostic elements of the Late Mesolithic lithic industry, *i.e.* from the mid 7th millennium calBC onwards, are the production of regular blades in so-called Montbani style and the appearance of trapezes. Due to the problematic dating of the assemblages, a detailed and reliable regional typochronology is not available. Rhombic and wide, rectangular trapezes are generally regarded as late (*e.g. Vermeersch et al. 1992*) and are followed by asymmetric points with flat inverse retouch and LBK-like points. The Late Mesolithic in the wetland area and its successors of the Swifterbant from the early 5th

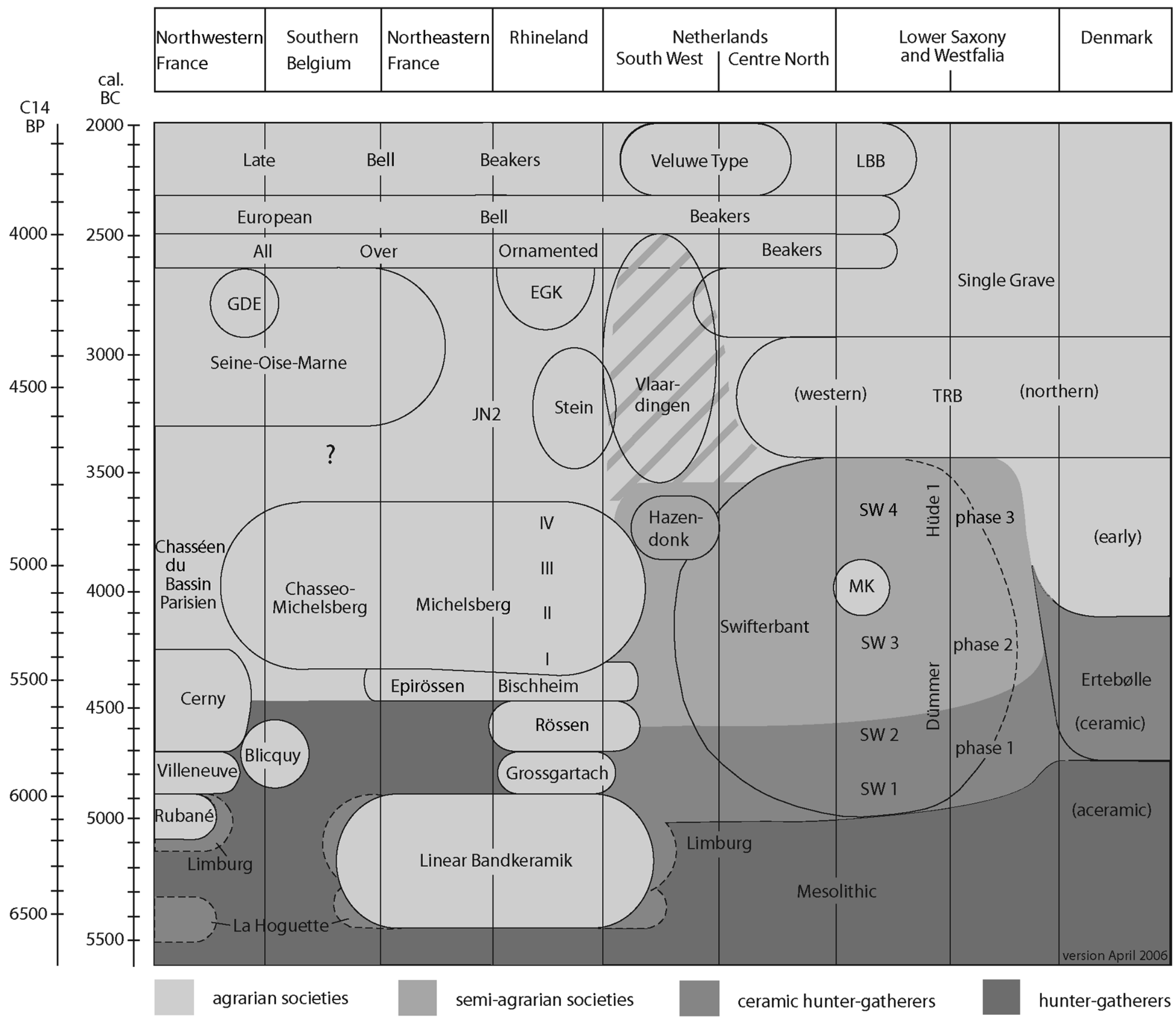

Fig. 1. The Neolithic sequence in the Lower Rhine Area and adjacent areas (*Louwe Kooijmans 2006.Fig. 27.15*).

millennium onwards, on the other hand, have a lithic industry characterised by more flake-based production and the presence of small and irregular symmetric trapezes (*e.g. Crombé et al. 2005; Peeters et al. 2001; Van Gijn et al. 2001b*).

A growing number of observations are claimed to indicate the introduction in Northwest Europe of elements conventionally linked with the Neolithic, like cereal cultivation, cattle herding and the production of pottery, prior to the arrival of the first archaeologically visible Neolithic culture (*e.g. Jeunesse 2003; Richard 2004*). These indications should not be ignored and need to be integrated in the debate as a working hypothesis. To date, however, the '*indices précoces*' remain extremely contentious (see *Behre 2007*) and cannot yet change the traditional idea that the Neolithic started with the arrival of Linearbandkeramik (LBK) communities.

The same is true for the Low Countries where, moreover, no 'initial indications' have yet been claimed. The LBK arrived in this region around 5300 calBC and has predominantly been regarded as intrusive and the result of demic migration to the region (*e.g. Bogucki and Grygiel 1993; Louwe Kooijmans in press*). Their relationship with possible local hunter-gatherer communities remains unclear. After an occupation of some centuries, the LBK communities suddenly disappeared from the stage. The reason for their disappearance is unknown. Possibly, the westernmost territories in Hainaut and Hesbaye had become a marginal area for the LBK communities in crisis (*Jadin 2003.714–15* referring to *unpublished hypotheses* of Zimmerman and Stehli; *Modderman 1988*). In any case, in their western settlement territories they are replaced by the Groupe de Blicquy/Villeneuve-Saint-Germain (BQY/VSG). Differences with the LBK as a whole can be noted mainly in stylistic issues. Archaeological remains relating to the settlement system, material culture and palaeo-economy are remarkably similar. Although its chronological position with respect to LBK is still debated (*cf. Constantin 2000; Jeunesse 1998b*), BQY/VSG can be seen as related to LBK in many ways. Current views imply it to have developed from the recent and final LBK in the Paris basin (RRBP and RFBP), probably contemporary with the final LBK in the Hesbaye region (*Jadin 2003.715*). Like the LBK, the BQY/VSG communities suddenly disappear, this time leaving the region more or less empty.

Whether hunter-gatherers continued to be active in the sandy lowlands during and after the LBK/BQY occupation is uncertain, due to the above-mentioned dating problems. Very few Late Mesolithic sites have been dated beyond the 5300 calBC LBK arrival date, and the few dates that are available are often contested (see *Crombé et al. 2005*). Arts (*1989*) stresses the absence of radiocarbon or typological evidence for the prolongation of the Mesolithic after the LBK occupation. He suggests that the region was virtually uninhabited during most of the 5th millennium calBC. In a recent paper, Shennan and Edinborough (*2007*) claim more or less the same thing for Germany and Poland. These authors use summed probability distributions of radiocarbon dates as a proxy for population density. Both the German and Polish datasets are characterised by a severe drop in the number of radiocarbon dates after the LBK occupation and prior to the end of the 5th millennium or even the middle of the 4th millennium calBC. The same exercise for the dates of the Low Countries would clearly result in a similar image. From their assumption of probability distributions as a proxy for population densities, this leads to the conclusion of a dramatic population crash after the LBK occupation. The reason for this population crash is unclear; conflict and climatic changes are invoked as possible intervening factors (*ibid.*).

For the southern part of the Low Countries, at least, the lack of dates from the middle 5th millennium calBC does, however, not prove the absence of occupation or even a much lower population density. Shennan and Edinborough (*ibid.*) rightly mention the problem of comparability between Mesolithic and Neolithic dates. They minimise this critique by claiming that the differences in estimated population densities are too great to be explained by an underrepresentation of Mesolithic dates, and that Mesolithic sites are not smaller or more difficult to discover than early Neolithic ones. The latter fact is deduced from the existence of, for instance, often large and extremely visible Mesolithic shell middens, and the assumption that the more mobile Mesolithic settlement system will have resulted in actually more occupation sites (*ibid.*). These arguments are, however, not apt to lead to a safety in numbers. It is clear that there is a fundamental problem of identifying, excavating and reliably radiocarbon dating late hunter-gatherer sites in general and in a coversand landscape in particular (*e.g. Crombé et al. 1999; Schild 1998; Vermeersch 2006*). At the same time, LBK settlement sites are generally scattered with features such as pits and postholes, often containing datable material. They are therefore particularly suitable for obtaining large numbers of radiocarbon dates. Moreover, in comparison to Late and Final Mesolithic sites or even those dating from the Michelsberg/Chasséen horizon, LBK site phases can be more easily distinguished on the basis of pottery seriations. LBK sites are thus more liable to be the object of specific radiocarbon dating programs (*e.g. Jadin and Cahen 2003a*), resulting in a clear over-representation of these sites. It may be doubted that taking into account only a single date per site phase (*Shennan and Edinborough ibid.*) solves the problem.

The existence of a yet archaeologically invisible local component should therefore still be considered. The exact position of La Hoguette and Limburg Pottery in this story is not yet clear, despite the fact that in the literature both elements are progressively regarded as pottery produced by hunter-gatherer groups that adopted certain agro-pastoral elements in their economy (*e.g. Gronenborn 2003; Jeunesse 2002; Zvelebil 2004*).

The Neolithic seems to have taken up its thread only several centuries later, by the end of the 5th millennium calBC. This 'second' Neolithic, belonging to the Chasséen/Michelsberg Culture phase clearly differs from that of the Danubian cultures. Several hypotheses have been raised on its origin: coming from the West (*Jeunesse 1998a; Jeunesse et al. 2002/2003; Scollar 1959*), from the East/Rhineland (*Lüning 1967*), from the North, *i.e.* rooted in the TRB culture (*Lichardus 1976*) or having a polycentric origin (*Dubouloz 1998; Schier 1993; Vanmontfort 2004*).[1] Ideas have been raised on the possibility of hunting-gathering communities having been active in the region during this phase (*Verhart 2000.115, 231; Vermeersch 1990*). Nevertheless, this phase is traditionally assumed to represent the ultimate Neolithisation of the loess belt and the adjacent coversand region.

The chronological hiatus in the sequence of the Neolithic in the Southern Low Countries between approximately 4850 and 4300 calBC, together with the fundamental difference between the late 6th and late 5th millennium calBC Neolithic makes this region particularly interesting. The question of where the people wearing the 'Michelsberg Culture' outfit came from is more topical than elsewhere. Was the region indeed practically void of human occupation during the 1/2 millennium hiatus, or was it occupied by a population not visible archaeologically? If the latter was the case, the question arises as to what the relationship was between this native population and the local variant of the Chasséen and Michelsberg Cultures. Two keys are needed to answer these questions: hunter-gatherer activity in and beyond the loess region prior to, during and possibly after LBK arrival, and evidence for interaction between native hunter-gatherers on the one hand and farmers of the different Neolithic traditions on the other.

Contact and interaction during the 'Early Neolithic' LBK/BQY phase (5300–3850 calBC)

It is currently assumed that the spread of the LBK from Central Europe was a combination of demic movement and acculturation processes (see *Gronenborn 1999; Gronenborn 2003; Price et al. 2001; Zvelebil 2000; Zvelebil 2004*). For the Low Countries, however, all available evidence still suggests that their introduction was principally the result of a demic movement perhaps, with a progressive integration of native populations. Arguments in favour of this hypothesis focus on the large contrast between LBK and the late Mesolithic as currently understood (*e.g. Louwe Kooijmans in press*): transitional complexes are inexistent; material culture, subsistence and mobility are quite different from those of the native Late Mesolithic populations, and raw material procurement strategies differ considerably (see *Allard 2005; Van Assche 2006*).

It can be assumed that native populations were present in the area at the time of LBK arrival. According to several authors, these may even have known a pre-LBK first Neolithisation stage (*Gronenborn 2003; Jeunesse 2000; Zvelebil 2000*) but, unfortunately, they remain largely invisible (see above). Awaiting new sites and dates proving the presence of other groups during the late 6th and 5th millennium calBC, they can best be identified indirectly. Contacts and exchanges between LBK and native populations should indeed be reflected in the archaeological record, both on Neolithic sites and beyond.

Patterns and contact finds

In a forthcoming paper, a new method is elaborated to map the hunter-gatherer activity on the loess belt and beyond (*Vanmontfort forthcoming*). Rather than focusing on well dated and excavated sites, which are absent anyhow, individual microliths were plotted and used as a proxy for changes in the human presence during the entire Mesolithic period. This analysis confirmed that hunter-gatherers ventured

1 For a discussion on the origins of the Michelsberg Culture see *Jeunesse et al. 2002/2003*.

on the loamy soils from the Pre-boreal phase onwards and that changes in exploitation could be identified by plotting the individual microliths. Several remarkable patterns resulted from the analysis. The LBK apparently settled in areas only marginally exploited by hunter-gatherers. Hunter-gatherer activity was not at all attracted to the regions where LBK communities had settled (Fig. 2). If anything, they seem to have retracted their activity to areas further away from the LBK settlement clusters. These patterns confirm the important differences between the LBK people and the local hunter-gatherers and as such can be regarded as an extra argument for the demic influx hypothesis of LBK dispersal.

Contact finds can bring us on the track of possible interactions between immigrating LBK and native populations. Assuming that native populations during this phase resemble their Mesolithic ancestors, this would be visible in Mesolithic type artefacts in Neolithic contexts or vice versa. Mesolithic artefacts in LBK context are, however, very scarce. Some microliths have been found in LBK pits, but it is unlikely that they actually represent contact and exchange. Only few of them are known and they also include Middle Mesolithic microlith types that are assumed to have been out of use since the middle of the 7th millennium calBC. They are more likely to be residual (*e.g. Allard 2005.237; Jadin and Cahen 2003b; Van Assche 2005*). Another element on LBK sites that relates to Mesolithic traditions is the use of Wommersom quartzite and Phtanite. Both were favoured raw materials during the Mesolithic (*Caspar 1984b*). However, Wommersom has only rarely been found in LBK contexts, for instance close by its source location on the LBK sites of the *Kleine Gete* cluster (*Lodewijckx and Bakels 2000*) and in some of the Hesbaye sites (*Jadin and Cahen 2003b.237*). In the latter case, the Wommersom artefacts are either undiagnostic or typically Mesolithic. Like the Mesolithic microliths, the most likely hypothesis is that they are residual remains of previous Mesolithic occupations (*ibid.*). None of the Wommersom artefacts from the *Kleine Gete* sites can with certainty be attributed to the Mesolithic or LBK (*Lodewijckx and Bakels 2000*). It therefore remains questionable

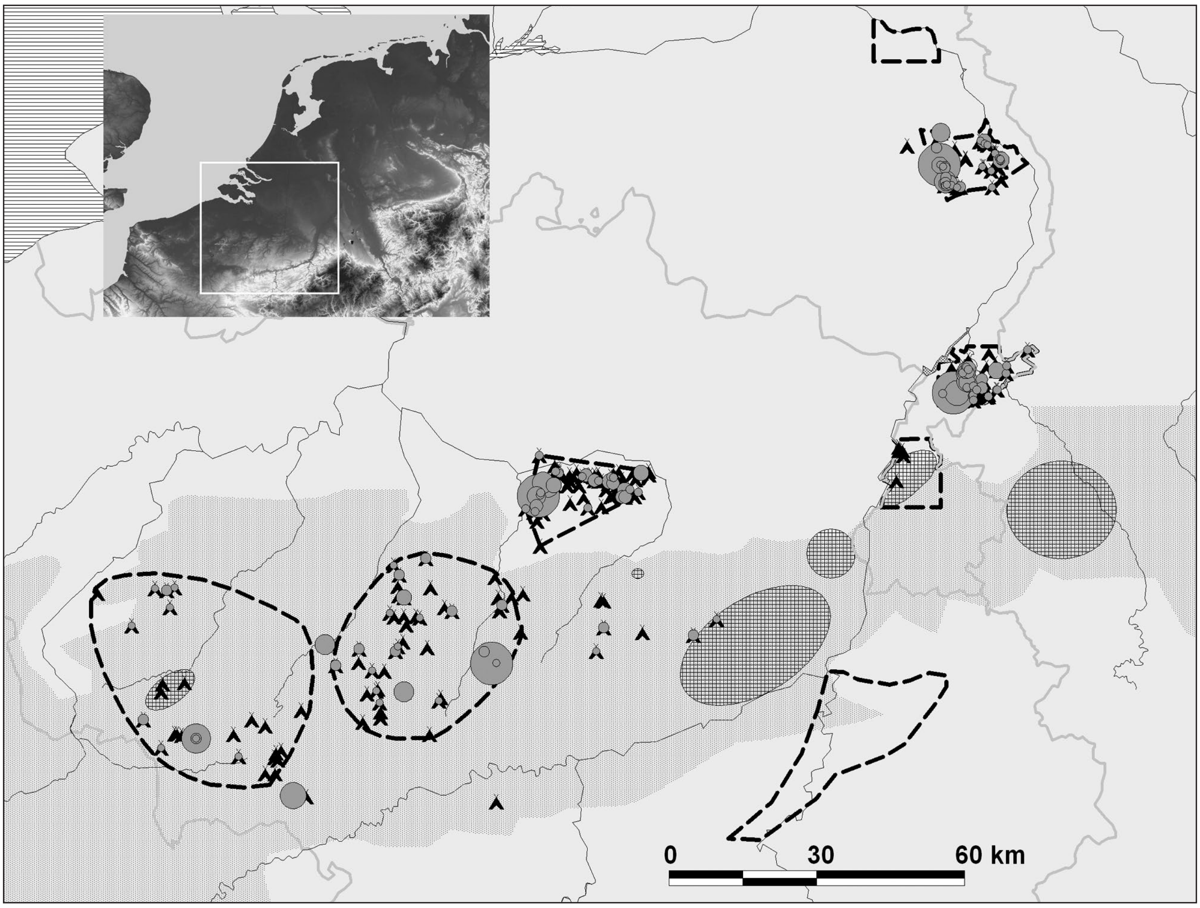

Fig. 2. Spatial distribution of microliths and LBK settlement territory. The loess belt region is shaded. Tents represent microlith find spots, circles show the number of trapezes (1/ 2/>3). Hatched regions correspond to LBK settlement territories (after* Vanmontfort forthcoming*).

if they are actually part of the LBK stone tool production. Even if they are, however, the role of indigenous populations in their acquisition and use remains purely hypothetical. Phtanite was frequently used for the production of LBK adzes, and unfinished fragments are known from several LBK sites in Hesbaye and the *Kleine Gete* region, all over 30 km from its source (*Caspar 1984a*). No additional information is known on how the LBK people acquired the raw material for their adzes. The involvement of Mesolithic communities in the LBK acquisition also remains purely hypothetical.

Evidence for contact in a 'Mesolithic' context is also generally contentious. LBK arrowheads, pottery fragments and adzes are frequently found beyond LBK settlement territory, including on Mesolithic sites. Their association with Mesolithic artefacts is, however, always uncertain. Most Late Mesolithic sites are known only by surface scatters, while none of the excavated sites yielded Mesolithic features containing reliably associated Neolithic artefacts. The Neolithic artefacts found together with the Mesolithic ones can also be explained by assuming the sites to be palimpsests and including both a Mesolithic and Neolithic occupation phase. This reasoning is confirmed by the presence of LBK artefacts on Early and Middle, as well as on Late Mesolithic sites (*Van Assche 2006*). Spatially, LBK artefacts beyond LBK settlement territory concentrate on the loess belt and a northern frontier zone of approximately 30 km. These artefacts may also have been remains of LBK expeditions in search for raw materials or pasture lands to herd their cattle (*e.g. Bakels 1978; Jeunesse 2000; Verhart 2000.37*). The flint procurement site at Banholt (*Brounen and Peeters 2001*) and the ephemeral site at Echt-Annendaal (*Brounen 1985*) are examples of such LBK excursions. On the other hand, there are at least some indications for contact and exchange. As Verhart (*2000.37; 2003*) rightly stresses, the LBK artefacts found further from LBK settlement territory are unlikely to be the result of excursions of LBK communities. In this case, more ephemeral LBK or Roessen sites would be expected in the intermediate region. Rather, they would represent theft or the exchange of LBK objects by native populations. A similar exchange system is in place during the subsequent Rössen phase (*ibid.*). The presence of an LBK arrowhead and BQY pottery in the Swifterbant contexts of Hardinxveld-Giessendam (*Raemaekers 2001; Van Gijn et al. 2001a*) are other indications of contact and the movement of objects during the late 6th and early 5th millennium calBC. The precise exchange systems, however, remain unidentified.

Discussion

Summing things up, there are at least some indications for interaction and exchange between native hunter-gatherer groups and LBK/BQY communities. Nevertheless, the identification of particular objects as the result of exchange remains difficult. Most Mesolithic sites are simply not suitable for identifying such contacts. The absence of evidence therefore should not surprise us and certainly does not equal the evidence of absence. This leaves two explanations for the nature of the data: either the archaeological hiatus actually corresponds to an absence of native populations from 5500 calBC onwards beyond the wetland Swifterbant territory, or those populations were present, but are not archaeologically visible. The first hypothesis implies a subsistence change that triggered the retraction of hunter-gatherer occupation into the wetland regions during the early 6th millennium calBC. From that moment onwards, the sandy and loamy uplands are at most marginally exploited in a wider exploitation system from the wetlands. This hypothesis seems hard to match with the numerous LBK adzes and Roessener Breitkeile scattered over the coversand region to more than 200 km from the nearest known LBK or Roessen settlement. Moreover, it does not fit with the mutual exclusion of LBK settlement territory and 'native' exploitation of the loess belt as shown on the basis of microlith distribution. This exclusion actually implies the active presence of native groups at the time of LBK arrival. The second hypothesis is more likely. It assumes that native populations are nearly invisible archaeologically due to their undiagnostic toolkit or taphonomical reasons. They are visible indirectly, through the LBK adzes and Roessener Breitkeile in the western part of the North European Plain, acquired by these populations and perhaps exchanged among them. The invisibility of their proper sites is related to dating problems (see above). Some of the already identified and/or excavated sites could have been contemporaneous with or even posterior to the LBK/BQY occupation, but they can hardly be, or not be separated at all from older Late Mesolithic sites. The only possible diagnostic element is the evolved arrowhead with flat inverse basal retouch (RIP). Unfortunately, its appearance is not exactly dated and could also predate the LBK arrival. Alternatively, the invisibility could be the result of a shift in material culture and site location choice, hampering the identification of the local Mesolithic's successors. The contemporaneous Swifterbant culture toolkit (*e.g. Peeters et al. 2001; Raemaekers 1999; Van Gijn et al. 2001a; Van Gijn et al. 2001b*), for example, is also hardly diagnostic. It is unlikely that such a toolkit would be identified in open-air sites on the uplands, regardless of the possibility for settlement location continuity from the earlier Late Mesolithic onwards. Due to the absence of data, the material culture of these populations and their subsistence can only be guessed. The paradox of practically no unquestionable indications for contact, but nonetheless the assumption that native populations must have occupied at least parts of the Low Countries' sandy and loamy uplands during and perhaps also after LBK/BQY occupation can be explained in different ways. It can be regarded as an indication of the limited exchange between the two groups, suggesting that they avoided contact (*Keeley 1992*). On the other hand, clear associations of imperishable exchange objects and 'Mesolithic' settlement debris should be presumed to be rare, due to the value doubtlessly ascribed to those items. Moreover, due to the nature of the sites, the association of items and dating samples will always be contentious.

Despite the indications of contemporaneity and interaction, the data confirm the difference between hunter-gatherers and LBK. There is no data supporting the idea of symbiosis.

Contact and interaction during the 'Middle Neolithic' Chasséen/Michelsberg Culture phase (4300–3800 calBC)

Michelsberg Culture?

The second Neolithic phase in the Low Countries is clearly different from the first 'Danubian' one in almost all its archaeological aspects. During this phase, settlement sites are not restricted to *Siedlungskammer*, but have a much wider distribution. The entire loess belt is fairly homogeneously covered with sites, including enclosure sites and flint mines as central foci (Fig. 3). The lack of large dwelling structures with deeply planted posts signals a more mobile settlement system. At several sites in this region thousands of artefacts are scattered over a surface of many tens of hectares. This is in clear contrast with the coversand region, for which only small and often undiagnostic surface scatters are typical, and where no enclosure sites have been identified thus far. These regions were thus differently exploited and perhaps

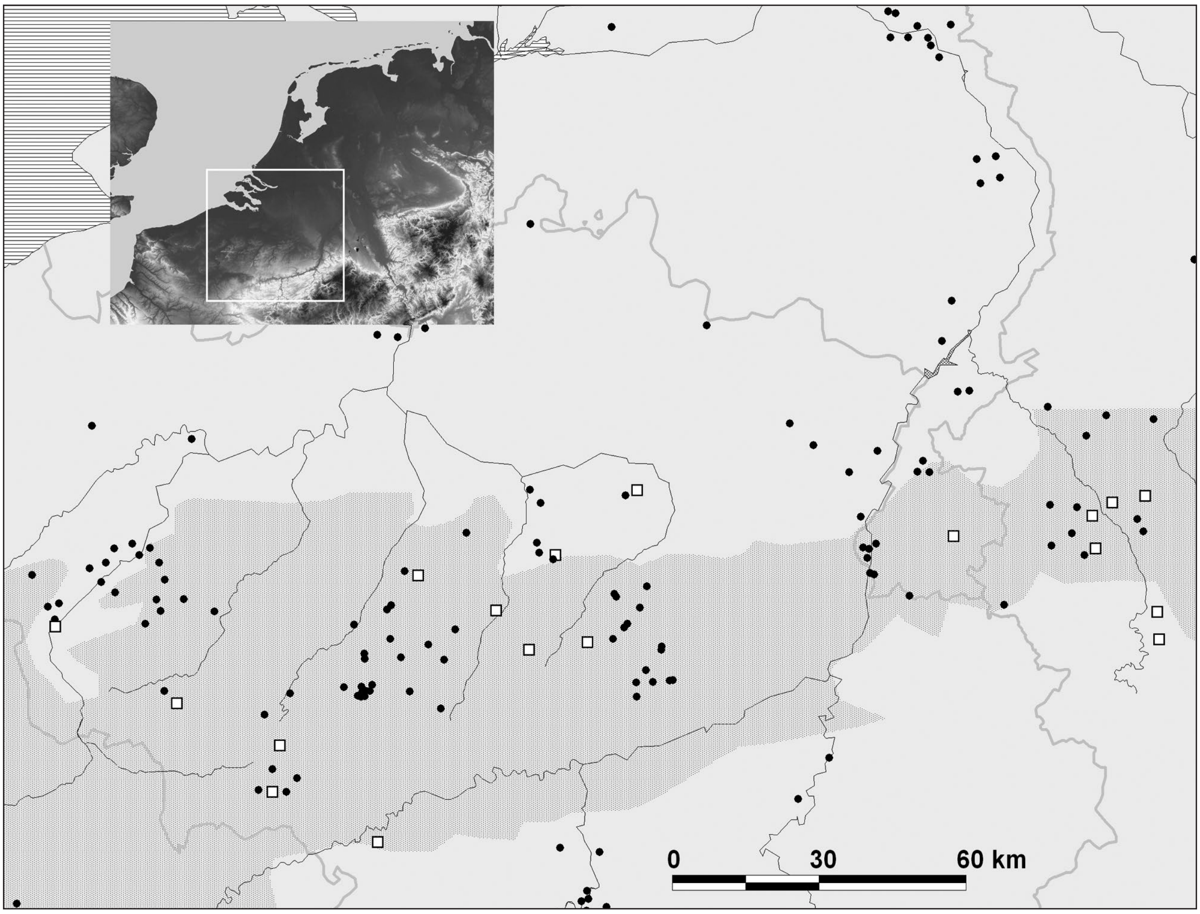

Fig. 3. Spatial distribution of sites and finds from the late 5th and early 4th millennium calBC. Enclosure sites are represented by squares (after* Vanmontfort 2004*).

part of a different settlement system (*Vanmontfort 2004.329–332*). The hierarchised settlement pattern, with enclosure sites, flint extraction and exploitation sites, as well as the scarcity or even absence of dwelling structures and other constructions, fits well with the wider Northwest European Neolithic of the late 5th and early 4th millennium calBC.

Fundamental differences from the preceding Neolithic phase can also be noted in the material culture, *i.e.* the lithic and pottery industry. The flint industry is no longer dominated by blade production. Instead, a generally dominant, expedient, flake-based common tool production can be distinguished from the specialised production of standardised tools. The latter tools include the flint axes and large blades, produced in and imported from the flint exploitation sites. This fits with the contemporaneous Neolithic lithic tool production traditions in the rest of Northwest Europe. The toolkit in the Scheldt basin occupies an intermediate position between the Chasséen and Michelsberg Culture traditions. Arrowheads are dominated by leaf-shaped examples as in the Rhineland *Michelsberger Kultur*. Flake axes, on the other hand, are a typical element and rather link it with the Northern French traditions of Cerny and *Chasséen septentrional*.

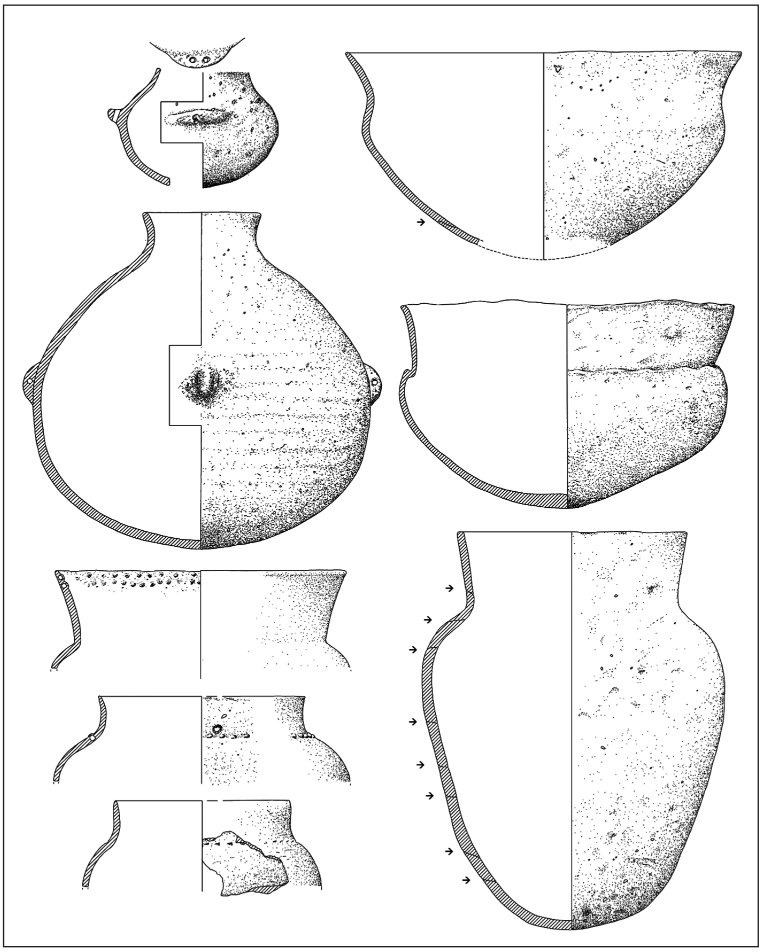

Fig. 4. Selection of pottery from Spiere–De Hel (after **Vanmontfort et al. 2001/2002*).***

The pottery is basically undecorated and characterised by a more varied range of shapes than the LBK/BQY pottery traditions. Instead of bone and grog, grit becomes the most frequently used tempering material. On a more detailed level, the lack of correspondence with Rhineland Michelsberg Culture pottery is apparent. Technical characteristics as well as morphology and the rare decoration (Fig. 4) fit much better with the Northern French Bischheim (Epi-Roessen) and Chasséen traditions (*Vanmontfort 2004; Vanmontfort et al. 2001/2002*). It may even be questioned to what extent the label Michelsberg Culture is appropriate for the Scheldt basin sites. Rather, these different pottery traditions – probably even including the Rhineland Michelsberg Culture – seem rooted in the Northern French post-Roessen (*Vanmontfort 2001; 2006*).

As for absolute dating, the origin of Chasséen septentrional, Bischheim occidental, Michelsberger Kultur, as well as the Scheldt basin sites can be placed after around 4300 calBC (*Vanmontfort 2004*). Unfortunately, due to a plateau in the calibration curve, between approximately 4300 and 4050 calBC, it can not be specified.

The Northwest European archaeological cultures of the late 5th and early 4th millennium in their polythetic meaning (*cf. Clarke 1968*) thus seem polycentrically formed and developed. The 'Belgian Michelsberg Culture', as it is still frequently labelled, is in this view a local version of similar developments in neighbouring regions.

Evidence for forager-farmer contact

Ideas have been raised about the existence of pure, Late Mesolithic hunter-gatherers during this Neolithic phase (*Verhart 2000.115 & 231; Vermeersch 1990*). No uncontested radiocarbon dates confirm this (see above), however, and examples for exchange are extremely scarce and contentious. The few Mesolithic artefacts in late 5th or early 4th millennium features could also be residual of an earlier occupation. For Middle Neolithic artefacts in Mesolithic context, similar reasoning can be followed, quite like most Danubian artefacts in such contexts (see above). A frequently cited association is that of the Late Mesolithic site at Dilsen-Dilserheide III (*Luypaert et al. 1993*), where sherds of a Neolithic vessel were found both vertically and horizontally interstratified within the Late Mesolithic artefact scatter. No other diagnostic Neolithic artefacts were found in the same context. The two arrowheads and three flakes of polished flint axes that were found within the plough layer cannot be dated securely enough. Still, this site is the only such example. Until more finds confirm the possibility of such associations, this situation should be regarded as a palimpsest of a Late Mesolithic site and a still unspecified Neolithic passage.

Discussion

A local development or transcription implies the input of a local component. Such a local component is, unfortunately, invisible archaeologically. The only candidates are successors of the local Mesolithic. Their archaeological invisibility should not surprise us. The number of excavated and dated contexts is, anyhow, small, and if we accept the presence of a local component to have been nearly invisible during LBK/BQY occupation (see above), then their continuation into the 4850–4300 phase can also be expected. Moreover, there are other arguments in favour of a Mesolithic-Middle Neolithic connection. In its contrast with the Danubian culture traditions, the settlement pattern and certain aspects of material culture during this phase in the Scheldt basin indeed link up with the Late and Final Mesolithic traditions.

The more mobile settlement pattern and the distribution of settlement sites all over the loamy but also sandy uplands are examples of such connection. The use of the same site locations is another. The combined presence on sites of Mesolithic and Middle Neolithic artefacts have in the past led to hypotheses of 'secondary Neolithic cultures' (*De Laet 1958.89 ff*) and 'Neolithising Mesolithic' (*Vermeersch 1976.237 ff*). These interpretations fully or partially ignored the possibility of palimpsests, but they are symptomatic of the continued use of locations.

Continuity has also been claimed for the Mesolithic and Middle Neolithic burial practices in Southern Belgium (*Cauwe 1998*). A recent radiocarbon dating program confirmed the existence of both Mesolithic and Neolithic burials (*Cauwe et al. 2000; Toussaint 2002*). A major counter argument against continuity is the existence of a chronological hiatus in the radiocarbon date sequence between the Early Mesolithic and Middle Neolithic period. Despite the presence of Mesolithic camps in the region between 8000/7600 and 6000/5700 calBC, there is only a single burial context known for the period between the early 8th millennium calBC and approximately 4300/4050 calBC (see *Toussaint 2002*). On the other hand, the disappearing of dated burial contexts nicely corresponds to a change in the exploitation of the region. From 8000/7800 calBC onwards, at least the Ourthe Basin no longer functioned as a residential centre, but only as a logistically exploited region (see *Henrard 2003; Vanmontfort forthcoming*). In this sense, the disappearance of burial contexts is a result of a change in the exploitation rather than a change in burial practices, as has been claimed by Toussaint (*2002*).

Lastly, Verhart (*2000.231*) identified a number of Mesolithic traits in the Chasséen/Michelsberg flint industry. Besides the similar use and processing techniques of the flint tools and similarities in certain tool types, both industries are characterised by a distinction between good quality imports and an expedient production on locally available flint of often inferior quality (*ibid.*).

Modelling the transition

The data presented in this paper show that the Mesolithic-Neolithic transition in the southern part of the Low Countries took a long time to complete and there appears to have been a mosaic of processes involved. Making abstraction of the contentious initial indications for a pre-LBK introduction of Neolithic elements, it all seems to have started around 5300 calBC when the first LBK communities came leapfrogging into the area. Possibly these colonists integrated native people in their settlements, but in general the data suggest the at least short-term survival of native hunter-gatherer populations in a mutual conflict-avoiding atmosphere. At least for this region, this challenges the interaction models based on mutual benefit (*Bogucki 1988; Gregg 1988*). These models assume the attraction of hunter-gatherer activity to the farmer settlements. It also challenges the idea of a complete assimilation or expulsion of native populations and the 'actively hostile' conflict model as proposed by Keeley (*1992*) for this region. In the latter model, more direct indications for conflict would be expected, for instance by a concentration of Mesolithic arrowheads near LBK settlement clusters. Nevertheless, there are some indications for exchange of at least prestigious items, and it is possible that these interactions also resulted in the movement of people across the frontier. All this fits best with the open stationary frontier zone as defined by Dennell (*1985*) and Zvelebil (*1998*). The entire period corresponds to the availability phase (*sensu Zvelebil 1986; Zvelebil and Rowley-Conwy 1984*).

The sudden disappearance of LBK and BQY cannot be explained, but it is clear that their relatively short stay in the area will have left its mark. What happened next is, unfortunately, still invisible archaeologically, and can only be deduced from the image at the end of the 5th millennium calBC. The region is likely to have been the scene for, possibly several and interacting, still unidentified populations that take up different positions on the continuum between the Mesolithic and Neolithic. In any case, these seem to have played an important role in the formation of the local Chasséen/Michelsberg Culture that is confirmed to be at least as much rooted in the Mesolithic than in the Danubian Neolithic. The processes responsible for the formation of this 'second' Neolithic and its precise timing remain unidentified. The result of these processes only becomes archaeologically visible once pits and enclosures are constructed and operate as traps for archaeological and datable remains. It remains impossible to determine what proportion of this period corresponds to the substitution phase and whether the consolidation phase only began around 4300 calBC.

Conclusion

A chronological gap between the early and late 5th millennium calBC is present in the Neolithic sequence in the southern part of the Low Countries. This gap can at present only be bridged indirectly, by a detailed analysis of the situation prior to and after the gap. A start to such analysis has been made in this paper. The first results show the transition process in this region to be more than a simple and unidirectional 'Neolithisation'. Several of the many Mesolithic-Neolithic transition models that have been put forward in the past can explain parts of the entire process. The working hypothesis proposed here encompasses the leapfrogging arrival of LBK, contacts and exchanges with native populations and their gradual transition to a Neolithic way of life quite different from that of the Danubian settlers. Future discoveries should be able to show the existence of transitional phases but, unfortunately, the taphonomy of both loamy and sandy uplands will always make it hard to obtain good quality data. The most informative data can be expected from the wetlands in the region.

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Early and middle Neolithic figurines – the migration of religious belief

Valeska Becker
Kelten Römer Museum Manching, Germany
Valeska.Becker@donau-archaeologie.de

ABSTRACT – *In Linear Pottery Culture, two types of anthropomorphic figurines are distinguishable: Type 1 figurines have a columnar body, without legs or hips, while Type 2 figurines show more detail in their body shape. These two types have parallels in the Neolithic of south-east Europe, especially in the Starčevo culture. These parallels become evident not only in the shape of the body, but also in other features such as sexual characteristics, breakage patterns and find circumstances. It is therefore, likely that LPC figurines and Starčevo culture figurines are manifestations of similar sets of religious beliefs.*

IZVLEČEK – *V kulturi Linearno trakaste keramike lahko razlikujemo dva tipa antropomorfnih figur: figure tipa 1 imajo stebrasto telo, brez nog in bokov; figure tipa 2 imajo detajlno oblikovano telo. Oba imata paralele v neolitiku jugovzhodne Evrope, še posebej v kulturi Starčevo. Te so očitne tudi pri drugih potezah, kot so spolne značilnosti, vzorci prelomov in okoliščine odkritij. Verjetno je, da antropomorfne figure tako v kulturi Linearno trakaste keramike kot v kulturi Starčevo izražajo podobna verovanja.*

KEY WORDS – *Neolithic; figurines; religion; Linear Pottery culture; Starčevo culture*

Introduction

In attempting to draw a picture of prehistory and to reconstruct our predecessors' life, it is essential to regard all aspects of a culture, as defined by Max Weber (*Weber 1980*): society, economy and religion. It is this last and most ambiguous facet which will be the subject of this paper; ambiguous because religion is probably the most interesting of the three aspects mentioned above, but also the most difficult to assess. The following considerations will confine themselves to the middle Neolithic Linear Pottery Culture (LPC) of central Europe, with some limited digressions to the early Neolithic cultures of south-east Europe. Obviously, it cannot be my aim to attempt a full reconstruction of LPC religion. Such an effort would have to comprise analyses of mortuary practices, as well as investigations of natural and artificially constructed cult sites, cult imagery, cult equipment, cult participants and cultic actions (*Bertemes and Biehl 2001.18*). Instead, I will restrict myself to anthropomorphic representations of the LPC, placing the main emphasis on figurines (*Becker in print*).

All in all, the following six types of anthropomorphic representation can be distinguished in LPC contexts (Fig. 1):

❶ massive and hollow figurines,
❷ vessels, specifically face vessels and vessels that imitate the whole human body,
❸ applications fixed on the outside of vessels,
❹ lugs, knobs and handles with human faces,
❺ incised anthropomorphic representations, formerly often misinterpreted as frogs or toads,
❻ anthropomorphic figurines made of bone.

Distribution of finds

Anthropomorphic finds from LPC can be found in almost the whole distributional area, from Hungary and Romania in the east, to France in the west. I noted no anthropomorphic finds in Ukraine, but this might be due to the lack of published excavations, or otherwise to my poor knowledge of foreign publications.

Oddly enough, anthropomorphic finds are not evenly distributed. There are regions of a certain density concerning this artefact group – East Austria; the Rhine-Main area, and the region around the rivers Elbe, Saale and Unstrut, for example. This unevenness in quantity cannot be explained with the current state of research, as the following example shows: East Austria yielded around 80 anthropomorphic finds, whereas Bavaria yielded barely a dozen. These two regions are comparable both in geographical and climatic respects and in their state of research, so this discrepancy must have other reasons, although what these reasons were is not so easy to determine. A possible explanation might be the existence of settlements with a special significance ('*Zentralplätze*' according to *Kneipp 2001.33–35*), where finds consist of a disproportionate amount of flint and stone tools, stones used for colouring (hematite, graphite) and last, but not least, anthropo- and zoomorphic figurines, vessels etc. These settlements might have served as places of trade and religious feasts and rituals, religion being not a private, but a public matter.

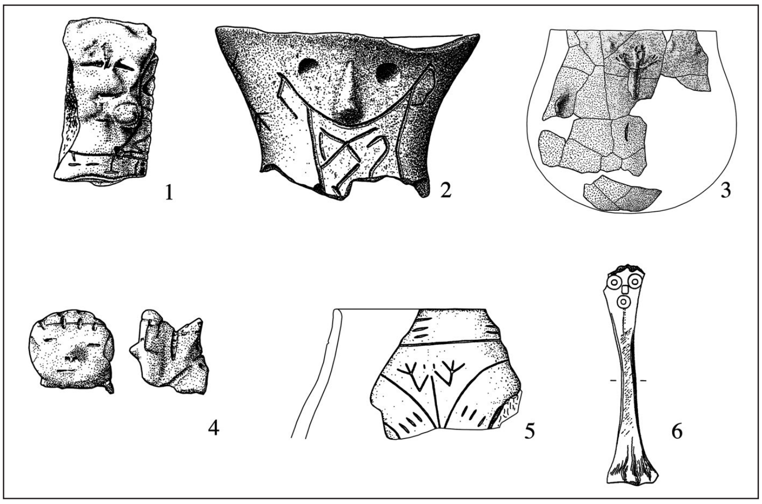

Fig. 1. Categories of anthropomorphic finds from the LPC. 1. Figurine, Bad Nauheim – Nieder Mörlen. 2. Face vessel, Stuttgart – Bad Cannstatt. 3. Application, Gneiding. 4. Knob, Mužla-Čenkov. 5. Incised representation, Bayerbach. 6. Bone figurine, Berry-au-Bac. Different scales (from* Schade-Lindig 2002.53 Abb. 4,1; Keefer 1993. 97 Abb. bottom left; Torbrügge 1963.Taf. 16,6; Kuzma 1990.436 fig. 7, 8; Bayerbach 1997.39 Abb. 10, 6; Sidéra 2001.145 Abb. 14*).

Dealing with figurines: problems and solutions

The following considerations will be confined largely to clay figurines of LPC. In the course of working with them, several problems emerged that had to be dealt with. The worst was that 99 % of all figurines are fragmentary, so *a priori* there was no knowing how they looked when they were complete. The construction of a typology based on entirely preserved figurines was therefore impossible.

There was a problem concerning interpretation because almost all figurines were either stray finds or found in pits in secondary locations, which makes it impossible to determine where they were originally placed. The problem with the find conditions created another setback: precise dating was either difficult or impossible.

Due to the wide distribution of LPC with, consequently, many different chronological systems, a synchronization of those figurines that could be dated also turned out to be a problem. While dating stray finds remains an obstacle yet to be overcome, the reconstruction of the figurines' shape and decoration could be achieved by employing an analysis of features.

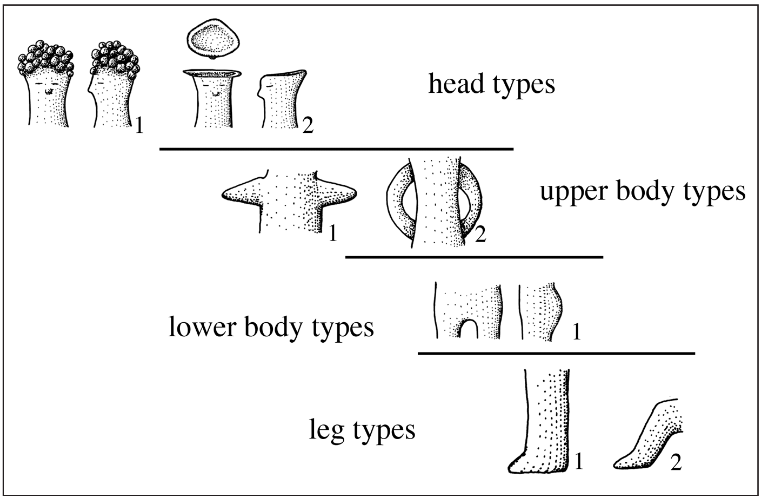

Fig. 2. Types of fragments from LPC figurines.

Every figurine and every fragment was treated as a closed find, all the features on it being contemporaneous. Thus a typology was accomplished with fragments, not with entirely preserved figurines. For example, 'head types', 'arm types', 'body types' and 'leg types' were constructed (Fig. 2). Every fragment made up of two or more features could be used in a combinatorial analysis. Finally, the combination of types of body parts yielded hypothetical whole figurines.

Figurine typology (Figure 3)

Two main types of figurine were the product of feature analysis. Type 1 is characterised by a columnar body without legs or feet. The head is shaped in a peculiar way, with an impression on the upper side that makes it look rather like a small bowl. The base is flat, and sometimes widens slightly.

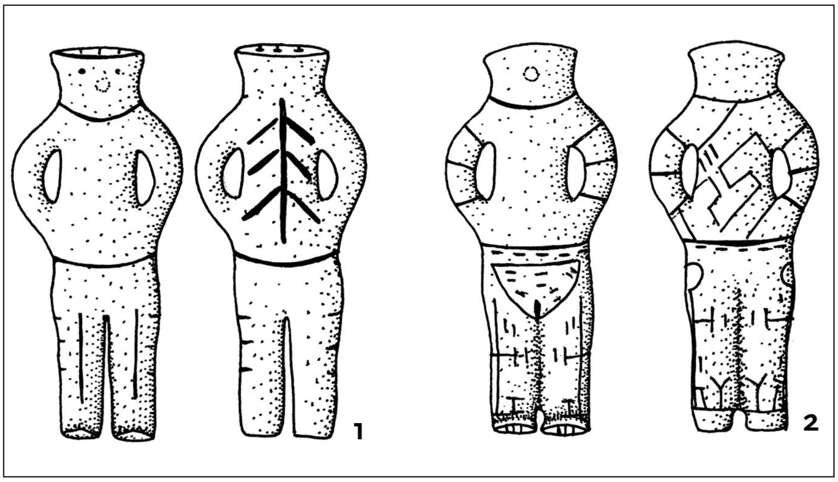

Fig. 3. Decoration styles in the LPC. 1. 'Danube' style figurine. 2. 'Elbe-Rhine' style figurine. Idealized reconstruction.

Type 2, however, has a body that is structured with more detail. There are always hips and legs. Due to the fact that there are standing and sitting figurines, this type can be divided into subtypes. Figurines of this type occasionally depict some kind of action such as holding a vessel.

These two types appear throughout the distributional area of LPC, so they are not regional variants. Chronologically, they emerge at the same time, starting with the oldest phase of LPC.

The analysis works, however, not only with types of body parts, but also with types of decoration. In contrast to painted decoration, *e. g.* in the Lengyel culture, LPC decoration is usually incised. It can be found in different places on the figurines, mainly on the back, although decoration also appears on top of the head, the arms and the legs.

In analyzing the decoration, two different styles are distinguishable. One style is typical of the regions along the Danube: Transdanubia, Austria, Moravia, Bavaria, and rarely, South Poland. This 'Danube' style consists of a decorated upper head, a fish bone-pattern on the back, and rectilinear decoration on the legs. The other decorative style can be found along the Rhine and in the Elbe regions, especially around the rivers Saale and Unstrut. Here, heads are not decorated. On the backs of the figurines there are mostly zigzag or meander patterns. The legs are decorated with lines accompanied by impressions.

These two styles can be clearly distinguished in the second phase of LPC development. In the oldest phase they are not so clearly visible; here, it is usually the 'Danube' style that can be found. This might be an indicator for the spread of LPC, along the Danube at first, travelling along (or on?) the river from Transdanubia to the north and the west.

With regard to LPC pottery, these different styles were noted some time ago. In 1980, M. Lichardus-Itten indicated that regional styles in vessel decoration existed within LPC culture (*Lichardus-Itten 1980. 114*). She named these styles according to Europe's great river systems, speaking of the 'Danube group', the 'Elbe group', the 'Rhine group' and the 'Seine group'. Obviously, this division can, at least to some degree, be extended to figural finds. As shown above, a 'Danube' style can be separated from decorative styles occurring in the Rhine and Elbe regions. Due to the lack of finds, a 'Seine style' could not be described.

Fertility? Sexual characteristics (Figure 4)

It is important to discuss sexual characteristics, because some authors tend to interpret figurines as mother goddesses and connect them with fertility rites. This feature, like those concerning shape and decoration, was investigated in the course of the analyses.

In LPC, as in most Neolithic cultures, most sexual characteristics indicate female representations: there are breasts, indicated by small clay pellets, and pubic triangles, incised. Only one figurine, from Zschernitz in Saxonia, is definitely male. But not all figurines have sexual characteristics. In fact, only one third of all of them can definitely be characterised as female. Two thirds of the figurines display no sexual characteristics. It is doubtful, therefore, whether 'fertility" was the only or even the main aspect in the use of figurines (provided that they are not to be seen as *art pour l'art*). Explanations for the absence of such features are not easily elucidated. Perhaps it was less important to apply sexual characteristics to a figurine, since most people knew whether it was supposed to be male or female; or perhaps the figurines were meant to be neither male nor female, but both or something else altogether. It has to be added that sexual characteristics are not restricted to one of the two types.

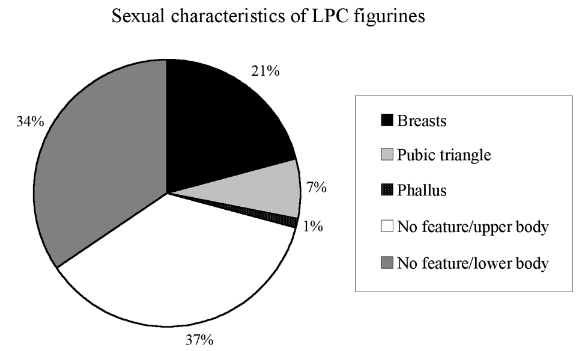

Fig. 4. Distribution of sexual characteristics in the LPC.

Especially interesting for an answer to this question are Type 1 figurines. Their columnar body is very massive and not easy to break. Still, only three figurines are unfragmented; all the others are destroyed. Most of them must have been broken deliberately, since it requires great force to smash them.

All Type 2 figurines are broken, but there are more places where they can break easily: the neck, the arms and legs. But here, also, breaks can be observed that must have been brought about on purpose. There are, for example, breaks vertically through the body, or through the hips, which are the most massive part of the figurines.

Although this is not easy to interpret, it seems clear that part of the figurines' function was their destruction at some point in time. From this we can conclude that LPC figurines were, at least partially, deliberately broken.

Fragmentation (Figure 5)

As mentioned before, almost all the figurines are broken. The question is whether this breaking happened accidentally, *e. g.* during use, or otherwise deliberately, for whatever reason. To answer this question it is necessary to analyze the position of the breakage. For example: if a figurine broke at the neck, the arms or legs, this break might have happened accidentally, since the material is weak at these points. But if a figurine is broken vertically through the body, this break was probably deliberate.

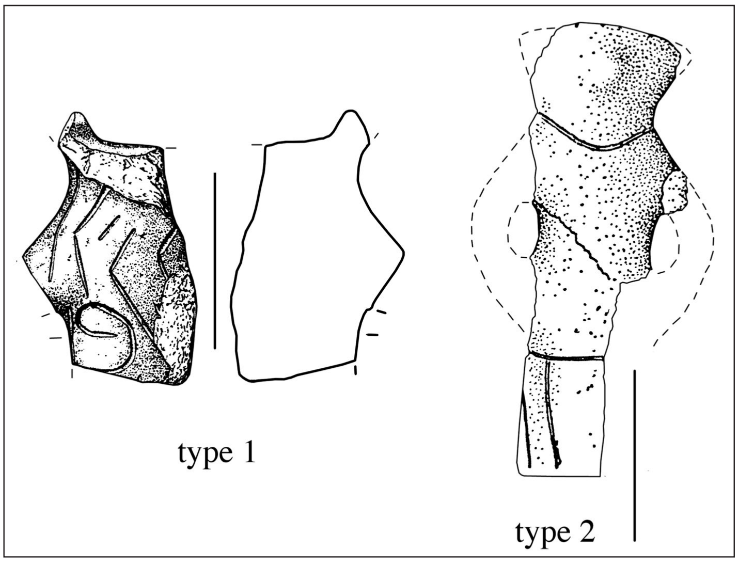

Fig. 5. Breakage patterns. Left: Type 1 figurine from Rimpar, broken in a vertical axis through the massive body. Right: type 2 figurine from Nerkewitz, also broken vertically (from **Rimpar 2002.318 Abb. 3,1; Höckmann 1967.27 Abb. 1,4*).***

From where? Find conditions

LPC figurines have so far never been found in graves. Instead, they seem to be part of ordinary settlement rubbish, lying in pits with fragmented pottery, flint, animal bones, and stone and bone tools. This is true for almost all early and middle Neolithic figurines, no matter from which culture they originate. It will be not until the late Neolithic that figurines appear in burials (*e. g.* figurines from the Hamangia culture: *cf. Vajsov 2002*).

Oddly enough, the missing parts of figurines have never been found, even when entire settlements were excavated. What happened to the missing parts is unclear. They might have been buried outside the settlement, or else thrown into a river, or even crushed and reused, although we have to bear in mind that only a small portion of a settlement's vessels could be refitted. So perhaps the missing parts of vessels and figurines went the same way and were simply lost in the course of the millennia.

Predecessors: Starčevo culture

When asking for the origin of the LPC figurines, it is obligatory to direct one's attention towards the early Neolithic of south-east Europe, as there are no Mesolithic figurines that could have triggered LPC figurine development. Is it, therefore, possible to find continuity in form and decoration and in other features in figurines from south-east Europe, or are LPC figurines something completely new? In order to answer this question it will be necessary to take a look at the early Neolithic figurines from the Balkans and the Carpathian Basin. They can be found in almost all cultures distributed in these areas, namely, the east Bulgarian Karanovo I and II cultures and the west Bulgarian early Neolithic; in Macedonia with its regional groups, Anzabegovo-Vršnik and Veluška Tumba-Porodin; in the Romanian Criş culture; in the Körös culture in Hungary, and also in Starčevo culture.

The latter is especially important, of course, as most researchers think that LPC originated from it, although the exact process is still matter of discussion. Recent research seems to prove genetic connections between late Starčevo and early LPC, as can be demonstrated from the excavations in Szentgyörgyvölgy-Pityerdomb (*Bánffy 2004*), Andrashída-Gébárti tó (*Simon 2002*), Vörs-Máriaaszonysziget (*Kalicz, Virág and Biró 1998.158–181*) and other places in Transdanubia. Over 100 Starčevo figurines, mostly from the literature, could be extracted for examination. There are certainly many more, but the aim was not to produce a complete catalogue of Starčevo figurines, but to gain enough samples for a solid analysis. In order to compare LPC and Starčevo, the same method was employed and the same features (shape, decoration, sexual characteristics, breakage patterns, find circumstances) were considered.

Starčevo figurines: a history of the research

In contrast to LPC figurines, Starčevo figurines and their systematic typology were the object of research early on. In 1966, Srejović noted that Starčevo figurines were geometrical and cylindrical (*Srejović 1966.29–30*). Höckmann, who dealt with Starčevo figurines in the course of his doctoral thesis published in 1968, distinguished cylindrical figurines and 'fat' figurines, with broad buttocks, short legs and long necks (*Höckmann 1968.44–45*). Finally, Letica has to be mentioned. While working with Starčevo figurines from the Divostin settlement, she identified types similar to those of Höckmann, with the difference that she subdivided the 'fat' figurines into seated ones whose arms rest below the breasts and whose legs are short and stumpy, and figurines without sexual characteristics, but prominent chins, which might therefore be males (*Letica 1988*).

Facts and features: Starčevo figurines (Figure 6)

Quite obviously, the previous research concluded in the formulation of two types which can possibly be subdivided: there is one type (Type 1) with a columnar/cylindrical body and a base that can be flat, bell- or pear-shaped, or even slightly rectangular. Legs or hips are not shown. The second type (Type 2) is often characterised by large buttocks and broad hips. A re-evaluation of Starčevo figurines has confirmed these two types.

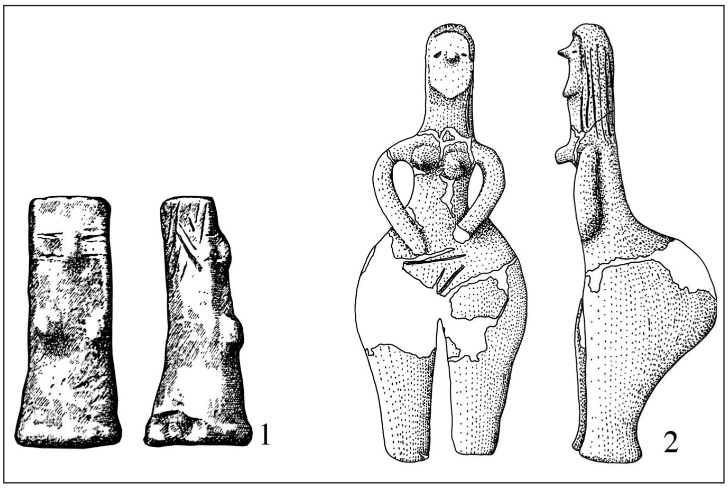

Fig. 6. Figurines from the Starčevo culture. 1. Type 1 figurine from Vinkovci. 2. Type 2 figurine from Donja Branjevina (**Garašanin 1979.tab. 41,6*****; after* **Karmanski 2005.83 tab. 1*).***

Decoration is very rare on Starčevo figurines. Two pieces from the eponymous excavation Starčevo-'grad' are decorated. One is covered in a dark, painted net-like pattern (*Arandjelović-Garašanin 1954.tab. 4, 12*); the second is decorated with incised lines in V-shapes around the neck and base (*Garašanin 1979.tab. 25, 3*). Both are Type 1 figurines.

These two types do not represent regional variants. There are settlements where both types can be found, and both types appear in the whole distributional area of Starčevo culture. Likewise, they do not differ chronologically.

As for sexual characteristics, only features pointing to female representations are discernible, *e. g.* breasts and pubic deltas. But they are represented on only one third of the figurines, while two thirds show no sexual characteristics.

Breakage patterns are quite similar to those of the LPC figurines. Especially with Type 1 figurines from the Starčevo culture, deliberate breakage seems likely, because the body is massive and column-like, and probably hard to break. Despite this fact, only one third of Type 1 figurines remain whole; two thirds are broken.

Type 2 figurines have bodies more susceptible to breakage, especially at the long neck. In fact most figurines are broken in this area. But there are also breakages through the buttocks which seem to be the most massive part of the figurine. Here, it can often be observed that figurines were made of different pieces pinned together with small wooden pegs. The surface would then be coated with a thin layer of clay, covering the seams of the individual parts. The pegs would perish during burning, making the figurine extremely fragile. Some authors propose that this is evidence of deliberate breaking, of the intention to break a figurine at some point in time.

Like LPC figurines, Starčevo figurines can be found only in settlements, not in graves. Usually, only fragments that cannot be refitted are found. This is true even when whole settlements were excavated.

Starčevo culture vessels and applications

For the sake of completeness it should be noted that there are a few anthropomorphic vessels in Starčevo culture. As they are mostly fragments, and of those only very few, the construction of a typology is difficult. Vessels that depict the whole human body are represented with fragments from Rudnik (*Tasić 1998.432 fig. 16*) and Mostonga (*Garašanin 1979. tab. 40, 1*); perhaps there were also face vessels (*cf.* the vessel from Gladnice: *Tasić 1998.440, fig. 30*). Rarely, anthropomorphic applications appear on the exterior of Starčevo culture vessels. They probably represent women (*Minichreiter 2000*). Two special pieces from Transdanubia conclude this enumeration of figural finds from Starčevo culture: 'altars' with anthropomorphic ends from Lánycsók (*Kalicz 1990. 127, Taf. 11, 3*) and Kéthely (*Sági and Törőcsik 1989.80–81 and 59–60 fig. 25–26*).

The Big Picture: figurines in the Balkans early Neolithic (Figure 7)

Quite obviously, parallels exist between LPC and Starčevo culture figurines, not only in the similarity of the two types, especially in their shape, but also in other features such as breakage and the representation of sex. Hence, it might not be surprising to see that in almost all cultures discernible in the Balkans, these two types appear: in the Romanian Criş culture, as well as in the east Hungarian Körös culture, the Macedonian, the east Albanian and the west Bulgarian early Neolithic. Only in Impresso- and Cardial cultures do figurines or other anthropomorphic finds not turn up in the cultural inventory (*Müller 1994.187*).

The figurines are evidently part of some system of religious belief that is the same in almost all early Neolithic cultures in south-east Europe. Of course, there are differences in detail, such as the shape of the head or the position of the arms. But the main idea – one columnar type without legs, and one type with a long neck, broad hips, large buttocks and small legs – seems the same.

From Starčevo to LPC

Now back to the initial question: do LPC figurines have predecessors in the Early Neolithic cultures of South-East Europe? Yes, they do. Both in Starčevo culture and in LPC there are two types of figurines that look very much alike. Obviously, there is continuity of form: in both cultures there is one columnar type and a type with legs and hips. They differ in detail; for example, LPC figurines do not possess the broad hips and tiny legs characteristic of Starčevo figurines. The main idea, however, is identical. Continuity can also be found in other features. For example, the distribution of sexual characteristics is the same in both cultures. And continuity appears in breakage patterns. In both cultures, there is evidence of a deliberate fragmentation of figurines. Decoration, however, is a (almost) unique feature of LPC. Starčevo figurines are hardly ever decorated, whereas since the oldest phase of LPC there is decoration on the figurines.

If we were to take a look at the other kinds of anthropomorphic representations, we could state that

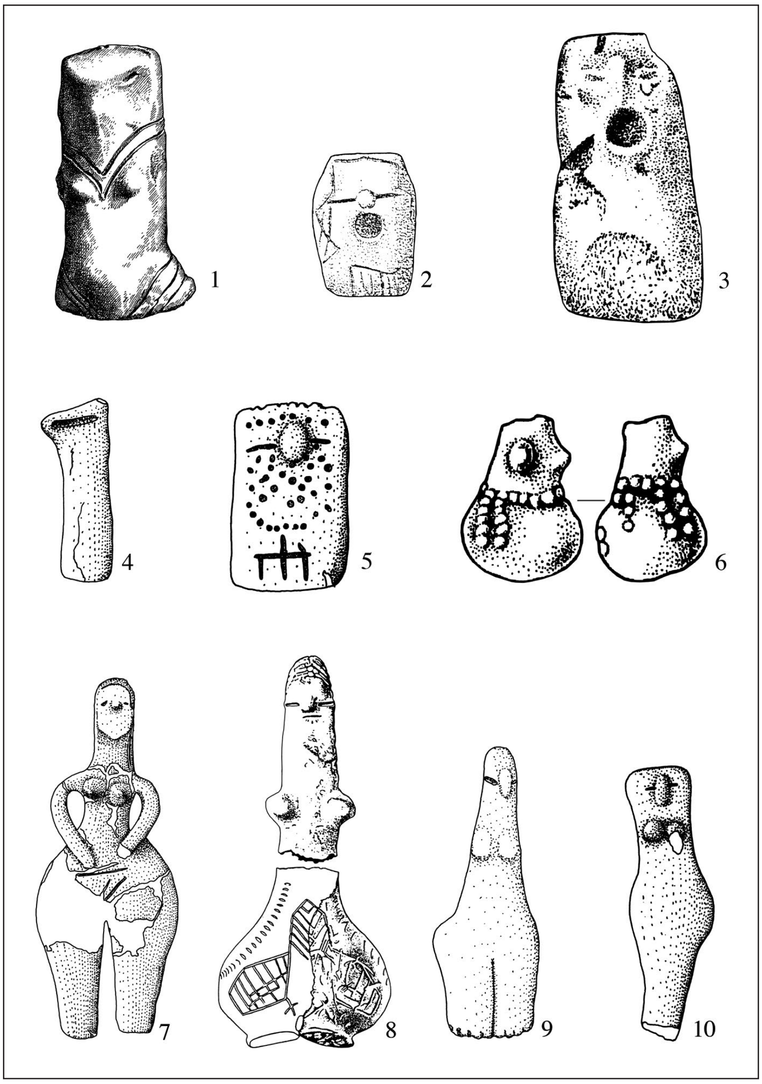

Fig. 7. Type 1 (1–6) and Type 2 (7–10) figurines from south-east Europe. 1. Starčevo, Starčevo culture. 2. Kunszentmárton, Körös culture. 3. Grădinile, Criş culture. 4. Zelenikovo, Makedonian early Neolithic. 5. Gălăbnik, west Bulgarian early Neolithic. 6. Barç, east Albanian early Neolithic. 7. Donja Branjevina, Starčevo culture. 8. Endrőd 39, Körös culture. 9. Zăuan, Criş culture. 10. Čavdar, west Bulgarian early Neolithic. Various scales (from **Garašanin 1979. tab. 25,3; Makkay 1993.78 Abb. 3; Nica 1981.36 fig. 5,1; Galović 1964.Taf. 16,1; Pavúk and Čochadžiev 1984.218 Abb. 16,2; Lera 1993.39 fig. 5*****; after*** **Karmanski 2005.83 tab. 1; Makkay 1993.77 Abb. 2,1*****; after*** **Lakó 1977.fig. 2,1*****; after*** **Georgiev 1981.104 Abb. 57*****).***

anthropomorphic vessels and applications can be found in both cultures. On the contrary, incised representations and bone figurines from LPC are without south-eastern parallels.

Still, in my opinion, it is evident that both in LPC and in Starčevo culture we have to deal with similar manifestations of religious belief, with two different types of figurines: figurines that were destroyed at some point in time and can be found not in graves but in settlements and that can never be refitted.

The ambiguity of argument: a question of faith

Though a continuity in belief is likely after the above considerations, it cannot be a help when dealing with the question of how this belief 'migrated': whether it travelled along with people coming to central Europe and bringing their religious beliefs, or whether it was a mere idea that travelled and adopted by the local late Mesolithics; or whether it was a combination of the two.

The problem is still heatedly discussed (*cf.* for example *Lichardus-Itten and Lichardus 2003*). New ideas come from Bánffy, who stated that LPC figurines were a mix of Mesolithic beliefs, proved by a special decoration on the back of some figurines (the so-called herring-bone motif consisting of V-shaped lines – ribs?, sometimes combined with a vertical line, probably marking the spine), and Neolithic beliefs, as proved by the making of figurines, which is uncommon in the Mesolithic. The disappearance of figurines during the Neolithic of central Europe occurred because "two highly conservative set of beliefs clashed" and because "the beliefs of the local hunter-gatherer communities eventually proved stronger in the life of the Central European Linear Pottery communities" (*Bánffy 2004.296*).

This hypothesis shows that discussion of Neolithization really is a question of faith: not the faith of Mesolithic or Neolithic people, but of modern researchers. Figurines can be interpreted in either way: In placing an emphasis on a decorative motif, Bánffy uses figurines as proof of an adoption of the Neolithic way of life by local hunter-gatherers. Yet it is equally possible to argue that Mesolithic hunter-gatherers never employed figurines; therefore, a religion involving the use of figurines must have come from abroad, brought by foreigners.

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Mesolithic heritage in early Neolithic burial rituals and personal adornments

Eva Lenneis
Institut für Ur- und Frühgeschichte, University of Vienna, Austria
eva.lenneis@univie.ac.at

ABSTRACT – *Some burial rituals such as cremation or the use of colorants, especially ochre, have old roots in the preceding Mesolithic and even in the Palaeolithic. The evidence for these old rituals is more dense in central or western Europe than in south east Europe, whence most of the new Neolithic ideas came. Among the personal adornments a small amount of snail-shell ornaments, stag tusks, tusks of wild boar and pendants made from antler are of special interest. People wearing these very traditional, old adornments are generally equipped with precious 'new' things such as spondylus, ceramics, adzes etc, and therefore show them as high status people in early Neolithic society.*

IZVLEČEK – *Nekateri neolitski pogrebni rituali, povezani s kremacijo in uporabo barvil, posebno okre, imajo star izvor v predhodnem mezolitiku ali celo v paleolitiku. Ti stari rituali so pogostejši v srednji in zahodni kot v jugovzhodni Evropi, od koder je prišla večina novih neolitskih idej. Med osebnim okrasjem je posebej zanimiva mala količina ornamentov iz polžjih hišic, jelenovih deračev, merjaščevih oklov in obeskov, izdelanih iz rogovja. Umrlim, ki večinoma nosijo to zelo tradicionalno, staro okrasje, so v grob pridani tudi dragoceni 'novi' predmeti, narejenimi iz školjke* Spondylus*, keramične posode, tesla, itd. Ti predmeti jih določajo kot visoko cenjene osebe v zgodnje neolitski družbi.*

KEY WORDS – *graveyards; use of ochre; snail-shell adornments; hunting attributes*

Introduction

Burial rituals are a very traditional matter. Therefore, it looks especially interesting to search for their roots in a preceding period. I know quite well that I am not the first and will not be the last to do this for the early Neolithic and preceding Mesolithic. Therefore, I will reduce my contribution to a few main points, where I think I am able to make new, interesting observations.

Geographically my focal point is central Europe, with a considerable attention given to the evidence of SE Europe, and I shall concentrate on three main topics:

❶ the graveyard phenomenon as an impressive fact of the early Neolithic in central Europe alongside with other sorts of burials inside and at the margins of settlements;

❷ cremations and the use of colorants as funerary rituals, which seem to be based on especially old traditions;

❸ adornments made of small snail-shells and the teeth of wild animals – less known and less spectacular than the *spondylus* ornaments, but extremely interesting.

The graveyard phenomenon

The synonym for early Neolithic in central Europe is Linear Pottery Culture (LPC). Graveyards are not the only burial sites within this culture, but their considerable number of 53, with over 2000 graves (*Nieszery 1995.28, Abb. 7*) all together is a sufficiently impressive fact to warrant an interest in roots.

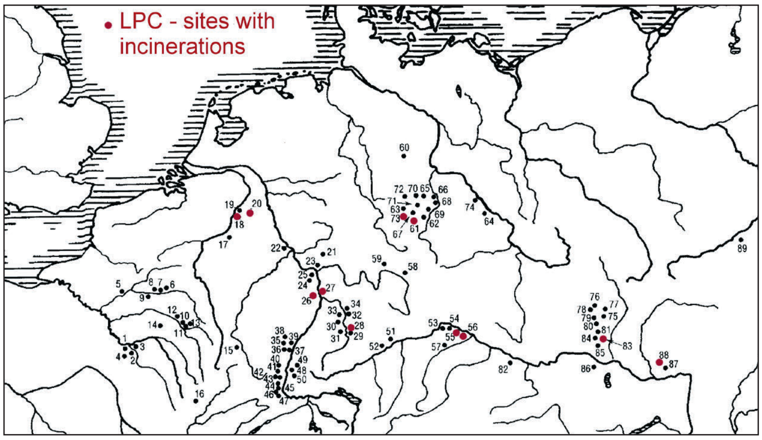

Fig. 1. Linear Pottery Culture – sites with incinerations. Main sites with LPC – graves by **Jeunesse 1997.Fig. 5 and catalogue 147–158.** *Sites with incinerations added as follows: 19 – Geleen/NL, 20 – Niedermerz, 26 – Schwetzingen, 27 – Mannheim-Seckenheim, 28 – Fellbach-Oeffingen, 55 – Aiterhofen-Ödmühle, 56 – Stephansposching, 61 – Arnstadt, 73 – Wandersleben-Gotha/D, 83 – Kleinhadersdorf/A, 88 – Nitra/SK.*

At the moment there is no evidence for them from the beginning. Only one small cemetery with 9 burials in Tesetice, Moravia, was clearly begun during the earliest phase (Phase Ia, after *Tichý 1962; Dočkalova and Koštuřík 1996*).

The earliest LPC graveyards are spread all over central Europe, the oldest at Tesetice is situated in the eastern part, as well as two other cemeteries, Vedrovice, also in Moravia (*Podborský et al. 2002*), and Kleinhadersdorf in Lower Austria (*Neugebauer-Maresch 1992*), which were both begun shortly after Tesetice, which means during phase Ib, (after *Tichý 1962*). Sondershausen in Thuringia (*Kahlke 2004*) and Flomborn in the Rhineland (*Richter 1969*) are approximately the same age.

Compared to the central European LPC the number of early Neolithic graveyards in south east Europe is very low. Most of the sites with burials are settlements with intramural burials (*Borić 1999; Lichter 2001. 37 Tab. 1, 180 Tab. 11; Perlès 2001. 273*). These early Neolithic burials are up to 500 years older in the central Balkans, and even more in Greece, than those of central Europe. All new Neolithic ideas entered to central Europe, but the idea of burying the dead outside the settlement in a special, perhaps sacrosanct site, seems not to have originated in this region.

In Europe the idea of burying the dead in separate areas was a very important innovation of the Mesolithic. There is evidence for Mesolithic graveyards dated before 5500 BC in south east Europe around the Iron Gate, which is where two of the five early Neolithic cemeteries are to be found. Evidence for Mesolithic cemeteries is very poor or even absent in east central Europe (where the eldest Neolithic graveyards are situated (see above) and only known from the north and north east of central Europe (*Grünberg 2000. Abb. 112 A*).

Burial rituals

The most common position of the deceased in the early Neolithic Linear Pottery Culture (LPC) of central Europe is the flexed position on the left, more seldom on the right side, in cemeteries as well as in

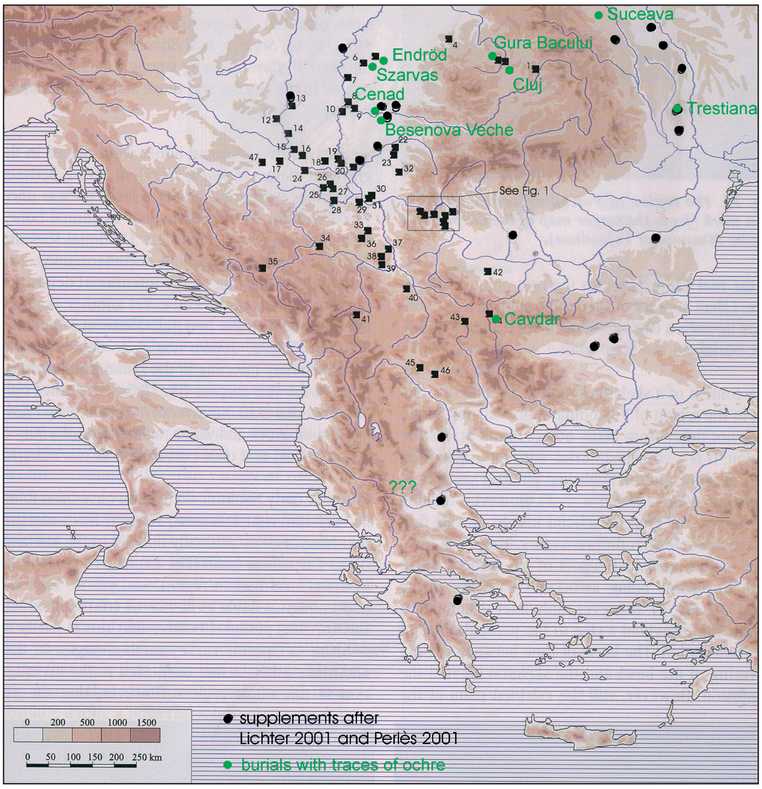

Fig. 2. Early and Middle Neolithic burial sites in souhteastern Europe (based on **Borić 1999.Fig. 24***, and* **Lichter 2001.40 and 173 (evidence of ochre)***).*

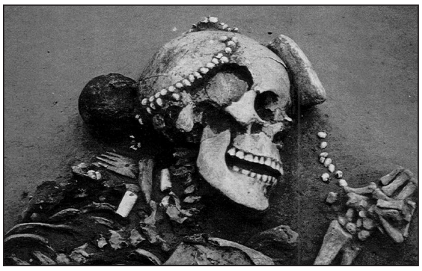

Fig. 3. Linear Pottery Culture – graves with snail shell adornments (**Nieszery 1995.Abb. 99, 100*****).***

settlement burials. The stretched position – more often proven from Mesolithic burials – appears seldom (*Kahlke 1954.Abb. 37*).

Cremations within the early Neolithic LPC of central Europe are known only in graveyards, and there is evidence for them just since a further developed phase of this culture, which is recently called middle LBK in western Central Europe (*Lüning 2005*) and '*Notenkopfkeramik*' in eastern central Europe (phase II after *Tichý 1962*). In some cases cremation burials even clearly overlay graves with skeletons. This is the case in the well-known LPC cemetery of Nitra in Slovakia, where 4 of 8 cremation burials clearly were situated above the inhumations (*Pavúk 1972. 39 and Plan 1*). A very similar situation is to be seen in the Kleinhadersdorf cemetery in Lower Austria (*Neugebauer-Maresch and Lenneis 2007/08*). In both cases the number of the inhumations greatly exceeds the incinerations which do not attain more than 10 %, while in the Bavarian cemetery of Aiterhofen it increases over 30% (*Nieszery 1995.88–90*). In other regions such as the Netherlands or Thuringia even over 40 % of the burials within one cemetery may be incinerations, as for example in Elsloo (*Modderman 1985.100–101*) and Wandersleben (*Hoffmann 1989.105*).

In total the number of sites where cremation burials of the LPC are proven is quite small (*Jeunesse 1997. 57–60; Nieszery 1995. 36 Abb. 9*). Only in about a fifth of the cemeteries are there also incinerations, and they seem to be restricted to parts of the LPC territory (Fig. 1). One possible reason for this may be their normally poorer preservation, as they often were dug less deep into the ground.

Evidence for early Neolithic cremation burials from south east Europe is very poor. The most impressive graves that sort surely are the group of 14 incinerations at the edge of Soufli Magoula in Greece (*Alram-Stern 1996.114; Gallis 1996*). In two early Neolithic sites only one lonely cremation burial inside the settlement area is known, up to 3 incinerations from 3 Middle Neolithic sites (*Lichter 2001. 377 Tab. 24*).

Therefore, the intention to treat death by burning the body seems not to have come from the south-east to central Europe either.

The distribution of Mesolithic cremations shows a big gap in and around central Europe (*Grünberg 2000.fig. 45 A*), so it does not really clear up the roots of this ritual. The only possible statement may be that the knowledge and custom of burning the dead existed in the preceding Mesolithic of Europe and is even proven from a few Palaeolithic sites, such as, for example, Dolní Vestonice in Moravia (*Vlček 1991. 11–12*).

Ochre is used within the early Neolithic LPC burials, mainly around the head of the dead. More seldom is ochre spread over the central part of the body. In many graveyards only part of the burials show this ritual; the number is very low in the Bavarian cemeteries (*Nieszery 1995.162*). In other regions of the big LPC territory such as, for example in Alsace, the use is so frequent that it gives the impression of being a strict custom (*Jeunesse 1997.101–102*). In sum,

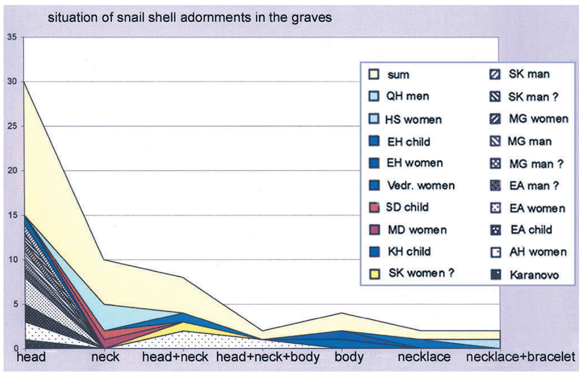

Fig. 4. Diagram about situation of snail shell adornments in the graves. Sites: QH = Quatzenheim, Alsatia, HS = Hoenheim – Souffleweyersheim, Alsatia, EH = Ensisheim, Alsatia, Vedr. = Vedrovice, 'Za dvorem', Moravia, SD = Saladorf, Austria, MD = Mitterndorf, Austria, KH = Kleinhadersdorf, Austria, SK = Sengkofen, Bavaria, MG = Mangolding, Bavaria, EA = Essenbach – Ammerbreite, Bavaria, AH = Aiterhofen, Ödmühle, Bavaria.

Site	Grave n°	situation: flexed	stretched	orientation	View to	Anthropology: Infans	Juvenil	femal	male	Cloth/adornments: Snail-shells	Spondy-lus	pearls	pearls: stone	comb	Grave goods: ceramics	flint	bone	Grinding stone	Graphit
BULGARIA																			
Karanovo grave 13			X	W–O	N			adult		7							2 needles		
GERMANY																			
AH	32	R		ONO–WSW	NNW			senil		234	1	4	4						
	33	back		WNW–OSO	SO			adult		3			1		1				X
	60	L		OSO–WNW	S			matur		80	16			1	1			1+	
	143	L		OSO–WNW	S ?		15–18			34	9		5	1					
	146	L		O–W	S ?			matur		10		3							
	150		X	OSO–WNW	NNW			senil		96		6							
EA	4	L		ONO–WSW	S	12-13				266					1				
	11	L		O–W	S		ca.14			142					4			1	1
	14	L		O–W	S			adult*		1				1					
	18	L		ONO–WSW	S			adult*		32	37								
	23	L		ONO–WSW	S				matur	X ?	1			2		2			
	27	L		O–W	S			matur*		217									
	29	L		O–W	?			adult		10	1					6			
Flomb.	7	?		SO–NW	?	?				1	1						1 bone		
MG	5	L		ONO–WSW	S ?			adult?		1						2			
	6	L		O–W	SW				matur	122		2			3 WS				
	7	L		NO–SW	S ?			adult?		6								1	
	13	R?		SO–NW	NO ?	?				x									
SK	18	Back		O–W	S				adult*	25		2			4 WS				
	26	L		O–W	S				Adult	48	3					1			
	29	L		O–W	S			adult*		86	1			1	1 WS			1	
AUSTRIA																			
KH. 26		L		SO–NW	S	I				124									
MD. 420		L		O–W	S			adult		28		12	1		2 WS				
RD. 556		?		?	?	?				120	1				2				
SD. 584		L		NO–SW	SO	I				79	1	10			2			1	
CZECHOSLOVAKIA / MORAVIA																			
Vedr. 9/88		L		SO–NW	S		18-20			300	47		506				1		
SUM GRAVES		23	2			3	3	8 (+ 4*)	3 (+3*)	27	12	8	4	5	9	4	3	5	2

Tab. 1. Early Neolithic graves with small snail shell adornments made from local snail shells – except Karanovo (snail species unknown). Sites: AH = Aiterhofen, Ödmühle, Bavaria, EA = Essenbach – Ammerbreite, Bavaria, Flomb. = Flomborn, Germany, KH = Kleinhadersdorf, Austria, MD = Mitterndorf, Austria, MG = Mangolding, Bavaria, RD = Rutzing, Austria, SD = Saladorf, Austria, SK = Sengkofen, Bavaria, Vedr. = Vedrovice, 'Za dvorem', Moravia, Vedr.S.u.Lesa = Vedrovice, 'Široká u lesa' Moravia, WS = sherd of body.

the ritual of covering the dead or part of them with ochre or red chalk seems to be a custom of regionally variable importance within the early Neolithic burials of central Europe and not linked with sex or age or the abundance or lack of grave goods.

In southeastern Europe the use of ochre mainly is proven from the northeastern region around the Carpathians (Fig. 2 based on *Lichter 2001.40 and 173*). As far as I know there is no evidence from Greece or the Near East.

The use of ochre for funerary rituals is well proven from European Mesolithic burials, where whole bodies were often covered with ochre, as it was the custom in younger Palaeolithic burials yet (*Grünberg 2000.220*).

Summing up the indications of some grave rituals of the early Neolithic, we can see that they show in large part traditions surviving from preceding periods, and in the case of the cremation burials and the use of ochre, these traditions should even be more based in the western and central parts of Europe than in the south east, where all the new ideas of the Neolithic way of life came from.

Personal ornaments

The best-known ornaments in early Neolithic graves in central Europe are those of the marine *spondylus* shell, imported from the Aegean, or to a lesser extent from the Adriatic coast. These ornaments are clearly connected to the richest burials and must have been of extremely high value. They are the most important evidence of long-distance connections through Europe in early to middle Neolithic times (*Sériades 1995; Müller 1997; Kalicz and Szénászky 2001*).

In a small number, in 39 of more than 2500 nearly Neolithic graves in central Europe we find ornaments made of small snail shells of only a few species. About 50 % of these graves are those of women and equal 25 % those of men and child-

Site		situation				Anthropology				Cloth / adornments					Grave goods				
Grave n°		flexed	stretched	orientation	View to	Infans	Juvenil	femal	male	Snail-shells	Spondylus	pearls	pearls: stone	Shell of mussel	ceramic	flint	bone	adze	other
FRANCE																			
Chichery, Grab 2			X ?	S–N	O			matur		3				1					
Cuiry G. 1			ventral			II				10 x		X		3					
EH	6	L		NO–SW	O			adult		>10									
	13	L		NO–SW	O	II				48	35	1		1			1 Idol		
	14	L		W–O	N	II				18	58	1 stag tusk							
Frignicourt		?				?				817		80	1 bracelet				1 chisel		
HS	26	?				III				4						2		1	1 Pyrit
	39		X	SO–NW				adult		69									
	S	L		O–W					adult	1									
QH	5		X	NW–SO	?				adult*	9					13 WS	1		1	1 Ochre
	6	L		NW–SO	?		13–15			13					2 WS	1	1	1	1 + 4 ochres
	7		X	?	?				adult*	14					1 WS	9	1	1	1
Wettolsh. 0		?						matur		5		>100		2					
SUM GRAVES		5	5			4	1	4	3	13	2			4	3	4	4	4	4

Tab. 2. Early Neolithic graves with small snail shell adornments mainly made from marine snail shells. Sites: Cuiry = Cuiry – les- Chaudardes, France, EH = Ensisheim, Alsatia, HS = Hoenheim – Souffleweyersheim, Alsatia, QH = Quatzenheim, Alsatia, Wettolsh. = Wettolsheim, Alsatia.

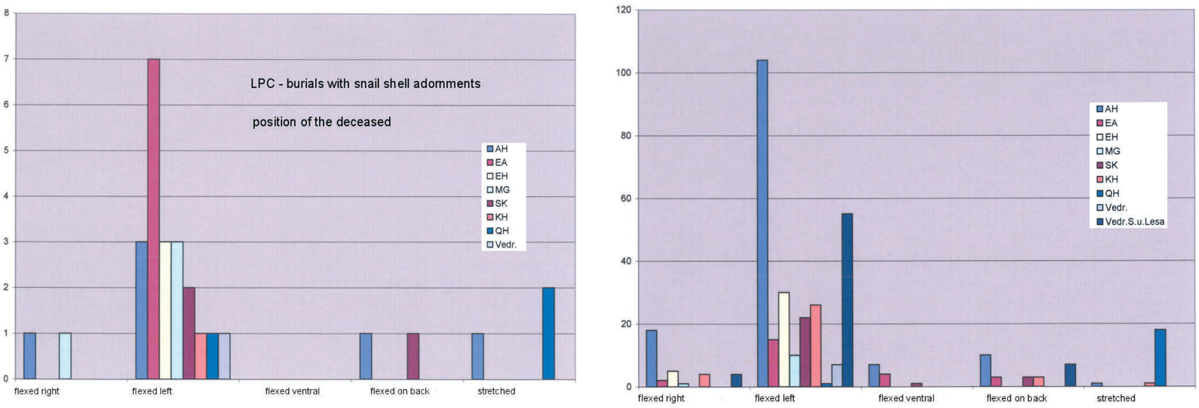

Fig. 5. Position of the deceased: left) burials with snail shell adornments; right) burials without snail shells. Sites: AH = Aiterhofen, Ödmühle, Bavaria, EA = Essenbach – Ammerbreite, Bavaria, EH = Ensisheim, Alsatia, MG = Mangolding, Bavaria, SK = Sengkofen, Bavaria, KH = Kleinhadersdorf, Austria, QH = Quatzenheim, Alsatia, Vedr. = Vedrovice, 'Za dvorem', Moravia, Vedr.S.u.Lesa = Vedrovice, 'Široká u lesa' Moravia.

ren (for more details see *Lenneis 2006*). Most of the snail shell ornaments are found on the head (*e.g.* in Aiterhofen, Fig. 3), around the neck, over both and/or around the body (Fig. 4). They might have been sown on bonnets or heads, or on cloth as was recently proven for the supposed bonnet of a baby at the Kleinhadersdorf cemetery (grave Verf. 26 – *Hartzhauser et al. 2007*). Only in France are there situations suggesting necklaces, or necklaces and bracelets (*Gallay and Mathieu 1988; Jeunesse and Schnitzler 1993*).

Persons equipped with these snail shells are usually buried in the flexed position on the left side, much more seldom on the right and a few stretched on their back. The frequencies of these positions are

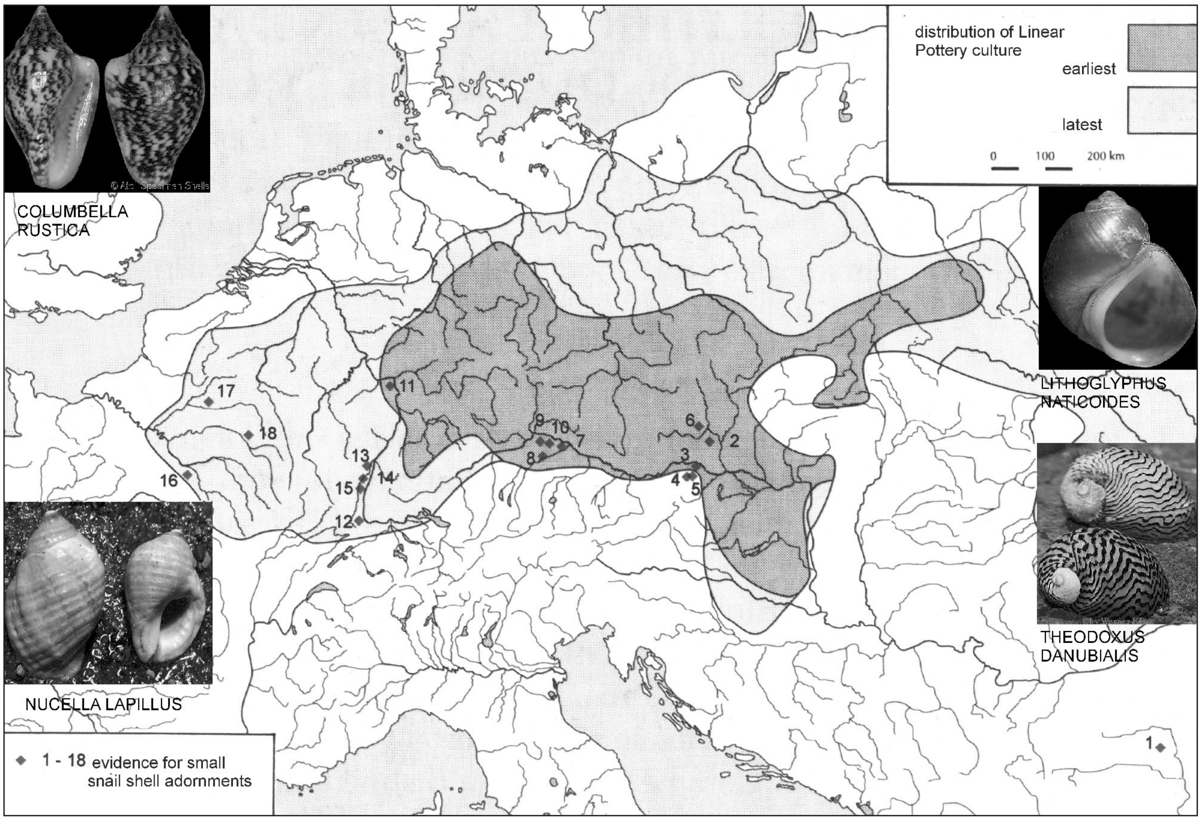

Fig. 6. Early Neolithic graves in Central Europe with snail shell adornments (map based on* Jeunesse 1997.fig. 1*). 1 – Karanovo/BG; 2 – Kleinhadersdorf, 3 – Mitterndorf, 4 – Ratzersdorf, 5 – Saladorf/A; 6 – Vedrovice/CS; 7 – Aiterhofen, 8 – Essenbach, 9 – Mangolding, 10 – Sengkofen, 11 – Flomborn/D; 12 – Ensisheim, 13 – Hoenheim, 14 – Quatzenheim, 15 – Wettolsheim, 16 – Chichery, 17 – Cuiry les Chaudardes, 18 – Frignicourt/F.

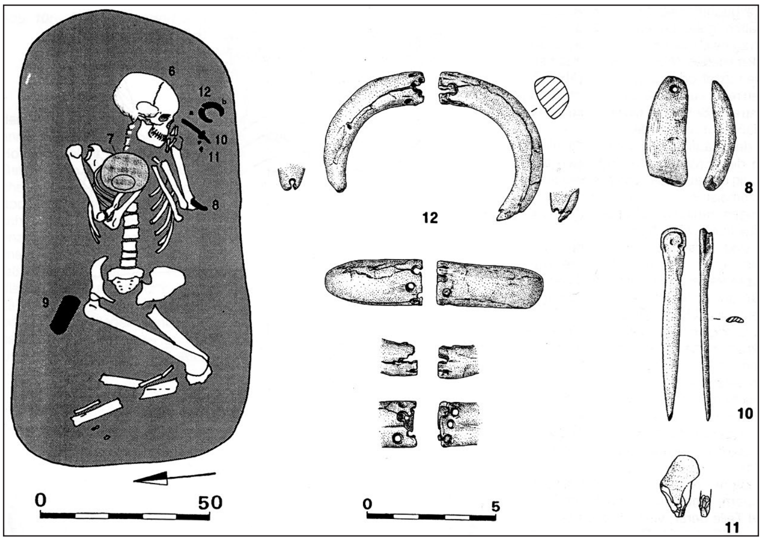

*Fig. 7. Kleinhadersdorf/Austria, grave 81 (***Neugebauer-Maresch 1992.Abb. 8***). 6 – layer of ochre, 7 – ceramic pot, 8 – spondylus, 9 – adze, 10 – bone awl, 11 – flint, 12 – pair of tasks of wild boar.*

It is most astonishing that there is no evidence for these ornaments from the large and rich Thuringian cemeteries, or from Slovakia.

From south east Europe the only evidence comes from layer II in the north east section of the tell of Karanovo (Fig. 6/no. 1), where a woman in a stretched position had 7 small snail shells around her head, further equipped with 2 bone needles (*Bačvarov 2003.47–48 and fig. 2.5*).

Snail shell ornaments were quite common in the Mesolithic of central and western Europe (*Grünberg 2000.fig. 65*); in the south east they are only proven from the Iron Gates (*Borić 2006.9–10, 13*), but there are

very like the other LPC graves without these ornaments (Figs. 5a and 5b). Most of the stretched inhumations are known from the Alsatian site of Quatzenheim (*Jeunesse 2005*).

As can be seen in Tables 1 and 2, burials with snail shell adornments were mainly richly equipped with other ornaments and grave goods. A remarkable fact is the very high evidence of *spondylus* within them. As seen in Table 1, 50 % of these 22 graves from eastern central Europe also contained *spondylus* ornaments. Adding to them the graves of the Rhineland and France (Tab. 2) the portion goes down to 41 %, which anyway represents a multiple value of the LPC average of 10–5 % (in Bavaria up to 27 %) of the graves containing *spondylus* ornaments (*Nieszery 1995.175*).

In the Rhineland and west of it (Fig. 6/no. 11–17) small marine shells, such as *columbella rustica*, *nucella lapillus* and others, had been used (*Jeunesse 1997.72; Bonnardin 2000.56*). From Bavaria eastwards (Fig. 6/no. 2–10) only shells of species living at the shores of brooklets were used, such as *theodoxus danubialis* and the very similar *lithoglyphus naticoides* (*Brink-Kloke 1990.440–441; Nieszery 1995.191; Podborský et al. 2002.263; Hartzhauser et al. 2007*).

also several examples of these ornaments from the upper Palaeolithic, such as from the Hundsteig site in Krems, Austria (*Neugebauer-Maresch 1993.78; Probst 1991.foto p. 133*). One gets the impression that in Europe these ornaments are very traditional such as ornaments made of the teeth of wild animals. There is rather unique evidence for a pair of tusks of wild boar from a men's burial at the Kleinhadersdorf cemetery in Austria (Fig. 7) (*Neugebauer-Maresch 1992.Abb. 8*). This man had some ochre over his head too, but also ceramics, *spondylus*, and an adze. There is further evidence of ornaments made

*Fig. 8. Rutzing/Austria, grave 13 (***Kloiber and Kneidinger 1970. Textabb. 2; Kloiber and Kneidinger 1968.Tafel IV/3; Binsteiner 2006.40 Abb. 5***). Grave of an adult man with and adze, spondylus adornments, 1 arrow-head and blades of Bavarian flint as well as 120 imitations of stag tusks.*

of stag teeth, for example in a men's grave at Vedrovice in Moravia, with two pairs of stag teeth beside rich, very Neolithic equipment (*Podborský et al. 2002. grave n°15/75. 264, obr. 15 a, b and tab. XVI*). Another man from the Austrian site of Rutzing had a luxurious outfit of *spondylus*, but a double necklace of imitation stag teeth beside a large adze and arrow heads (Fig. 8) (*Kloiber-Kneidinger 1970.Textabb. 2; Binsteiner 2006.Abb. 5*). The largest quantity, of 31 stag teeth, comes from a male burial in Sondershausen, Thuringia, which also contained a large *spondylus* set (*Kahlke 2004.grave SO 32 on table 12*). In the Bruchstedt cemetery, again in Thuringia, even a small child (infans I) had been given these very typical hunter attributes (*Kahlke 2004. grave RB 30 on table 25*).

Other ornaments typical of hunters are decorated pendants made from antler, such as are known from the Bavarian cemeteries of Aiterhofen, grave 158, and Sengkofen, grave 19 (*Nieszery 1995.196, Taf. 55/2 and 69/6*), but also these persons have Neolithic equipment such as adzes or even ceramic pots beside their hunting arms.

Conclusions

I have tried to show within the grave rituals and adornments of the dead some traditions which apparently survived from preceding periods, a few even indicating very old roots in central and western Europe. As traditions can not survive without people, these facts clearly indicate the survival of some of the autochthonous population. To me the most striking observation concerning these persons was that although their numbers might have been small, the way most of them were treated shows them as integrated and highly esteemed people in early Neolithic society.

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A Pan-European model of the Neolithic

Kate Davison[1], Pavel M. Dolukhanov[2], Graeme R. Sarson[1], Anvar Shukurov[1] and Ganna I. Zaitseva[3]

1 *School of Mathematics and Statistics, University of Newcastle upon Tyne, NE1 7RU, U.K.*
kate.davison@ncl.ac.uk; g.r.sarson@ncl.ac.uk; anvar.shukurov@ncl.ac.uk
2 *School of Historical Studies, University of Newcastle upon Tyne, NE1 7RU, U.K.*
pavel.dolukhanov@ncl.ac.uk
3 *Institute for the History of Material Culture, Russian Academy of Sciences, St. Petersburg, Russia*

ABSTRACT – *We present a mathematical model, based on a compilation of radiocarbon dates, of the transition to the Neolithic, from about 7000 to 4000 BC in Europe. With the arrival of the Neolithic, hunting and food gathering gave way to agriculture and stock breeding in many parts of Europe; pottery-making spread into even broader areas. We use a population dynamics model to suggest the presence of two waves of advance, one from the Near East, and another through Eastern Europe. Thus, we provide a quantitative framework in which a unified interpretation of the Western and Eastern Neolithic can be developed.*

IZVLEČEK – *Predstavljamo matematični model, ki temelji na kompilaciji radiokarbonskih datumov med 7000 in 4000 BC. Ti datumi so v Evropi povezani s prehodom v neolitik, ko sta poljedelstvo in živinoreja v mnogih regijah zamenjala lov in nabiralništvo; lončarstvo pa se je širilo še dlje. S pomočjo modela populacijske dinamike predstavljamo dva vala napredovanja, enega iz Bližnjega Vzhoda in drugega preko Vzhodne Evrope. Z njim zagotavljamo kvantitavni okvir, v katerem lahko razvijamo enovito interpretacijo 'zahodnega' in 'vzhodnega' neolitika.*

KEY WORDS – *Neolithic; population dynamics; radiocarbon dates; archaeology; mathematical modelling*

Introduction

The transition to the Neolithic was a crucial period in the development of Eurasian societies, defining to a large extent their subsequent evolution. The introduction of agro-pastoral farming, which originated in the Near East about 12 000 years ago and then spread throughout Europe, is usually considered to be a key feature of this transition (*Zvelebil 1996*). Yet the Neolithic was not a simple, single-faceted phenomenon. In his early definition of the Neolithic, Sir John Lubbock (*1865*) specified its main characteristics to be the growing of crops, the taming of animals, the use of polished stone and bone tools, and pottery-making.

Ceramic pottery is one of the defining characteristics of the Neolithic. It is true that there are examples of early farming communities apparently not involved in pottery-making. For example, aceramic Neolithic cultures have been identified in the Levant, Upper Mesopotamia, Anatolia (9800–7500 BC) and also in the Peloponnese (7000–6500 BC) and Thessaly Plain (7300–6300 BC). (All BC dates supplied are radiocarbon dates calibrated using OxCal v3.10 (*Bronk Ramsey 2001*) with calibration curve intcal04.14c.) Wheat, barley and legumes were cultivated at those sites; permanent houses with stone foundations were used. There is no widespread evidence of pottery (*Perlès 2001*) but recent excavations have revealed the occurrence of pottery in Thessaly, albeit in small quantities (*J. K. Kozłowski, personal communication 27/03/2007*). In contrast, the Neolithic in North-Eastern boreal Europe is identified with a sedentary (or seasonally sedentary) settlement pattern, social hierarchy and sophisticated symbolic expression, the use of polished stone and bone tools, large-scale manufacture of ceramic ware, but not with agriculture (*Oshibkina 1996*): the subsistence apparently remained based on foraging. This combination of attributes is characteristic of the 'boreal Neolithic'; of these, pottery is in practice the most easily identifiable.

In the present paper we attempt to develop a unified framework describing the spread of both the 'agro-pastoral' and 'boreal' Neolithic. Our quantitative model of the Neolithization is based on the large amount of relevant radiocarbon dates now available.

Selection of radiocarbon dates

The compilation of dates used in this study to model the spread of the Neolithic in Europe is available upon request from the authors; unlike all other similar studies known to us it includes dates from the East of Europe. We used data from Gkiasta et al. (*2003*), Shennan and Steele (*2000*), Thissen et al (*2006*) for Southern, Central and Western Europe (SCWE) and Dolukhanov et al. (*2005*), Timofeev et al. (*2004*) for Eastern Europe (EE). Our selection and treatment of the dates, described in this section, is motivated by our attempt to understand the spread of agriculture and pottery making throughout Europe.

Many archaeological sites considered have long series of radiocarbon dates: often with 3–10 dates, and occasionally with 30–50. Associated with each radiocarbon measurement is a laboratory error, which after calibration was converted into a calibration error σ_i. The laboratory error characterises the accuracy of the measurement of the sample radioactivity rather than the true age of the archaeological site (*Dolukhanov et al. 2005*) and, thus, is often unrepresentatively small, suggesting an accuracy of 30 years on occasion. Therefore, we estimated an empirical minimum error of radiocarbon age determination of the archaeological age and then used it when treating sites with multiple dates. A global minimum error of σ_{min} = 160 years is obtained from well explored, archaeologically homogeneous sites with a large number of tightly clustered dates. Such sites are: (1) Ilipinar, 65 dates, with the standard deviation σ = 168 years (and mean date 6870 BC); (2) Achilleion, 41 dates, σ = 169 years (mean 8682 BC); (3) Asikli Höyük, 47 dates, σ = 156 years (mean 7206 BC). Similar estimates are σ_{min} = 100 years for LBK sites and σ_{min} = 130 years for the Serteya site in North-Western Russia (*Dolukhanov et al. 2005*); the typical errors vary between different regions and periods but we apply σ_{min} = 160 years to all the data here.

For sites with multiple radiocarbon date determinations, the dates are treated and reduced to two (and rarely more) dates that are representative of the arrival of multiple Neolithic episodes to that location. For the vast majority of such sites, the radiocarbon dates available can be combined, as discussed below, to just two possible arrival dates. Examples of sites with multiple radiocarbon measurements are Ilipinar and Ivanovskoye-2 where, respectively, 65 and 21 dates have been published. Figures 1a and b indicate that for these sites the series of dates form very different distributions; different strategies are used to process these different types of date series as described below (see *Dolukhanov et al. 2005* for details). If a geographical location hosts only one radiocarbon measurement associated with the early Neolithic, then this is taken to be the most likely date for the arrival of the Neolithic. The uncertainty of this radiocarbon date is taken to be the maximum of the global minimum error discussed above and the calibrated date range obtained at the 99.7 % confidence level and then divided by six (to obtain an analogue of the 1σ error). There are numerous such sites in our collection, including Casabianca, Dachstein and Inchtuthil.

If only a few (less than 8) date measurements are available for a site and those dates all agree within the calibration error, we use their mean value and characterise its uncertainty with an error equal to the maximum of each of the calibrated measurement errors σ_i, the standard deviation of the dates involved $\sigma(t_i)$, $1 \le i \le n$, and the global minimum error introduced above:

$$\sigma = \max\left\{\sigma_i, \sigma\left(t_i\right), \sigma_{\min}\right\}, \tag{1}$$

n is the total number of dates in the cluster. An example of such a site is Bademağaci, where we have 4 dates, all within 60 years of one another; Figure 1c shows the histogram of radiocarbon dates of this site. The typical calibration error of these dates is approximately 30 years, thus Eq. (1) yields σ_{min} as an uncertainty estimate. However, we apply a slightly different procedure for clusters of dates that do not agree within the calibration error.

For a series of dates that cluster in time but do not agree within the calibration error, we use different approaches depending on the number of dates available and their errors. Should the cluster contain less than 8 dates, we take the mean of the dates (as in the previous case), as any more sophisticated statistical technique would be inappropriate for such a small sample; the error is taken as in Eq. (1). An example of such a site is Okranza Bolnica – Stara Zagora with 7 measurements, and Figure 1f shows that the dates are tightly clustered around the mean value.

If however, the date cluster is large (*i.e.* more than 8 dates, such as Ilipinar, shown in Fig. 1a), the χ^2 statistical test can be used to calculate the most likely date T of a coeval subsample as described in detail by Dolukhanov et al. (*2005*):

$$T = \frac{\sum_{i=1}^{n} t_i / \bar{\sigma}_i^2}{\sum_{i=1}^{n} 1 / \bar{\sigma}_i^2},$$

where $\bar{\sigma}_i = \max(\sigma_i, \sigma_{\min})$. The coeval subsample is obtained by calculating the statistic:

$$X^2 = \sum_{i=1}^{n} \frac{(t_i - T)^2}{\bar{\sigma}_i^2}$$

and comparing it with χ^2. If $X^2 \leq \chi^2_{n-1}$, the sample is coeval and the date T is the best representative of the sample. If $X^2 > \chi^2_{n-1}$, the sample is not necessarily coeval, and the dates that provide the largest contribution to X are discarded one by one until the criterion for a coeval sample is satisfied. This process is very similar to that implemented in the *R_Combine* function of OxCal (*Bronk Ramsey 2001*). However, OxCal's procedure first combines the uncalibrated dates into one single radiocarbon measurement and then calibrates it. Our approach on the other hand first uses the calibration scheme of OxCal and then combines the resulting calibrated dates to give T. Furthermore, our procedure adds the flexibility of identifying and discarding dates with the largest relative deviation from T. Within *R_Combine* the minimum error is not used in the calculation of X^2 but is rather only incorporated into the final uncertainty estimate. We feel that it is more appropriate to include the minimum uncertainty into the calculation from the outset. As a check, we combined several set of dates using both OxCal and our procedure, and the results agree within a few years in most cases where such agreement could be expected.

If a site has many radiocarbon determinations that do not cluster around a single date, a histogram of the dates is analyzed. If the data have a wide range and have no discernable peaks (*i.e.*, are approximately uniformly distributed in time), they may suggest prolonged Neolithic activity at the site, and we choose, as many other authors, the oldest date (or one of the oldest, if there are reasons to reject outliers) to identify the first appearance of the Neolithic. Examples of such sites are Mersin and Halula where there are 6 and 9 dates with a range of 550 and 1900 years, respectively, and no significant peaks (see Figs. 1d and 1e), here the oldest dates are 6950 and 8800 years BC and the associated errors are 217 and 167 years.

Apart from sites with either no significant peak or only one peak, there are sites whose radiocarbon dates have a multimodal structure which may indicate multiple waves of settlement passing through this location. Ivanovskoye-2 (with 21 dates) is a typical site in this category, and Figure 1b depicts two distinct peaks. In such cases multiple dates were attributed to the site, with the above methods applied to each peak independently. Admittedly our method of assigning an individual date to a specific peak could be inaccurate in some cases as appropriate stratigraphic and/or typological data are not invoked in our procedure. In future refinements to this technique we may consider fitting bimodal normal distributions to the data to avoid the rigid assignment of measurements to one peak or another. After selection and processing, the total number of dates in our compilation is 477. In our final selection, 30 sites have two arrival dates allocated and 4 sites have three arrival dates allocated, namely Berezovaya, Osipovka, Rakushechnyi Yar and Yerpin Pudas.

Modelling

The mechanisms of the spread of the Neolithic in Europe remain controversial. Gordon Childe (*1925*) advocated direct migration of the farming population; this idea was developed in the form of the demic expansion (wave of advance) model (*Ammerman and Cavalli-Sforza 1973*). The Neolithization was viewed as the spread of colonist farmers who overwhelmed the indigenous hunter-gatherers or converted them to the cultivation of domesticated cereals and the rearing of animal stock (*Price 2000*). An alternative approach views the Neolithization as an adoption of agriculture (or other attributes) by indigenous hunter-gatherers through the diffusion of cultural novelties by means of intermarriages, assimilation and borrowing (*Tilley 1994; Thomas 1996; Whittle 1996*). Recent genetic evidence seems to favour cultural transmission (*Haak et al. 2005*).

Irrespective of the particular mechanism of the spread of the Neolithic (or of its various signatu-

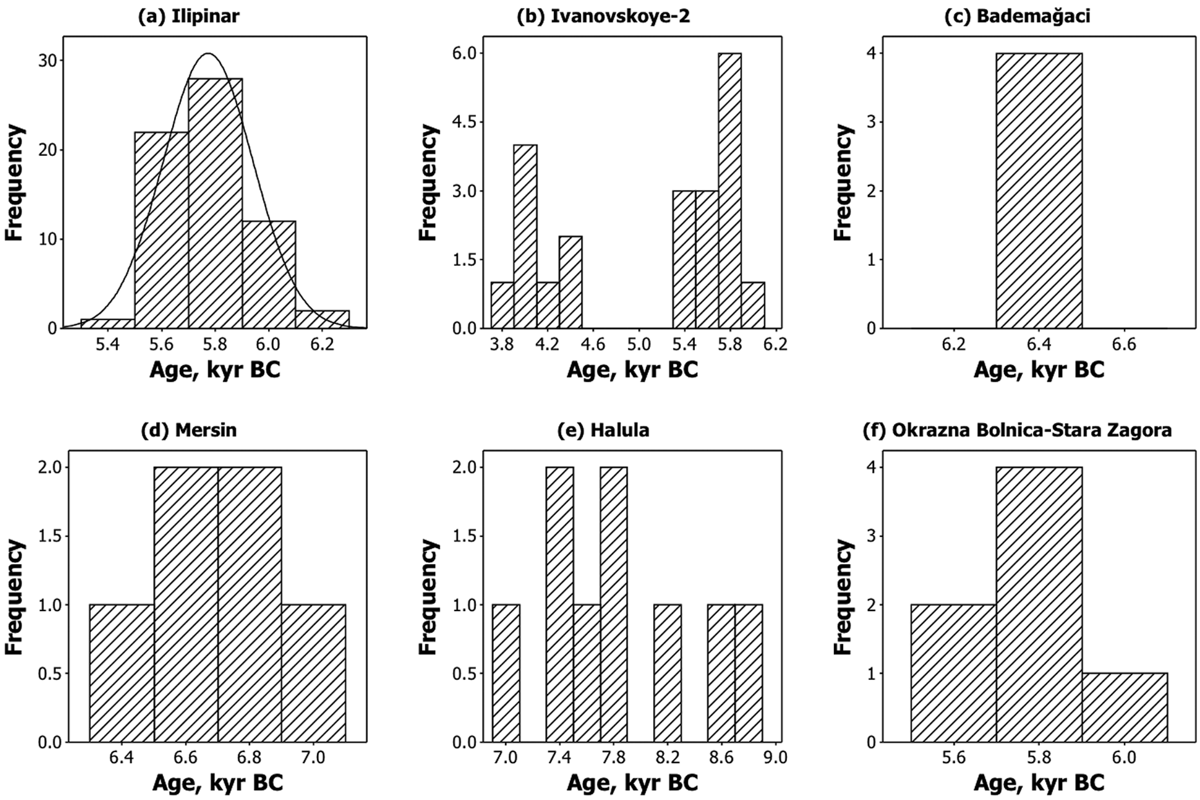

Fig. 1. Histograms of calibrated radiocarbon ages from archaeological sites in kyr BC, binned into 200 year intervals representing various temporal distributions. (a) The 65 dates from Ilipinar (40.47°N, 29.30°E) are approximately normally distributed, so the χ^2 criterion can be employed to calculate the age of this site as described by Dolukhanov et al (2005). The resulting Gaussian envelope is shown solid. (b) Ivanovskoye-2 (56.85°N, 39.03°E) has 21 dates showing a multimodal structure where each peak can be treated as above. (c) The 4 dates from Bademağaci (37.40°N, 30.48°E) combine into a single date when their errors are taken into account. (d) The 6 dates from Mersin (36.78°N, 34.60°E) are almost uniformly distributed in time, so the oldest date can be used as representative of the arrival of the Neolithic. (e) The 9 dates from Halula (36.40°N, 38.17°E) are treated as in (d). (f) The 7 dates from Okrazna Bolnica – Stara Zagora (42.43°N, 25.63°E) are not numerous enough to justify the application of the χ^2 test, but they form a tight cluster, so the mean date can be used for this site.

res), the underlying process can be considered as some sort of 'random walk', of either humans or ideas and technologies. Therefore, mathematical modelling of the spread (at suitably large scales in space and time) can arguably be based on a 'universal' equation (known as reaction-diffusion equation) with parameters chosen appropriately (*Cavalli-Sforza and Feldman 1981*). A salient feature of this equation is the development of a propagation front (where the population density, or any other relevant variable, is equal to a given constant value) which advances at a constant speed (*Murray 1993*) (in the approximation of a homogeneous, one-dimensional habitat). This mode of spread of incipient agriculture has been confirmed by radiocarbon dates (*Ammerman and Biagi 2003; Ammerman and Cavalli-Sforza 1971; 1973; 1984; Gkiasta et al. 2003; Pinhasi et al. 2005*). In Figure 2a we plot the distance from a putative source in the Near East versus the ^{14}C dates for early Neolithic sites in SCWE; the linear interdependence is consistent with a constant propagation speed. Due to the inhomogeneous nature of the landscape we would not expect to see a very tight correlation between distance from source and time of first arrival, since there are many geographical features that naturally cause barriers to travel (*e.g.* the Mediterranean Sea). It is also suggested in a previous work (*Davison et al. 2006*) that there are local variations in the propagation speed near major waterways; this again detracts from the constant rate of spread. In spite of this, the correlation coefficient is found to be –0.80; reassuringly high given the above complications. There is also a tail of older dates that originate in early Neolithic sites in the Near East, where a Neolithic tradition began and remained until it saturated the area and subsequently expanded across the landscape.

In contrast to earlier models, we include the 'boreal', East-European (EE) Neolithic sites, which we present in the same format in Figure 2b. It is clear that the Eastern data are not all consistent with the idea of spread from a single source in the Near East. A correlation coefficient of –0.52 between the EE dates and distance to the Near East is sufficient evidence for that. Our modeling, discussed below, indicates that another wave of advance swept westward through Eastern Europe about 1500 years earlier than the conventional Near-Eastern one; we speculate that it may even have spread further to produce early ceramic sites in Western Europe (*e.g.* the La Hoguette and Roucadour groups).

Our population dynamics model, described in detail by (*Davison et al. 2006*), was refined for our present simulations. We thus solve the reaction-diffusion equation supplemented with an advection of speed **V**, arising from this anisotropic component of the random walk of individuals that underlies the large-scale diffusion (*Davison et al. 2006; Murray 1993*):

$$\frac{\partial N}{\partial T} + (\mathbf{V} \cdot \nabla) N = \gamma N \left(1 - \frac{N}{K}\right) + \nabla \cdot (\nu \nabla N), \qquad (2)$$

where N is the population density, γ is the intrinsic growth rate of the population, K is the carrying capacity, and ν is the diffusivity (mobility) of the population. We solve Eq. (2) numerically in two dimensions on a spherical surface with grid spacing of 1/12 degree (2–10 km, depending on latitude). All the variables in Eq. (2) can be functions of position and time, as described by Davison et al. (*2006*).

We consider two non-interacting populations, each modelled with Eq. (2), but with different values of the parameters $\mathbf{V}$, γ, K and ν; the difference is intended to represent differences between subsistence strategies (farmers versus hunter-gatherers) and/or between demic and cultural diffusion.

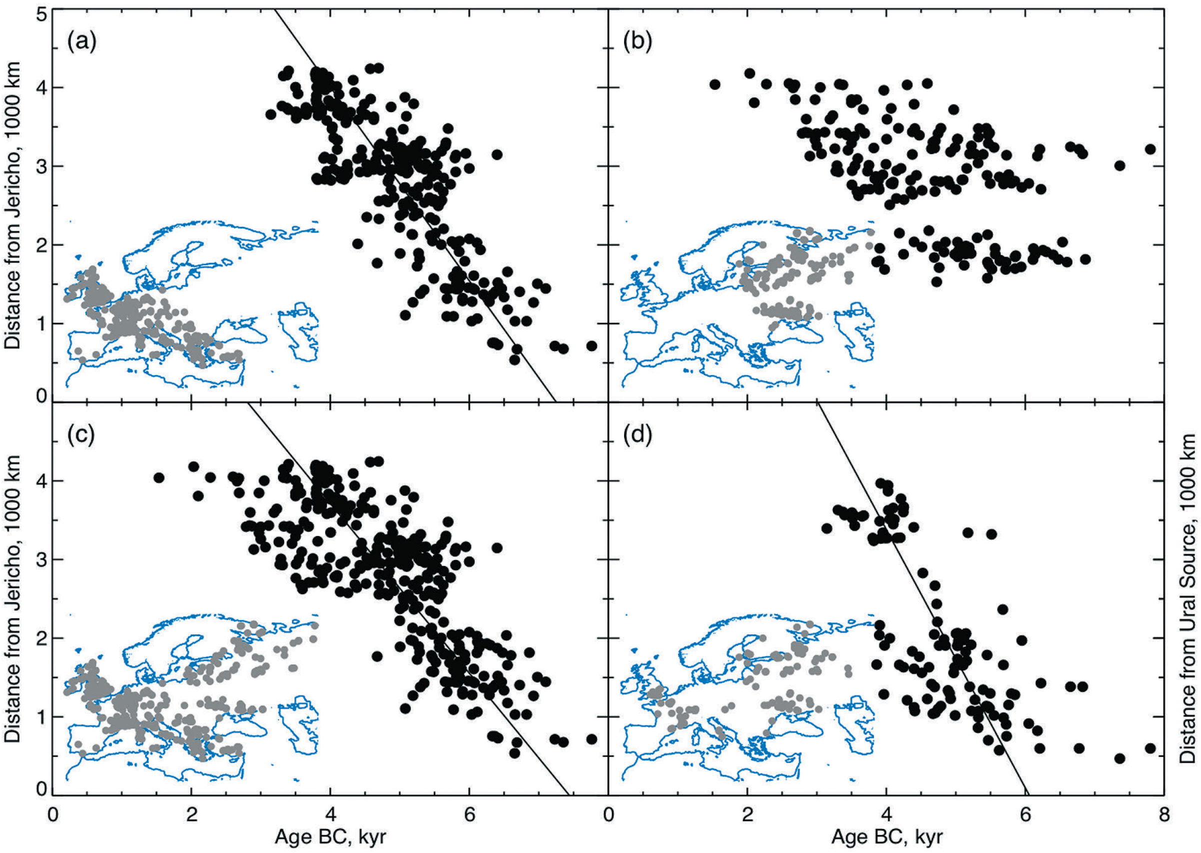

Fig. 2. Radiocarbon dates of early Neolithic sites versus the great-circle distance from the assumed source. Inset maps show the location of the sites plotted, and the straight lines correspond to spread at a constant speed given below. (a) Sites from Southern, Central and Western Europe (SCWE) with respect to a Near Eastern source (Jericho). The linear correlation (cross-correlation coefficient C = –0,80) suggests a mean speed of advance of U = 1.2 ± 0.1 km/year (2σ error). (b) Sites from Eastern Europe (EE) show very poor correlation with respect to the same Near-Eastern source (C = –0,52), so that straight-line fitting is not useful. (c) Sites attributed, using our two-source model, to the Near-Eastern source (note a significant number of EE sites clearly visible in the inset map) show a reasonable correlation (C = –0,77) and a mean speed U = 1.1 ± 0.1 km/year. (d) Sites attributed to the Eastern source (from both EE and SCWE) show a correlation similar to that of Panel (c) (C = –0,76), and a mean speed U = 1.7 ± 0.3 km/year.

We thus numerically solve two versions of Equation (2), one for each of two non-interacting populations with different origins of dispersal. The boundaries of the computational domain are at 75°N and 25°N, and 60°E and 15°W as shown in Figure 3, they are chosen to comfortably incorporate our pan-European area. The environmental factors included into the model are the altitude, latitude, coastlines and the Danube-Rhine river system. The equation describing the farming population also includes advection velocity **V** along the major waterways (the Danube, the Rhine and the sea coastlines; $\mathbf{V} \neq 0$ within corridors 10 km wide on each side of a river or 10 km inshore near the sea) which results from anisotropic diffusion in those areas. The prescription of the components of the advective velocity are given in Davison et al. (*2006*).

The focus of our model is the speed of the front propagation U, since this quantity can be most readily linked to the radiocarbon age used to date the 'first arrival' of the wave of advance. This feature of the solution depends only on the linear terms in Equation (2) and, in particular, is independent of the carrying capacity K. Moreover, to a first approximation U only depends on the product $\gamma\nu$:

$$U = 2\sqrt{\gamma\nu}. \qquad (3)$$

Taking the intrinsic growth rate of a farming population as $\gamma = 0.02$ year^{-1} (*Birdsell 1957*), the mean speed of the front propagation of $U \approx 1$ km/year for the population of farmers suggests the background (low-latitude) value of the diffusivity $\nu = 12.5$ km^2/year (*Ammerman and Cavalli-Sforza 1971; Davison et al. 2006*). For the wave spreading from Eastern Europe, $U \approx 1.6$ km/year is acceptable as a rough estimate obtained from the EE radiocarbon dates (*Dolukhanov et al. 2005*); this estimate is confirmed by our model (see Fig. 2d). Analysis of the spread of Paleolithic hunter-gatherers yields $U \approx 0.8$ km/year; the corresponding demographic parameters are suggested to be $\gamma = 0.02$–0.03 year^{-1} and $\nu = 50$–140 km^2/year (*Fort et al. 2004*). These authors use an expression for U different from Eq. (3); it is plausible, therefore, that the intrinsic growth rate obtained by Fort et al. (*2004*) for hunter-gatherers is a significant overestimate; for $\nu = 100$ km^2/year and $U \approx 1.6$ km/year, the nominal value of γ obtained from Eq. (3) is about 0.006 year^{-1}. A growth rate of $\gamma = 0.01$ year^{-1} has been suggested for indigenous North-American populations in historical times (*Young and Bettinger 1992*). The range $\gamma = 0.003$–0.03 year^{-1} is considered in a model of Paleoindian dispersal (*Steele et al. 1998*). Our simulations adopt $\gamma = 0.007$ year^{-1} and $\nu = 91.4$ km^2/year for the hunter-gatherers.

For the wave that spreads from the Near East carrying farming, K and ν smoothly tend to zero within 100 m of the altitude 1 km, above which land farming becomes impractical. For the wave spreading from the East, K and ν are similarly truncated at altitudes around 1500 km as foraging is possible up to higher altitude than farming. The low-altitude (background) values of K adopted are 0.07 persons/km^2 for hunter-gatherers (*Dolukhanov, 1979; Steele et al. 1998*) and 3.5 persons/km^2 for farmers, a value 50 times larger than that for hunter-gatherers (*Ammerman and Cavalli-Sforza 1984*). The values of K do not affect any results reported in this paper.

In seas, for both farmers and hunter-gatherers, both the intrinsic growth rate and the carrying capacity vanish as seas are incapable of supporting a human population. The diffusivity for both farmers and hunter gatherers tails off exponentially as

$$\nu \propto \exp(-d/l),$$

with d the shortest distance from the coast and $l = 40$ km, allowing the population to travel within a short distance offshore but not to have a sustained existence there. The value of l has been fine-tuned in this work in order to reproduce the delay, indicated by radiocarbon dates, in the spread of the Neolithic from the continent to Britain and Scandinavia. This provides an interesting inference regarding the sea-faring capabilities of the times, suggesting confident travel within about 40 km off the coast.

The inclusion of advection along the Danube-Rhine corridor and the sea coastlines is required to reproduce the spread of the Linear Pottery and Impressed Ware cultures obtained from the radiocarbon and archaeological evidence (see *Davison et al. 2006* for details). The speed of spread of farming in the Danube-Rhine corridor was as high as 4 km/yr (*Ammerman and Cavalli-Sforza 1971*) and that in the Mediterranean coastal areas was perhaps as high as 20 km/yr (*Zilhão 2001*); we set our advective velocity in these regions accordingly. However, there are no indications that similar acceleration could occur for the hunter-gatherers spreading from the East. Thus, we adopt $\mathbf{V} = 0$ for this population.

The starting positions and times for the two waves of advance – *i.e.*, the initial conditions – were selected as follows. For the population of farmers, we position the origin and adjust the starting time so as to minimize the root mean square difference between the SCWE ^{14}C dates and the arrival time of the modelled population at the corresponding locations; the procedure is repeated for all positions between 30°N, 30°E and 40°N, 40°E with a 1° step. This places the centre at 35°N, 39°E, with the propagation starting at 6700 BC. For the source in the East of Europe, we have tentatively selected a region centered at 53°N, 56°E in the Ural mountains (to the east of the Neolithic sites used here), so that the propagation front reaches the sites in a well developed form. We do *not* suggest that pottery-making independently originated in this region. More reasonably, this technology spread, through the bottleneck between the Ural Mountains and the Caspian Sea, from a location further to the east. The starting time for this wave of advance was fixed by trial and error at 8200 BC at the above location; this reasonably fits most of the dates in Eastern Europe attributable to this centre. For both populations, the initial distribution of N is a truncated Gaussian of a radius 300 km.

Comparison of the model with radiocarbon dates

The quality of the model was assessed by considering the time lag $\Delta T = T - T_m$ between the modelled arrival time(s) of the wave(s) of advance to a site, T_m, and the actual ^{14}C date(s) of this site, T, obtained as described in Sect. 2. The sites were attributed to that centre (Near East or Urals) which provided the smallest magnitude of ΔT. This procedure admittedly favours the model, and the attributions have to be carefully compared with the archaeological and typological characteristics of each site. Such evidence is incomplete or insufficient in a great number of cases; we leave the laborious task of incorporating independent evidence in a systematic and de-

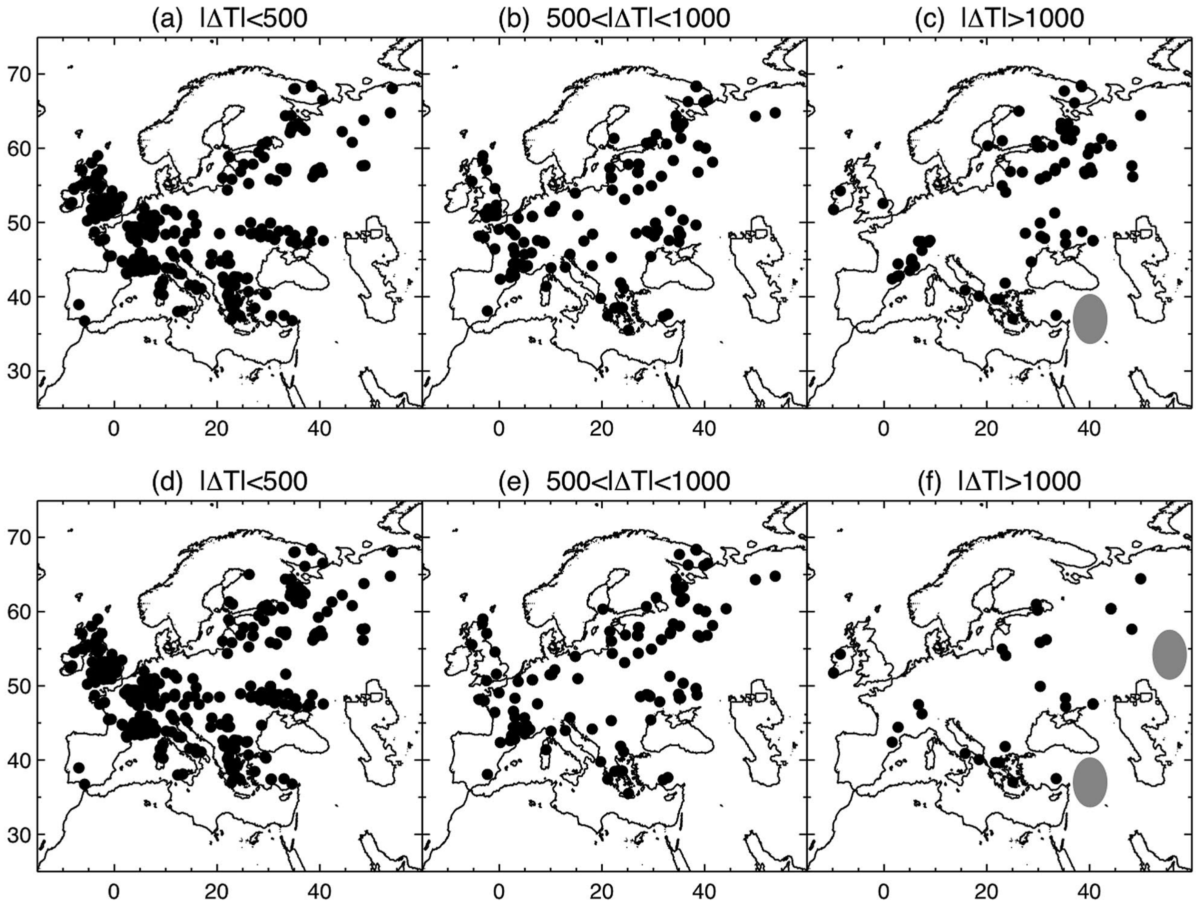

Fig. 3. Time lags, $\Delta T = T - T_m$, between the actual and modelled arrival times for the early Neolithic sites shown against their geographical position: panels (a)–(c) refer to a model with a single source in the Near East, and panels (d)–(f) to our best model with two sources (with the second on the Eastern edge of Europe). The positions of the sources are shown in grey in panels (c) and (f). Sites with $|\Delta T| < 500$ are shown in (a) and (d), those with 500 yr $< |\Delta T| <$ 1000 yr in panels (b) and (e), and those with $|\Delta T| >$ 1000 yr in panels (c) and (f). There are 265, 132, 80 sites in panels (a)–(c) and 336, 113, 28 sites in (d)–(f), respectively. Many data points corresponding to nearby sites overlap, diminishing the apparent difference between the two models. The advantage of the two-source model is nevertheless clear and significant.

tailed manner for future work. Our formulaic method of attribution has inevitably failed in some cases, but our preliminary checks have confirmed that the results are still broadly consistent with the evidence available, (see below).

First, we considered a model with a single source in the Near East (see Fig. 4a for histogram of time lags). The resulting time lags are presented in Figure 3a–c. The best fit model with two sources is similarly illustrated in Figure 3d–f. The locations of the two sources are shown with grey ellipses in panels (c) and (f).

In Figure 3a the sites shown are those at which the model arrival date and the radiocarbon date agree within 500 years (55 % of the pan-European dates); Figure 3d gives a similar figure for the two source model (now 70 % of the pan-European dates fit within 500 years). The points in the EE area are significantly more abundant in Figure 3d than in Figure 3a, while the difference in the SCWE area is less striking. The SCWE sites are better fitted with the one source model, with $|\Delta T| < 500$ years for 68 % of data points, but the fit is unacceptably poor for EE, where only 38 % of the radiocarbon dates can be fitted within 500 years. A convenient measure of the quality of the fit is the standard deviation of the time lags

$$s = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(\Delta T_i - \overline{\Delta T}\right)} \quad \text{with} \quad \overline{\Delta T} = \frac{1}{N}\sum_{i=1}^{N}\Delta T_i .$$

The standard deviation of the pan-European time lags here is $s = 800$ years. Outliers are numerous when all of the European sites are included (illustrated by the abundance of points in Figure 3c), and they make the distribution skewed, and offset from $\Delta T = 0$ (see Fig. 4a). The outliers are mainly located in the east: for the SCWE sites, the distribution is more tightly clustered ($s = 540$ years), has negligible mean value, and is quite symmetric. In contrast, the time lags for sites in Eastern Europe (EE), with respect to the centre in the Near East, have a rather flat distribution ($s = 1040$ years), which is strongly skewed and has a significant mean value (310 years).

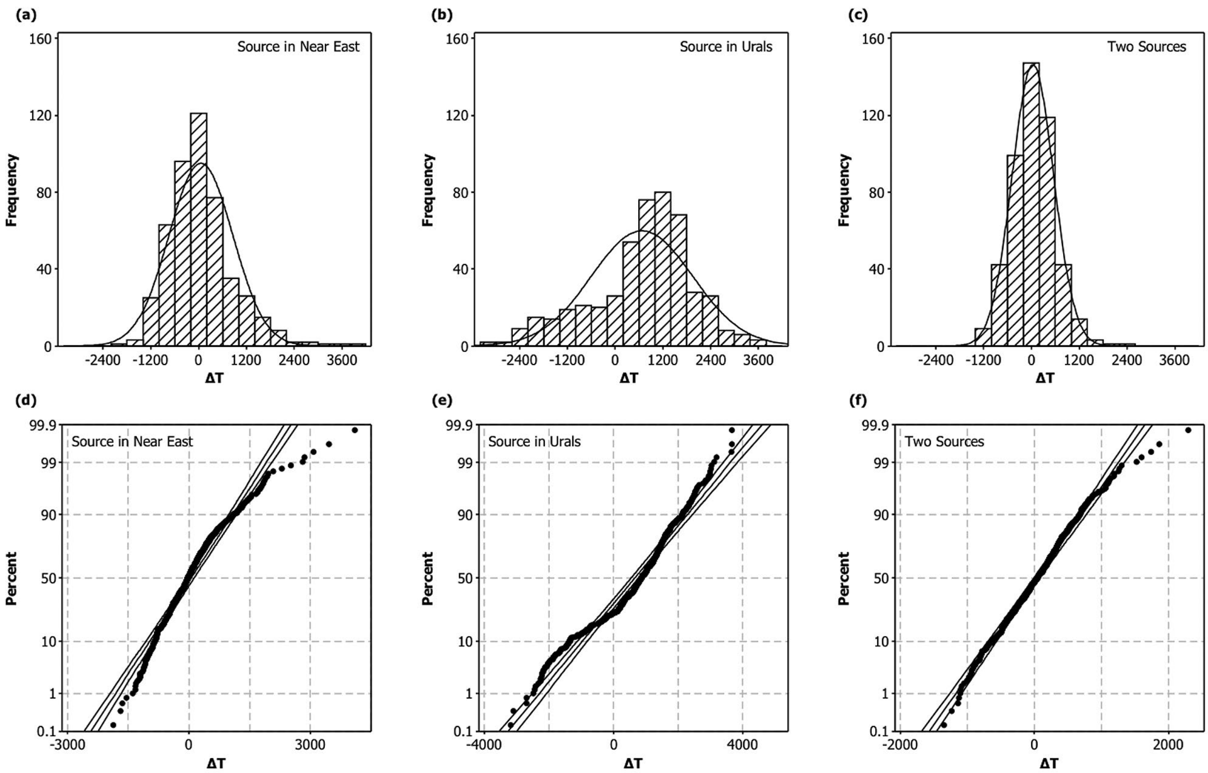

Fig. 4. Time lags, ΔT = T–T$_m$, between the actual and modelled arrival times for the early Neolithic sites. (a)–(c): Histograms of the time lags, with a normal distribution fit (solid), for a model with a single source in the Near East (a), for a single source in the Urals (b) and for a two-source model (c). (d)–(f): The cumulative probability distribution of the time lags from panels (a)–(c), respectively, rescaled such that a normal probability distribution corresponds to a straight line (known as a normal probability plot). The straight lines show the best-fitting normal distribution, and the 95 % confidence interval. A significant reduction in the number of outliers can be seen in (f) or (c) as compared to (d) or (a) and (e) or (b). The distributions of panels (d) and (e) fail the Anderson-Darling normality test, while (f) passes the test confirming that ΔT is normally distributed (p-value = 0.149).

The failure of the single-source model to accommodate the ^{14}C dates from Eastern Europe justifies our use of a more complicated model that has two sources of propagation. Attempts were made at locating the single source in various other locations, such as the Urals, but this did not improve the agreement (see Fig. 4b for the histogram of time lags for the model with single source in the Urals).

Adding another source in the East makes the model much more successful: the values of the time lag, shown in Fig. 3d–f, are systematically smaller; *i.e.* there are significantly fewer points in Fig. 3f (5 %) compared to Fig. 3c (17 %). The resulting ΔT distribution for all the sites is quite narrow (s = 520 years) and almost perfectly symmetric, with a negligible mean value (40 years), see Fig. 4c. The distributions remain similarly acceptable when calculated separately for each source (with s = 490 and 570 years for the sites attributable to the Near East and Urals, respectively). The improvement is especially striking in EE, where the sites are split almost equally between the two sources.

We tentatively consider a model acceptable if the standard deviation, s, of the time lag ΔT is not larger than 3 standard dating errors σ, *i.e.*, about 500 years, given our estimate of σ close to 160 years over the pan-European domain. This criterion cannot be satisfied with any single-source model, but is satisfied with two sources. While we would never expect a large-scale model of the sort proposed here to accurately describe the complex process of the Neolithization in fine detail (and so the resulting values of ΔT cannot be uniformly small), the degree of improvement in terms of the standard deviation of ΔT clearly favours the two-source model. The reduction in s is statistically significant, and cannot be explained by the increase in the complexity of the model alone. The confidence intervals of the sample standard deviations s for one-source and two-source models do not overlap ($740 < \sigma < 840$ and $480 < \sigma < 550$, respectively); the F-test confirms the statistical significance of the reduction at a 99 % level.

It is also instructive to perform some further basic statistical analysis of the time lags ΔT. We use the Anderson-Darling test to assess if the sample of time lags can be approximated by the Gaussian probability distribution (*i.e.*, in particular, have a symmetric distribution with an acceptably small number of outliers). The null hypothesis of the test is that the time lags have a Gaussian distribution with the sample mean and standard deviation, while the alternative hypothesis is that they do not. This test leads us to accept the null hypothesis in the case of the two-source model (p-value = 0.149) while rejecting the null hypothesis for both one source models. Figure 4d–f show the cumulative probability distributions of the time lags for each model studied, rescaled such that a normal probability distribution corresponds to a straight line (known as a normal probability plot). The straight lines show the best-fitting normal distribution together with its 95 % confidence interval. As quantified by the test, the time lags more closely follow the straight line in (f) than in (d) or (e); the number of outliers is reduced very significantly in (f). Table 1 shows those sites that have $|\Delta T| >$ 1000 years, *i.e.*, where the disagreement between the data and the best-fit, two-source model is the strongest. There are 28 such sites: 14 of these have not undergone any statistical treatment, while the remaining 14 are a result of date combination or selection as described in Section 2. Five of the dates in Table 1 arise from the four sites (Berezovaya, Osipovka, Rakushechnyi Yar and Yerpin Pudas) where we have been unable to isolate less than three representative dates (see Section 2). This may suggest that a reinvestigation of these sites in particular is required and improved stratigraphic and typological data are required for these sites.

As further quantification of the quality of the model, the χ^2 statistic has been calculated for each model:

$$X^2 = \sum_{i=1}^{N} \frac{\left(\Delta T_i\right)^2}{\sigma_i^2}. \qquad (4)$$

The results are shown in Table 2.

The values of X^2, given in Table 2, may then be compared to the χ^2 value at the 5 % level with N–1 degrees of freedom (χ^2_{N-1} = 527.86). On all occasions the value of X^2 significantly exceeds χ^2_{N-1} (at 5 % level) this is not surprising given the simplicity of our model. The χ^2 statistical test would be satisfied if we discard about one third of the sites. It should be highlighted however that there is an approximate threefold increase in the accuracy of the model with two sources with respect to a single-source model. Some increase in the fit would be expected since we have increased the complexity of the model, but an increase of this magnitude surpasses what we believe could be attributed simply to the increase in model complexity. Development and application of further statistically robust techniques for comparison of our model with archaeological evidence is subject to our ongoing study.

				Sample				Site			Model arrival time	
Site Name	**Lab Index**	**Latitude deg.**	**Longitude deg.**	**Age BP yr**	**Error**	**Age cal BC yr**	**Calibration Error**	**Age cal BC yr**	**Calibration Error**	**Note**	**From Near East, yr BC**	**From Urals, yr BC**
Argisa Magula	UCLA-1657A	39.64	22.47	8130	100	7100	400	7100	400	One date	6052	3975
Balma Margineda	Ly-2439	42.41	1.58	6670	85	5600	130	5600	130	One date	6700	3256
Bavans	LV-1415	47.47	6.70	7130	70	6000	170	6000	170	One date	4903	3777
Berezovaya	LE-6706a	60.38	44.17	7840	75	6775	92	6775	92	Older date	3697	5509
Berezovaya	LE-67066	60.38	44.17	8700	300	7800	267	7800	267	Oldest date	3697	5509
Bolshoe Zavetnoye	LE-6556	60.98	29.63	7750	180	6650	150	6650	150	Oldest date	3836	4913
Canhasan III	BM-1666R	37.50	33.50	8460	150	7450	133	7338	233	Chi-Squared	5814	3664
Canhasan III	BM-1664R			8470	140	7450	133					
Canhasan III	BM-1660R			8390	140	7375	108					
Canhasan III	BM-1667R			8480	110	7450	100					
Canhasan III	BM-1662R			8460	110	7450	100					
Canhasan III	BM-1663R			8350	210	7300	233					
Canhasan III	BM-1665R			8270	160	7200	133					
Canhasan III	BM-1656R			8090	170	7050	150					
Canhasan III	HU-12			8543	66	7600	40					
Canhasan III	BM-1658R			8060	130	7025	142					
Canhasan III	HU-11			8584	65	7635	38					
Canhasan III	BM-1657R			8080	130	7050	133					
Carrowmore	Lu-1840	54.27	-8.53	5750	85	4575	215	4575	215	One date	3517	2445
Cashelkeelty	UB-2413	51.72	-9.82	5845	100	4695	245	4695	245	One date	3585	2267
Choinovtyi-1	LE-5164	64.42	49.95	4640	25	3435	28	4070	595	Average of site one	2963	5374
Choinovtyi-1	LE-1729			5320	60	4160	57					
Choinovtyi-1	LE-4495			5750	70	4615	55					
DobriniöËe	Bln-3785	41.83	23.57	6650	60	5575	32	5575	32	One date	6700	4199
Dubokrai-5	Le-3003	55.85	30.37	4720	40	3505	45	3578	160	Average of middle peak	4628	5025
Dubokrai-6	Le-6279			4820	130	3650	117					
Golubjai-1	LE-4714	54.95	22.98	7060	270	5950	167	5950	167	Older date	4577	4703
Grotta del Sant della Madonna	R-284	40.90	15.78	5555	75	4395	155	4395	155	One date	5722	3326
Grotta di Porto Badisco	R-1225	40.08	18.48	5850	55	4675	135	4675	135	One date	5815	3452
Kamennaya Mogila	Ki-4023	47.20	35.35	5120	80	3975	92	3975	92	Younger date	5675	4984
Koshinskaya	LE-6629	57.63	48.23	8350	100	7360	73	7360	73	Older date	3896	5767
Kurkijokki	LE-6929	60.18	29.88	7900	80	6825	75	6825	75	One date	3973	4963
Marevka	OxA-6199	48.35	35.30	7955	55	6865	62	6865	62	Older date	5566	5042
Osipovka	OxA-6168	49.93	30.40	7675	70	6535	38	6535	38	Older date	5473	4896
Planta	CRG-280	46.23	7.37	6500	80	5465	155	5465	155	One date	6700	3697
Racquemissou VIII c1		44.42	2.73	7400	300	6400	233	6400	233	One date	5209	3445
Rakushechnyi Yar	Le-5387	47.55	40.67	4830	90	3585	72	3862	283	Average of younger cluster	5417	5209
Rakushechnyi Yar	Le-5340			5060	230	3850	183					
Rakushechnyi Yar	Le-5327			5290	260	4150	217					
Rakushechnyi Yar	Le-5344	47.55	40.67	7180	250	6050	167	6600	319	Average from older cluster	5417	5209
Rakushechnyi Yar	Ki-6475			7690	100	6600	83					
Rakushechnyi Yar	Ki-955			7840	105	6750	100					
Rakushechnyi Yar	Ki-6477			7860	130	6775	108					
Rakushechnyi Yar	Ki-6476			7930	140	6825	125					
Saliagos	P-1311	37.05	25.08	6172	74	5080	230	5080	230	One date	6165	3471
Serteya-10	Le-5260	56.22	31.57	7350	180	6200	133	6225	317	Average of older dates	4571	5081
Serteya-10	Le-5261			7300	400	6250	317					
Theopetra Cave	DEM.576	39.68	21.68	8060	32	6980	53	6980	53	One date	5969	3980
Zapes	Vs-977	54.08	23.67	4860	260	3600	233	3600	233	One date	4708	4716

It is instructive to represent the data in the same format as in Figure 2a, b, but now with each date attributed to one of the sources, as suggested by our model. This has been done in Figure 2c, d, where the close correlation of Figure 2a is restored for the pan-European data. Now, the dates are consistent with constant rates of spread from one of the two sources. Using straight-line fitting, we obtain the average speed of the front propagation of 1.1 ± 0.1 km/year for the wave originating in the Near East (Fig. 2c), and 1.7 ± 0.3 km/year for the source in the East (Fig. 2d); 2σ values are given as uncertainties here and below. The spread from the Near East slowed down in Eastern Europe to 0.7 ± 0.1 km/year; the dates from the west alone (as in Fig. 2a) gives a higher speed of 1.2 ± 0.1 km/year. The estimates for the data in both western and eastern Europe are compatible with earlier results (*Dolukhanov et al. 2005; Gkiasta et al. 2003; Pinhasi et al. 2005*). Care must be taken when using such estimates, however, since the spread occurs in a strongly heterogeneous space, and so cannot be fully characterised by a single constant speed. The rate of spread varies on both pan-European scale and on smaller scales, *e.g.*, near major waterways (*Davison et al. 2006*).

Our allocation of sites to sources suggested and used above requires careful verification using independent evidence. Here we briefly discuss a few sites. Taking Ivanovskoye-2 (56.85°N, 39.03°E) as an example, the data form two peaks (Fig. 1b); the times at which each of the waves arrive at this location are 4349 BC (for the Near-Eastern wave) and 5400 BC (for the Eastern wave) closely fitting the two peaks in ^{14}C dates. As another example, we accept two dates for the Mayak site (68.45°N, 38.37°E); one from the younger cluster (2601 ± 192 BC), and also the older date (4590 ± 47 BC) detached from the cluster. The younger cluster is consistent with the near-eastern wave (arriving at 2506 BC) and the older date with the Eastern wave (arriving at 4718 BC).

Tab. 1 (on previous page). The 28 sites where the deviation of the model arrival times from the ^{14}C dates exceeds 1000 years, |ΔT| > 1000 years: (1) site name; (2) laboratory index; geographical (3) latitude and (4) longitude in degrees; (5) uncalibrated age and (6) its 1σ laboratory error in years (BP); (7) calibrated age and (8) its 1 σ error in years (BC); (9) combined site calibrated age and (10) its 1σ error in years (BC) obtained as discussed in Section 2; (11) method used to select this date; and the model arrival times (years BC) for the wave spreading from (12) the Near East and (13) the Urals. The data are presented in alphabetical site name order.

Model	X^2
Single source in Near-East	9553
Single source in Urals	28268
Two-source model	3740

Tab. 2. The X^2 test statistic, given by Eq. (4), for each model.

We further consider those sites which are geographically in the west (*i.e.*, to the west of a boundary set to join the Baltic Sea to the Black Sea) but are allocated to the source of pottery making in the Ural mountain area. These sites are shown in Table 3. There are 40 such sites (*i.e.*, 14 % of sites in the west); they deserve further analysis in order to verify the attribution suggested by the model and, if necessary, to further refine the model to improve the agreement with the archaeological data. There are also 104 sites in the east of the above boundary that are allocated to the source of farming in the Near East (*i.e.* 56 % of data points in the east). These sites are listed in Table 4. Where a site is characterised by a combined date obtained as described above, only the final age estimate is given (see entry in the column labelled 'Note' for the selection technique applied). All sites in Tables 3 and 4 should be reassessed both in terms of the statistical processing of multiple measurements and in terms of the agreement with independent archaeological data.

Conclusions

Our model has significant implications for the understanding of the Neolithization of Europe. It substantiates our suggestion that the spread of the Neolithic involved at least two waves propagating from distinct centres, starting at about 8200 BC in Eastern Europe and 6700 BC in the Near East. The earlier wave, spreading from the east via the 'steppe corridor', resulted in the establishment of the 'eastern version' of the Neolithic in Europe. A later wave, originating in the Fertile Crescent of the Near East, is the better-studied process that brought farming to Europe.

It is conceivable that the westernmost extension of the earlier (eastern) wave of advance produced the pre-agricultural ceramic sites of La Hoguette type in north-eastern France and western Germany, and Roucadour-type (also known as Epicardial) sites in western Mediterranean and Atlantic France (*Berg and Hauzer 2001; Jeunesse 1987*). The available dates for the earlier Roucadour sites (7500–6500 BC) (*Roussault-Laroque 1990*) are not inconsistent with

				Sample				Model arrival time	
Site Name	Lab index	Latitude deg.	Longitude deg.	Age BP, yr	Error	Age cal BC, yr	Calibration Error	From Near East, yr BC	From Urals, yr BC
Abri de la Coma Franceze	Gif-9080	42.83	2.92	5180	60	4010	220	5338	3327
Bridgemere	BM-2565	51.21	-2.41	4630	50	3375	275	4291	3156
Burntwood Farm. R6	OxA-1384	51.12	-1.29	4750	50	3510	140	4324	3232
Bury Hill		50.92	-1.37	4750	50	3510	140	4343	3223
Chatelliers du Viel	Gif-5717	46.43	-0.87	5200	110	4025	325	4829	3402
Cherhill	BM-493	51.43	-1.95	4715	90	3400	300	4276	3186
Coma Franceze	Gif-7292	42.83	2.92	5200	70	4025	225	5338	3327
Corhampton	BM-1889	50.98	-1.15	4790	70	3535	165	4334	3237
Coufin	Ly-3321	45.07	5.40	5260	120	4050	300	5188	3565
Derriere les Pres	WM	49.07	-0.05	5110	70	4030	320	4576	3502
Feldbach	UCLA-1809A	47.23	8.78	5170	70	4010	220	4998	3861
Fendmeilen	UCLA-1691F	47.28	8.63	5415	60	4200	160	4998	3857
Fengate	GaK-4196	52.57	-0.21	4960	64	3145	225	4198	3200
Frankenau	VRI-207	47.50	16.50	5660	100	4525	125	5377	4213
Frigouras	GIF-8479	44.13	5.95	5450	100	4250	210	5341	3506
Grande Louvre	GIF-7618	48.87	2.33	5260	70	4105	155	4612	3619
Greifensee	WM	47.37	8.68	5140	49	3920	130	5010	3861
Grotta dei Ciclami	WM	45.70	4.92	5445	60	4245	205	5114	3597
Grotta del Sant della Madonna	R-284	40.90	15.78	5555	75	4395	155	5722	3326
Grotte de la Vieille Eglise	WM	45.92	6.28	5295	52	4115	135	5018	3657
Grotte du Sanglier	WM	44.68	5.33	5440	130	4250	300	5268	3531
Honeygore Track	GaK-1939	51.18	-2.82	4590	40	3305	205	4298	3130
Horné Lefantovce	Bln-304	48.42	18.17	5775	140	4700	200	5396	4318
Le Coq Galleux	WM	49.40	2.73	5300	140	4100	350	4554	3652
Le Trou du Diable	Ly-6505	47.32	4.78	5105	55	3905	135	4870	3682
Les Coudoumines	WM	42.75	2.57	5135	36	3920	120	5309	3315
Les Longrais	Ly-150	46.58	2.77	5290	150	4100	167	4898	3561
Mannlefelsen	Gif-2634	47.45	7.23	5140	140	3950	300	4954	3800
Millbarrow	OxA-3172	51.45	-1.87	4900	110	3675	325	4277	3191
Peak Camp	OxA-1622	51.83	-2.15	4865	80	3650	300	4224	3163
Phyn	WM	47.58	8.93	4993	28	3820	120	5029	3883
Redlands Farm	OxA-5632	52.33	-0.59	4825	65	3545	165	4209	3211
Sente Saillancourt	Gif-5840	49.08	2.00	5220	110	4050	300	4569	3609
Shurton Hill	UB-2122	50.92	-0.58	4750	50	3510	140	4346	3282
Source de Reselauze	WM	43.52	4.98	5380	110	4210	240	5424	3460
Windmill Hill	OxA-2395	50.92	-1.88	4730	80	3505	155	4335	3183
Winnall Down	HAR-2196	51.08	-1.32	4800	80	3540	180	4324	3226
Zurich	UCLA-1772B	47.37	8.58	5145	70	3975	275	5010	3857
Zurich-Bauschanze	WM	47.41	8.52	5320	60	4155	175	5018	3857
Zurich-Wollishofen	WM	47.41	8.52	4993	46	3805	145	5018	3857

Tab. 3. The 40 sites which are allocated to the source of spread in the Urals but are located to the west of a west-east borderline joining the Baltic Sea to the Black Sea: (1) site name; (2) laboratory index; geographical (3) latitude and (4) longitude in degrees; (5) uncalibrated age and (6) it's 1σ laboratory error in years (BP); (7) calibrated age and (8) it's 1σ error in years (BC); and the model arrival times (years BC) for the wave spreading from (9) the Near East and (10) the Urals. The data are presented in alphabetical site name order.

			Site			Model arrival time	
Site Name	**Latitude deg.**	**Longitude deg.**	**Age cal BC, yr**	**Calibration Error**	**Note**	**From Near East, yr BC**	**From Urals, yr BC**
Babshin	48.47	26.57	5160	50	One date	5518	4680
Bara	60.00	40.15	2900	150	One date	3884	5386
Bazkov Isle	48.08	28.47	5568	160	Average of the younger cluster	5660	4745
Bazkov Isle	48.08	28.47	6143	160	Average of the older cluster	5660	4745
Berendeevo-2a	56.57	39.17	3883	187	Average of middle peak	4376	5408
Bernashovka	48.55	27.50	5565	212	Average of older cluster	5552	4722
Besovy Sledki	64.38	34.43	3190	60	Younger date	3310	4993
Besovy Sledki	64.38	34.43	4010	205	Average of older three dates	3310	4993
Bilshivtsy	48.93	24.58	5307	160	Average	5353	4610
Chapaevka	47.30	35.52	5853	160	Average	5663	5000
Chernaya Guba-4	62.82	34.87	3414	316	Average of younger cluster	3558	5104
Chernushka-1	57.68	48.77	3995	276	Average	3875	5784
Choinovtyi -2	64.30	49.87	3668	11	One date	2977	5379
Choinovtyi-1	64.42	49.95	4070	595	Average of site one	2963	5374
Daktariske	55.82	22.87	4350	100	Oldest date	4454	4707
Drozdovka	68.33	38.28	1535	52	One date	2510	4716
Dubokrai-5	55.85	30.37	3578	160	Average of middle peak	4628	5025
Dubokrai-5	55.85	30.37	4700	600	Oldest Date	4628	5025
Gard-3	47.70	31.20	5722	160	Average	5800	4839
Ivanovskoye-2	56.85	39.03	4094	201	Weighted average of younger peak. X^2	4349	5400
Kääpa	57.87	27.10	3509	217	Average of older cluster	4299	4898
Kamennaya Mogila	47.20	35.35	5717	460	Average of older cluster	5675	4984
Kizilevyj-5	48.25	35.15	5640	53	One date	5580	5031
Kodrukõla	59.45	28.08	3590	160	Average	4081	4929
Korman	48.57	27.23	5193	160	Average	5541	4712
Koshinskaya	57.63	48.23	3550	167	Younger Date	3896	5767
Krivina-3	54.95	29.63	4145	58	Older date	4755	4986
Krivun	68.28	38.43	2685	65	Younger date	2518	4726
Krivun	68.28	38.43	3375	92	Older date	2518	4726
Kuzomen	66.27	36.77	2100	200	One date	2733	4791
Lanino-2	57.18	33.00	4779	533	Average of older cluster	4431	5144
Lasta -8	64.77	53.73	2690	70	One date	2780	5381
Lasta -8	64.77	53.73	3500	267	One date	2780	5381
Maieri-2	61.88	30.57	2975	125	One Date	3657	4971
Mamai Gora	47.47	34.38	5940	160	Average	5664	4964
Marevka	48.35	35.30	6477	167	Average	5566	5042
Marevka	48.35	35.30	6865	62	One date	5566	5042
Mariupol Cemetry	47.15	37.57	5518	160	Average	5636	5075
Marmuginsky	60.80	46.30	3500	47	One date	3564	5554
Mayak	68.45	38.37	2601	192	Weighted average. X^2	2506	4718
Modlona	60.35	38.80	3067	575	Average	3873	5327
Mys-7	67.98	34.97	2660	63	Older date	2665	4685
Navolok	66.50	40.58	2975	125	Younger date	2777	4922
Navolok	66.50	40.58	3575	68	Older date	2777	4922
Nerpichya Guba	68.37	38.38	2275	108	Younger date	2506	4718
Nerpichya Guba	68.37	38.38	3325	108	Older date	2506	4718
Okopy	49.97	26.53	5458	223	Average	5334	4730
Orovnavolok	62.77	35.08	2790	33	One date	3570	5116
Ortinokh-2	68.05	54.13	2035	55	One date	2317	5132
Osa	56.85	24.58	4434	435	Average of middle cluster	4380	4795
Oshchoy - 2	63.77	48.58	3230	47	One date	3099	5406
Osipovka	49.93	30.40	6535	38	One Date	5473	4896
Osipovsky Liman	48.87	34.92	6400	57	One date	5514	5047
Pechora	48.83	28.70	6117	160	Average	5573	4782

Pegrema-3	62.58	34.43	3433	506	Average of younger cluster	3598	5099
Pleshcheyevo-3	56.78	38.70	3505	45	Oldest date	4371	5386
Povenchanko-15	62.82	34.85	2875	72	One date	3558	5104
Pugach-2	47.85	31.23	5633	160	Average of older cluster	5780	4850
Pyalitsa-18	66.18	39.83	3500	47	One date	2823	4945
Rakushechnyi Yar	47.55	40.67	5456	333	Average from middle cluster	5417	5209
Rakushechnyi Yar	47.55	40.67	6600	319	Average from older cluster	5417	5209
Razdolnoye	47.60	38.03	5475	160	Average	5571	5112
Repishche	58.35	33.88	3313	160	One Date	4252	5176
Rudnya Serteyskaya	55.63	31.57	4381	233	Chi-Squared	4656	5077
Sakhtysh-8	56.80	40.47	4068	189	Weighted average	4296	5465
Sarnate	57.33	21.53	3290	233	Average	4201	4639
Savran	48.12	30.02	5853	160	Average	5720	4808
Semenovka	48.28	30.13	5863	262	Average	5702	4822
Semenovka-5	45.42	29.50	5455	179	Average	5979	4615
Serteya-10	56.22	31.57	3688	200	Ave of young dates (exc. Corded)	4571	5081
Sev. Salma	68.03	35.18	3050	483	One date	2661	4687
Sheltozero-10	61.35	35.35	3000	117	Youngest date	3791	5173
Silino	60.85	29.73	3820	160	Average of younger cluster	3865	4919
Skibinsky	48.57	29.35	6303	160	Average	5631	4801
Sokoltsy-2	48.72	29.12	6253	160	Average	5600	4796
Spiginas	56.02	21.85	3850	167	Older date	4393	4670
Sukhaya Vodla-2	62.40	37.10	3540	57	One date	3604	5194
Sulka	56.75	27.00	3890	346	Average of middle cluster	4452	4891
Suna-12	62.10	34.22	4005	75	One Date	3677	5108
Surskoi Isle	48.32	35.07	6110	160	Average	5570	5032
Šventoji 9	56.02	21.08	3950	100	Oldest date	4354	4653
Syaberskoye-3	58.78	29.10	3750	217	Older date	4193	4975
Tamula	57.85	26.98	4150	60	Oldest date	4298	4894
Tekhanovo	57.07	39.28	4100	47	One date	4308	5409
Tokarevo	60.50	28.77	3450	183	One date	3883	4904
Tugunda-14	64.37	33.30	2848	160	Average	3324	4974
Vashutinskaya	57.37	40.13	3835	45	Yougest date	4243	5445
Vodysh	58.13	41.53	3275	125	One date	4087	5487
Voynavolok-24	62.90	34.57	2838	160	Average of younger cluster	3546	5092
Voynavolok-24	62.90	34.57	3115	72	Older date	3546	5092
Vozhmarikha -4	63.33	35.78	3620	160	Average of younger cluster	3477	5113
Vyborg	60.67	28.65	3260	80	One date	3855	4893
Yazykovo-1a	57.27	33.37	4700	177	Chi Squared	4416	5157
Yerpin Pudas	63.35	34.48	4175	160	Average of yougest cluster	3482	5072
Yumizh-1	62.23	44.35	3000	221	Average	3446	5416
Zalavruga-4	62.80	36.47	3333	286	Average of older cluster	3547	5159
Zapes	54.08	23.67	3600	233	One date	4708	4716
Zarachje	56.15	38.63	4515	52	One date	4448	5387
Zatsen'ye	54.40	27.07	4255	68	One date	4778	4868
Zedmar-D	54.37	22.00	3898	250	Weighted average. X^2	4607	4651
Zejmatiške	55.25	26.15	4355	38	Oldest date	4640	4841
Zolotets-6	62.78	36.53	3688	442	Average of older cluster	3560	5162
Zveisalas	57.83	27.25	3730	70	One date	4302	4904
Zvejnieki	57.82	25.17	4211	273	Average of younger cluster	4257	4824

Tab. 4 (beginning on previous page). The 104 sites which are allocated to the source of spread in the Near East but are located to the east of a west-east borderline joining the Baltic Sea to the Black Sea: (1) site name; geographical (2) latitude and (3) longitude in degrees; (4) calibrated age and (5) its 1σ error in years (BC); (6) method used to select this date; and the model arrival times (years BC) for the wave spreading from (7) the Near East and (8) the Urals. For sites with multiple ^{14}C dates only one (or a few) representative dates are given, obtained as discussed in Section 2. The selection method applied is given in the column labelled Note. The data are presented in alphabetical site name order.

this idea, but a definitive conclusion needs additional work.

The nature of the eastern source needs to be further explored. The early-pottery sites of the Yelshanian Culture (*Mamonov 2000*) have been identified in a vast steppe area stretching between the Lower Volga and the Ural Rivers. The oldest dates from that area are about 8000 BC (although the peak of the culture occurred 1000 years later) (*Dolukhanov et al. 2005*). Even earlier dates have been obtained for pottery bearing sites in Southern Siberia and the Russian Far East (*Kuzmin and Orlova 2000; Timofeev et al. 2004*). This empirical relation between our virtual eastern source and the earlier pottery-bearing sites further east may indicate some causal relationship.

According to our model, the early Neolithic sites in Eastern Europe belong to both waves in roughly equal numbers (56 % to near-eastern wave and 44 % to eastern wave). Unlike elsewhere in Europe, the wave attributable to the Near East does not seem to have introduced farming in the East. The reason for this is not clear and may involve the local environment where low fertility of soils and prolonged winters are combined with the richness of aquatic and terrestrial wildlife resources (*Dolukhanov 1996*).

Regardless of the precise nature of the eastern source, the current work suggests the existence of a wave which spread into Europe from the east carrying the tradition of early Neolithic pottery-making. If confirmed by further evidence (in particular, archaeological, typological, and genetic), this suggestion will require serious re-evaluation of the origins of the Neolithic in Europe.

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Indo-Europeanization – the seven dimensions in the study of a never-ending process

Harald Haarmann
Institute of Archaeomythology (Sebastopol, USA), European Branch
harald.haarmann@pp.inet.fi

ABSTRACT – *This contribution focuses on the multifaceted process of Indo-Europeanization which started out, in the Pontic-Caspian region, with the formation of a distinct ethno-cultural epicenter, the Proto-Indo-European complex. Since the late Neolithic, the Indo-Europeanization of Europe and parts of Asia produced various scenarios of contact and conflict. Altogether seven dimensions are highlighted as essential for the study of the contacts which unfolded between Indo-Europeans and non-Indo-European populations (*i.e., *Uralians, Caucasians, ancient populations in southern and central Europe). Selective aspects of cultural and linguistic fusion processes during the Neolithic and subsequent periods are discussed, and the controversial term 'migration' is redefined.*

IZVLEČEK – *Ta prispevek se osredotoča na večfasetni proces indoevropeizacije, ki se je začela na Pontsko-kaspijskem območju z oblikovanjem izrazitega etno-kulturnega epicentra, proto-indo-evropskega kompleksa. Od mlajšega neolitika dalje je indoevropeizacija Evrope in delov Azije proizvedla različne scenarije kontakta in konflikta. Predstavljenih je sedem bistvenih dimenzij, pomembnih za preučevanje kontaktov, ki so so potekali med Indoevropskimi in ne-Indoevropskimi populacijami (Ural, Kavkaz, stare populacije v Južni in Srednji Evropi). Razpravljamo o selektivnih aspektih procesov kulturnega in lingvističnega zlitja v času neolitika ter kasneje. Ponovno smo opredelili kontroverzni pojem »migracija«.*

KEY WORDS – *formation of ethnic stocks; transition to pastoralism; early language contacts; movement from the steppe zone to the west; cultural fusion and linguistic convergence*

Introduction: A Complex Agenda

The history of Europe's peoples, cultures and languages is the history of Indo-Europeanization. This process started somewhere, some time, and it is still unfolding. In fact, the Indo-Europeanization of Europe and other regions of the world will not come to an end as long as there are non-Indo-European languages and cultures that withstand the pressure of constant assimilation and acculturation.

As for Europe, the great majority of its recent populations speak Indo-European languages. Until the Neolithic, the proportions of non-Indo-European and Indo-European languages in Europe were the opposite of modern times, with Palaeo-European languages of non-Indo-European affiliation dominating the linguistic landscape (*Haarmann 2002*).

In Western Europe, Basque in southwestern France and northern Spain is the only surviving non-Indo-European language from antiquity (*Haarmann 1998a*). The Basque community has suffered a continual loss of its area of distribution and of the number of speakers of Basque since the tenth century AD, under the pressure of Spanish and French.

In central Europe, Hungarian (of Finno-Ugric affiliation within the Uralic language family) is like a non-Indo-European island amidst Indo-European speech communities. Northeastern Europe is home to a number of Finno-Ugric languages. Of these, Finnish, Estonian and Saami are the best known. Among the Finno-Ugric minority languages in the European part of Russia, processes of assimilation to the Russian-speaking environment have caused a decline in the number of speakers of languages such as Mordvin, Mari, Udmurt, Komi and others (*Abondolo 1998*).

In the Pontic-Caspian region (that is, in the area between the Volga in the west, the Caucasus in the south and the Ural mountains in the north), several languages of Turkic affiliation (as a branch of the Altajic language family) are spoken, among them Tatar (Kazan Tatar), Chuvash, Bashkir, Nogay, Kumyk, Karachay-Balkar and others. The presence of Turkic speech communities in that region is due to the migrations of Turkic tribes during the Middle Ages (*Menges 1995.19–23*). Many of the early migrant communities such as the Huns, Avars, Khazars, Volga Bolgars, Pechenegs, Onogurs and others that had established themselves in the steppe zone and adjacent areas have vanished from the ethnographic landscape.

The speech communities of the minorities in the eastern areas of the European part of Russia, of Finno-Ugric and Turkic affiliation, have experienced a weakening of the social functions of their languages and, in some regions, the younger generation has no more command of the mother tongue, which has been lost to Russian (*Haarmann and Holman 1997; 2000*).

In order to understand the magnitude of the Indo-Europeanization process in the horizon of time it is significant to shed light on its dynamic history. The beginnings of that dynamic process are associated with the circum-Pontic region and date to the Neolithic. The story of human populations, their cultures and languages in the area north of the Black Sea is a fascinating sequence of early sustainability, internal change and subsequent external expansion. The basic processes of human ecology can be observed in the span of time from the immediate post-glacial period to the Late Neolithic. In the course of time, the pace of cultural development accelerates to culminate in the dynamic fragmentation of the Proto-Indo-European complex. During this crucial stage, which covers the period between *c.* 4500 and *c.* 3000 BC, the process of Indo-Europeanization is set in motion.

This process has been described as a replacement of the ancient languages of Europe by the imported Indo-European languages (*Renfrew 2002b.6–7*). The idea of replacement readily associates situations of daily life when older equipment (*e.g.*, a car, a TV set or a computer) is literally re-placed by a new machine. Such a notion of replacement is far from realistic and even misleading in this context of culture studies (*Haarmann 2007.ch. 5.3*).

Ancient populations, cultures and languages do not simply vanish. They always leave traces. This is true for the non-Indo-European peoples and their cultures in Europe and Asia that came in contact with and under pressure from Indo-Europeans. The Indo-European cultures and languages that spread did not replace the local languages of different linguistic affiliation. They entered into a process of fusion with them, so as to produce various locally specific patterns of a cultural-linguistic blend of old and new constituents.

In this contribution, new perspectives for pinpointing the beginnings of the process of Indo-Europeanization, the area of its irradiation and its dynamic unfolding are explored. The study of this agenda is of great complexity and requires the investigation of altogether seven dimensions:

- the economic dimension (*e.g.*, the question of the transition from foraging to pastoralist subsistence),
- the sociopolitical dimension (*e.g.*, the emergence of stratified society and statehood in southeastern Europe),
- the ethnic dimension (*e.g.*, configurations of genomic profiles of local populations in areas that were Indo-Europeanized),
- the cultural dimension (*e.g.*, fusions of divergent cultural traditions among populations in contact, such as the Mycenaean-Minoan or Celtiberian symbioses),
- the linguistic dimension (*e.g.*, patternings of indigenous and borrowed elements in lexical structures and word formation; shifts in word order),
- the visual-artistic dimension (*e.g.*, the spread of diagnostic imagery related to the horse, such as horse-headed sceptres in the steppe zone, and figurines depicting the horse goddess as in the Celtic tradition),
- the mythical dimension (*e.g.*, the role and functions of pre-Greek goddesses such as Demeter, Hestia, Athena and others in Greek mythology).

In the present contribution, argumentation for a selection of these dimensions is presented.

The identification of the Indo-European homeland

The agenda of Indo-Europeanization is intrinsically interwoven with the issue of the origins of Indo-Europeans, their cultures and languages. Any assessment of the movements of Indo-European populations depends on the geographical identification of the homeland. The debate about the Indo-European homeland has a history of over 150 years. Some ten homeland candidates have been seriously discussed since the twentieth century. Of these, two are still a matter of lively debate. The two major hypotheses stand in sharp contradiction with each other:

Alternative 1 The early Indo-Europeans were agriculturalists and migrated from their original homeland in western Asia (Anatolia) to the west (southeastern Europe) and to the east (Iranian plateau, India).

Alternative 2 The early Indo-Europeans were pastoralists and migrated from their original homeland in eastern Europe (the area north of the Black Sea) to the west (to southeastern and central Europe) and to the east (into central Asia and beyond).

The issue of the Indo-European homeland is extremely complex. It is not possible to identify the homeland with any certainty while applying the methodology of one single scientific discipline only. Inquiries into the homeland agenda have been made by historical linguists, anthropologists, archaeologists, ethnographers, geneticists, historians of religion and culture, and they all have contributed to our knowledge of the prehistoric conditions of the spread of Indo-European populations, cultures and languages.

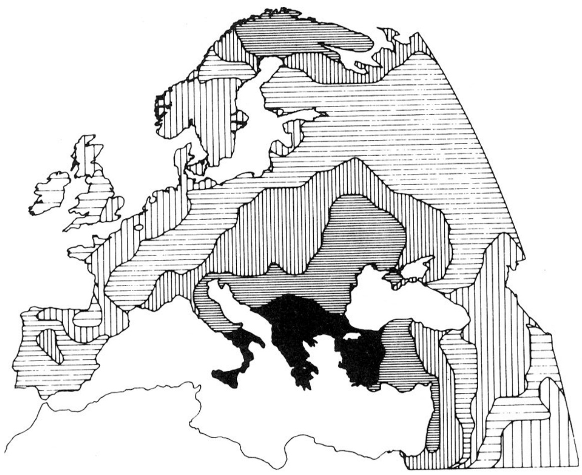
The Pros and Cons of the modern debate have been mapped out in a recent study (*Haarmann 2006a. 152–170*). The author of the present contribution takes a stand for Alternative 2 as the original homeland of Indo-Europeans. Some of the major arguments in favour of the northern Pontic zone as a homeland will be summarized in the following. Besides arguments for a positive identification, the analysis will also take into consideration aspects of a negative identification, that is, arguments of exclusion. One of these exclusive argumentations is the evidence that the original population in southeastern Europe was of non-Indo-European stock, thus excluding the validity of this region as a possible candidate for an extended homeland.

The genetic map for southeastern Europe and western Asia shows a pattern which has been identified as the 'Mediterranean genotype' (Map 1). This is a so-called local genetic 'outlier' because it differs markedly from surrounding patterns.

In their archaeological and cultural interpretation of genotypes, Cavalli-Sforza and his colleagues relate the Mediterranean genotype to the geographical dispersal of the Greek population during the times of colonization in the eastern Mediterranean, that is, to the period of the early first millennium BC (*Cavalli-Sforza et al. 1994.290–296*; recently repeated in *Cavalli-Sforza 2000.119–120*). However, upon closer inspection of the geographical profile of this genetic outlier, it becomes apparent that the contours of the Mediterranean genotype do not coincide with the historical boundaries of the Greek population.

The area covered by the inner genetic gradient of the genotype expands far beyond the gravitational limits of Greek settlements. Greeks never settled in regions situated nowadays in Bulgaria, Romania, Serbia, Albania or Bosnia-Hercegovina. They did not settle as far as central Anatolia either, where the inner gradient extends to the east. Even in the western part of Anatolia, on the eastern coast of the Aegean Sea, the Greek population concentrated in urban centers and only very scarcely settled in rural areas. A sizeable population, however, must have shaped the genetic profile of the region.

When inspecting the distribution of the second gradient of the genetic outlier, the assumed association of the Mediterranean genotype with Greek settlement becomes even more improbable. Furthermore, the question has to be asked: why would the Greek genotype differ so radically from the genetic profiles of the neighbouring Indo-European populations if not for the reason that it reflects a substantial substratum in the region of divergent ethnic stock? A comparison with the profile of other principal components shows that the gradients which cover the



Map 1. The Mediterranean genotype (after* Cavalli-Sforza 1996.63*).

southern Pontic zone, respectively, form a consistent belt stretching on either side of the Bosphorus, without any significant profile of the Greek stock having been made.

There is a more plausible explanation for the geographical extension of this genotype, and this is that it reflects the stratum of the pre-Greek population. In all probability, the Mediterranean genotype documents the density of non-Indo-European settlements in the circum-Pontic region. In an anthropological perspective it becomes apparent that the population around the Aegean Sea stretching on the European and on the Asian side of the southern Pontic zone was ethnically homogeneous, which does not exclude the possibility of cultural and/or linguistic diversity.

There is the question of time depth. When did non-Indo-Europeans live in the circum-Pontic region? Given the possibilities of free movement between Asia and Europe in the pre-deluge era (that is, before *c.* 6700 BC), it can be conjectured that demographic diffusion happened long before 7000 BC. The non-Indo-European population of the circum-Pontic region reflects the continuous presence of foragers who had roamed the wood- and grasslands of western Asia and southeastern Europe since the Mesolithic Age. There is clear evidence for the continuity of populations in the region from the Upper Palaeolithic onwards (*Bailey 2000.16–38*). In the light of this assumption of a very old circum-Pontic population of non-Indo-European stock, the spread of agriculture in southeastern Europe is understood as being due primarily to idea diffusion rather than the migration of agrarian settlers from Anatolia to Europe (*Haarmann 1998b; Budja 2001.29–31*).

The data provided by human genetics do not unilaterally favour the idea of demic diffusion from western Asia into Europe. There is no genetic evidence for one big wave of population transfer during the seventh millennium BC. On the contrary, recent research confirms the view that, in southeastern Europe, the process of Neolithization is characterized by several small-scale movements of populations within geographically limited ranges (*Semino et al. 2004; Di Giacomo et al. 2004*).

The non-Indo-European population of the circum-Pontic region not only left a genetic 'footprint', but also linguistic traces of their presence. These traces are best preserved by toponymy and hydronomy. The non-Indo-European elements that can be identified in the names of places, rivers and phenomena of the natural environment form part of the most ancient onomastic residue. Characteristic of the onomastic roots of non-Indo-European origin are certain suffixes (*i.e.*, *-ss-*, *-nd-*, *-nth-*). The formative element *-ss-* is the most frequent in this group of names: Assa (Macedonia), Bubassos (Caria), Passa (Thrace), Sardessos (Troad), Termessos (Pisidia), Kabassos (Lycia), Larissa (Thessaly), etc. (*Otkupshchikov 1973. 7–9, 20–23*).

Certain onomastic roots occur in names on either side of the Aegean:

European side	***Asian side***
Alos (Thessaly)	Alinda (Caria)
Bargos (Illyria)	Bargasa (Caria)
Kurba (Crete)	Kurbasa (Caria)
Leba (Macedonia)	Lebinthos (Caria)
Oinoe (Attica)	Oinoanda (Lycia)
Passa (Thrace)	Passanda (Caria)
Prinos (Argolid)	Prinassos (Caria)
Sardos (Illyria)	Sardessos (Troad)
Sindos (Macedonia)	Sinda (Pisidia)
Tegea (Arcadia)	Tegessos (Cyprus)

In an onomastic survey of the circum-Pontic region, the distribution of names containing these formative elements points to a balanced dispersal in Europe and Asia. In the Aegean Archipelago and in the Balkans we find altogether 181 names, in contrast to 175 names in Asia Minor. The highest concentration of these pre-Greek names can be observed in the historical areas of Caria, Crete, Thrace, Thessaly, Macedonia and Troy. The onomastic material of pre-Greek origin is most verified on the islands and in the coastal areas of the Aegean Sea: *e.g.*, Arakynthos (names of mountains in Aetolia, Boeotia and Attica), Tiryns (gen. Tirynthos, town in Argolis), Titaresios (river in Thessaly), Ordymnos (mountain on Lesbos), Mykonos (island in the Cyclades), Kameiros (city on Rhodes), Skiathos (island in the Cyclades) (*Katičić 1976.42–55*).

The assumption of a pre-agrarian population of non-Indo-European stock in the circum-Pontic region stands in sharp contrast to the hypothesis of a presumed old Indo-European population in the area. This hypothesis which was first publicized by Colin Renfrew (*1987*) and adopted by Luca Cavalli-Sforza and others relates the spread of agriculture to early Indo-European migrations from western Asia to southeastern Europe. According to Renfrew these migrations were large-scale and included a great number of people. If the spread of agriculture was related to possible migrations, this population movement must have taken place in the course of the seventh millennium BC. However, the argumentation in favour of an old Indo-European population in southeastern Europe (see *Renfrew 1999* for a remake of his earlier claims) fails to give convincing answers to crucial questions (see a-d below) concerning the antiquity of Anatolian languages.

The hypothesis that Indo-Europeans were the autochthonous population of Anatolia brings up the question of who were the bearers of the high culture at Çatalhöyük? Since this culture started to flourish as early as *c.* 7250 BC, it would be hazardous to associate it with cultural activities of proto-Indo-Europeans. Even if the Indo-European homeland is sought in Anatolia, there would be many difficulties to link Çatalhöyük with Indo-Europeans. The assumption of an Anatolian homeland places this "*within eastern Anatolia, the southern Caucasus, and northern Mesopotamia*" (*Gamkrelidze and Ivanov 1995.791*). This means, if Indo-Europeans had anything to do with Çatalhöyük, they would have had to migrate first from their homeland to western Anatolia long before 7000 BC, and there is no evidence whatsoever for such an early migration. It seems much more reasonable to suppose "*Çatal Hüyük was part of a different, non Indo-European, culture*" (*Duhoux 1998.31*).

In addition to the arguments that have been brought forward in connection with the evaluation of the Mediterranean genotype which contradict the assumption of an old Indo-European population in the circum-Pontic region, there is further circumstantial evidence for the absence of Indo-Europeans and for the presence of non-Indo-Europeans there. Several issues will be addressed here briefly.

a. Were the Proto-Indo-Europeans sea-faring? The answer to this question is negative. In the lexical layers of the protolanguage as far as it can be reconstructed there is no old vocabulary relating to seafaring. The lexical items which are associated with water in a natural environment refer to lakes, riverine landscapes, marshes and swamps, but not to the sea. It is significant that the Greek term for sea, *thalassa*, is of pre-Greek (non-Indo-European) origin. Since the flood of *c.* 6700 BC destroyed the land bridge and separated Europe from Asia (see *Haarmann 2006b* for an outline of the consequences of that event), sea-faring must be assumed as a precondition for the migrations that allegedly took place in the post-deluge period. If there had been migrations requiring sea-faring at that early period, then the people involved were definitely not Indo-European speakers.

b. Were Indo-European immigrants responsible for the promotion of sedentary life-styles on the European side of the circum-Pontic region? In recent years, more and more attention has been paid to the nature of processes of acculturation that might well have been responsible for foragers to accustom themselves to a sedentary life-style. According to the acculturation hypothesis (see *Whittle 1996.43–46* for this terminology), the diffusion of the idea of food production in combination with lively trade provided the incentive for foragers to adopt farming. In connection with the spread and regional appearance of seals in the archaeological assemblages, it has been stated that

"*... 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.*" (*Budja 2005.66*).

To explain the transition to plant cultivation among the populations in the Balkan region, the hypothesis of an immigration of farmers is not needed. Evidently, there is a growing tendency among archaeologists to favour the acculturation hypothesis. In a number of scholarly contributions, the assumption of a possible interconnection between Indo-European migrations and the spread of farming has been discarded (see *Haarmann 1998b and Dergachev 2002* for basic arguments). The crucial question of how long the transition from foraging to farming (that is, the acculturation process) might have lasted has still to be investigated with more scrutiny. It might have lasted longer in some areas than in others. The Baltic region provides well studied settings where the transition to farming lasted several hundreds of years and was associated with lively trade contacts and inter-ethnic social relations, including bride purchase (*Zvelebil 1996; Haarmann 2003c*).

c. Are there traces of an old Indo-European population in Anatolia? When referring to the period of the seventh millennium BC, the answer to this question is no. The oldest traces of the presence of a population in Anatolia which was definitely Indo-European comes from Assyrian sources *c.* 2000 BC in which the Hittites are mentioned for the first time. The assumption that Anatolia was originally inhabited by a non-Indo-European population is more consistent with reliable data than the hypothesis of this region being the homeland of proto-Indo-Europeans. The non-Indo-European Hatti were the previous occupants of the later Hittite capital of Hattusa, and their culture is dated to *c.* 2500–2000 BC (*Akurgal 2001. 4–18*).

There is a Hattic substratum in the Hittite language, which proves that Hattic is the older language in the region, predating the presence of Hittite. In addition, there is a functional clue relating to the status of the two languages which provides evidence for the fact that the Hittites were late-comers. Hattic served as a liturgical language in the Hittite state cult, a traditional function of that language which was adopted by the Hittite priesthood. If the Hatti had come as immigrants to an area where the majority of the inhabitants were Hittites, the Hattic language would have never assumed the prestigious status in Hittite society which it did enjoy.

d. Is there any evidence for an old layer of Indo-European languages in Anatolia, dating to the seventh millennium BC? In fact, there is none. The oldest Indo-European languages which can be individualized in Anatolia from early inscriptions are Hittite, Luvian and Palaic (see *Mallory and Adams 1997. 12–17* on Anatolian languages). In terms of their affiliation they form two groups: Hittite-Palaic and Southwest-Anatolian (Luvian). There are more recent cognate languages which belong to the latter group (*i.e.*, Lycian, Lydian, Sidetic, Pisidian, Carian). If the Anatolian languages were the remnants of a much older layer of Indo-European in the region, one would expect their structures to reflect an overall pattern of archaic features.

Indeed, there are several major features of great antiquity in the Anatolian branch (*i.e.*, the retention of a laryngeal phoneme, numerous heteroclita, a divergent verbal system), but these features do not signal a time depth extending to the seventh millennium BC. Since in Hittite, the major language of the Anatolian branch, cognate terms are found that date to the fourth millennium BC (see e), the final separation from the Indo-European continuum cannot have happened earlier than about 3500 BC.

The most convincing explanation of this puzzle is the assumption of a two-phase migration movement, not away from Anatolia but directed toward it. The speakers of the ancestral language of Anatolian, the bearers of the Suvorovo culture (*c.* 4500–4100 BC) in Moldavia and Bulgaria, came to the region with the first migration wave of Indo-Europeans from the east, that is, from the northern Pontic zone. The language of the Suvorovo people "*would have been taken over and transmitted to Anatolia by the next wave of steppe immigrants (coming with wheeled vehicles), who formed the Ezero culture (*c. *3300–2700 calBC) of Bulgaria*" (*Carpelan and Parpola 2001.64*).

e. Is there any evidence for an early separation of the Anatolian branch of languages from the rest of the Indo-European stock? There is none. If Proto-Indo-Europeans had migrated from Asia to Europe, this process would be somehow reflected in the reconstruction of the Indo-European protolanguage. One would expect the most archaic layer of cognate terms in the cultural vocabulary to be found in Anatolian. However, this is not the case. Moreover, one would not expect lexical innovations in Anatolian which emerged in the fifth and fourth millennia BC. And yet, in the vocabulary of Anatolian languages we do find cognate terms for the yoking of animals (*cf.* PIE **iugóm* > Hit *yukan* 'yoke; couple, pair', Greek *zugon* 'yoke', Lat *iugum* 'yoke', Lith *jungas* 'yoke', etc.), for wheel and wheeled vehicles (*cf.* PIE **Hwerg*ʰ- > Hit *hurki*- 'wheel', Toch A wärkänt 'wheel'; variant roots in other Indo-European languages), for wool (*cf.* PIE **ul-na* > Hit *hulana* 'wool', *OInd urna*- 'wool', Lat *lana* 'wool', Goth *wulla* 'wool', etc.) and other items relating to weaving (*Mallory and Adams 1997.640–641, 648–649, 655*).

It is obvious that the Anatolian branch separated from the rest of Indo-European rather late. In any case, a connection between Hittite, Palaic or Luvian and the autochthonous population of Anatolia cannot be conclusively established.

The non-Indo-European languages left traces, in manifold transformations, in the lexical layers of ancient Greek. Hundreds of terms in various domains of the vocabulary were adopted as elements of the pre-Greek substratum in the circum-Pontic region (see *Strunk 2003.86–96* for an overview of research in this field). In the archaeological record, the numerous relics of Aegean cultures are the most illustrative reminiscence of this old terminology. The expressions which are "*connected by their content with the old Aegean culture, show clearly that the derivational types with the characteristic suffixal elements belong to a definite foreign layer in the Greek vocabulary*" (*Katičić 1976.55*).

Among the pertinent borrowings of pre-Greek origin, we find nouns, adjectives and verbs which represent foreign derivational types (*Haarmann 1995. 44–47*). The occurrence of verbs in the repertory of borrowings (*e.g.* ancient Greek *iapto* 'to throw', *dynamai* 'to be capable, potent') points to the fact that the contacts between Greeks and the pre-Greek autochthonous populations were intensive. Most extensive is the pre-Greek layer in the domain of names for plants. A considerable number of borrowings are also found in terms for natural phenomena, utensils, clothing, social relations, handicrafts, etc.

The archaeological record shows continuity of settlement in the areas north of the Black Sea from the end of the Ice Age (beginning of the Holocene) into the Neolithic period. This means that the local populations were indigenous and that there was no migration from outside into those regions during that span of time. The people that lived there left their genetic 'footprints', which testify to ethnic diversity. On the genetic maps, two distinct genomic profiles are discernible (Map 2):

- a genomic concentration in an area north of the Azov Sea which has been identified as the putative Indo-European homeland;

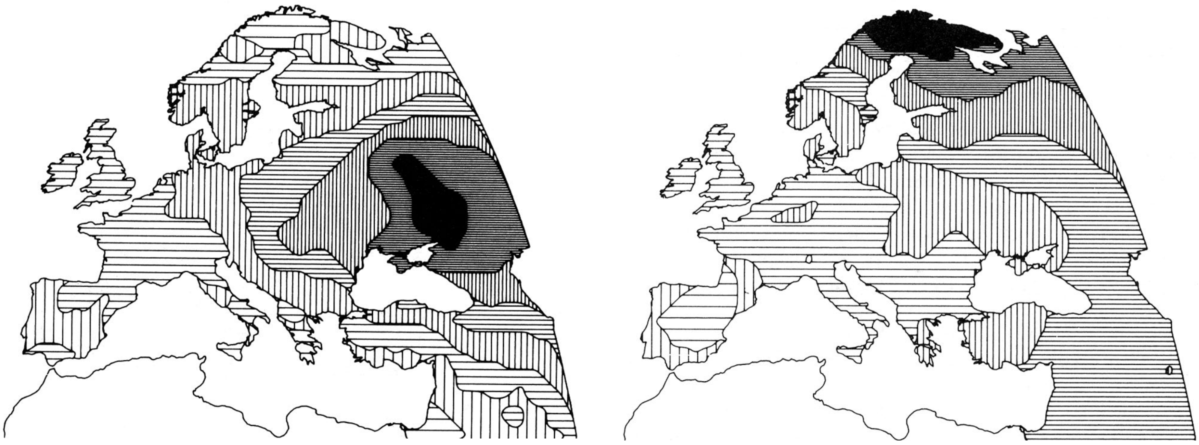
- a genomic concentration further north which has been identified as the homeland of Uralic populations.

The Neolithic cultures in the area of the Indo-European homeland (Seroglazovo culture) and the Uralic homeland (Agidel culture) demonstrate a continuity of lithic industries from the Mesolithic period (*Mallory 1989.192–193; Parpola 1999.181–187*). The homeland question both for Proto-Indo-Europeans and Proto-Uralians has been much debated. As for the Uralic homeland, a nuclear area (Volga-Kama region) of more concentrated settlement and an extension of a more thinly populated area stretching from the Baltic to the Urals have been identified (*Carpelan et al. 2001*). There is a growing consensus focusing on the Caspian depression (with an extension into the region between Volga and Don) as the area of the Indo-European homeland. This hypothesis is seemingly being accepted by archaeologists and linguists alike as the most plausible of all homeland candidates (see *Mallory 1997; Carpelan et al. 2001; Dergachev 2005.14–40; Haarmann 1998b; 2006a.154–160* for the history of this scholarly debate).

Historical linguistics has reconstructed grammatical structures and lexical roots which are similar in both Uralic and Indo-European. These linguistic traces attest to conditions of a long-term cultural and linguistic convergence when both Uralians and Indo-Europeans were still foragers. Since the genetic 'footprints' of the ancient populations in the northern Pontic area can be made visible (see Map 2), the linguistic reconstructions of an early period of Uralic-Indo-European convergence gain in profile. In the languages of both families, there is a core vocabulary and a set of grammatical forms which testify to a genealogical relationship (see *Haarmann 2006a. 137–146* for the reconstruction of the Nostratic superphylum). These elements are not borrowed in either language family, but belong to the core inventory of forms inherited from oldest times (Tab. 1).

The emergence of pastoralism in the steppe zone

The eighth millennium BC brought about decisive environmental changes. According to Ryan and Pit-



Map 2. The genomic profiles of ancient populations north of the Black Sea. Left: the Indo-European genotype (after* Cavalli-Sforza 2000.117*); Right: the Uralic genotype (after* Cavalli-Sforza 2000.114*).

man (*1998.157–158, 174–178*), the circum-Pontic zone experienced a stage of progressive desiccation after the mid-tenth millennium BC. The second melt-water spike (beginning about 9400 BC) never reached the ancient Euxine Lake, and the aridification of the area north of the freshwater lake proceeded rapidly. The ecological preconditions for the beginnings of pastoralism among Proto-Indo-Europeans are found in the forest-steppe zone during this period. The ongoing process of desiccation in the northern Pontic zone caused an extension of the steppe zone in the south and a receding of the forest-steppe belt to the north.

These environmental changes had long-term repercussions on human ecology. Gradually, the development in the south shifted, economically, culturally and linguistically. This was a prolonged process that might have taken more than a millennium to unfold. The people in the southern steppe zone experienced a socio-economic transition from foraging to herding. Since the climatic effects of desiccation enhanced the transition to pastoralism in the Pontic steppe zone, the development there in the communities of Proto-Indo-European stock detached itself from the former socioeconomic, cultural and linguistic basis of convergence with the Proto-Uralians, resulting in the formation of a gravitational epicentre of Proto-Indo-European culture (as distinct from the Proto-Uralian epicentre further north).

In the course of the seventh millennium BC, the differences between foraging, as the major type of proto-Uralian economy, and pastoralism, as practiced by Proto-Indo-Europeans, became more marked and the geographical zone of each type of economy more concentrated.

The process of the dissolution of the former basis of convergence and of the formation of the Proto-Indo-European epicentre was of local coinage. This means that – beyond the assumed internal population movement in the Pontic steppe zone after the flood – there was no population influx from either the steppe zone of central Asia or from the region of agrarian population of Ukraine and central Europe.

Eventually, the two epicentres with their differing ethnic stock also became characterized by divergent proto-languages, which can be reconstructed with the methods of historical-comparative linguistics (see *Beekes 1995.124–257* for Proto-Indo-European*, Hajdú and Domokos 1987.179–271* for Proto-Uralian).

At first sight, it may seem problematic to conflate a linguistic term with the assumed speakers of a language, such as to identify the northern foragers (with Uralian cultural patterns who are assumed to have spoken Proto-Uralian) as 'the Proto-Uralians,' and to identify the pastoralists further south (with Indo-European cultural patterns who are assumed to have spoken Proto-Indo-European) as 'the Proto-Indo-Europeans.' And yet, the archaeological record indicates the continuity of distinct cultural patterns in each area where, at a later date, the presence of Indo-European languages (in the Pontic steppe region) and Uralian languages (further north) are documented by linguistic interferences (*Haarmann 1996.9–10; Koivulehto 2001*). Since there is no evidence of population influx from outside, the local Neolithic populations must be ancestral to the later Uralian and Indo-European speakers of each region.

The transition from a foraging to a pastoralist economy was accompanied by changes in life-styles. As part of the process of Neolithization, this transition has been a matter of much debate. There are those who explain the shift to herding and pastoralism

a)	*Indo-European/ Indo-Iranian	*Uralic/Finno-Ugric (Finnish)	Hungarian equivalent	English
1.	**wedh-*	**wetä*	*vezet*	leads
2.	**wegh-*	**wiyge-*	*visz*	carries
3.	**doyn-<*dō-*toye*	**toke-/*Finnish *tuo*	*hoz*	brings
4.	**mozge-*	**moške-,*muške-*	*mos*	washes
5.	**dhзk-*	**teke-*	*te-sz*	makes
6.	**nōmn̥-*	**nime*	*név*	name
7.	**wed-*	**wite,*wete*	*viz*	water
8.	**kot-*	**kota*	*ház*	house
9.	**sńew-,*sen-,*son-*	**sōne,*si̯ne,*senę*	*ín*	sinew

b)	*Personal pronouns*	*Proto Uralic*	*Proto-Indo-European*
	Singular		
	1. pers.	**-me*	**me-*
	2. pers.	**-te*	**tu-*
	3. pers.	**-se*	**se (Reflexive pronoun)*
	Plural		
	1. pers.	**-met*	**mes/*nes-*
	2. pers.	**-tet*	**yu-*
	3. pers	**-set (?)*	*no reconstructed protoform*

Tab. 1. Linguistic convergences between Proto-Uralic and Proto-Indo-European. a) Convergent lexical roots (after* Makkay 2001. 320*); b) Convergences in the pronominal system (after* Hajdú and Domokos 1987.234–235*).

as resulting from the spread of technologies relating to the 'agricultural package' (technologies of plant cultivation and of stock-breeding) that were introduced to the steppe zone from the northwestern Pontic area. The term 'agricultural package' has been defined as "*the sum of traits that appear repeatedly in the Neolithic assemblages of SW Asia, Anatolia and SE Europe*" (*Çilingiroglu 2005.3*). Others see a direct transition without the participation of agrarian technologies and relating forms of cattle-raising.

As far as the Proto-Indo-Europeans and their homeland are concerned, two basic assumptions have been elaborated which stand in absolute contradiction to one another.

Pastoralism in the steppe zone emerged independently and its origins are not associated with agriculture

Although the archaeological evidence for this early transition is scarce, historical linguistics has reconstructed an old layer of common lexical roots for the domain of pastoralism. This terminology forms part of the core vocabulary of Proto-Indo-European, the reconstructed common basis from which all Indo-European languages derive. The old layer of terms for herding "*appear to be widespread across the entire range of IE [Indo-European] stocks*." (*Mallory and Adams 1997.7*) (Tab. 2).

While the Proto-Indo-Europeans experienced their shift to a pastoralist economy, the Proto-Uralians, in their homeland in the forest zone further north, continued to live on foraging. Therefore, such terminology relating to early pastoralism reconstructed for Proto-Indo-European is absent from the basic vocabulary of Proto-Uralic.

An inspection of the core terminology of pastoralism that can be reconstructed for Proto-Indo-European reveals that the diagnostic terms referring to goat and sheep – the oldest known animals that played a role in Indo-European herding – as well as to field and herd are either widespread in the branches of this language family (see Tab. 2, nos. 1, 2, 5, 6 and 9), or seem to be best preserved in the eastern Indo-European languages (see Tab. 2, nos. 3, 4, 7 and 12). The wide distribution is an indication of the general importance of this vocabulary for the early Indo-Europeans. The persistence of the old diagnostic terms, especially in the eastern Indo-European languages, points to the steppe zone as the area of pastoralism's origin.

Based on observations about the lack of an old layer of agricultural terminology in the Indo-Iranian branch of languages, it was assumed that the pastoralists who spoke such languages knew nothing about agriculture. Given the lack of old agricultural terminology in this major branch of Indo-European, it is tempting to deny the existence of old agricultural terms for the Indo-European protolanguage.

The meaning of the lexical material referring to agriculture is, in many cases, diffuse and does not allow the reconstruction of a very old layer. For example, there is no old term for 'wheat' and no general term for 'barley'. The more extensive agricultural terminology becomes in historical languages, the younger is the lexical layer (often relating to stages of linguistic development of the fifth millennium BC or later).

To sum up, the linguistic and archaeological evidence speaks in favor of pastoralism as having developed independently of farming in the steppe zone of southern Russia.

GOAT		
1	*díks	(gen. *digós) 'goat (*Capra hircus*)'
2	*bhuĝos	'buck, he-goat (male *Capra hircus*)'
3	*h$_a$eiĝs	'goat (*Capra hircus*)'
4	*h$_a$eĝós	'he-goat (male *Capra hircus*)'
SHEEP		
5	*h$_2$óu̯ís	(gen. *h$_2$éu̯i̯os) 'sheep (*Ovis aries*)
6	*h$_2$ou̯ikéh$_a$-	'ewe'
7	*h$_a$eg^{w}hnos	'lamb'
8	*u̯r̥h$_1$én	(gen. *u̯r̥h$_1$énós) or (*u̯(r̥)rén) (gen. *u̯r̥nós) 'lamb'
9	*h$_1$er-	'lamb, kid'
FIELD		
10	*lendh- ~*londh-	'open land, waste'
11	*póh$_x$iu̯eh$_a$-	'open meadow'
12	?*u̯élsu	'meadow, pasture'
HERD		
13	*u̯rētos (or *u̯ereh$_1$tos?)	'flock, herd'
14	*kerdheh$_a$-	'herd, series'

Tab. 2. Diagnostic terms of pastoralist economy in the Proto-Indo-European lexicon (after* Mallory and Adams 1997*).

Is pastoralism an offshoot of a farming economy?

This view has been advocated by Renfrew (*2002a. 4–7*) and others. It is argued that hunter-gatherers would not have experienced a transition to pastoralism without a previous stage of animal husbandry, and this would have been intrinsically associated with farming practises. Renfrew categorically denies the possibility that hunter-gatherers might have started to herd wild sheep and goats – the essential animal domesticates – without the parallel stage of farming. It is admitted that the horse was used by hunter-gatherers and that the early users might have been horse-herders. But it is denied that these horse-herders could have been horse-breeders.

It is hazardous to discard, in a discussion of Neolithic economies of the seventh and sixth millennia BC in eastern Europe, any alternative a priori (*e.g.* negating a direct transition from a foraging to a pastoral economy). There are well known examples of a transition to herding and breeding without the participation of farming practises from the historical period.

The earliest traces of reindeer herding date to the fifth millennium BC, as evidenced in rock carvings at Alta in northern Norway (see *Helskog 1988* for the pictures of Bergbukten I). Among the Saami people of the North, reindeer herding and breeding developed as an independent economic system, and there was no influence from farming communities with animal husbandry which would have provided the incentive for breeding. Similar processes of a transition from hunting and gathering to reindeer herding and breeding evolved in northern Siberia among the ethnic groups of Samoyedic, Altajic and Paleoasiatic stock (*Funk and Sillanpää 1999.16, 39, 62, etc.*).

In the case of the Proto-Indo-European context, a prominent factor gives additional weight to this assumption of a direct transition, and this is the chronological continuum. Pastoralism can be readily assumed to have emerged no later than the seventh millennium BC. However, agriculture did not reach the eastern Pontic zone prior to 5500 BC (see the isochrones in the map presented by *Carpelan and Parpola 2001.63*). Pastoralism in the region clearly antedates the practise of farming. The lexical layer of Proto-Indo-European terms for herding is older than the terminology of the 'agricultural package' which arrived on the western fringes of the steppe zone at a later time.

Diagnostic items of early Indo-European culture

The horse is of special significance for the Indo-Europeans and their culture. There is consensus about this basic fact among scholars. What is disputed, though, is the process of the domestication of this animal and since when it was used for riding. A lexical root for 'horse' (*hekuos in simplified transcription) can be reconstructed for the Proto-Indo-European vocabulary, and this root is common for the equivalents in all the local languages of this phylum (Tab. 3). There is a linguistic feature which makes the issue of the horse and all that is related to it difficult. In the Indo-European terminology, no difference is made between the wild and the domesticated horse.

According to the original version of the Kurgan hypothesis, propagated by Gimbutas, it was assumed that the Indo-Europeans left the steppes on horseback, and that it was the military supremacy of mobile horse-riders which gave the pastoralists the edge during their expansions. However, horse-riding is not attested for the fifth millennium BC. The archaeological record of the steppe zone of southern Russia points to *c.* 5000 BC as an early date for the appearance of the horse motif in imagery (*Gimbutas 1991. 353*). The existence of imagery relating to this prominent animal as such does not entail that the horse was already domesticated at that time. The imagery might well relate to mythical conceptualizations of wildlife among the early pastoralists.

In the beginnings, the wild horse might have been hunted for its meat. Most probably, the domestication of this animal to become used for riding was a prolonged process (*Levine et al. 1999*). And yet, it seems reasonable to assert that humans "*would rapidly have recognized the greater potentiality of the horse as a means of transport and a powerful cultural symbol*" (*Dolukhanov 2002.18*).

Judging from ethnographic literature and from empirical observations of traditional herding in recent nomadic cultures, the role of the horse may at first have been marginal for the socio-economy and its significance might have increased gradually. Shishlina (*1997*) draws attention to a certain custom among herders of the modern steppe zone in Kalmykia who keep horses as draught animals and, for another special purpose. In winter, when the snow cover of the pasture may be too hard for sheep and goats to find fodder, the horses break the cover with their

HORSE

h*$_1$*ék̂u̯os 'horse (*Equus caballus*)'. [*IEW 301* (**eku̯o*-s); Wat 16 (**ekwo-*); GI 463 (**ek̂ʰwos*); Buck 3.41]. OIr *ech* 'horse', Wels *ebol* 'colt', Gaul *epo-* 'horse', *equos* (name of a month), OLat *equos* 'horse', Lat *equus* 'horse',Venetic (acc.) *ekvon* 'horse', ON *jōr* 'horse', OE *eoh* 'horse', Goth *aíhva-tundi* 'brambles' (= 'horse-thorn), OPrus *aswinan* 'horse-milk', Lith *ašvíenis* 'stallion', Myc *i-qo* 'horse', Grk **ἵππος** 'horse', Arm *ēš* 'horse', HierLuv *azu(wa)* 'horse', Lycian *esbe-* 'horse', Av aspa- 'horse' OPers *asa-* 'horse', Sogd *'sp* 'horse', Oss *jæfs* 'horse', OInd *áśva-* 'horse', TochA *yuk* 'horse', TochB *yakwe* 'horse'. Cf. The derivative **h*$_1$*ekuó-t-* in Lat *eques* (gen. *equitis*) 'rider', Grk **ἱππότης** 'rider'.

Tab. 3. The lexical root for 'horse' in Proto-Indo-European and its derivations in individual Indo-European languages (after* Mallory and Adams 1997.273–274*).

strong hoofs and provide access for the smaller animals to the grass below. Such a function can be conjectured to have been the first possible use of the horse by the Kurgan pastoralists.

At a later stage, the horse was certainly used as a draught animal. This can be assumed for the migrants who, coming from the eastern steppe, arrived at Durankulak, and later at Varna in the northwestern Pontic zone. The movement of the Kurgan people from their homeland in the Pontic-Caspian region to the southwest can be traced on the basis of the spread of a diagnostic cultural item, the horse-headed sceptre (Fig. 1).

Those groups of steppe people who reached the northwestern Pontic region introduced a technological innovation: wheeled wagons. Horse-riding became a custom at a later date. Although this means that the first migrants who made their incursions in the region where the agriculturalists settled were not horse-riders, it does not follow that the Kurgan hypothesis would lose its value as an explicative model. The advance of a powerful élite imposing their order on the local population would be a realistic scenario to explain the early stage of movements of the Kurgan people (Kurgan I).

Non-Indo-Europeans and Indo-Europeans: scenarios of contact and conflict

The drifting apart of the socio-economic systems caused a shift in culture and language, too. This meant the gradual dissolution of the older network of Nostratic convergences, with the cultural as well as linguistic differences between Uralic and Indo-European becoming more marked in time. The Proto-Indo-Europeans who roamed the steppe in search of pastures for their herds had a life-style that differed markedly from that of the Proto-Uralians who had continued as hunters and gatherers in the northern forest zone.

The population of the south, the Proto-Indo-European pastoralists, did not experience a development of their culture and language in isolation. From the earliest times of the formation of the Indo-European complex the pastoralists engaged in contacts, social interaction and trade relations, with their neighbors in the north (Proto-Uralians) and further south (Proto-Northern Caucasians).

Conflict-free contacts between pastoralists and hunter-gatherers in the sixth and fifth millennia BC

Despite the differences in life-styles, the hunter-gatherers from the north maintained contact with the pastoralists from the south. The social interaction of populations in the former Nostratic zone of convergence changed its nature and transformed into patterns of contact between bearers of distinct cultures and speakers of distinct languages. The contacts which the Proto-Indo-Europeans established with the northern neighbours date to the sixth and fifth millennia BC. Evidence for these early contacts of Proto-Uralians with Proto-Indo-Europeans are the loanwords which were borrowed from Indo-European into the Uralic vocabulary (Tab. 4).

The movement of lexical borrowing was unilaterally directed from the Indo-European south to the Uralic north. This observation supports the assumption that the language of the pastoralists and their culture were considered to be prestigious by the Proto-Uralians. Judging from the distribution of the old Indo-European loanwords in the sections of the Uralic lexicon it can be concluded that the Indo-Europeans engaged in trade (see the borrowing for the idea 'to sell') and had prestigious goods (such as honey) and technologies (such as spinning and construction) to offer to the hunter-gatherers of the north.

There were also contacts with the southern neighbours, the indigenous population of the Caucasus. Most probably, interactions between Proto-Indo-Europeans and local people in the northern Caucasus began to unfold in the early fifth millennium BC. Apparently, the same kind of prestige that the Proto-Indo-Europeans enjoyed with their Uralian neighbours also dominated contacts with the people in the south. Among the Indo-European borrowings in northern Caucasian languages, we find diagnostic terms of pastoralism such as expressions for 'goat' and 'cattle', lexical evidence for trade relations (*i.e.*, 'payment'), and for the transfer of trade goods (*i.e.*, 'axe', 'ring'); (Tab. 5).

The scenarios of contact involving Proto-Indo-Europeans, Proto-Uralians and Proto-Caucasians unfolded under the auspices of peaceful relations, with no recognizable agenda of conflict. As is known from ethnographic literature and from comparisons of the world's cultures, contacts between pastoralists and hunter-gatherers are, in principle, friendly in nature, and this is because there is no competition over resources. The hunter-gatherers do not need the pastures of the pastoralists, and there is no advantage for the pastoralists to move with their herds into the hunting-grounds of foragers. As a rule, hunter-gatherers assign a higher prestige to the culture of pastoralists and to their trade goods.

Contacts between pastoralists and agriculturalists with agendas of conflict

On the western periphery of the steppe, where the terrain that was frequented by the pastoralists and their herds bordered the area of arable land (*i.e.*, in southern Ukraine), the boundaries between the two economic systems of pastoralism (the eastern tradition) and of agriculture (the western tradition) began to float soon after *c.* 5000 BC. The initial contacts between pastoralists and agriculturalists may have been peaceful, but things changed when the socioeconomic sphere of the Cucuteni-Tripillye culture experienced its expansion to the East and new agrarian settlements were established in areas formerly frequented by pastoralists.

The direct consequences of this expansion were an infringement of the movements of the pastoralists and a reduction of their resources, the pastures that had been turned into fields. And yet, there were other consequences that had an even stronger impact on the sustainability of pastoralism in the contact region. And this had to do with the ways herding as a socio-economic system operates. A true understanding of the ways of pastoralist economy is not seldom hampered by stereotyping views that outsiders carry in their minds.

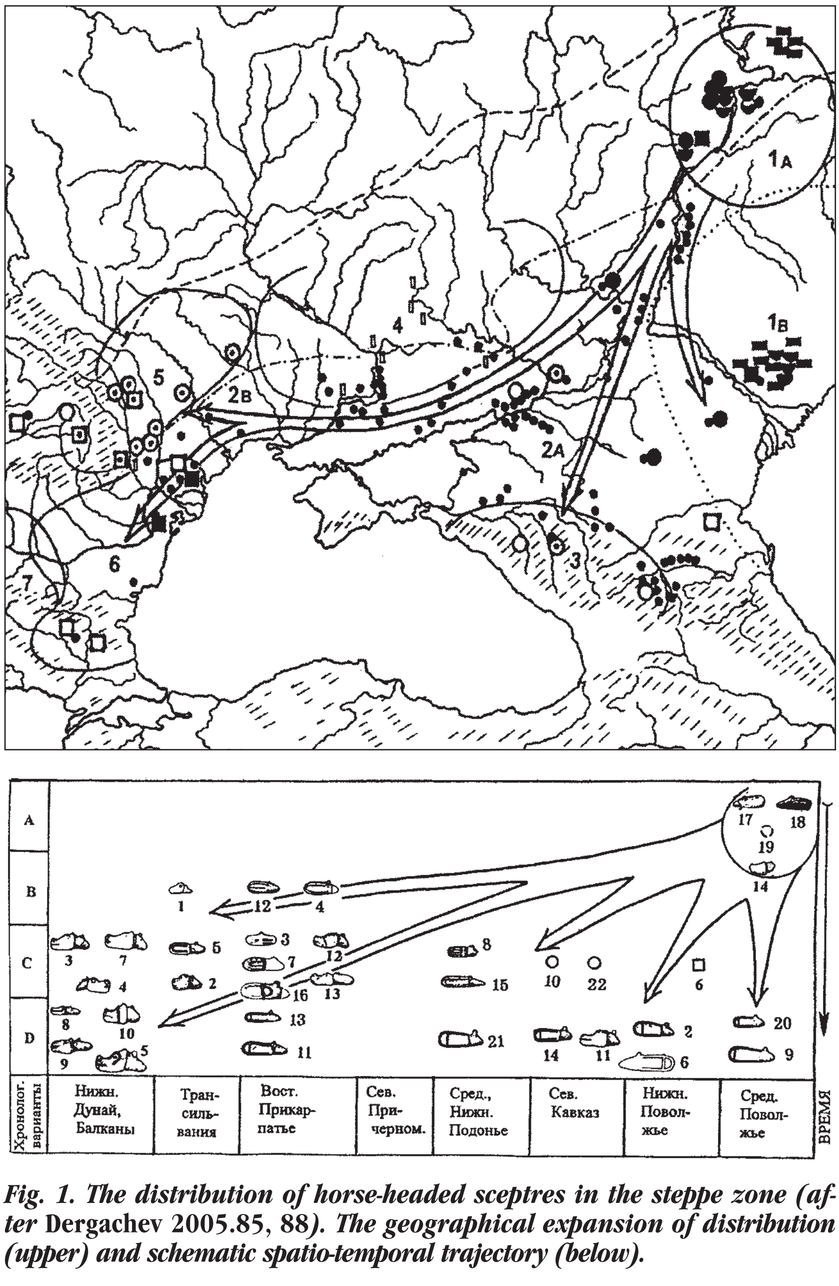


Fig. 1. The distribution of horse-headed sceptres in the steppe zone (after* Dergachev 2005.85, 88*). The geographical expansion of distribution (upper) and schematic spatio-temporal trajectory (below).

PIE. **meyH-* 'give, sell' > U.mexe-*, e.g. Finnish *myydä***
PIE. **med^{h}u-* 'honey' > Finno-Ugric **mete*, e.g. Finnish *mesi* (genitive *meden*)
PIE. **ket^{s}tro-* 'spindle' > Volgaic-Finnic **kesträ*, e.g. Finnish *kehrä*, dialectal *keträ* (PIE. **ket^{s}tro-* has been preserved only in the Aryan branch of IE.: i.e. Proto-Iranian **castra* > Pashto *cãšai*, Proto-Indo-Aryan **cattra* > Sanskrit *cattra*; (Parpola 1995,1.2)
PIE. **seitu-* 'bridge, floorboard' > Mordvin-Permian **se(j)tV*, e.g. Erza-Mordvin *sed'*, Zyryan *sod*
PIE. **pewH-eno-* 'sieve' > Proto-Permian **pe(w)šen(V)*, e.g. Udmurt *puž*, Zyryan *pož*
PIE. **lond^{h}o-* or **lomd^{h}o-* 'field, plain' > Proto-Permian **lonta/*lomta*, e.g. Finnish *lansi* (stem *lante-*).

Tab. 4. The transfer of Proto-Indo-European (PIE) terminology to Uralian (U) (after* Haarmann 1996.10*).

"*The free-moving, chaotic 'nomad' is a myth. The most complex system regulates these movements by strict formal schedules, restrictions on numbers and types of animals, reserving or deferring pastures, assigning members to particular pastures and controlling the amount of time spent in one pasture. Thus, the organisational complexity varies greatly between different pastoral groups*" (*Niamir 1995.245*).

The prehistoric expansion of Tripillye settlements into the steppe zone was more than a territorial occupation of former pastures; it caused more disturbance than an infringement of the movements of the pastoralists. The consequences of this expansion culminated in a shake-up of the nomadic socio-economic system and in a threat to the accessibility of resources. The magnitude of this threat might have been felt differently in the regional groups of pastoralists, but, in principle, the world of the agriculturalists exposed itself to the herders as harmful to their socio-economic sustainability.

Given these unfavorable conditions, the expansion of the agrarian system of subsistence to the east caused increasing frictions between agriculturalists and pastoralists, stirring up ever more competition over the exploitation of the terrain. During the first half of the fifth millennium BC, under the pressure of growing socio-economic stress in the local communities, there are signs of clashes and even warfare between the western agriculturalists and the steppe people, as evidenced by layers of ashes and an increased number of arrow-heads in the archaeological record of the easternmost settlements of the Cucuteni-Tripillye culture.

By the middle of the fifth millennium BC, ever more settlements on the eastern periphery of the Cucuteni-Tripolye culture (Cucuteni-Tripillye, respectively) A and B1 periods were fortified, and the frequency of arrow-heads in the archaeological record increases. The end of the Tripillye culture is marked by its replacement, in the northern region, by the Globular Amphora culture and, in the steppe region, by the late Pit-Grave culture.

"*In the latter case, the question inevitably concerns Gimbutas' third wave of steppe invasion. However, if the equally abrupt increase in the number of artificially-fortified settlements of the final Tripolye period is due to the threat of invasion by other cultures, may we infer a similar quantitative increase in fortified settlements during the Cucuteni A-Tripolye B1 period which is attributable to similar circumstances? Following the principle of analogy, there can be only one explanation – invasion, and therefore, this completely confirms Gimbutas' idea of the first wave of steppe livestock breeders.*" (*Dergachev 2002.102*)

Arguably, the migrations of the steppe people find their ultimate motivation in elementary counterreactions to these scenarios of unrest.

PIE. **(H)aiĝ-* 'goat' > PNC. **Hēǯ̆ʒu*, e.g Dargin *ʕeža*, Adygey *ãča*, Kabardin *āža*
PIE. **peḱu-* 'cattle' > PNC. **p̄äHäk'wV*, e.g. Tsez *bek'*, Andie *bek'iri*, Chechen *bož*
PIE. **kenk-* 'thigh' > PNC. **q'ămqə*, e.g. Tabasaran *q'amq'*, Dargin, Kadar dialect *q'unq'a*
PIE. **ĝ^{h}erd-* 'pear' > PNC. **qū̄IrV*, e.g. Dargin *qaIr*, Ingush *qor*
PIE. **ag^{u}(e)sī* 'axe' > Proto-Western-Caucasian **ǵ$_{w}$aš$_{w}$V*, e.g. Abazin *g$_{w}$aš$_{w}$*, Ubykh *ǵaš$_{w}$a*
PIE. **Hu̯erk-* 'ring' (e.g. Hittite *ḫurki-*, Tokharian A *wärkänt-*) > PNC. **həlkwV, e.g.* Dargin *urku-*, Avar *hokó*
PIE. **d^{h}olo-* 'plain' > Proto-Eastern-Caucasian ** ʒʒəlHV*, e.g. Lezgin *t'ul*, Rutul *dil*
PIE. **mizd^{h}o-* 'payment' > PNC. **maświV*, e.g. Archin *mas*, Lak *maša*

Tab. 5. The transfer of Proto-Indo-European (PIE) terminology to Proto-Northern Caucasian (PNC) (after* Haarmann 1996.11*).

Early movements of steppe people to the west and the nature of Indo-European migrations

It is reasonable to assert that the early pastoralists in the Pontic-Caspian zone were challenged by the advance of agricultural practises into the region, and their reactions to this 'intruding' factor triggered a chain reaction: the great Kurgan migrations. Marija Gimbutas (*1974; 1991; 1992*) coined this overarching term to define the movement of the steppe people, and to identify the bearers of the earliest recognizable Indo-European culture, that of the people who built huge burial mounds, called *kurgan* (a word of Turkic origin).

Gimbutas assumed that the thrust of the migrations, which she imagined as movements of populous groups, was effected by groups of horse-riders. If it holds true that the pastoralists were highly mobile, then this mobility on horse-back would be a decisive asset of any of their military operations to ensure their migratory advance. The assumed mobility of horse-riding pastoralists became the target of criticism intended to discredit the Kurgan hypothesis. Admittedly, there is no evidence for the use of the horse as a riding animal in the fifth millennium BC. The validity of the Kurgan hypothesis, however, is not at the mercy of the horse as a factor to explain the swiftness and success of the migrations.

The most crucial factor in any approach to explaining the movements of the steppe people is a refinement of the key concept 'migration'. Migration is a comprehensive notion, with various conceptual facets in the wide array of its overall meaning (*Bell-Fialkoff 2000*). Migration does not exclusively mean 'mass movement'. The process of Indo-Europeanization of the northwestern and western Pontic region between *c.* 4400 BC (beginning of the first wave) and *c.* 3000 BC (end of the third wave) was not necessarily the result of massive population movements.

The cultural and linguistic changes could well have resulted from the exertion of control of a ruling élite over people and territory either by intermarriage into families of local dignitaries, or by assuming power through conquest. As a rule, the culture of the élite dominates, and its language is more prestigious than that of the local population, eventually resulting in the assimilation and language shift of the latter. In this process, elements of the local language are absorbed as a substratum by the dominating language. The same holds true for cultural patterns, like the survival of cults of female divinities among the ancient Indo-European peoples in southeastern Europe (*i.e.*, Thracians and Illyrians).

In the northwestern Pontic region, the incursions of the steppe people produce permanent patterns of change. Judging from richly equipped graves, a new social élite makes its appearance at Durankulak (northeastern Bulgaria) around 4600 BC and, a hundred years later, the tradition of burials also changes at Varna. There, insignia such as a horse-headed sceptre and other ceremonial items of political power provide evidence "*of the spread of steppe tribes from the east to the west and in the 'Kurgan' model of Indo-European origins is seen to reflect the first wave of Indo-Europeans from their homeland in the steppelands of the Ukraine and south Russia*" (*Mallory and Adams 1997.557*) (Map 3).

Durankulak, Varna and other sites provide 'diagnostic' socio-cultural profiles for the establishment of social hierarchy and élite power typical of nomadic societies.

Fusion processes of Non-Indo-European and Indo-European elements: patterns of dominance and indominance

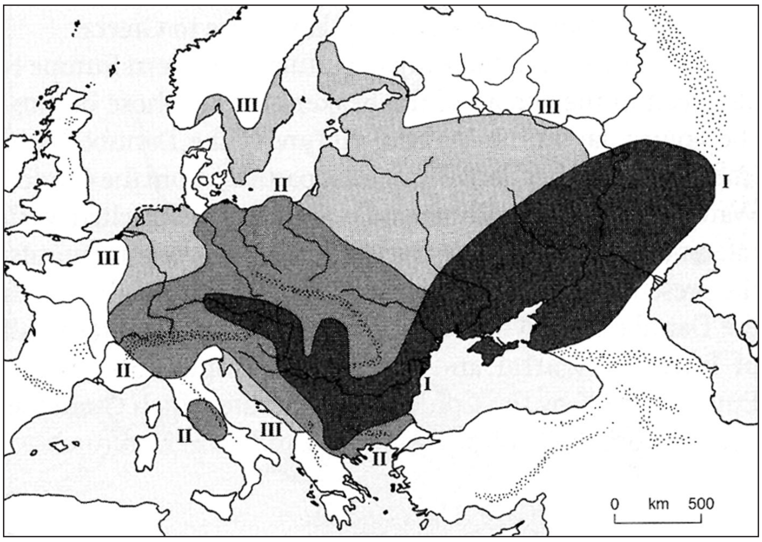
Fusion processes of cultures and languages may be compared to the endeavour to reconstruct a ship while floating in the water. You can never succeed in replacing everything old by everything new because the vessel has to stay afloat. Therefore, there will always be old elements that persist, regardless of how many new elements are introduced. The Indo-Europeanization of the cultures and languages of Europe did not produce strategies of 'replacement', but patterns of fusion in which older constituents (of non-Indo-European origin) and younger elements (of Indo-European coinage) intermingled.

The results of such fusion differ greatly in the regions where non-Indo-Europeans and Indo-Europeans interacted, and they are specific for any local culture and language. According to the parameter of 'dominance-indominance' the following major configurations can be identified in the cultures and languages of Europe.

Scenarios of a dominance of Indo-European elements over non-Indo-European elements

The fusion process in which the cultures of Indo-Europeans and of non-Indo-Europeans participated in southeastern Europe "*...not only involved those ele-*

ments that survive in the archaeological record, but affected the non-material dimensions such as stories, songs, myths, rituals, and beliefs which function within complex webs of meaning" (*Marler 2005.60*). This holds true for language, also, in this case for the fusion of linguistic elements of Indo-European and of local non-Indo-European origin. I refer here to the Indo-European language with the longest written record, Greek. The earliest records in Mycenaean Greek, written in Linear B, date to the seventeenth century BC (*Haarmann 1995.125–126*).



Map 3. The Kurgan migrations (after* Mallory and Adams 1997.339*).

Greek is categorized as an Indo-European language. However, its lexical structures and its system of word formation differ markedly from other cognate languages such as Latin, Persian, Sanskrit, etc. The reason for this is the pre-Greek substratum, a layer of old lexical borrowings and formative elements from the ancient non-Indo-European languages that were spoken in southeastern Europe before the advent of the Indo-Europeans. In ancient Greek, the old loanwords do not represent a lexical inventory which was isolated from the Greek vocabulary inherited from Indo-European. Borrowed and indigenous lexical items form a symbiotic network of expressions. This can be illustrated for the various terminologies, of spinning and weaving for one.

Evidence for the vertical loom dating to the pre-deluge era cannot be given, and its appearance during the seventh millennium BC is scarce, although evidence does exist from Çatalhöyük in Anatolia, Greece, and the Tisza valley in Hungary. Nevertheless, the presence of loom weights in cultural strata of the seventh and early sixth millennia BC demonstrates the existence of a similar textile producing technology throughout Anatolia and southeastern Europe. Later, textile production proliferated and spread to various regions. "*In short, we might be seeing connections southward into the Aegean, as well as northwestward into Hungary.*" (*Barber 1991.98*)

It is noteworthy that in ancient Greek weaving terminology there is an abundance of borrowings that have survived from pre-Greek times. These borrowings of non-Indo-European origin are not isolated in the lexicon, but have been integrated into the language, forming a broad layer of terminology that is symbiotically interconnected with expressions based on Indo-European cognates.

In the lexical structures, two integrational patterns can be discerned that indicate the fusion and persistence of pre-Greek terms within Greek terminology (Tab. 6).

One is the duality of pre-Greek (non-Indo-European) and Greek terms (of Indo-European origin):

a. In the entire terminology relating to weaving, there are clusters of expressions with a specialized meaning that stem from a non-Indo-European source, and others which are inherited from the bulk of Indo-European cognates.

b. The other integrational pattern is synonymity of pre-Greek and Greek terms, which provides the ancient Greek language with a great potential for stylistic variation.

Another domain where pre-Greek (=non-Indo-European) terms have survived in ancient Greek is metallurgy (Fig. 2). The oldest gold treasure of the world is known from Varna and dates to *c.* 4500 BC, to the times of the earliest Indo-European incursions in the northwestern Pontic region.

Since some basic non-Indo-European expressions are attested for the terminology of metal-working in Greek, this is evidence that this technology was not introduced to the region by the Indo-Europeans, but had been in use before the Kurgan migrations. As specialized terms, some of these loanwords of pre-Greek origin have been mediated to our modern languages via Greek civilization, among them, *metallon* metal and *kaminos* furnace. The archaeological term Chalcolithic Age is comprised of two elements of the pre-Greek substratum, *khalkos* copper and *lithos* stone (*Hofmann 1966*).

Another area of contacts of cultures and languages of different stock, non-Indo-European and Indo-European, is Tuscany in Italy. On the historical map showing the spread of human genes, the genetic 'footprint' of the pre-Roman population (*i.e.* the Etruscans) is recognizable as a divergent genomic profile (*Cavalli-Sforza et al. 1994.278–279*). The most prominent non-Indo-European language of ancient Italy, Etruscan, was not simply 'replaced' by Latin, but influenced the colonial language of Roman supremacy, and later Italian, in manifold ways. In the cultural vocabulary of Latin, there is a significant number of Etruscan expressions (*Breyer 1993*). Among the terms which Latin borrowed from Etruscan are *atrium* atrium house, *elementum* element (original meaning: 'letter of the alphabet'), *persona* person, individual, *populus* people and others, and many of the old loanwords have been transferred to the lexicon of modern European languages.

Still today, Etruscan habits of pronouncing certain consonants are still recognizable in the sound structure of the Italian dialect in Tuscany. In the area between the rivers Arno and Tiber, called 'Gorgia toscana' (literally 'Tuscan throat'), the consonants k, p and t are regularly aspirated (to be transcribed as h, ph and th): *e.g.* Tuscan *poho* little (for standard Italian *poco*), *lupho* wolf (for *lupo*), *ditho* finger (for *dito*); (*Haarmann 2003a.344–345*). The corresponding consonants in Etruscan were aspirated. Most probably, the habits of pronouncing among those Etruscans who assimilated to Latin continued among local people and were transferred to Italian, the daughter language of Latin, that originated in the early Middle Ages.

Scenarios of a balanced distribution of Indo-European and non-Indo-European elements

Speakers of Indo-European came in contact with Uralic peoples in the southern coastal region of the Baltic Sea. These were long-term contacts with far-reaching repercussions. Gradually, the speakers of Uralic were driven to the Northeast or they were assimilated. Although this meant an ethnic Indo-Europeanization of a region with a formerly Uralian population, in the languages that were involved in the contact, traces of a mutual influence are clearly recognizable.

The stress in Germanic languages is on the first syllable of a word, unless the word is a loanword or is coined on borrowed elements from another language. Deviant from the principle of the first-syllable stress is a word such as English 'replácement', formed on the basis of elements of Latin origin, with the stress on the second syllable. While Proto-Indo-European had a free stress, first syllable stress is an innovation in the Germanic languages. The change of the stress pattern is an Uralic substratum, that is, it stems from contacts with Uralic languages, where first syllable stress is the rule (*Suhonen 1995*).

The Baltic-Fennic languages that continue the tradition of Uralic in the Baltic region

a

Indo-European			Not Indo-European		
λίνον	(linon)	'linen'	στυπ-	(stup-)	'stalk; scutch'
κεσ-/ζ	(kes-/ks-)	'comb, scratch'	σφόνδυλος	(sphondulus)	'spindle whorl'
πλεκ-	(plek-)	'plait'	μίτος	(mitos)	'headdless(?)'
ίστός	(histos)	'loom'	καῖρος	(kairos)	'shed bar'
άντίον	(antion)	'cloth beam'			
			στ(ρ)υπτηρία	(st[r]uptēria)	'mordant'
			κναφ-	(knaph-)	'fulling'

b

Indo-European	Not Indo-European	Meaning
λῆνος (lēnos)	μαλλός/μάλλυκες (mallos/mallukes), έριον (erion) (?)	'wool'
πεκ-/ποκ- (pek-/pok-)	τιλ- (til-)	'pluck wool'
νη- (nē-)	κλωϑ(klōth-)	'spin'
ἄτρακτος (atraktos)	ἠλακάτη (ēlakatē)	'spindle'
-	τολύπη (tolupē), ἀγαϑίς (agathis)	'ball of yarn'
(νη- [nē-])	(κλωϑ- [klōth], μήρινϑος (mērinthos)	'thread'
-	μηρυ- (mēru-), έλκ- (helik-)	'wind thread'
ὑφ- (huph-)	ἀζ-/ἀττ-/ἀστ- (az-/att-/ast-)	'weave'
ίατόποδες (histopodes)	κελέοντες (keleontes)	'uprights'
-	λαιαί (laiai), άγνῦϑες (agnuthes)	'loom weights'

Tab. 6. The symbiosis of Greek and pre-Greek terminology in the domain of weaving and textile production (after* Barber 1991.278, 280*) a. The duality of Greek and pre-Greek terms with specific meanings; b. Synonymity of Greek and pre-Greek terminology.

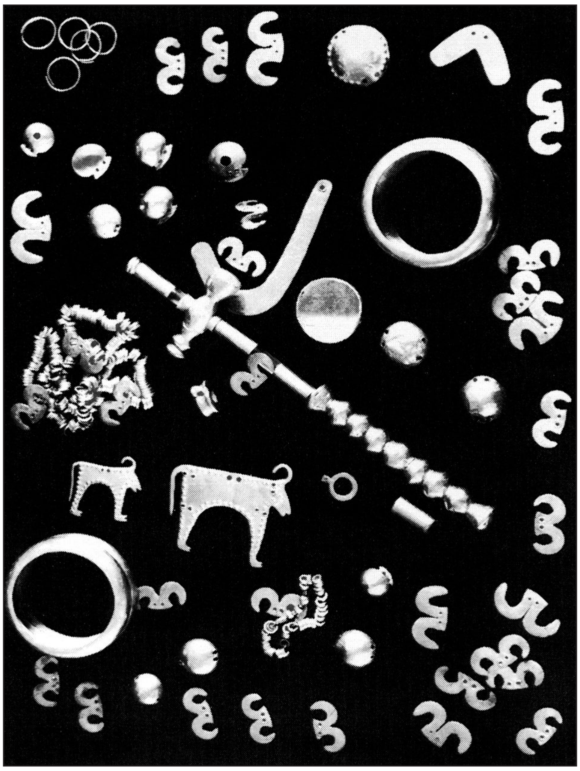


Fig. 2. Objects made of gold from the cemetery of Varna (*c. *4500 BC; after* Gimbutas 1991.120*).

know a morphophonetic phenomenon which is called 'gradation' and unknown in other Uralic languages. Uralic languages operate with techniques of the agglutinative type, which means that formative elements are associated with the word stem in a way that the structure of the stem does not change (*e.g.* Hungarian *ház* house: *házak* houses: *házakban* 'in houses': *házaimban* 'in my houses', with the unchanged stem form *ház*). In Baltic-Fennic languages, the stem of words may change like in Indo-European languages of the inflectional type.

Among the most prominent properties of the Finnish sound system is regular alternation of the word stem, or to be more precise: changes within the stem which occur in conjunction with the addition of specific formative elements (*Haarmann 2003b.878–882*). These alternations (called in Finnish *astevaihtelu* 'gradation') are governed by a multiple set of specific rules which cause structural changes in the stems of words. Altogether, there are 130 stem classes. Of these, 85 are declension classes (of nouns), and 45 are conjugation classes (of verbs). Attempts to reduce the number of classes to a few or only one have so far been unsuccessful.

As for the phonetic features which underlay the manifold variations of the word stem, these can be categorized as follows: consonant gradation, total or partial consonant assimilation, vowel mutation, and vowel loss. The operation of these realizations of change may occur singly (simple alternation) or in a combination of various techniques (complex alternation).

The realization of systematic alternation by means of consonant gradation is the most widely applied technique. In consonant gradation, two grades are distinguished, a strong grade and a weak grade. These correlate with specific syllable types. The strong grade correlates with an open syllable, the weak grade with a closed syllable. Open syllables are those ending in a vowel, closed syllables end in a consonant. The sound changes which occur when consonant gradation operates may be quantitative (*e.g.* pp: p, *piippu* 'pipe/nominative': *piipun* 'pipe/genitive') and qualitative (*e.g.* k: Ø, *joki* 'river/nominative': *joen* 'river/genitive').

The described alternations of the word stem are a heritage from the times when Indo-European languages exerted a strong influence on the Baltic-Fennic languages in their formative period.

Scenarios of a dominance of non-Indo-European elements over Indo-European elements

Indo-Europeanization may articulate itself in certain ways, so that despite the massive impact of Indo-European culture, life-style and language, there is no shift to a predominance of Indo-European constituents in a local culture and language. The scenario of Indo-European and Uralic in contact in the Baltic region illustrates such proportions of fusion.

In the course of their advance into central Europe, the Indo-Europeans who had left their homeland as pastoralists shifted to an agrarian subsistence. Agriculture, as practised by the ancestors of the Baltic tribes, reached the southern part of the Baltic region by about 1800 BC. The emergence of the Balto-Fennic branch of Fenno-Ugrian (as a major subdivision of Uralic) falls within the span of time when the Fennic population in the Baltic region experienced their transition to sedentism and plant cultivation (*c.* 1500–1000 BC).

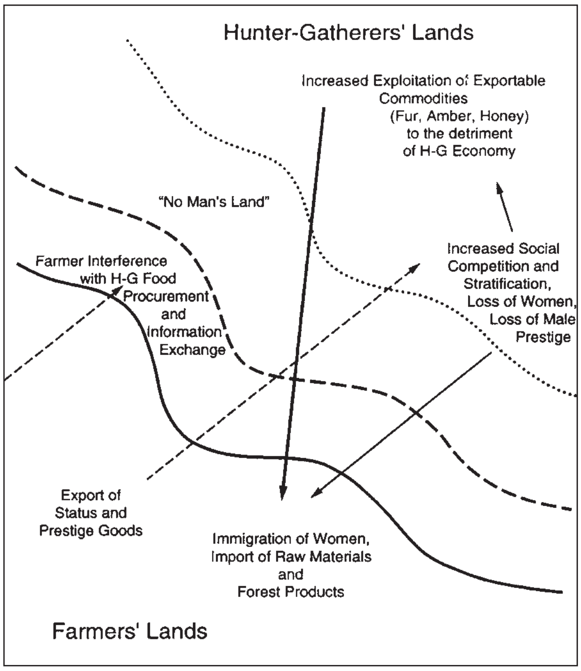
It is significant that, in the Baltic region, an exceptionally prolonged phase of transition can be observed, lasting some 700 years. Among the distinct features of this phase is "*the existence of mixed hunting-farming groups, characterized by an extended sub-*

stitution phase..." (*Zvelebil 1996.328–329*). At an early date, the zone of mixed hunting-farming groups was located in an area stretching from western Prussia and northern Poland to eastern Prussia and southern Lithuania. From there it gradually shifted in a northeastern direction.

Concluding from the archaeological record and, particularly, judging from the existence of mixed hunting-farming groups, contacts between the southern (Baltic) agriculturalists and the northern (Fennic) foragers were friendly. The foragers had a vast hinterland for hunting activities where they could withdraw with the spread of sedentism and the agrarian life-style into territories which were formerly hunting-grounds. In addition to this factor of ample space, the two groups engaged in mutual trade (Map 4).

Among the commodities of the north, one was particularly preferred by men in the south, namely women. These were mostly obtained via bride purchase. In a cross-cultural comparison of contacts between agriculturalists and foragers, it can be stated that the farming culture is viewed by both parties as more prestigious. The higher prestige of the farming culture also created images of a more advanced society among foragers, in a way that the communities of the south became more and more attractive for women of the north who had a chance to marry into the prestigious society (*Haarmann 2003c.98–100*).

Against the background of unilaterally directed prestige relations, it is not surprising to observe that the lively social intermingling between farmers and foragers resulted in a unilaterally directed innovation of the social terminology among the speakers of Fennic languages. An indicator of this is the broad layer of loanwords of Baltic origin in two sensitive sections of the basic vocabulary of Fennic languages, in kinship terminology and, in the terminology for body parts (Tab. 7). Since prestige values were associated with the culture of the south, conceptualizations of prestige extended to also include the language of the south that was involved in the contact (*i.e.*, Baltic).



Map 4. Trade relations and socio-economic competition in the Baltic convergence zone (after* Zvelebil 1996.338*).

(a) TERMINOLOGY OF KINSHIP AND SOCIAL RELATIONS

Finnish lapsi 'child', tyttö 'girl', nainen 'woman', häät 'wedding', morsian 'bride', sulhanen 'bridegroom', lanko 'wife's brother; husband's brother', nuode 'sister's husband', tytär 'daughter', veli 'brother', sisar 'sister', etc.

(b) TERMINOLOGY OF BODY PARTS AND BODILY FUNCTIONS

Finnish raaja 'extremity', limb', kaula 'neck', leuka 'jaw', hammas 'tooth', ranne 'wrist', karva 'hair (of the body)', napa 'navel', koipi 'upper leg (of animals)', reisi' 'thigh', perna 'spleen', hiki 'sweat', hilse 'scurf', virtsa 'urine'.

Tab. 7. Lexical borrowings of Baltic origin in Finnish (after* Haarmann 2003c.98–100*); a) Terminology of kinship and social relations; b) Terminology of body parts and bodily functions.

Outlook

The stage of transition from a hunter-gatherer economy to pastoralism in the steppe zone can as yet not been pinpointed with any accuracy in terms of absolute time, except for estimates of relative time in relation to the sequence of socio-cultural developments.

At present, it is not possible to distinguish different layers of the Proto-Indo-European vocabulary according to absolute chronology (*i.e.*, pastoralist terminology vs. agrarian vocabulary). In this domain, only statements about relative chronology can be made, along the lines that pastoralist terminology must be older than the younger – and more scarce – agricultural vocabulary. The exclusive application of the methods of historical linguistics which are available at present (*i.e.* lexico-statistical dating) does not produce satisfactory results for the pinpointing of the date of the dissolution of the Proto-Indo-European complex and its dispersal into regional cultures and languages. Estimates range from *c.* 4500 BC to *c.* 3000 BC.

It is essential to correlate insights about the relative chronology of transitions and events during the formative period of the Indo-European complex and of the fusion processes induced by contacts with non-Indo-European populations to an absolute time-frame. This task calls for interdisciplinary cooperation, exploring the chronological depth of the prehistory of the steppe zone in an orchestrated fashion to refine dating methods in archaeology (archaeobotany), human genetics (genomic profiles of ancient populations and their distribution), anthropology (human ecology), studies of cultural and linguistic fusion processes, and historical linguistics.

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Why were the Neolithic landscapes of Bela krajina and Ljubljana Marshes regions of Slovenia so dissimilar?

Maja Andrič
Institute of Archaeology, ZRC SAZU, SI
maja.andric@zrc-sazu.si

ABSTRACT – *This paper compares the development of Holocene vegetation in Bela krajina and Ljubljana Marshes (Ljubljansko barje) regions of Slovenia. The results of pollen analysis suggest that in Bela krajina the human impact on the environment (forest clearance and burning) was very intensive throughout the Holocene and led to changes in forest composition, increased biodiversity, and the formation of a mosaic landscape. In the Ljubljana Marshes, forest burning and clearance seem less intensive, although changes in forest composition and 'anthropogenic indicator' pollen types were detected. These differences between study regions are presumably a consequence of various climates, hydrology, bedrock and land-use in the past.*

IZVLEČEK – *V članku je predstavljena primerjava razvoja holocenske vegetacije v Beli krajini in na Ljubljanskem barju. Rezultati pelodne analize kažejo, da je bil človekov vpliv na okolje (sekanje in požiganje gozda) v Beli krajini zelo intenziven, kar je povzročilo povečanje biodiverzitete in spremembe v sestavi gozda, oblikovala se je mozaična pokrajina. Na Ljubljanskem barju je sekanje in požiganje gozda sicer res videti nekoliko manj intenzivno, kljub temu pa na pelodnem diagramu lahko opazimo spremembe v sestavi gozda in pojav 'antropogenih indikatorjev'. Te razlike med regijama so verjetno posledica različne klime, hidrologije, geološke podlage in različne izrabe pokrajine v preteklosti.*

KEY WORDS – *palynology; Neolithic archaeology; Bela krajina; Ljubljana Marshes*

Introduction

This paper aims to address the question of the diversity of the environment of the first farming communities in the region of Bela krajina and the Ljubljana Marshes area of Slovenia (Fig. 1). Differences in the composition of vegetation detected in the pollen record will be analysed in order to estimate whether they were a consequence of specific natural characteristics of the regions studied, dissimilar land-use in the past, or the size of the study sites.

In recent decades an extensive pollen analysis of sedimentary cores and samples collected during archaeological excavations was carried out on Ljubljana Marshes, so the general development of vegetation in the area is very well known (*e.g. Culiberg 1991; Šercelj 1996 and references cited there, Gardner 1999a; 1999b*) and the results presented in this study (a pollen analysis of 'Na mahu 1' core) accord with previous research. The question of past hydrological conditions in the area was also addressed by several researchers using sedimentological, geomorphological, archaeological and multidisciplinary palaeoecological data (*e.g. Melik 1946; Šercelj 1966; Šifrer 1984; Budja 1995; Veluščček 2005; Gaspari and Erič 2006; Verbič 2006; Mlekuž et al. 2006; Andrič et al. in prep., and many others*). This led to various interpretations of the complex hydrological conditions in the basin (most complex in the Neolithic; many researchers would probably agree that in the early Holocene the area was covered by a freshwater lake, whereas later it became a floodplain and in some parts a peat bog). In contrast to Ljubljana

Marshes palynological, research in Bela krajina was less extensive, and both palynologically investigated sites in the area (Mlaka and Griblje, *Andrič 2001; Andrič in press*) are presented in this paper. To date, no studies of past hydrology have been carried out in the area. Therefore, since hydrological conditions on Ljubljana Marshes were very complex, whereas (presumably much simpler) hydrological conditions in Bela krajina have not been investigated at all, more (detailed) research is needed in both regions in the future. Palynological research was much more intensive, and for that reason this paper will focus on only one aspect of both Neolithic landscapes: the composition of vegetation as revealed by palynological studies.

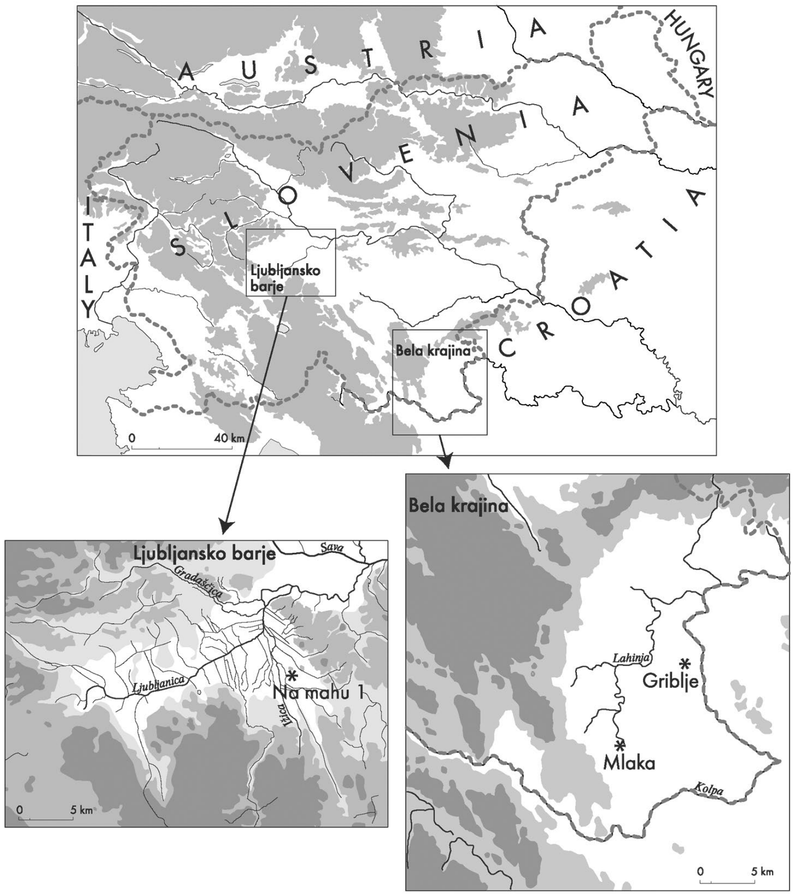


Fig. 1. Bela krajina and Ljubljana Marshes study regions and the position of palynological cores.

The main reasons for the variety of flora in Slovenia include its geographical position, diverse climate, relief and bedrock (*Wraber 1969; Kladnik 1996; Ogrin 1996; Perko 1998*). The distinctive vegetation of Slovenia's phyto-geographic regions became apparent after *c.* 8800 calBP, whereas the onset of an intensive, large-scale forest clearance, burning and the formation of the present-day landscape is dated between late prehistory and the medieval period (*c.* 3000 calBP – 1000 calBP). Palynological research also suggests that the human impact on the vegetation was important and contributed to increasing biodiversity (*Andrič and Willis 2003*). Neolithic/Eneolithic farming communities (*c.* 7000–5000 calBP) lived in an environment where differences between regions had already become apparent, but large-scale forest clearances had not yet occurred. In such environments it is very difficult to distinguish the natural from the anthropogenic causes of environmental change. Therefore, in order to better understand the human impact on the vegetation, the vegetation history in the vicinity of archaeological sites was studied in detail. Sedimentary cores for pollen analysis (Fig. 1) were collected at Mlaka (Bela krajina) and 'Na mahu 1' (Ljubljana Marshes) coring locations in order to estimate the similarity/dissimilarity of vegetation development during the Holocene in both study regions. In addition to this, the vegetation history at Griblje was investigated and compared with Mlaka to assess also the intra-regional variability of Bela krajina vegetation.

The Bela krajina study area

Bela krajina (Fig. 1) is located in south-eastern Slovenia, between high Dinaric Plateaus in the west and the Kolpa River and Pannonian Plain in the east. More than half of its territory lies below 400 m a.s.l., on predominantly Mesozoic limestone and dolomite bedrock (*Gams 1961; 1984; Buser 1984*). The climate of Bela krajina is moderate continental-sub-Pannonian, with a sub-Mediterranean precipitation regime (primary precipitation is highest in autumn), and hot, dry summers. The annual amount of precipitation is between 1200 and 1300 mm in western parts. The average temperatures of the warmest month are between 15 °C and 20 °C, and of the coldest month, between –3 °C and 0 °C (*Bernot 1984; Ogrin 1996; Plut 1985*).

The composition of Bela krajina forests varies according to altitude, land-use and soil type. Predominantly beech forests are characteristic of higher altitudes, whereas patchy oak-hornbeam forests grow in the lowlands (*Miklavžič 1965; Wraber 1956; Marinček and Čarni 2002; Čarni et al. 2003*). Meadows, fields, pastures and human-managed birch (*Betula pendula*) forests ('*steljniki*'), which were originally used as spring/summer grazing areas, spread into the lowlands due to intensive human impact in the last centuries.

Both palaeo-ecological study sites presented in this study (Mlaka and Griblje) are small lowland marshy areas with diameters of *c.* 30 m and without inflowing/outflowing streams (Fig. 1). Numerous archaeological sites, including Neolithic/Eneolithic settlements, are located close to Mlaka and Griblje (*e.g.* Pusti Gradac and Griblje, *Arheološka najdišča Slovenije 1975; Dular 1985; Mason 2001; Phil Mason, personal communication 2005*).

The Ljubljana Marshes study area

Ljubljana Marshes lies in central Slovenia (Fig. 1) at about 289 m a.s.l., on predominantly carbonate bedrock, with Triassic and Jurassic limestones and dolomites in southern and western parts of the basin, whereas Palaeozoic sandstones, conglomerates, shales and limestones prevail in the north and east (*Mencej 1989*). The bottom of the basin is covered by thick layers of Pleistocene and Holocene alluvial and lacustrine sediments (*Mencej 1989; Grimšičar and Ocepek 1967; Tancik 1965; Šercelj 1965; 1967*). The climate on Ljubljana Marshes is temperate-continental, with a sub- continental precipitation regime (precipitation highest in the summer) and annual precipitation between 1000 and 1300 mm. The average temperatures of the coldest month are between –3 °C and 0 °C, and in the warmest month the average is between 15 °C and 20 °C (*Ogrin 1996*).

Ljubljana Marsh is currently covered by meadows, fields and patchy woodlands of pine (*Pinus*), birch (*Betula*), alder (*Alnus*) and oak (*Quercus robur*). Only very small peat-bogs with ombrotrophic species have remained (*Martinčič 1987*). Predominantly beech (*Fagus*) forests grow on the hills surrounding the area (*Čarni et al. 2003*). In the 18th century it was much wetter than today, and mostly covered by peatbogs, smaller 'puddles' and springs (*Melik 1927*) and drier heather lands, with spruce (*Picea*), pine, alder and birch trees. However, in the second half of the 18th century, the first drainage works in the area started, and by the end of 19th century almost all the peat had been burnt or cut in order to obtain dry land needed for agriculture (*Melik 1927*).

The sedimentary core presented in this study ('Na mahu 1') was collected in the eastern part of the Ljubljana Marsh basin (Fig. 1). Archaeological sites, mostly dated to the 7th and 6th millennium calBP, were discovered in the vicinity of the coring location (*e.g.* Resnikov prekop and Maharski prekop, *Dimitrijević 1997; Budja 1995; Čufar and Korenčič 2006; Velušček 2006; Čufar and Velušček 2004; Bregant 1974; 1975*)

Methodology

The pollen record of three study sites, Mlaka and Griblje (G3) in Bela krajina, and 'Na mahu 1' in Ljubljana Marshes (Fig. 1) is presented and compared in this study. The detailed methodology and results for individual study sites have been published (for Mlaka and Griblje see *Andrič in press*) or are currently in preparation ('Na mahu 1', *Andrič et al. in prep.*), therefore only selected data will be presented in this paper.

All sedimentary sequences were collected by Livingstone piston corer, and standard laboratory procedures (*Bennett and Willis 2002*) were used for pollen analysis. The age was determined by AMS radiocarbon dating of organic carbon extracted from the sediment. The radiocarbon dates at Mlaka and Griblje were calibrated by the BCal program (hosted by the Department of Probability and Statistics at the University of Sheffield, *Buck et al. on-line*), which incorporates the IntCal 04 calibration dataset (*Reimer et al. 2004*), and these results were used for age-depth modelling in PSIMPOLL (general linear line-fitting by singular value decomposition for Griblje, and a combination of general linear line-fitting by singular value decomposition and linear interpolation for Mlaka). The conventional radiocarbon dates used for age-depth modelling are marked on each diagram. The age-depth modelling for 'Na mahu 1' core was a linear interpolation between the median values of ^{14}C dates (the lower two dates were excluded from the age-depth modelling due to an error, presumably caused by the reservoir effect). The percentage pollen diagrams of selected taxa were plotted by PSIMPOLL 3.00, 4.25 and PSCOMB 3.01, C programs (*Bennett 1998; Bennett on-line*). They were divided into zones using binary splitting by sum of squares, and the number of significant zones was determined by the broken-stick model (*Bennett 1996; 1998*). Dots on the pollen diagram indicate values lower than 0.5 %. Palynological richness (rarefraction analysis) was also calculated by PSIMPOLL. Microscopic charcoal (in two size classes:

<40 μm and >40 μm) was counted with the pollen ('Na mahu 1' and Griblje cores) and, in addition to this, the concentration of microscopic charcoal was determined according to Clark's (*1982*) point count method at both Mlaka and Griblje.

Results

The results are presented on percentage pollen diagrams of selected taxa (Fig. 2) and compared in Table 1. Landscape openness, the microcharcoal record and palynological richness of all three study sites are also compared (Fig. 3). More detailed results are being published in separate publications (*Andrič in press, Andrič et al. in prep.*). The mismatch of Mlaka and Griblje pollen diagrams (compare *Fagus* curves) for levels older than *c.* 6000 calBP are most probably a consequence of problematic radiocarbon dating at Griblje, where levels between 50 and 61 cm seem to be up to *c.* 900 years 'too old' (*Andrič in press*).

Early Holocene

At the beginning of the Holocene (between *c.* 11 500 and 9000–8750 calBP) an open, predominantly broad-leaved woodland with oak (*Quercus*), hazel (*Corylus*), lime (*Tilia*), elm (*Ulmus*), pine (*Pinus*), birch (*Betula*) and spruce (*Picea* mostly around Ljubljana Marshes) was growing in both study regions (Fig. 2, Tab. 1). The increased concentration of microscopic charcoal suggests that forest fires were common, probably due to the arid early Holocene climate (*e.g. Kutzbach and Guetter 1986; COHMAP Members 1988*).

Later (at *c.* 9000 – 8750 calBP) the forest composition suddenly changed, and thick, mostly beech (*Fagus*) forest started to grow in Bela krajina and Ljubljana Marshes (Fig. 2, Tab. 1). In Ljubljana Marshes this beech forest persisted until *c.* 6750 calBP, whereas in Bela krajina the development was much more dynamic. Slight fluctuations in beech pollen curves (some of them coincide with charcoal peaks and even with Cerealia-type pollen grain at Griblje) suggest that the forest in Bela krajina was less dense than in the Ljubljana Marshes region, and occasional small-scale landscape fires probably caused minor openings in the canopy. After *c.* 7800 calBP beech (*Fagus*) at the Mlaka site started to decline, and by *c.* 7300 calBP the percentage of tree pollen had significantly declined (with the exception of lime (*Tilia*), which increased), whereas herbs and monolete fern spores (Filicales) increased, suggesting the opening of the landscape (Fig. 2a). A similar change in vegetation was also detected at Griblje (Fig. 2b), where beech forest was replaced by a more open landscape, with higher percentages of pine (*Pinus*) and Trilete spores than at Mlaka. In contrast to Bela krajina, the hills surrounding Ljubljana Marshes basin remained very much forested with beech (*Fagus*), and after 7600 calBP also fir (*Abies*) (Fig. 2c). No such increase in fir (Abies) was detected in Bela krajina, although the forest started to regenerate at the beginning of the 7th millennium calBP.

After *c.* 7000 calBP, hazel (*Corylus*) and oak (*Quercus*) at Mlaka, increased and between *c.* 6700–6100 calBP hornbeam (*Carpinus betulus*) woodland was growing around the coring location. The Griblje forest also regenerated, and beech (*Fagus*), alder (*Alnus*) and hazel (*Corylus*) started to increase again, but in contrast to Mlaka, there was no hornbeam (*Carpinus b.*) phase. The human impact on the environment around both study sites was significant and can be associated with the Neolithic/Eneolithic sites at Pusti gradac and Griblje. Small-scale forest burning (increased micro-charcoal concentration), agriculture and grazing (anthropogenic indicator taxa: Cerealia-type, *Centaurea*, *Plantago l.*, Chenopodiaceae, *Artemisia*, Compositae lig. and Compositae tub.) was most intensive at *c.* 6100 calBP (Fig. 2a, 2b).

What happened at the same time on Ljubljana Marshes? A major change in the composition of vegetation occurred between 6750 and 5600 calBP (roughly at the same time as *Carpinus b.* phase at Mlaka), when beech (*Fagus*) and fir (*Abies*) declined, whereas oak (*Quercus*), alder (*Alnus*) and hazel (*Corylus*) increased (Fig. 2c), but an increase in hornbeam (*Carpinus betulus*, best seen at Podpeško jezero, *Gardner 1999b*) was less significant than at Mlaka. An increased percentage of herb pollen after 6600 calBP and anthropogenic/grazing indicators (*Plantago l.*) suggest that the landscape became slightly more open, which can be associated with human activity at the Resnikov prekop settlement, located *c.* 1.5 km south of the coring location.

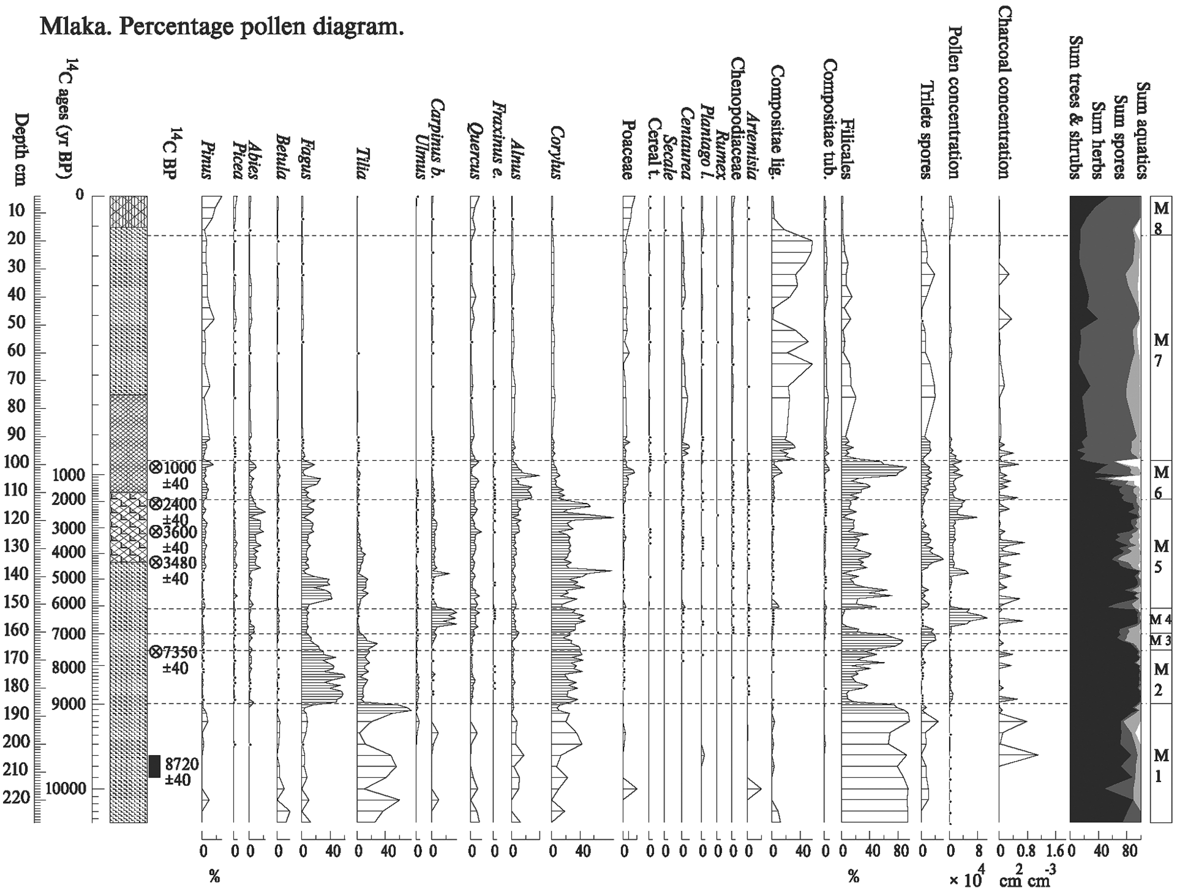
Middle Holocene

In the second half of the Holocene, shade-tolerant tree taxa started to increase in both study regions. In Bela krajina, beech (*Fagus*) forest spread again after 5700 calBP, but forest composition changed at *c.* 4800 calBP, when beech was replaced by fir (*Abies*) (Fig. 2a). Similarly, an increase in beech on Ljubljana Marshes is dated after *c.* 6000 calBP, but this was very soon replaced by fir, which remained the most important tree taxon until *c.* 4500 calBP, when spruce (*Picea*) and alder (*Alnus*) increased (Fig. 2c). The de-

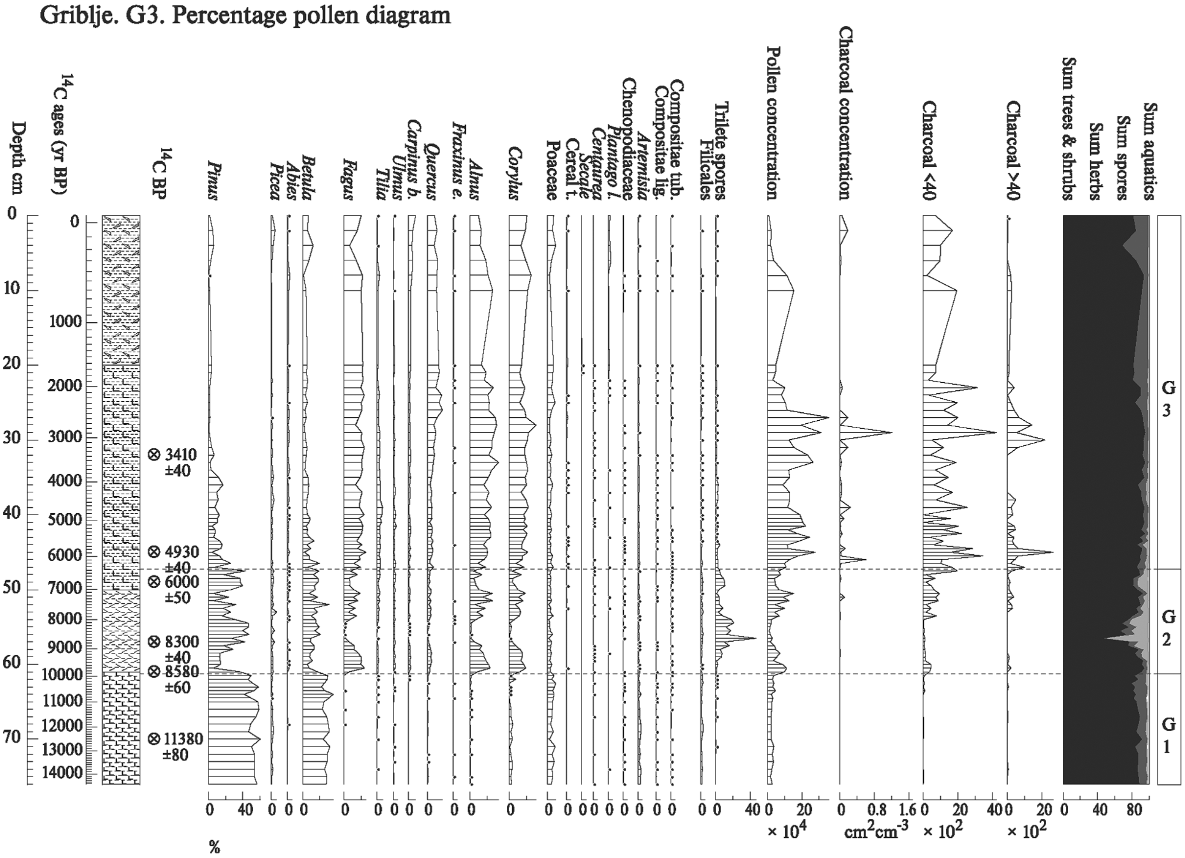
Age (calBP) Bela krajina (Ljubljansko barje)	Vegetation development in Bela krajina (Mlaka, Griblje)	Vegetation development in Ljubljansko barje ('na mahu 1')	Archaeological sites in the vicinity of coring locations and their impact on the vegetation
Middle Holocene			
c. 4800-4500 calBP	Forest composition changes: beech (*Fagus*) declines and fir (*Abies*) increases at Mlaka	Fir (*Abies*) remains high and only declines after *c.* 4500 calBP, when spruce (*Picea*) and alder (*Alnus*) increase	?
c. 5700-4800 calBP	Beech (*Fagus*) forest and decreased human impact on the environment	Fir (*Abies*) increases Human impact continues, but without large-scale forest clearance	Bela krajina: Neolithic/Eneolithic sites near Mlaka (Pusti Gradac) and Griblje ? small scale forest clearance/burning, agriculture and grazing Ljubljansko barje: Maharski prekop (*c.* 5500-5000 calBP?) small-scale forest clearance, agriculture and grazing
Early Holocene			
c. 6700-5700 calBP	Hornbeam (*Carpinus betulus*) phase at Mlaka Human impact on environment (small-scale forest burning, agriculture and grazing), most intensive at *c.* 6100 calBP, when hornbeam woodland was burnt/cut.	Fir (*Abies*) and beech (*Fagus*) decline, whereas oak (*Quercus*), alder (*Alnus*) and hazel (*Corylus*) increase at 6750 calBP, Human impact (agriculture and grazing) Beech (*Fagus*) increases again after *c.* 6000 calBP	Bela krajina: Neolithic/Eneolithic sites near Mlaka (Pusti Gradac) and Griblje, small scale forest clearance/burning, coppicing, agriculture and grazing Ljubljansko barje: Resnikov prekop (*c.* 6600-6500 calBP), small-scale forest clearance, agriculture and grazing
c. 7000-6700 calBP	Forest regrowth through a phase of hazel (*Corylus*) and oak (*Quercus*)	Beech-fir (*Fagus-Abies*) forest	Bela krajina: Neolithic/Eneolithic sites near Mlaka (Pusti Gradac) and Griblje?
c. 7500-7000 calBP	Beech (*Fagus*) decline and more open landscape at Mlaka and Griblje (with slight differences between study sites)		?
c. 9000 (8750) - 7500 (7600) calBP	Predominantly beech (*Fagus*) forest (with occasional small-scale openings of the canopy due to burning), gradually opening up, first 'Ceraealia-type' pollen grain occurs at Griblje	Beech (*Fagus*) forest, fir (*Abies*) starts to increase after 7600 calBP	?
before *c.* 9000 (8750) calBP	Woodland with lime (*Tilia*), oak (*Quercus*), elm (*Ulmus*), hazel (*Corylus*), spruce (*Picea*), increased microcharcoal concentration, more pine (*Pinus*) and birch (*Betula*) at Griblje than at Mlaka	Woodland with spruce (*Picea*), elm (*Ulmus*), lime (*Tilia*), oak (*Quercus*) and hazel (*Corylus*), increased microcharcoal concentration	?

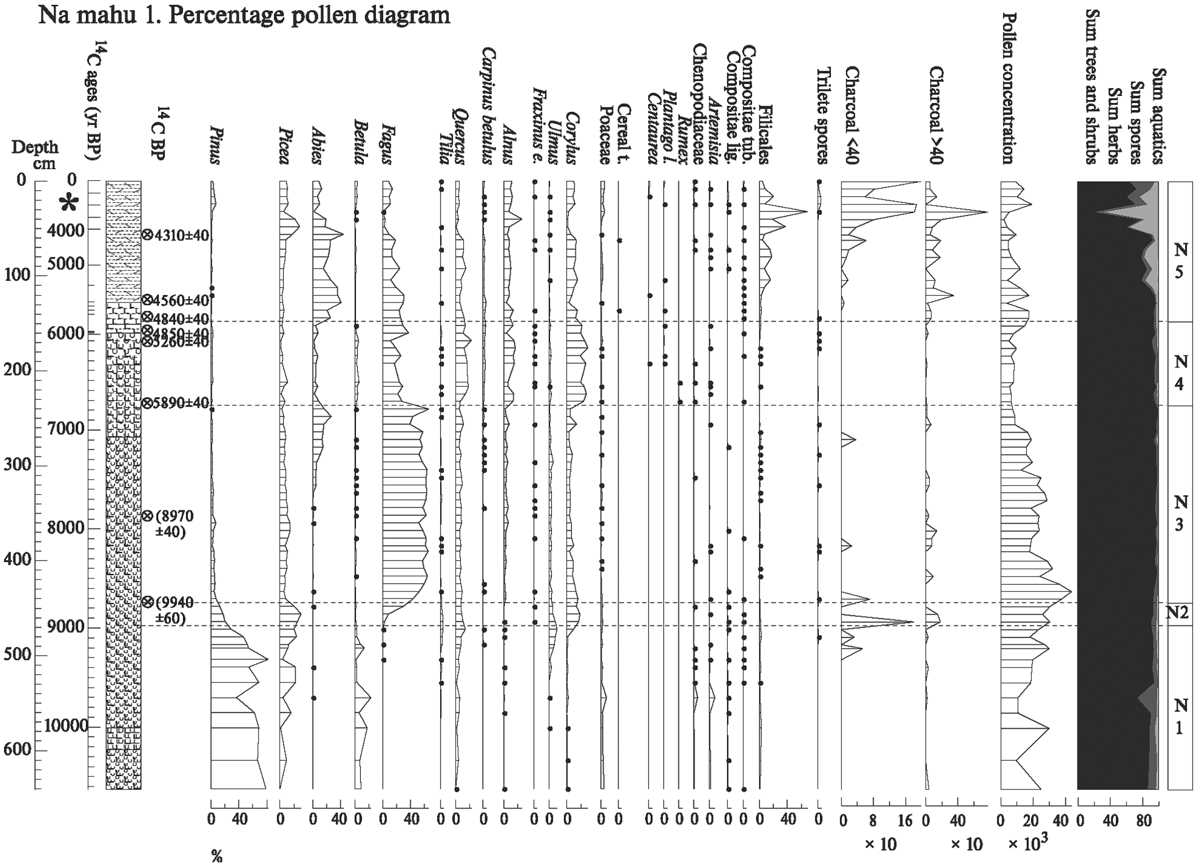
Tab. 1. Comparison of vegetation development in Bela krajina and Ljubljana Marshes regions of Slovenia.

Mlaka. Percentage pollen diagram.



Gribljе. G3. Percentage pollen diagram





Figs. 2a and 2b (on previous page) and 2c (up). Mlaka, Griblje (G3) and 'Na mahu 1' percentage pollen diagrams of selected taxa. * hiatus due to peat cutting/burning on Ljubljansko barje.

velopment of vegetation on Ljubljana Marshes in subsequent millennia cannot be reconstructed, since the younger sediment was destroyed by peat cutting and burning in the 18th/19th century.

Discussion

The human impact on the environment

After comparing the pollen record from both study regions, it appears that the intensity of human impact on the environment in Bela krajina was very considerable. Constant small-scale forest burning and cutting associated with the appearance of anthropogenic indicator taxa and increased biodiversity (palynological richness, Fig. 3) was detected from at least *c.* 6000 calBP, which led to changes in forest composition, increasing differences between the Mlaka and Griblje study sites and the formation of mosaic landscape (*Andrič in press*).

The human impact on the environment on Ljubljana Marshes seems much less intensive; here, thick beech and beech-fir forest persisted until *c.* 6750 calBP. At *c.* 6600 calBP a minor forest clearance (Fig. 2c, 3) and anthropogenic indicator taxa were detected, but the landscape remained very much forested (as already demonstrated by previous research, *Gardner 1999a; 1999b*) and the development of vegetation much less dynamic than in Bela krajina. Does this mean that in Bela krajina, Neolithic/Eneolithic settlements were more numerous and farming activities more intensive (or earlier) than on Ljubljana Marshes? Not necessarily. The differences between Bela krajina and Ljubljana Marshes could be a consequence of the natural features of the study sites (Fig. 1). Both sites in Bela krajina, Mlaka and Griblje, are small basins with diameters of *c.* 30 m and without inflowing or outflowing streams. In such small basins, which receive pollen deriving mainly from local vegetation, small-scale local changes in vegetation are very visible (*Jacobson and Bradshaw 1981*). In bigger basins with complex hydrology, such as Ljubljana Marshes, regional pollen prevails (*Jacobson and Bradshaw 1981*), so local, small-scale forest clearance is less visible in the pollen record. Considering palynological theory, therefore, these results were expected.

Despite all these differences between Bela krajina and Ljubljana Marshes, there is one similarity: an increase

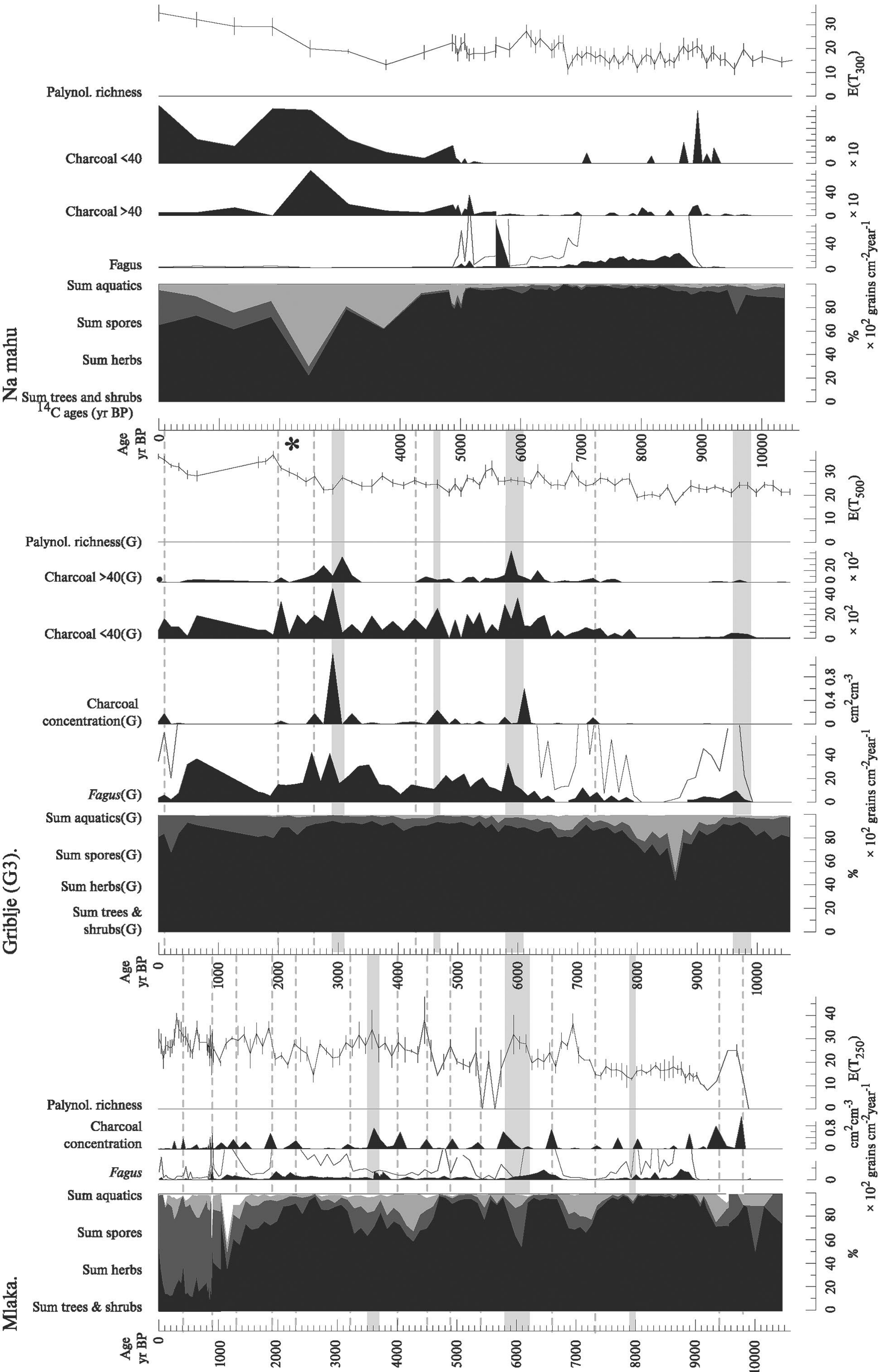


Fig. 3. Landscape openness, microcharcoal record and palynological richness at Mlaka, Griblje (G3) and 'Na mahu 1' study sites. * hiatus due to peat cutting/burning on Ljubljana Marshes.

in biodiversity (palynological richness, Fig. 3) at the beginning of the 7th millennium calBP (*c.* 7000 calBP at Mlaka and 6700 calBP at 'Na mahu 1' core), although no major landscape forest clearance has been detected on pollen diagrams. This could probably be associated with small-scale forest clearance and the activities of early farming communities.

Human impact versus climate

Changes in forest composition and differences between the study regions can be a consequence of climatic fluctuations and/or human impact. Today, summers in Bela krajina are warmer and drier than on Ljubljana Marshes, and it is possible that a similar contrast existed in the past. Therefore, less fir (*Abies*), which needs a humid climate (*Ellenberg 1988*) was growing in Bela krajina than on Ljubljana Marshes. However, fir is susceptible to fire (*Tinner et al. 1999*), and it is possible that in Bela krajina it was suppressed by anthropogenic burning of the landscape. The charcoal record suggests that the vegetation around Ljubljana Marshes was not burnt so often. Why not – because the lake/marshy landscape of Ljubljana Marshes was more difficult to burn, and this landscape was used instead for hunting, fishing and gathering? Due to the complex hydrological conditions, more open land probably already existed (or was regularly formed) near the edge of the lake and/or along floodplains, and very extensive forest clearance for agriculture was not needed (*Willis 1995*)?

Palynological research also demonstrated that differences in the composition of vegetation occurred not only between the phytogeographic regions of Slovenia, but also within each individual region. This can best be demonstrated by the differences between Mlaka and Griblje, where, although the study sites are located only *c.* 10 km apart, the vegetation history was very dissimilar. While at Mlaka (located on predominantly limestone bedrock) human pressure on the environment was intensive throughout the Holocene, and the present-day open landscape had formed by the medieval period at *c.* 1000 calBP, the landscape at Griblje (on sand and clay) remained predominantly forested up to the present. This suggests that areas more suitable for agriculture were probably most intensively used.

Climate

To date no studies of local (regional) climate have been carried out, therefore changes in vegetation (*e.g.* forest composition) can be only compared with the global (Northern Hemisphere) climate. In both study regions beech (*Fagus*) establishment at the beginning of the 9th millennium calBP was presumably associated with climatic change – an increase in precipitation. A similar increase in shade-tolerant tree taxa also occurred in other regions of Slovenia (*Andrič and Willis 2003*) and neighbouring countries (*Abies* expansion in the lowlands of the southern Alps, *Tinner et al. 1999; Gobet et al. 2000; Tinner and Lotter 2006*; and *Fagus* increase in Dalmatia, *Schmidt et al. 2000*) and it seems that this palaeoenvironmental change was of regional extent. It was limited to the areas south of the Alps, where a continental climate regime had already been replaced by an Atlantic climate regime at about 9100 calBP, whereas north of the Alps, the Atlantic climate is associated with the 8.2 ky BP event (*Tinner and Ammann 2001*).

At the beginning of the 8th millennium calBP, beech (*Fagus*) in Bela krajina started to decline, and by *c.* 7300 calBP, the beech forest had been replaced by a more open landscape. *Fagus* decline is limited only to Bela krajina (the Ljubljana Marshes region remained very much forested), so it seems unlikely that it would have been triggered by cold global climatic fluctuations, such as the 8.2 ky BP event (*Alley et al. 1993; Meese et al. 1994; Stager and Mayewski 1997; Haas et al. 1998; Alley and Ágústsdóttir 2005*). However, the impact of precipitation fluctuations might have been more important than the temperature, especially since the 8.2 ky event is assumed to have been dry in the lowlands (*Haas et al. 1998*), with lower lake levels north and south of 50°N and 43°N respectively (*Magny and Begeot 2004*). It is possible that in the 8th millennium calBP climatic differences between Bela krajina and the Ljubljana Marshes were more pronounced than today, and forest composition in Bela krajina was affected by warm and dry summers, whereas at the same time no major change in forest composition took place on the Ljubljana Marshes.

Is it possible that *Fagus* decline was caused by the impact of hunter-gatherers and/or farmers on the landscape? Yes. Admittedly, no archaeological sites reliably dated before *c.* 7000 calBP have been discovered in Bela krajina, but this option cannot be completely ruled out, and further archaeological and multi-proxy palaeo-ecological research of the regional climate is needed.

After *c.* 6700 calBP, the percentage of beech (*Fagus*) and fir (*Abies*) was low in both study regions. This is most probably a consequence of significant human impact (forest clearance and burning), and coincides with a major climatic reversal after 8.2 ka calBP (*Stager and Mayewski 1997; Alley and Ágústsdóttir 2005*), when the oceanic early Holocene climate with enhanced westerly airflow was presumably replaced by a more meridional flow pattern, with anti-cyclonic summer conditions, and thus a dry climate and lower lake levels in the period between *c.* 6800–5700 calBP (*Seppä and Birks 2001*).

After *c.* 6000–5700 calBP, beech (*Fagus*), and later also fir (*Abies*), increase in both regions, with a slightly decreased human impact on the environment. This could have been associated with the cold and wet climate in the 6th millennium calBP (*Mayewski et al. 2004; Haas et al. 1998; Magny 2004; Magny and Haas 2004; Denton and Karlén 1973; Seppä and Birks 2001; O'Brien et al. 1995; Bond et al. 1997*).

Conclusions

The above described differences between Bela krajina and the Ljubljana Marshes are presumably a consequence of different climates (wetter/colder in the Ljubljana Marshes region?), hydrology, topography and bedrock, as well as archaeological settlement patterns and land-use (more frequent landscape burning in Bela krajina) in the past. However, different natural characteristics and thus the pollen source area of individual study sites should not be ignored. While at Bela krajina, where all the study sites are small marshes without inflowing/outflowing streams, the local Neolithic impact on the landscape is very visible, the Ljubljana Marshes study site is much bigger and has a more complex and changeable hydrology, which affected the pollen source area. Here, a weak local human impact on the vegetation is more difficult to detect.

How to proceed: more archaeological research is needed in both regions in order to better understand the economy of past societies and their impact on the vegetation. Especially in Bela krajina, where natural conditions are not very favourable for the preservation of archaeological sites or animal and plant remains, more information about archaeological settlement patterns and the economy during the transition from hunting-gathering to the first farming communities would be very valuable. More multi-proxy palaeo-ecological (palaeo-climatological and palaeo-hydrological) research is also needed, since the impact of climate fluctuations on the vegetation and hydrology was significant.

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The 8200 calBP 'climate event' and the process of neolithisation in south-eastern Europe

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

ABSTRACT – *Climate anomalies between 8247–8086 calBP are discussed in relation to the process of transition farming and to demographic dynamics and population trajectories in south-eastern Europe.*

IZVLEČEK – *Predstavljamo klimatske spremembe med leti 8247–8086 calBP v povezavi s procesom neolitizacije, demografskimi dinamikami in populacijskimi trajektorijami v jugovzhodni Evropi.*

KEY WORDS – *8200 calBP 'climate event'; neolithisation process; population trajectories; south-eastern Europe*

Introduction

Since the Last Glacial-Interglacial transition was marked by rapid and pronounced climatic oscillations during general deglaciation, many investigations have focused on this period. Little attention has been devoted to climate variation during the Holocene period, although the climate was characterised by a wide, abrupt and repeating series of climatic anomalies. The abrupt climate change "*occurs when the climate system is forced to cross some threshold, triggering a transition to a new state at a rate determined by the climate system itself and faster than the cause*" (*Alley et al. 2003.2005*). During the Holocene, these climate changes were manifested by cooling oscillations, tropical aridity, and major atmospheric circulation changes at round 8200, 5200, 4200, 3500, 1200, and 600 calBP (*Mayewski et al. 2004.243–255*; see also *Alley et al. 2003.2005– 2009*) (Fig. 1). The most recent manifestation is known as the Little Ice Age.

Climate anomalies between 82000–8000 calBP

The '8.2 ka BP event' has often been compared to the much wider Younger Dryas event; it has been hypothesised that the latter punctuated the termination of the last glacial with a flood outburst from the final deglaciation of the Laurentide ice sheet. The proposed mechanism for the first Holocene climatic event is similar. Although it has been suggested that the cooling was linked to reduced solar output, the generally accepted explanation points to pulse a melt and cold fresh water released by a sudden drainage of the proglacial Laurentide lakes in North America into the North Atlantic, and to the curtailment and slowdown of North Atlantic Deep Water formation and associated northward heat transport. Ellison et al. (*2006.1929–1932*) showed that the near-bottom flow speed of the Iceland-Scotland Overflow Water, an important component of the Atlantic meridional overturning circulation, declined significantly at the onset of the cold event. Climate models forced with a strong fresh water pulse into the North Atlantic do suggest widespread consequences. Anomalies have been observed around 8200 calBP in palaeoclimate archives on a near-global scale, except for the high southern latitudes. It appears to have been generally cool over much of the Northern Hemisphere throughout this anomaly, as evidenced by major ice rafting, strengthened atmospheric circulation over the North Atlantic and Siberia, and more frequent polar north-westerly (winter) outbreaks over the Aegean Sea. Mountain glacier advances occur in north-western

North America and Scandinavia, and the tree line limit is lower in Sweden. At low latitudes this is a period of widespread aridity. The record of German tree-ring widths shows a distinct low caused by colder and more arid climatic conditions over northern-central Europe. Summer monsoons over the Arabian Sea and tropical Africa weaken dramatically. Widespread and persistent drought occurs in central Asia and Africa, but precipitation increases in the Middle East (*Alley and Ágústsdóttir 2005.1123–1149; Rohling & Pälike 2005. 975–979*).

The 8200 calBP 'climate event' was first clearly noted in Greenland ice core records and in deep sediment cores in Lake Ammersee in southern Germany. In summer 1992 (within the European Greenland Ice Core Project – GRIP) the core was drilled at the top of the Greenland ice cap, some 30 km east of the parallel core of US Greenland Ice Sheet Project 2 (GISP2), which reached bedrock a year later.

Significant changes in chemical concentrations of different elements were detected in certain sections of the cores: GRIP from 1320 to 1340 m, and GISP from 1310 to 1355 m. Sharp anomalies were found in the oxygen isotopic ratios of ice $\delta^{18}O$, indicating rapid cooling. The sharp decrease in atmospheric methane concentration shows a decline of biogenic methane sources generally associated with wetlands in response to aridity in high, mid and low-latitude (monsoon) regions. Anomalies in chloride and calcium accumulations mark a larger-scale atmospheric response: chloride primarily from sea salt indicates strength of atmospheric circulation or distance from oceanic source areas; while calcium, primarily from continental dust, is a signal of dust availability, dryness, and transport vigour from continental regions (*Alley et al 1997.483–486; von Grafenstein et al. 1998.73–81; 1999.1654–1657; Alley and Ágústsdóttir 2005.1123–1149*).

The palaeoclimate records from across Europe show events very probably correlative with the 8200 calBP 'climate event'. The typical signature of cooling in

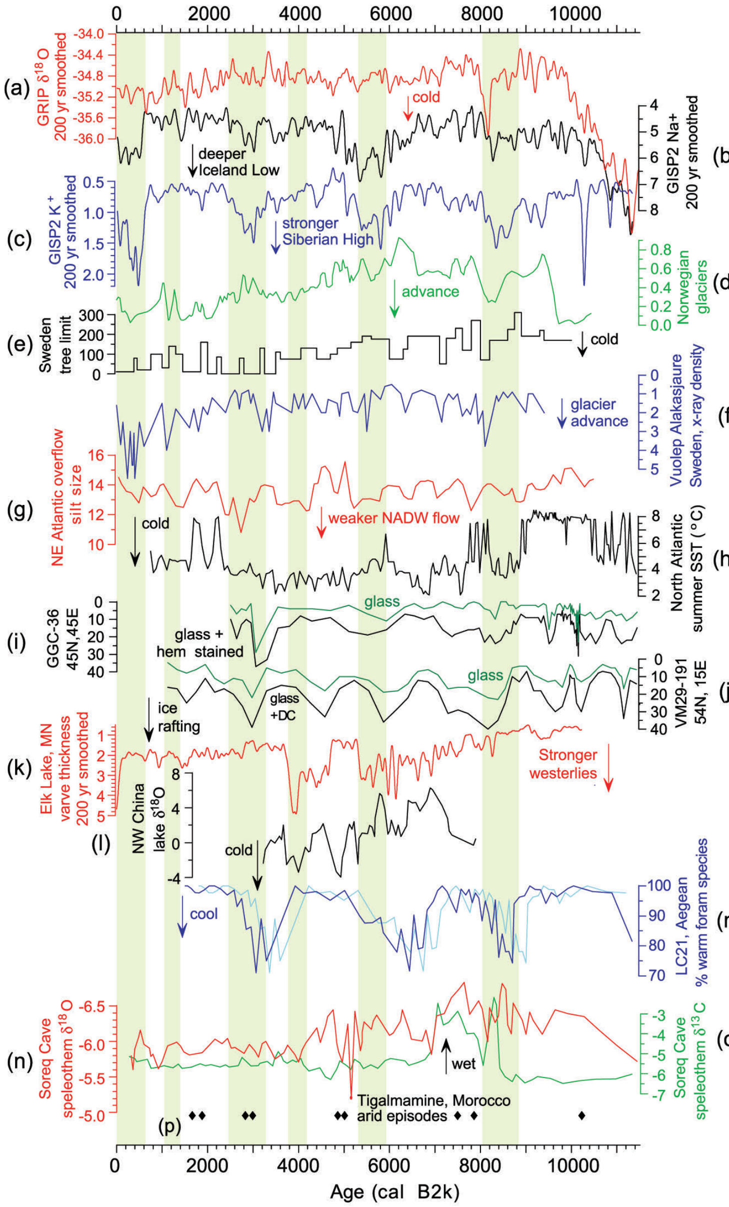

Fig. 1. The sequence of Holocene climate oscillations (from* Mayewski et al. 2004.Fig. 3*).

the Norwegian Sea, the Mediterranean and Adriatic marks the interruption of cooler and drier conditions in Sapropel S1(a) formation and an increase in the appearance of the left-coiling planktonic foraminifer *Neogloboquadrina pachyderma* (*Trincardi et al. 1996.53; Ariztegui et al. 2000.226; Weninger et al. 2005.79–82; 2006.401–420; Rohling & Pälike 2005.975*) (Fig. 2 a–c).

Cooling in Scandinavia and the Baltic region is marked by reduced annual temperatures in the Estonian Lake Rõuge, by the advance of Norwegian glaciers, and by a decrease in the early flowering of *Alnus*, *Corylus* and *Ulmus* pollen productivity and reproduction, which indicates frost damage in early spring

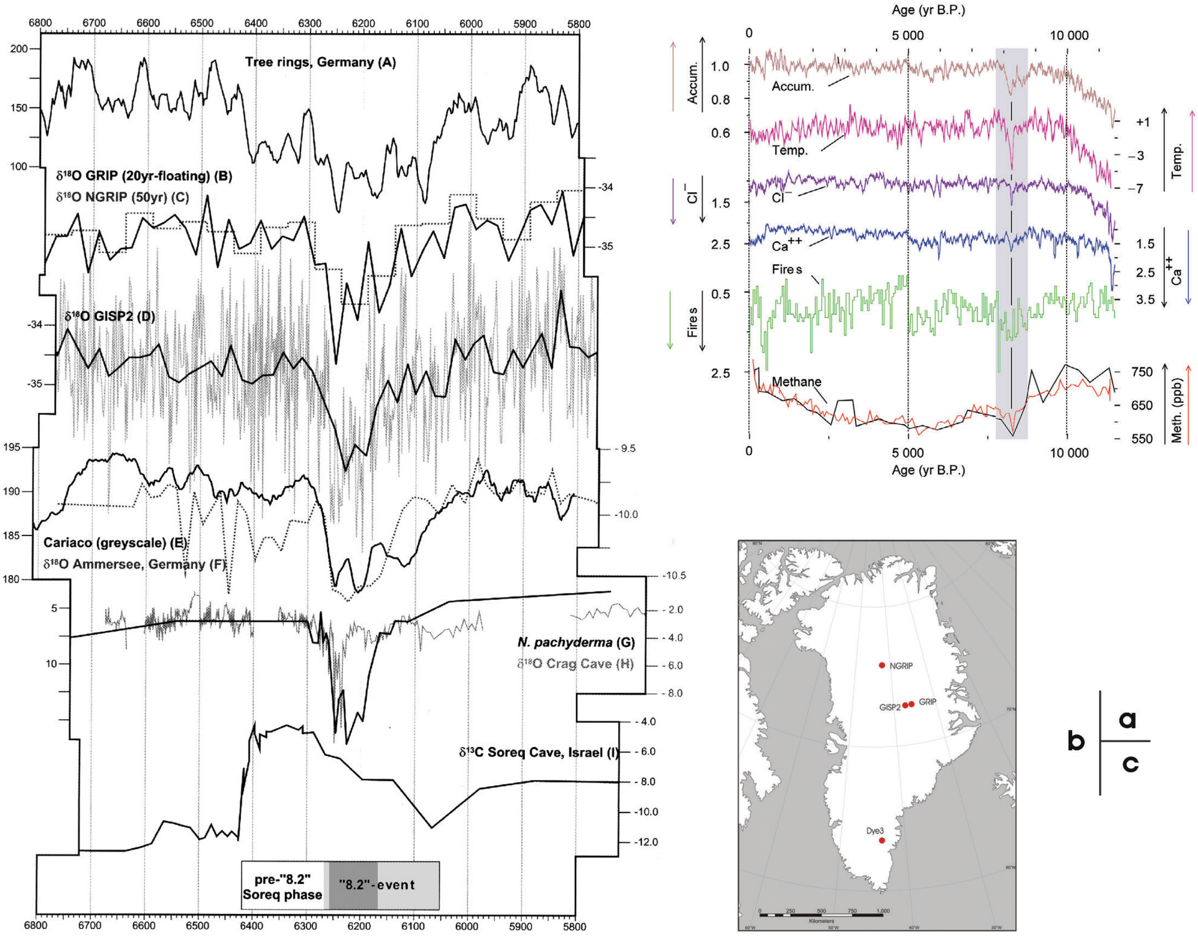

Fig. 2. The climate data from GISP2 and GRIP Greenland ice-cores show changes in concentration of chloride, calcium, methane, temperature, snow accumulation rate, and frequency of fallout of forest-fire smoke mark at* c. *8200 calBP (from* Alley and Ágústsdóttir 2005.Fig 2*) (a). Climate proxies from Europe and Near East that correlate to climate anomalies: oak tree-ring width in Central Europe; appearance of left-coiling planktonic foraminifer* Neogloboquadrina pachyderma *(Norwegian Sea); $\delta^{18}O_{Ostracodes}$ (Ammersee); $\delta^{13}C_{stalagmite}$ (Soreq Cave, Israel); $\delta^{18}O_{stalagmite}$ (Crag Cave, Ireland) (from* Weninger et al. 2006.Fig. 1*) (b). Greenland ice-cores GISP2 and GRIP location (from* Thomas et al. 2007.Fig 1*) (c).

and lower summer temperatures (*Rohling & Pälike 2005; Sarmaja-Korjonen and Seppä 2007.457–467*). A synthesis of well-dated high-resolution pollen records, however, suggests a spatial structure in the 8200 calBP event in northern Europe. The temperate Thermophilous tree taxa, especially *Corylus*, *Ulmus*, and *Alnus*, decline abruptly between 8300 and 8000 calBP at most sites located south of 61°N, whereas there is no clear change in pollen values at sites located in the north European tree-line region. Pollen-based quantitative temperature reconstructions and several other, independent palaeoclimate proxies, such as lacustrine oxygen-isotope records, reflect the same pattern, with no detectable cooling in the sub-arctic region. Seppä et al. (*2007.165–195*), thus suggesting a spatial pattern in the 8200 calBP event, with more distinct evidence of cooling in the Baltic region and in southern Fennoscandia than in the central and northernmost parts of the region.

In southern Germany, the abrupt climate change is dendro-climatically recorded in oak trees in the Main valley. Between 8200 and 8000 calBP, the ring widths of oaks were at a low level, implying poor growing conditions during summer. The extraordinarily low deposition rate of trees was synchronous with reduced germination and a shift in the dominant growth trend in the trees, indicative of poor regeneration conditions. After two centuries, normal conditions were re-established. The climate anomaly thus reduced the growth and germination of oak, but did not reduce forest density. Pollen analysis from Germany also shows a short-term climate change, evident as an increase in pine and a contemporaneous decrease in mixed hazel and oak forest, indicating cooler and/or drier conditions (*Spurk et al. 2002.711–712*).

The climate anomaly in the Levant was detected in stalagmites in Soreq Cave in the Judean Mountains in central Israel, where periods of wetter conditions from 8400 to 6900 calBP were interrupted by a dry period at 8250–8000 calBP (*Bar-Matthews et al. 2003.3181–3199*). The Dead Sea sedimentary record indicates a rapid drop in lake level at 8100 calBP, and the rise of the lake some 300 years later (*Migowski et al. 2006.421–431*).

The anomaly, however, was not detected in Anatolia, neither from Lake Gölhisar, located in the Taurus Mountains in south-west Turkey, nor from Lake Van in eastern Turkey (*Eastwood et al. 2007.327–341*). The interpretation of the data can be biased because of rough sampling, which may be reflected in the low temporal resolution of stable isotope and pollen data.

A similar climate anomaly was recorded in the stalagmites in Carburangeli Cave in Sicily. The wet phase, comprised of periods of high rainfall in winter from 8500 to 7500 calBP, was interrupted by a prolonged, relatively dry period centred at around 8200 calBP (*Frisia et al. 2006.388–400*).

A weak isotopic signal, recorded in the stalagmites in Poleva Cave in the Danube Gorge in Romania indicates temperature changes that correspond to a short-term cold event (*Constantin et al. 2007.322–338*). No evidence of anomalies corresponding to the 8200 calBP 'climate event' has been found in the Teleorman Valley, a tributary of the Danube in the Romanian Plain, although the remaining sequence of alluvial deposits shows changes in river activity and accelerated sedimentation around 12 800 calBP, 4900–4800 calBP, 4000–3800 calBP, 3300–2800 calBP, 1000 calBP, and within the past 200 years (*Howard et al. 2003.271–280*).

In southern-central Europe, pollen spectra show pronounced and immediate responses and a restructuring of terrestrial vegetation in response to the climatic change at 8200 calBP. A sudden disappearance of *Corylus avellana* (hazel) was accompanied by the rapid expansion of *Pinus* (pine), *Betula* (birch), and *Tilia* (lime), and by an invasion of *Fagus silvatica* (beech) and *Abies alba* (fir). Temporary expansions of *Betula* and *Pinus* are dated at 8170–8050 and at 8120–8000 calBP, respectively, whereas the disappearance of *Corylus* occurred between 8170 and 7950 calBP. This change in vegetation reorganization is thought to relate directly to annual temperatures decreasing by about 2–3°C, and to increased moisture availability (see below). The rapid retreat of drought-adapted *Corylus* was probably caused by taller and longer-lived trees (*e.g. Pinus, Betula, Tilia, Quercus, Ulmus, Fraxinus excelsior*) forming dense and more shaded stands. In the long term, these trees were in their turn overwhelmed across the continent by the stepwise expansion of *Fagus* and *Abies* (*Tinner and Lotter 2001.551–554; 2006.526–549*).

For the southern Balkans, Bordon (*et al. 2007*; see also *Denèfle et al. 2000.423–432*) suggests rainfall seasonality changes during this climate event, with a drastic decrease in autumn to spring precipitation, and considerable falls in temperature. This suggestion is based on a re-evaluation of pollen-climate transfer functions applied to the Holocene pollen sequence of Lake Maliq and Lake Ohrid in Albania, and Lake Ioannina (Pamvotida) in Epirus in Greece.

The reconstruction of climatic parameters from European lake-level fluctuation data suggests distinct regional patterns of hydrological change in response to the 8200 calBP 'climate event'. Regions at mid-latitudes between around 43° and 50°N underwent wetter conditions in response to the cooling, whereas northern and southern Europe was marked by a drier climate. The hydrological tri-partition of Europe has been thought to relate to a shift between two prevalent climatic modes. A strong high-pressure system over Central Europe, connected with enhanced westerly (humid) airflow in Scandinavia, was important before 8200 calBP. Thereafter, the high-pressure field over Central Europe weakened and a low-pressure anomaly over western Ireland became established, allowing the rerouting of humid air masses towards Central Europe. This new, persistent setting in atmospheric circulation would have induced more humid oceanic conditions in Central Europe (*Magny et al. 2003.1589–1596*) (Fig. 3).

The records from Lake Annecy in the French pre-Alps, Le Locle in the Swiss Jura, Soppensee and Haas at Wallisellen-Langachermoos, a former oligotrophic lake on the Swiss Plateau, and Lago di Mezzano in north-central Italy show a sequence of lake level maxima (preceded and followed by lake level minima) that correlates to the 8200 calBP cold event. The increasing moisture was observed in Schleinseeand in Germany, and a parallel increase in river discharge was recognized in the middle Rhône basin and in the Durance Valley in France. A fall in water level in the same period was recorded in Lake Siles in southern Spain, in Lago di Vico in central Italy and lakes Albano and Nemi in Central Italy (*Magny and Schoellammer 1999.183–197; Magny et al. 2003. 1591–*

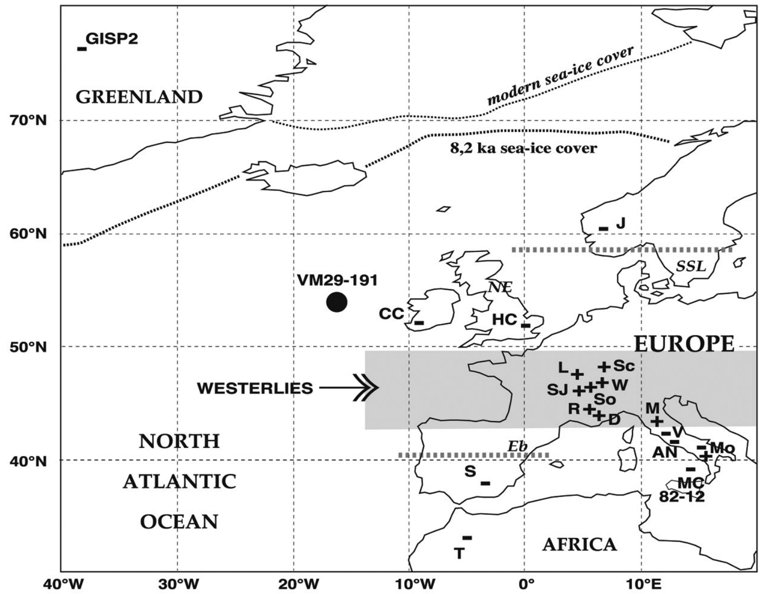

Fig. 3. The hydrological tri-partition of Europe. Shaded area marks mid-European zone with wetter conditions and marked lake-level maxima (+) and minima(–) that correlates to 8.200 calBP cold event. AN – lakes Albano and Nemi, L – Le Locle, M – Lago di Mezzano, Mo – Lago Grande di Monticchio, S – lake Siles, Sc – Schleinsee, SJ – Saint-Jorioz, So – Soppensee, T – lake Tigalmamine , V – Lago di Vico (from* Magny et al. 2003.Fig.2*).

the global scale. Alley and Agustsdottir (*2005*) discuss the contrast between longer anomalies (several centuries) at some sites and short, high-amplitude anomalies at others. Recent calculations show that the cold event in central Greenland started at 8247 calBP, and ended at 8086 calBP. The event was asymmetrical, with considerable decadal variability in the record as shown by the presence of relatively warm spikes at around 8220 and 8160 calBP, within which there is a central cold event of 69 years, when values were significantly below the Holocene average.[1] The length for the full event is calculated at 160.5±5.5 years, and 69±2 years for the central event (*Thomas et al. 2007.72–76*) (Fig. 4). A similar duration of 180 years was estimated for the isotopic anomaly in Ammersee in central Europe (*von Grafenstein et al. 1998.77*).

1593) (Fig. 3). The abrupt climate deterioration (cold and wet period) was recognized recently in the sediment core from the Alpine lake Oberer Landschitzsee, located at the southern slope of the Niedere Tauern in the Austrian Central Alps (*Schmidt et al. 2006. 499–500*).

The contrasting patterns of hydrological change were confirmed by radiocarbon dated fluvial deposits and river dynamics in Poland, Great Britain and Spain, indicating the period was particularly dry (*Macklin et al. 2006.145–154; Starkel et al. 2006.24–33; Thorndycraft and Benito 2006.34–41*). The dry climatic conditions and lake level fluctuations observed in southern and northern Europe have equivalents in major falls in water level reconstructed for the event in African tropical lakes (*Gasse 2000.189–211*) due to lower sea surface temperature and weaker evaporation, which fully accords with the interruption of Sapropel 1 formation in the Mediterranean, as mentioned above.

However, there is considerable imbalance in interpreting the rapidity, duration, and extent of the 8200 calBP 'climate event' on

The paleoclimatic records from across Europe clearly show that these cold conditions spread beyond Greenland, but as Rohling and Pälike (*2005. 975–978*) have pointed out, at most locations out of the North Atlantic the signals around the event are smaller, and these sudden climate changes appear superimposed on a longer period of 4 to 6 centuries of cooling, beginning as early as 8600 calBP. It was not related to the impact of a slowdown in North Atlantic Deep Water formation, but to variations in solar radiation and output fluctuations. Thomas et al. (*2007.77–79*) on the other hand suggest that a re-examination of chemical data in the ice core records shows smaller changes in the chemical deposition of Ca and Cl than those reported previously, which could reflect

Age of markers in the 8.2 ka event

Event	Depth (GRIPm)	Age (GICC05yr BP)	Age (GICC05yr b2k)
Start	1340.12	8247	8297
Start central event	1336.45	8218	8262
End central event	1329.96	8141	8191
End	1324.77	8086	8136

Fig. 4. The age of 8200 calBP 'climate event' (from* Thomas et al. 2007.Tab.1*).

1 The tripartite nature of the 8200 calBP 'climate event' has also been observed in French and Swiss lake sediments at Lake Annecy and Haas at Wallisellen where two lake-level maxima was separated by a lowering episode (*Magny et al. 2003.1592*).

small changes in Asian conditions and only minor changes in atmospheric circulation. There was, however, an alternative hypothesis of climate mechanisms and precipitation climatology in the eastern Mediterranean, western Asia, and the Indian subcontinent, whether linked to North Atlantic oscillation, or solar radiation variability, suggested by Staubwasser and Weiss (*2006.372– 387*). They believe that a change in the subtropical upper-level flow and its steering of precipitation over the eastern Mediterranean and Asia was responsible for the reduced winter rainfall and long-term trend towards drier conditions in the Levant, and for the weakness of the Indian monsoon over its northernmost region in the Ganges and Indus catchments and the western Arabian Sea.

Settlement context	Sample reference	^{14}C age (BP)	Calendric Age calBP
Deszk	OxA–9396	7030 ± 50	7870 ± 55
Miercurea Sibiului	GrN28520	7050 ± 70	7875 ± 67
Pitvaros	OxA–9336	7060 ± 45	7898 ± 41
Vinogradi-Bečej	OxA–8557	7080 ± 55	7909 ± 48
Foeni-Salas	GrN–28454	7080 ± 50	7910 ± 45
Ocna Sibiului	GrN–28110	7120 ± 60	7940 ± 56
Magareči Mlin	GrN–15973	7130 ± 60	7946 ± 57
Gura Baciului	GrA–24137	7140 ± 45	7971 ± 30
Perlez-Batka	OxA–8605	7145 ± 50	7973 ± 34
Donja Branjevina	GrN–15974	7155 ± 50	7981 ± 32
Topole Bač	OxA–8639	7170 ± 50	7993 ± 33
8200 calBP 'climate event' in Greenland			**8247–8086**
Padina H17	OxA–11103	7315 ± 55	8118 ± 61
Padina H12	OxA–9034*	7755 ± 65	8530 ± 64
Lepenski Vir H 54	Z–143	7300 ± 124	8142 ± 128
Blagotin Poljna	OxA–8608	7480 ± 55	8239 ± 65
Poljanica Platoto	Bln–1571	7535 ± 60	8326 ± 68
Nea Nikomedeia	P 102	7557 ± 91	8348 ± 96
Anza	Lj–2519	7560 ±70	8355 ± 65
Hoca Çeşme IV	Bln–4609	7637 ± 43	8449 ± 42
Sesklo 'Initial Neolithic'	P–1681	7755 ± 97	8570 ± 111
Achilleion Ia	LJ–4449	7540 ± 140	8346 ± 137
Argissa ENI/II	H–889–3080	7760 ± 100	8582 ± 120
Knossos X	BM–278	7910 ± 140	8780 ± 120
Franchthi 0/1	P–2094	7930 ± 100	8798 ± 148

Tab. 1. The list of settlement contexts and the ^{14}C sequence of initial appearances of farming and pottery (Lepenski Vir and Padina) in the Balkans, south-eastern part of Pannonian Plain and Southern Carpathians (**Boyadziev 1995.149–191; Borić and Miracle 2004.341– 371; Whittle et al. 2002.15-62; Biagi and Spataro 2005.41–50; Eingruber and Thissen on-line 2005*****). The dates are calibrated using the calibration curve CaLPaL2007_HULU (www.calpal-online.de). *The OxA-9034 (*****Canis familiaris, tibia*****) was not corrected for the freshwater reservoir effect, as suggested in Borić and Miracle (*****2004.347, 350, tab. 4*****). If we apply it, the date is 200–500 years younger.***

Climate events, the transition to farming and population trajectories

A strong parallelism between climate events and Middle and Near Eastern, and European cultural and social trajectories in the Neolithic was suggested recently (*Staubwasser, Weiss 2006.372–387; Migowski et al. 2006.421–431; Weninger et al. 2005.75–118; 2006. 401–420*). The 8200 calBP 'climate event' was associated with the transition from the Pre-Pottery to Pottery Neolithic, which was marked by the collapse of a 'ritual economy' and agricultural PPN aggregation centres in Levant. The Jericho settlement was abandoned, and the arid period appears to coincide with the temporal abandonment of settlements at Ain Ghazal in the Levant and Catalhöyük-East in Central Anatolia. Weninger et al. (*2005.75–118; 2006.401–420*) suggest correlating the climate anomaly with both a 'great exodus', and 'demic' diffusion, in which Levantine and Anatolian farmers spread from West Asia and the Near East into Europe. Bonsall et al. (*2002(2003).1–15*) propose, on the other hand, that in the hunter-gatherer cultural context at Lepenski Vir, the large stone boulders which were decorated with sculpted representations of fish-human beings represented material commemorations of the 8200 calBP 'climate event', which caused floods in the Danube Gorge in the Northern Balkans.

The climate oscillations undoubted chronologically correlates with the process of Neolithisation of south-eastern Europe, and certainly affected regional environmental conditions. How it affected contemporary hunter-gatherers and farmers and the process of transition to farming is a question still awaiting an answer. Weninger et al. (*2006.418*) have proposed that 'the rapid spread of early farming to South-East Europe can be most plausibly understood as a direct and immediate reaction to abrupt climate forcing'. This scenario seems unlikely, as they showed that the first agriculture in the Peloponnesus, and the southern, central and northern Balkans clearly predate this event (*L.c. 411–417*). Pottery, on the other hand, appeared in hunter-gatherer contexts at Lepenski Vir and Padina in the Danube Gorge, in the most northerly region of the Balkans, before this climatic oscillation. Animal domesticates, however, arrived there immediately after. Domestic goat *Capra hircus*, pig *Sus scrofa domesticus* and domestic cattle *Bos Taurus* were found in association with pits and a domed oven that were not in direct association with the trapezoidal buildings at the site. Animal domesticates were introduced into the Lepenski Vir culture context as early as 7891 ± 38 calBP (see *Borić and Dimitrijević, this volume*).

The ^{14}C series (Tab. 1) shows that the full 'Neolithic package' crossed the Danube and entered the southernmost Pannonian Plain after the climate event, and stopped there for several centuries.

There are not many analyses of climate records of the early and middle Holocene in Central and Southeastern Europe. We may hypothesise, however, that the 8200 calBP 'climate event' and associated increase in regional precipitation, floods, and restructuring of terrestrial vegetation at mid-latitudes between around 43° and 50°N (see above) hampered the Neolithisation of south-eastern and central Europe. The Morava River valley, which was traditionally recognized as a river waterway connecting the southern Balkans to north-central Europe supposed to be badly affected by river dynamics and floods. It is well known, on the other hand, that prior to hydrological regulation, the Pannonian Plain was flooded at least twice a year (*Sümegi and Kertész 2001.405–415*) (Fig. 5), and perhaps we may speculate (in agreement with the model in *Magny et al. 2003.1589–1596*; see also *Szlavik and Rátky 2001.121–140*) that there was an extension of wetlands and long-term flooding in the region at the time of the climate event. In one of the modified models of 'demic' diffusion it was suggested, paradoxically, that the migrating farmers preferred to occupy the flood plains of rivers and lakes in south-eastern Europe, where they supposedly reached 'saturation' in population growth, which allowed them to drive 'demic' diffusion to the next floodplain towards the Carpathian basin (*van Andel and Runnels 1995.481–500*). The settlement distribution pattern in the Middle Morava valley is instructive, where a single site of 28 Early Neolithic sites of Starčevo culture (phase I) was located in the river valley. All the sites are distributed within the surrounding hilly areas (*Vetnić 1998.76–77; Perić 204.26–27*) (Fig. 6). It is worth remembering that Todorova and Vajsov (*1993.62*, see also *Todorova 2003.267*) have already pointed out the reverse direction of Neolithic dispersal in north-eastern Bulgaria. They hypothesised that because of climate instabilities and falling temperatures after 6000 cal BC, farmers migrated southward, settling northern Thrace.

We do not know, if and how the 8200 calBP 'climate event' affected hunter-gatherer and farming population demographics in the various climatic (wetter and drier) conditions in various Eurasian regions. We know that an increase in infectious diseases has been noted in various regions following a transition from foraging to farming subsistence (*Larsen 1997.85–87*). We also know that climate change, including rising and falling temperatures, and greater frequency and magnitude of extreme events such as drought and flood, appear to be inevitable influences on effective population size. Variations in population size bring us to two important population processes that shape populations: bottleneck and founder effects. Both processes result in a reduced ancestral population size, but founder effects relate to the process of colonization and the genetic separation of a subset of the diversity present within the source population (hypothesised farming migration from Near East). In contrast, bottlenecks refer to dramatic reductions in size of a single, previously larger, population and the loss of prior genetic diversity. This may relate to hunter-gatherer and farmer populations in flooded plains and between river valleys

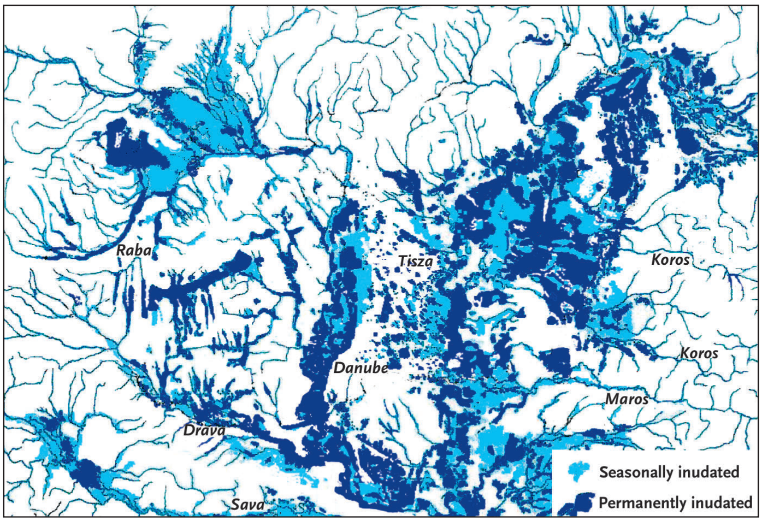

Fig. 5. The Pannonian Plain: periodically and permanently flooded areas prior to the flood control and drainage in 1830 (from* Szlavik on-line www.om.hu/research/framework5/ist/copenhagen/SZLAVIK/FMIS_Hungary.ppt*)

in the Balkans, the Pannonian Plain, and the Carpathians, who were isolated during the climate event.

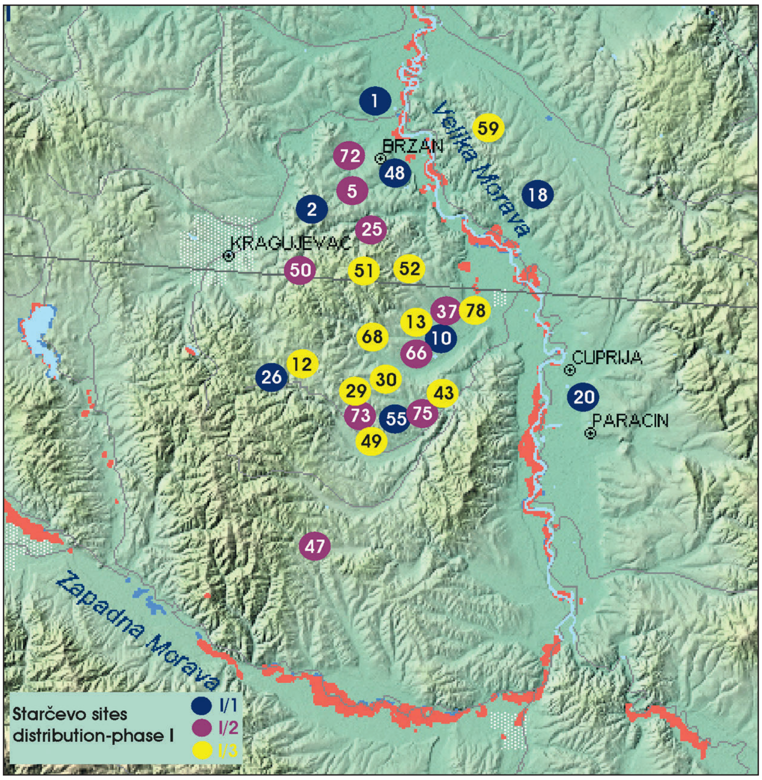

Fig. 6. The Middle Morava Valley and Early Neolithic farmers' settlement dispersal. The 2006 floods in Morava River basin is marked in red. The figure is based on a relief map www.reliefweb.int/rw/rwb.nsf/db900sid/LPAA-6QJMBS?OpenDocument and Maps no. 3 and 4 from Perić (*2004.26–27*).

Population geneticists correlate the paternal Y-chromosome gene flow, objectified in Palaeolithic-Mesolithic sub-haplogroup I1b* and Neolithic haplogroups J and E, with the Neolithisation of south-eastern Europe and the Mediterranean (*Budja 2005. 56–60*). Haplogroup J is subdivided into two major clades, J1 (M267) and J2 (M172). Their estimated ages, particularly those calculated using microsatellite mutation rates (YMRCA) at around 8400 and J2 at 3600 years ago, demonstrate that the genetic record of south-eastern Europe and the Mediterranean can be read as a palimpsest of repeatedly overwritten demographic dynamics (*Di Giacomo 2004. 364–366; Novelletto 2007. 158–160*); and, we suggest, they may have correlated with climate anomalies in the Neolithic and Bronze Age. Additionally, the expansion time for clade V13 within haplogroup E (M78) was calculated at about 5300 years ago (*Cruciani et al. 2007.1307*). It seems that these population trajectories fit well with the cooling periods, aridity, and major atmospheric circulation changes in the Holocene mentioned in the introduction.

In place of concluding remarks

The 8200 calBP 'climate event' which abruptly and drastically changed global environments during the transition to farming has been overlooked in almost all the archaeological interpretations of the Neolithisation process in Eurasia. It was overlooked in reconstructions of demographic dynamics and population trajectories, whether based on analyses of classical and DNA markers within modern populations, or on ancient DNA records from Mesolithic and Neolithic populations.

The climate anomalies chronologically correlate with the process of Neolithisation in Near East and south-eastern Europe, and they certainly affected regional environmental conditions. How it affected the contemporary hunter-gatherer and farmer populations and the process of transition to farming is a question that still needs to be answered. We may hypothesise that the collapses of a 'ritual economy' and agricultural PPN aggregation centres in the Levant correlate with the cooling period and aridity. The initial agriculture in Peloponnesus and most of Balkans predate the climate event at around 6200–6000 cal BC, but the 'Neolithic package' seems to have crossed the Danube and entered the southernmost region of the Pannonian Plain after the major climate fluctuations, and stopped there for centuries.

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Some indications of shamanism in Arasbaran rock carvings

Jalal Rafifar*
Department of Anthropology, Faculty of Social Sciences, University of Tehran, Iran
jrafifar@ut.ac.ir

ABSTRACT – *Four seasons (1998–2002) of ethnological and archaeological researches in the northern part of the Iranian Azerbaijan have revealed hundreds of carved and scratched drawings and figures on rocks and in subterranean rock-shelters. An anthropological study reveals remarkable information about the situation and the limits of the cultural domains, the cultural relations and the process of cultural diffusion in the prehistorory at the intersection of Anatolia, Caucasus, Zagros and the central plateau of Iran. The human and animals figures and signs are contextualized and iconographicaly interpreted. The animal symbolism is discussed in the contexts of ancient Iran and Caucasus art and tradition.*

IZVLEČEK – *Štiri sezone (1998–2002) etnoloških in arheoloških raziskav v severnem delu iranskega Azerbejdžana so razkrile stotine vklesanih in vpraskanih risb in figur na skalah in v spodmolih. Antropološko proučevanje razkriva pomembne informacije o situaciji in mejah kulturnih domen, kulturnih povezav in o procesu prazgodovinke kulturne difuzije na področju Anatolije, Kavkaza, pogorja Zagros in Centralnega iranskega platoja. Človeške in živalske podobe ter znaki so postavljeni v kontekst in ikonografsko interpretirani. Simbolizem smo pretresli v kontekstu staro iranske in kavkaške umetnosti ter običajev.*

KEY WORDS – *Arasbaran; Soungoun; Ghegham; Gobustan; Rock Carving; Shamanism; Azerbaijan*

Introduction

Rock carving art has been found and recognized in at least three forths of the rocky regions of the world. In ancient times, it seems that rocks were considered as noticeable places for artworks and perhaps for the transmission of significant human messages and concepts to future generations. Qualitatively, such art is unique. Although a large part of it has been lost or not discovered yet, a huge volume of such works have been unearthed and studied. The experts believe that rock-carving art dates to prehistoric communities *i.e.* before the invention of alphabets. Hence, many experts believe it the first and an epoch-making step towards the invention of alphabets. Scholars work on this art for two reasons:

● It is one of the most important documentary instances of human history (especially the prehistoric period). The only and best way to find out the different layers of the human mind's structures and their evolution through time is to study rock-carving art. Moreover, it helps to have a better understanding about the infrastructure of the human mind today.

● As it plays a communicative role by employing symbolic signs which led to the invention of alphabets, scholars have an interest in working on the art.

Emmanuel Anati, a European expert on rock carving art, says: "*Perhaps drawings and rock carvings*

* J. Rafifar is Professor at the Department of Anthropology at the University of Tehran. He would like to thank Mr. Shervin Moazami Goudarzi, who translated the article.

prior to the invention of alphabets constitute a languages with its own grammar and syntax." (*Anati 1998*). This Italian expert believes that almost all of the prehistoric arts concentrated on three main subjects: sexual matters, food and territory (*ibid.*). It seems that the human being's concerns have not changed a lot through history.

Fig. 1. Iran and Central Asia region (area where carvings discussed in the text are found).

The assemblage of Arasbaran rock carvings is a huge and precious volume of rock carving art in this region, and one of the most distinctive assemblages of its kind identified in Iran. The reason for the significance of the drawings is the thematic distinction used in this assemblage in comparison with others in Iran.

This assemblage is dispersed over a wide area from the north of Iranian Azerbaijan and at least two provinces of Ardabil and Eastern Azerbaijan. It can be divided into three sub-assemblages:

❶ The assemblage of Soungoun-Varzaghan in Ghoushaghdash Mountains (region of Ahar);

❷ The assemblage of Hourand-Laghlan and Kalibar (region of Arass);

❸ The assemblage of relics of Razi-Gay Baglou and Hajj Hussein Countryside (in environs of Meshkinshahr) (Fig.1).

As the present article is too short to introduce all the works, only the assemblage of Soungoun is presented, because it is the most important one and perhaps contains the greatest variety of drawings in this region (*Rafifar 2002*).

The main objective of the article is to analyze and comment as far as possible on the function of such drawings. These drawings have been studied in a field research operation. Research in the field shows that the oldest and richest ones are on the rocks situated in the Ghoushaghdash Mountains close to the copper mine of Soungoun. This article targets and deals only with the assemblage at Ghoushaghdash.

The latter assemblage contains hundreds of carvings and paintings, which can be divided into three groups:

❶ The first group, and the smallest in number of drawings, comprises a few human and animal images. They are located at the beginning of Ghoushdash Rocks. There are three natural shelves lying over each other vertically that are incised with some drawings (Fig. 2).

The main feature of this part is the conventional gestures in the human drawings. Two human beings stand face to face (Twins) and each of them has raised one of his hands in the opposite direction toward the other man. There are drawings of what appear to be ibex on each of these shelves.

❷ The second group of drawings is in a stone shelter (Soungoun) and its surrounding rocks. This assemblage comprises a unique collection of hundreds of drawings: human beings (all in conventional and repetitive gestures), as well as animal drawings (mainly ibex, deer, gazelle and snake), and finally a series of signs cover the walls and ceiling of the shelter and neighboring cliffs on a regular basis (Figs. 3, 4 and 5).

❸ The third group of drawings has been identified at a distance of tens of meters beneath another small shelter. Women in dancing in pairs or groups can be seen in all of these drawings (Fig. 8). Unlike men,

Fig. 2. The first part of Soungoun assemblage (figures of twins).

their clothes are skirts, not pants, and they are raising one hand and keeping the other down, very similar to Sufi costumes and dances. The interesting point here in this small shelter is that, in contrast to the previous shelters, the motif of all drawings is the human being only, and in very few of numbers (approximately 10 drawings) and astonishingly there are no animal drawing.

The precise number of drawings cannot be calculated because damages affected the drawings and as a result they cannot be easily distinguished one from from another. Only a part of the drawings is distinguishable and countable. We estimate that they may be more than five hundred drawings spreading over an area of 50 square meters.

A glance at the mode of presentation and composition of the main scene in the principle shelter (Soungoun)

The Twins drawing has been situated at the highest point of the shelter and right in the center of the scene. This drawing, which has been already mentioned, has been repeated twice in a short space.

It seems that this composition is not only one of the most important, but is also undoubtedly the one possessing the key motif (a symbol of a certain concept) (Figs. 2, 3, 11). The other drawings stand beneath the Twins drawing. In this assemblage, most of the human drawings are similar to the Twins, but in some instances they are sometimes singular and scattered among the animal drawings and sometimes as Twins all over the walls of the principle shelter.

The only painted work in this assemblage seems to be a drawing of a buck. It is painted in ochre and is noticeably bigger than the other drawings (its length is 40 centimetres). The length of other drawings does not exceed 20 centimetres. There are drawings of four men in the four corners of the buck. Each has raised a hand, while the other hand is down (as mentioned before). The latter drawing has been situated in the centre of the scene because of its paramount importance (Fig. 7).

Fig. 3. The Soungoun principal shelter, general view.

At first sight, it seems that these men surrounded the animal from four directions, but no sign of hunting can be observed. The composition here shows a ritualistic situation. There are other instances of seven men in the same situation. In one of the drawings that has been carved, it is fairly distinguishable that there is a dagger-like outgrowth on the left side of the men's waist. There are two drawings in which the directions of the dagger-like outgrowths are identical (Fig. 6), and just close to this composition, a drawing comprising a pair of snakes can be distinguished.

Most Soungoun drawings are of ibexes and gazelles. In addition to the animal-human figures, some other conventional drawings can be seen that certainly and meaningfully symbolize something. They have been employed to complete the concepts of different scenes and to convey the ideas much more precisely. Some of these drawings are in the form of crosses and others in a circle and or several circles that interrupt each other. There is a strong probability that all of the drawings in this assemblage are conventional. There might be a few drawings that have been accidentally or by taste carved over there. The style employed and the mode of showing the drawings (figures) in connection to each other are mostly under specific and fixed rules.

On the rocks close to the principle shelter of Soungoun at an inaccessible height, one can easily see noticeable numbers of drawings from animals (mainly ibex) and some from human beings making the above-mentioned gestures (Fig. 5).

Before any analysis and interpretation of the drawings, some considerations should be discussed:

Fig. 4. Part of a large, complex panel of the Soungoun principal shelter.

a. With regard to the existing information, the composition of scenes in Soungoun drawings has not been seen anywhere else in Iran. Although thousands and thousands of bedrock drawings have been identified all over the country, none of them can be compared with Soungoun in terms of presentation, composition, status and structure of scenes. On the other hand, it should be mentioned that the identified drawings from the northern Iranian border, especially in some instances in Gobustan in the Republic of Azerbaijan (*Abbaszade 1998*), the Geghama Mountains in Armenia (*Martirossian 1981*) and Tamgaly in Kazakhstan (*Ksica 1969*), have meaningful similarities with Soungoun drawings (Figs. 9, 10 and 11).

Therefore, in the latter situation it can be noted firstly that the Soungoun drawings belong to a culture that expanded its territory toward the northern borders, not in the domestic territory (southern regions), and secondly it proves not only a deep relationship between the drawings of the four above-mentioned assemblages, but also absolutely refutes the theory that the drawings could have been by local inhabitants and shepherds for fun. In other words, the scenes of human being + ibex + deer + serpent in similar gestures and styles in all the regions confound any such theory.

b. The antiquity of these drawings in all assemblages (Gobustan, Geghama and Soungoun) does not differ from the others, and they had to be from the same period of time and belong to one culture.

c. There exist quite different motifs in the Gobustan assemblage in comparison with Soungoun and Geghama (for instance, lion and horse). Therefore, two conclusions can be at the moment put forward:

- The Soungoun and probably the Geghama drawings could be older than some of the drawings of the Gobustan assemblage, as the lion drawing that has been popular in Urartian art and Hittite culture belongs to the near to the end of the second millennium and the early days of first millennium BC. This type of drawing is absent in the Soungoun and Geghama assemblages.

Fig. 5. Part of a large complex panel in the Soungoun shelter.

● Not all the Gobustan drawings belong to one period: the Twins and ibex drawings are older than the lion and horse drawings.

d. The drawings in the Soungoun assemblage are not contemporaneous with the other identified assemblages in the Arasbaran region such as Hourand, the District of Razi, Gay-Baglou and even Daee Mamigh, which are located at a distance of three kilometers from the Soungoun assemblage, because there is no sign of Soungoun key scenes: the Twins in a special pose, serpent, deer and ibex.

Art and its environment

It is necessary to discuss the connection between these artworks and their environment before any analysis of their ideological content.

The natural structure and location selected for presentation of such artworks on bedrocks show a direct connection between such arts with the environment. As the artist or artists of different times and places followed the same pattern, it shows that they observed the same norms, including the selection of rocks that are fairly smooth and large and that can be carved and scraped. Secondly, they are situated in sites that not only can be easily viewed, but also have been, as much as possible, removed from the impact of climatic changes (wind, rain, etc.). For the same reason, these artworks have been mostly found in ca-

Fig. 6. Part of a large complex panel in the Soungoun shelter (twins with daggers).

ves and/or beneath the ceilings and walls of natural bedrock shelters. The artworks under study enjoy most of these norms.

The other noticeable fact is that not all of the people participated in the creation of such artworks. In other words, only some specific persons had to have key roles in this regard.

With regard to the style, techniques, professional qualities, selection of signs and finally the positions and manner of presentation, a small number of people (one or two) had to create the artworks in a short period. The final notion is that these artworks had a public function.

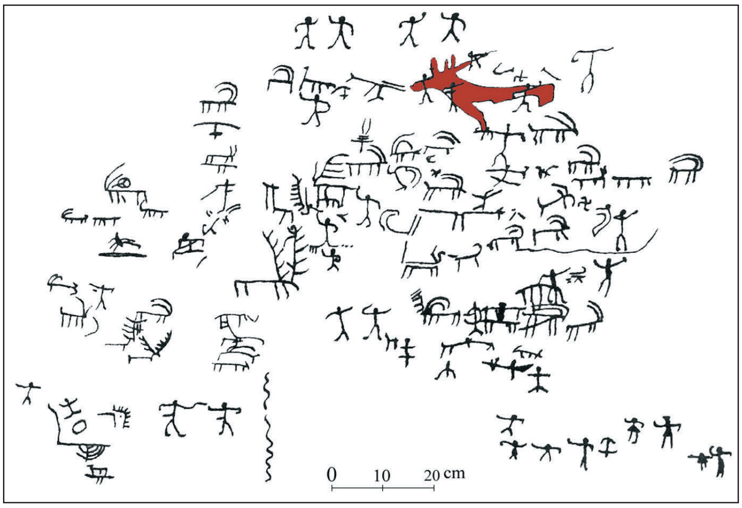

Fig. 7. The Soungoun shelter, general view on carvings.

Semiotics

The differences between these signs indicate an interconnection. Emanuel Annati applies 'syntax' to the manner of connection (the way in which the drawings have been arranged in relation to one another), and 'grammar' to the kind of states and gestures in each drawing. In his opinion, one can identify three categories of sign in most of these assemblages:

❶ Pictographs or mythographs that are mostly identifiable representations of real or imaginary objects and animals or human beings. There are many such artworks in the region under study.

❷ Ideograms are signs or combinations of repeated signs that have been presented in different ways (circle, cross, branches of tree, star etc.). As has already been seen, it can be confirmed that the Soungoun assemblage includes such ideograms. There are many drawings of crosses, intersecting circles and some specific signs.

❸ Psychographs that are neither signs nor resemble any object. Anati believes that these drawings were created as a result of an abrupt psychological discharge and or expression of emotions about life or death, love or hatred, and or any other notions of this kind (*1998*). As such drawings can mainly be found in caves and on portable objects rather than on bedrocks and in open spaces, we do not deal with them in our study.

Generally speaking, the special syntax of bedrock art in the Soungoun shelter is probably a combination of mythographs of known animals (ibex, gazelle, serpent, deer) and a small number of signs related to the ideograms that are mostly images of crosses, circles etc (*Rafifar 2005*).

In order to understand the concepts hidden in these drawings, a vast knowledge of signs that can change through time and space is needed. Therefore, to understand the mythographs, one should be familiar with the mythological and conceptual backgrounds of the land where the artist lived. In this way, we might discover the root concept of these symbolic signs (mythographs) as well as the inhabitants' layers of mind in a specific time and place and, consequently, discover part of the culture of the members of such a society.

The five main categories of art

Emanuel Anati classifies primitive art into five general categories based on style, concept and social structure:

❶ primitive hunters;
❷ primitive gatherers;
❸ later hunters;
❹ pastoralists and herdsmen;
❺ the complex economy (*Anati 1998*).

The art of the region under study falls mostly within the fifth category, because most of the drawings are mythographs containing signs and animals.

It should be noted that the pictorial language of primitive societies is universal. In other words, not only do the styles and the order governing the manner of presentation and selection of images in different re-

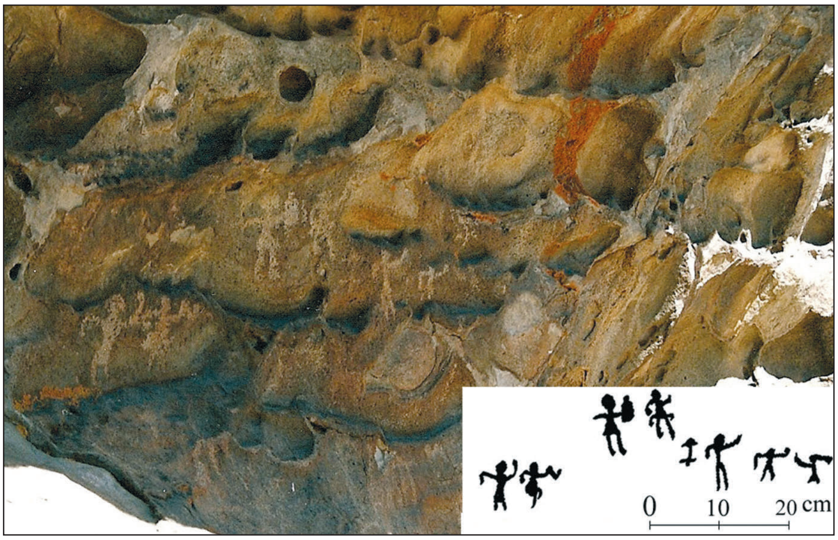

Fig. 8. The third part of the Soungoun assemblage (with dancing figures).

gions of the world observe a specific set of approximately similar regulations, but also this language is a composition of regulated symbolic signs that can show a fairly similar way of thinking. Probably for the same reason, despite the huge time and space gaps between these societies, which make impossible any interaction between them, we may witness astonishing and wonderful similarities in their art: for instance, the image of the 'human palm' in an overwhelming majority of primitive societies all around the world. But no evidence exists to prove that this sign shows a connection between all these societies and has been transferred from one society to another and originates from a certain time and place. It should be remembered that the latter symbolic images appeared around 40 thousand years ago in European Palaeolithic art and have continued to the present time over almost all the globe. This sign has been identified at two sites in Iran: the region of Bastak in Hormozgan Province (*Rafifar 2005.109*), and the Tanbour Mountains of Sirjan in Kerman Province (*Farhadi 1998*). On the other hand, apart from several instances (in Australia), bedrock art is universally mythological and its creators do not live among us any more. Hence, it may not be impossible, but far too difficult to retrieve the minds and beliefs of its creators. The very few survivors having such beliefs and thoughts can be traced to tribes that have lived in recent centuries in some regions of Australia, the United States of America, Africa and perhaps in some regions in Asia and enjoyed such an art. In fact, it should be admitted that we can hardly achieve the real concepts hidden in such assemblages, and even its comparison with later societies cannot lead to relaible conclusions. Moreover, there exists no guarantee that a society which existed in a specific region one hundred years ago had the very same beliefs and thoughts as its ancestors who lived several thousand years earlier and created the bedrock art. But as discussed previously, we should not disregard the common aspects of humanity's patterns of thought.

According to Francfort, two approaches to the petroglyphs (Indo-European or shamanistic) can be considered:

❶ The first approach uses the ancient Indian Vedas and Old Iranian Avesta as the main sources. In short,

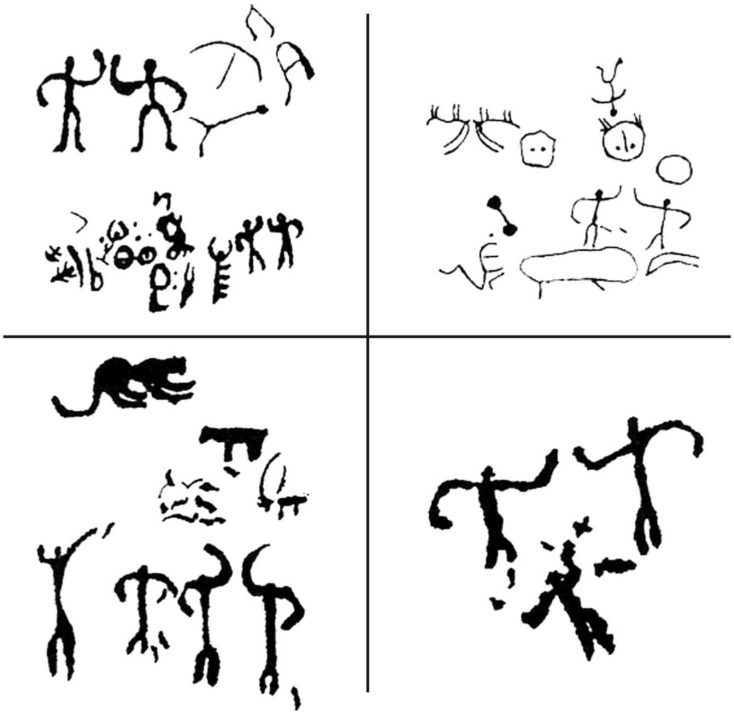

Fig. 9. The twins's figures of Gerama (Armenia)(after* Mardirossian 1981*).

"*the Chalcolithic and Bronze Age petroglyphs were made by Indo-Aryan tribes moving to the south, especially towards India, while the Iron Age rock images are traces of Iranized Saka tribes related to the Scythians peopling the steppe zone from Europe to Mongolia.*" (*Francfort 2000.305*). Within the corpus of rock images, supporters of the Indo-Iranian theory select the images of horse, cattle, deer, chariot, and various anthropomorphic figures: those with weapons, with radiating 'solar' heads and so forth.

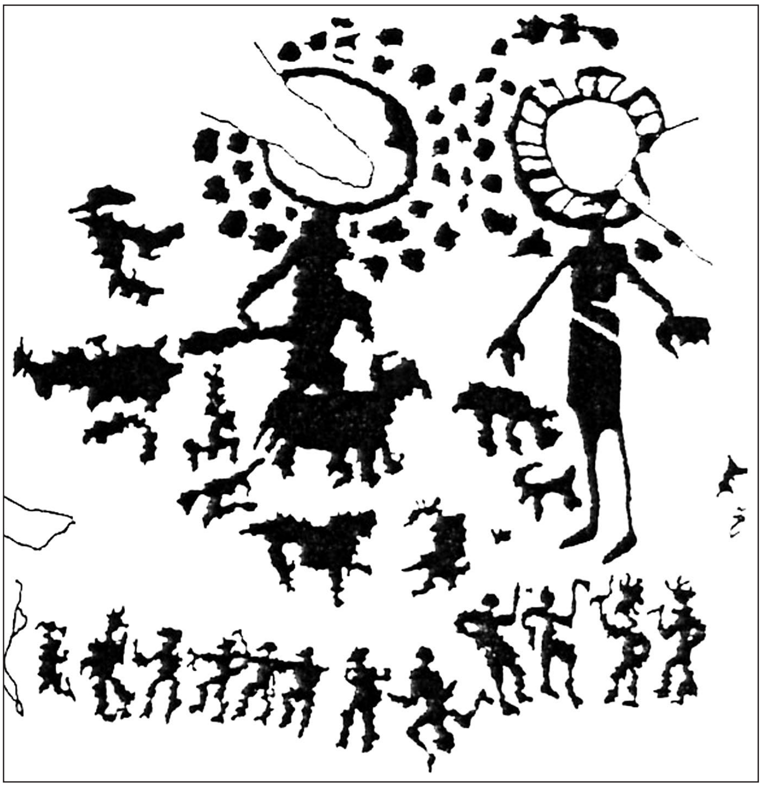

Fig. 10. Tamgoly IV (Kazakestan): figures with solar-heads and dancing figures.

❷ The second shamanistic approach relies upon abundant ethnographic data from Siberia, Mongolia and even Kazakhstan.

'The relationship of rock carving art to shamanism'

Shamanism was first distributed among the inhabitants of Siberian, and it exists today in many different peoples all around the world. In this ritual, shamans claim that they are able to communicate with some powers in this world or other parallel worlds and, accordingly, they can trace those events that affect our world (*Dortier 1998*).

Another feature of this ritual is communication with the world beyond directly through conjuration. Spirits are usually in the form of animals that assist the shaman. From the other side, he/she can send his/her spirit to the other worlds in order to meet other spirits and be helped by them. This journey is done through a set of 'magical practices' administered by the shaman through which he/she goes into ecstasy. The French archaeologist Jean Clottes, and David Lewis Williams (*1996*), the South African anthropologist, published a book entitled 'The Prehistoric Shamans' that caused an uproar. The book discusses the similarities between the rock paintings of the San, a hunter-gatherer community living in South Africa, with drawings carved in caves located in Europe. The themes of images in Europe are the same as the African ones: dotted lines, lines, geometrical drawings, and images of large mammals and [imaginary] creatures composed of two types: demi-human-demi-animal. According to Lewis Williams, these images are produced by the magicians' minds, made susceptible to illusions by taking 'hallucinogenic' drugs, and pass several phases. Perhaps those who drew these images might also have been shamans who created images originating in delusions of communication with spirits. The anthropological findings prove remarkable similarities in these illusionists' way of thinking and workout. Perhaps the main reason for such similarities is the mental infrastructures and homogenous fundamental beliefs.

Shamanic practices traditionally have a close relationship with hunting. The purpose was to capture the animals' spirits and make hunting easier. Therefore, shamanism should be regarded as a supernatural approach toward a world in which animals possess spirit. It seems that as primitive societies moved forward to animal husbandry and agriculture, the shamanic function directed to the human spirits more than this. However, Professor M. Lorblanchet, an expert on prehistoric art in France, after a series of field trips among Australian aboriginals, came to the conclusion that: "*The carved caves were undoubtedly 'temples' in which sacred ceremonies and rituals were held. Therefore, several ceremonies have always being administered in the temples, just like in churches and cathedrals*" (*Lorblanchet 2002*). In his opinion, these ceremonies (rites of passage, ceremonies relevant to the dead, collective and or individual prayer etc.) can be attributed to the drawings carved in such temples.

Iranian anthropologists have found some footprints of shamanic rituals in their studies. They have been identified in a number of regions in Iran, and some places in Azerbaijan, as well as Turkmen Sahra[1]. Among the Turkmen tribes, there are some people referred to as 'porkhān', meaning shaman, and they claim that they communicate with spirits, and through this connection are able to cure patients and perform extraordinary actions.

At the time of writing, one of the most famous shamans (porkhan) of the region lives in Yal Chishmeh village in the District of Kalaleh in the suburbs of Minou Dasht. He visits clients every day or most days of the week, and tries to solve their problems through communication with spirits and their powers (*Alimardanian 2006*).

There are similar rituals in the regions of Azerbaijan that are conducted by special people called Amchi. The conductors of such rituals in this region are usually women. The Amchis perform only those actions that are suitable for healing of some diseases. Usually, Amchis cure phobic illnesses through 'magic' methods. Although they are not aware of psychotherapy, they do their job somehow in the same way, in that it is based on belief. One of their tools is the wolf's paw (*Sepehrfar 1992*).

It should be noted that the wolf's paw has been considered a symbol of power in this region and its use in this ceremony is rooted in the inhabitants' beliefs. According to a myth, this animal is found as a symbol of merciless power that is able to destroy everything. If a human being touches it, whatever frightens him/her will be frustrated, as a result of the power that is granted to his/her body and even soul.

"*Deer are also interpreted as a marker of shamanism especially as far as the perspective of the Scythians is concerned. In this case, a dose of shamanistic influence is admitted.*" (*Martynov 1991.52–73*)

"*Cervid representations (deer, moose) and in general all horned herbivore images can be seen frequently in the frame of shamanism, either as riding animals or in the context of hunting.*" (*Devlet 1990. 110–112*).

There is no doubt that deep caves have not been used for dwelling for more than 20 thousand years. It was universally believed that the Underworld means the Other World and belongs to the spirits and the dead. For the same reason, going into the depths of caves could not be considered as a simple exploratory action. As prehistoric people believed that such spaces are the territory of spirits' and the dead's, they expected to meet spirits there. According to Jean Clottes (*1998*), as prehistoric people went into the dark caves and they used torches to illuminate the caves, they saw images through the reflection of torchlight, and they fancied that these caves were places where spirits come and go. They assumed that the natural openings and cracks in the caves were points from which the animal spirits entered the caves. It could be for the same reason that most of the animal drawings were carved on these walls. In addition, many speleologists have remarked on the hallucinogenic effects of caves in their accounts. Cold, humidity, darkness and the sounds in the caves intensify hallucinations. A majority of experts corroborate the imaginary images attributed to spirits through the drawings carved on the walls of the caves. Accordingly, it is possible that many prehistoric artworks were created in a shamanic framework.

The very same possibility exits for works created in open air spaces. According to Clottes, many works created in America, Africa and other places are undisputedly rooted in shamanic practices. The caves and rock shelters are mostly seen as two-way roads that connect the Real World with the Other World. The spirits can appear in such roads, and a person may reach the Other World through these roads and meet the spirits. Whoever wishes to goes toward these carved walls. According to shamanic beliefs, in order to go from this [Real] World to another parallel world, we should pass through tunnels that are protected by these animal phenomena (*Clottes 1998*). In California, bear and rattlesnake (*Whitley 2000*), and in Arasbaran, ibex, deer and serpent might protect them. From the other side, as we have seen, the drawings carved on the walls of Soungoun shelter do not represent any sign of animal husbandry and even no sign of hunting. These drawings belong to animals that had not been domesticated (ibex, deer, serpent, gazelle) and at the moment, there might be no reason in this regard, but these drawings do not undoubtedly belong to a society whose economy is on hunting and gathering.

1 Turkmen Sahara is a region in the province of Khorassan in northeast Iran. The Turkmen are of Mongolian descent. Apparently, they came to Iran in the 12th century AC.

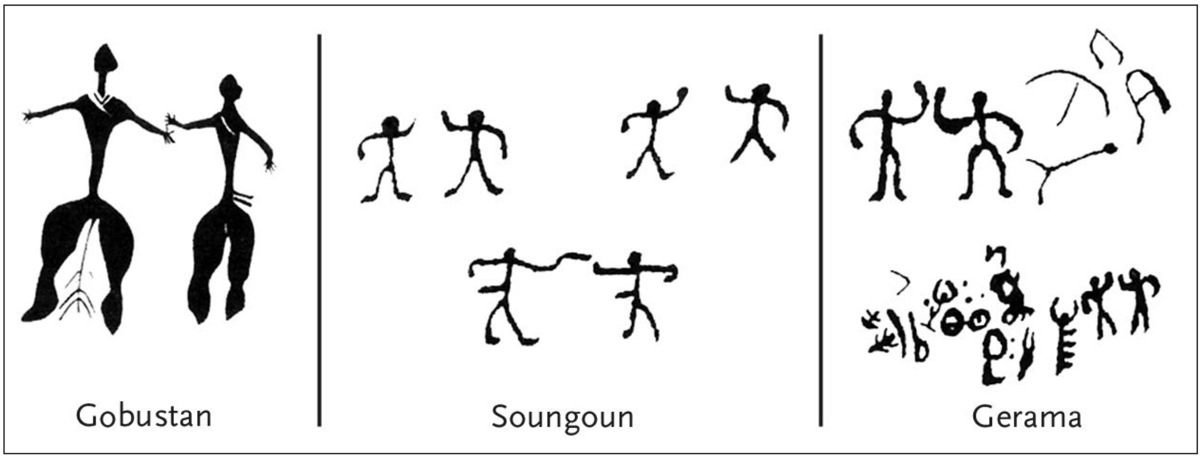

Fig. 11. The motives (twins) of Gobustan, Soungoun and Gerama.

Another significant issue is that the manner of presentation of drawings under study is governed by specific rules that do not match with a large number of rock carvings found in other parts of Iran. The Soungoun shelter has all the necessary elements, facilities and attractions for the administration of shamanic practices. Indisputably, illustrations share the logical arrangements for the scene of a performance and is one of the significant indicator of this assemblage. The illustrator conveys concepts organized into categories, to the audience, through the manner of presentation in the scene, where there is sufficient space for gatherings. The messages can also be conveyed to the audience in a more unambiguous way when the shaman employs and arranges these drawings. Moreover, the veiled concepts in each image can direct the ceremony to assumed goals through the creation of a theatrical atmosphere. The same thing can also be seen in the narrating of Shahnameh with the help of pictures (Shāhnāmeh-khānī)[2] that may have no shared goals with shamanic practices, but from the viewpoint of performance elements are somehow identical. It should be noted that the mythological approach to these practices are of paramount importance. The elements of such an approach can be easily be seen in these assemblages in the form of animal images, or as Andrè Leroi-Gourhan calls them, 'mythographs' (*Leroi-Gourhan 1987*).

As has been seen, one of the marker of this assemblage is that there exists no connection between the drawings with the method of production, lifestyle and even ordinary daily activities. Therefore, those tribes who created these drawings had no intention of depicting the material world and its relevant issues. They are completely symbolic and have been presented in a very precise convention. On the other hand, there is no doubt that the drawings of the Soungoun shelter, especially those carved in the principal shelter, have structural similarities with Caucasian rock carvings (for example Geghama and Gobustan). In the end, there are large numbers of documents and historical records indicating that the first inhabitants of Turkmen Sahara and Arasbaran herdsmen were immigrants who came to Iranian territory from the outer side of the northern borders, and at the outset they settled down in two regions (in Turkmen Sahara and then several parts of Iranian Azerbaijan). In addition, some cultural elements verify such a theory, of which language and style of settlement (pergola) are the most significant indicators. The linguistic factor can be easily confirmed in Turkmen Sahara and there are many linguistic similarities between Turkmen language and that of the tribes in Iranian Azerbaijan. Consequently, one can conclude that shamanic practices came to Iran in distant times. Affirmatively, similar elements can be seen in Gobustan and Geghama, as well as Tamgaly. At least, these similarities prove that the inhabitants of such a large area shared some radical cultural elements, and most probably they established a complete cultural territory. Anyway, the relationship between shamanism with Arasbaran rock carvings cannot absolutely been rejected, because at the moment it not only exists in the region among Caucasian and Mongolian immigrants as described earlier, but also some footprints of shamanism can be identified in a way in the drawings and composition of themes of

2 Shahnameh is the greatest Iranian collection of epic poems from the 10th century A.D. by epic writer Abolghasem Ferdowsi. Some of the scenes of Shahnameh are preformed by a storyteller. He utilizes pictures or paintings on fabric or paper in large sizes to show the event in question.

the above-mentioned assemblages. It has been verified that some drawings in the Gobustan assemblage belong to shamans (following picture) and they are absolutely similar to drawings identified in Geghama and Soungoun. Here a question is raised as to whether the Twins with dagger-like outgrowths from their waists cannot be assumed to be a symbol of spirits, just like animal drawings, *e.g.* deer, that is a symbol for the 'protection of the family and spirit'. The very spirits that the shamans refer to? There exists a big probability in this respect, because such a conventional drawing has also been found in the Gobustan assemblage (Fig. 11) which has been attributed to a spirit or soul.

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The Grotta dei Cervi (Otranto – Lecce)

Elettra Ingravallo
Università di Lecce, Dipartimento di Beni Culturali, Lecce, Italy
elettra.ingravallo@unile.it

ABSTRACT – *Warburg (*1988*) offers an interesting interpretative approach to the images of Grotta dei Cervi by the notion of the concept of 'survival'. We can read them as the images of memory which acquire other meanings every time they are brought back to the present flow.*

IZVLEČEK – *Warburg (*1988*) ponuja s konceptom 'preživetja' zanimivo pojasnitev podob v Grotta dei Cervi. Jamske poslikave lahko razumemo kot podobe spomina, ki vedno znova spreminjajo svoj pomen.*

KEY WORDS – *Neolithic; art; Grotta dei Cervi; Italy*

In the art of the Grotta dei Cervi and therefore of the Neolithic period, Graziosi (*1980*) believes that two trends can be recognised: the first is simplification, the tendency to contract reality into simple graphemes in order to make their meaning more immediate; the other is the tendency to complication, by which a real subject is made more obscure, thus expressing its immaterial essence. On the other hand, Whitehouse (*1992*) sees in this a reproduction of roles in Neolithic societies: the woman corresponds to nature, the man to culture, since the former is always depicted in her biological nudity, and the latter is always depicted with artefacts or weapons such as the bow. The cave, therefore, must have been used by secret societies of men for initiation rituals which enabled them to exert control and power over women. Finally, other authors generally prefer to refer to it as a place connected with initiation rituals reserved for a few prominent individuals.

From the first discoveries of prehistoric art dating back to the Upper Palaeolithic Period, all scholars have attempted the difficult task of decoding incised or painted images and signs on the walls of caves or on simple artefacts. However, the use of images as a means to interpret what their authors thought entails a series of difficulties, as has been acknowledged during a long debate in which historians of art and philosophers have participated.

The material remains of Neolithic cultures undoubtedly show that they were societies that lived by agriculture and farming. Thus, agricultural practices played a central role, as they allowed people to have rich harvests and store food in case of shortages. In this way, the land became the main source of survival and wealth. All this, of course, does not authorize anyone to believe that there is a clear connection between living conditions and symbolic production, since the relationship between them is more complicated than it seems. Yet, many ritual practices seem to refer to the celebration of the land, as in the case of those discovered in many caves where, however, it is not always easy to distinguish cult aspects from funerary rituals. While offers of agricultural products enable us to hypothesize that agrarian cults were performed, other evidence show such a vast range of situations that it is impossible either to make a generalization or to give just one single interpretation. With its ancestral allusion to subterranean depths, the cave has always represented a powerful metaphor which has to do with the beginning and the end of everything: the Great Mother from whom everything is born and to whom everything returns. A cosmic principle that regulates the universe, marking the cycle through birth, death and resurrection.

Female statuettes are the reincarnation of this, and some authors consider many decorative motifs on pottery a reproposal of the goddess (*Coppola 1999–2000; Grifoni Cremonesi 2004*).

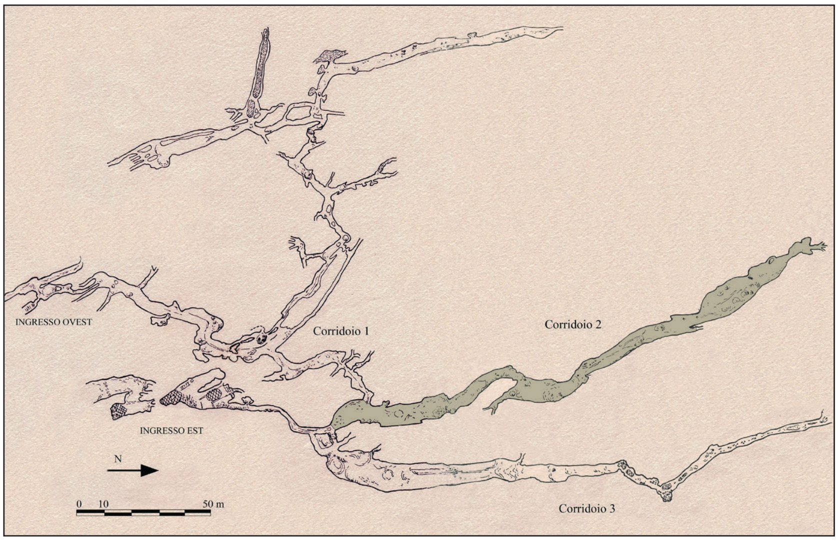

Fig. 1. Grotta dei Cervi: plan (after* Graziosi 1980*).

It is a fact that the ideological world of Neolithic societies has come down to us through a discontinuous and heterogeneous documentation, such as the one regarding social and political organization and the consequent power relations inside the communities. It is normal, therefore, that the possibility to interpret their embedded meanings is limited compared with the various evidence of funerary and cult rituals. Nevertheless, it is not inappropriate to remember that such difficulty – even more present in prehistory – concerns all historical periods when having to deal with the immaterial world and all its unexpressed concepts. In fact, because of its nature, symbolic activity is irreconcilable with the ordered and hierarchical world of reason, since it draws from the subconscious of countless experiences, of which there is no trace in the records or in archaeological findings.

In the case of the Grotta dei Cervi several authors agree that the images may be of help. But it is known that images are also deceitful witnesses, whose content is often untranslatable into words able to convey their meaning. Even representations defined as realistic – the reference is to the hunting scenes in the Grotta dei Cervi – hide various views that are linked to different perceptions of the world and that alternated and stratified throughout time. It is also inappropriate to attempt to find particular meanings in the abstract images, such as the cruciform, spiral-shaped images or the various compositions with geometric motifs. Yet, there is one more possible declination of the image which produces results irreducible neither to its supposed reproduction of reality nor to its nature as a symbol permanently connected to its fixity. The key to avoid these two possibilities is offered by Aby Warburg (*1988*) and, in particular, by his known and controversial notion of 'survival' (Nachleben) (*cfr. Didi-Huberman 2006.51–59*) as a statute of images. The time of images is the time of 'survival': not a way to deny the incidence of historical time, but an attempt to correct the evolutive linear conception, acknowledging that during history a mixture of heterogeneous temporal factors also play a role. This mixture disrupts the definition of styles based on 'the spirit of the time' (*Zeitgeist*), since the 'ghosts' (*Gespenst*) of a remote and never forgotten past merge with it.

Fig. 2. Grotta dei Cervi: red paintings on the cave wall at the entrance (after* Graziosi 1980*).

The action of an image which survives its time is, in other

Fig. 3. Grotta dei Cervi: red paintings on the cave wall at the entrance (after* Graziosi 1980*).

sition of the masculine and feminine principle exemplified by the relative images. Similarly to Leroi-Gourhan, other authors have drawn from the images of the Upper Palaeolithic period a sort of 'spirit of the time', identified occasionally with the magic of hunting, shamanism etc. (*Ingravallo 2006*). Gimbutas, instead, has come to the conclusion that the character of a Great Goddess was at the centre of religious conceptions in the Neo-Eneolithic Period in Europe. A Great Goddess thanks to whom Neolithic Europe was to be matrilineal, rural and sedentary.

words, that of remembering that there is no past which deposits itself passively in the record of time, but it creeps under the earth like a karstic river along a path with gaps and latent presences, anachronisms and survivals. It is not, as mistakenly thought, the idea of an eternal return, or of archetypes, which in their immutability explain nothing.

What is, then, the meaning of an image that goes beyond its time? Differing from Panofsky, who wanted to understand the meaning of images (according to Warburg), an image, more than being deciphered, needs to be comprehended in its evocative energy. According to Panofsky (*1999*), the levels of interpretation of an image are threefold: the pre-iconographic level, by which the 'natural' meaning is identified, things and events represented in the image; the iconographic level, which allows the identification of characters and personifications; the third level, the iconological, aims at interpreting the orientations and basic principles of an epoch. Although following independent paths, many scholars of prehistoric art have come to this approach in an attempt to interpret it. Some of the best-known cases are those of Leroi-Gourhan (*1965*) for the Palaeolithic period and Gimbutas (*1982*) for the Neolithic period. Even though he later denied it, Leroi-Gourhan believed he had caught – in the art of the Upper Palaeolithic period – a binary representation of the cosmos through the juxtapo-

The risk in similar reconstructions is to reduce to a presumed homogeneity the complexity of periods such as the Palaeolithic and the Neolithic, which lasted thousands of years.

It is on this issue that one may agree with Warburg: the knowledge of an epoch determined by its images is illusory, especially when one tries to investigate the symbolic meanings and come to a solution of the rebuses they embody. Images, those of prehistory, are not meant to fill our gaps. But they 'survive', as they continue to produce rebus chains, challenging a science, such as prehistoric research, which aims at surveying the obscure and unreachable depths of our culture. Here images, stories and legends conceived in unmemorable times acquire other meanings every time they are brought back into the present flow.

The morphological identity which they share is often in contrast with the heterogeneity of their con-

Fig. 4. Grotta dei Cervi: brown paintings on the cave wall in the second corridor (after* Graziosi 1980*).

Fig. 5. Grotta dei Cervi: hand stencils (after **Graziosi 1980***).*

the Grotta dei Cervi is due to their metamorphic capability, which is able to dissolve in thousands of variations, none of which is imprisoned by metaphors fixed throughout time. 'Realistic' motifs and 'abstract' compositions are arrayed on the walls, becoming part of the walls themselves, and with them they perform an enchanting game with which they accompany, perhaps, an initiation path which ends in the room with hand prints.

'*Pathos formulas*', Warburg would say, in which form and content are indissolubly intertwined and in which various times blend and continue to convey emotions and tensions.

The iconographic apparatus of the Grotta dei Cervi cannot be easily deciphered. It offers a cosmic abundance of shapes which can be interpreted and re-interpreted to create the stories of human lives with an unceasing proliferation of rebuses. In this apparatus the social actors of that time could recognise themselves. By sharing myths and stories transmitted in versions that were never the same, they found a meaning to their own existence.

Images of these people remain and they bring 'ghosts' back to life. If today we still continue to tell their

texts, and this shows that history had a role behind their forms, in the sense that every context declined them in the way it wanted. While describing the images of the Grotta dei Cervi, though aware of the geographical and sometimes chronological distance, Graziosi (*1980*) found some similarities with Balkan, Aegean and Anatolian civilizations. Behind this appearance of kinship it is logical to perceive a circuit of exchanges and contacts among cultures which, after thousands of years of sedimentation, have been able to produce isomorphisms. Whether these have also been realised among other cultures in other periods of history is an open question concerning the limits of knowledge of human history. Today, in images of prehistory it is possible to admire their evocative force, comparable to that of mythical characters with the eternal charm conveyed by their countless disguises. Similarly, the 'survival' of the images of

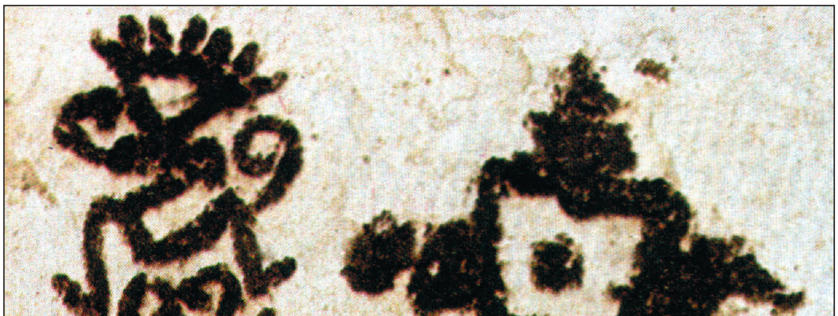

Fig. 6. Grotta dei Cervi: anthropomorphic and cruciform motifs (after **Graziosi 1980***).*

story, it is because in the intertwinement between the world of the living and the world of the dead there is an invisible relationship which links one to the other. What is our research into the past if not another way of asking the dead for a past which legitimises us in exchange for a future that commemorates them?

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Notes on some cultic aspects of Italian Prehistory

Renata Grifoni Cremonesi
Dipartimento di Scienze Archeologiche, Università di Pisa, Italy
grifoni@arch.unipi.it

ABSTRACT – *Many cultual manifestations are known in the Neolithic and Metal Ages in Italy. They were associated with pits, dug in the floors of caverns, and stone circles where vases or votive objects were deposited. They related to agricultural rituals, but also to funerary practices associated with birth, life and death. Another type of cults relates to water and water circulation: to cold or warm springs in underground cavities or in surface; to stalactites and their white water; to geothermal phenomena that attracted the interest of people prehistory. Many vases and bronzes were deposited near lakes, sources, rivers and fumaroles.*

IZVLEČEK – *V neolitiku in kovinskih obdobjih poznamo v Italiji mnogo kultov. Povezani so z jamami, vkopanimi v tla v spodmolih in jamskih najdiščih; s kamnitimi okroglimi strukturami, v katere so položene posode in votivni predmeti. Povezujemo jih z religijskimi praksami poljedelcev in rituali ob rojstvu in smrti. Nekateri so povezani z vodo in izviri hladne in tople vode v podzemnih jamah; s stalaktiti in jamskim mlekom; z geotermalnimi fenomeni, ki so privlačili pozornost ljudi v prazgodovini. Mnogo posod in bronastih predmetov je bilo položenih na jezerska obrežja, ob izvire, reke in vulkanske razpoke.*

KEY WORDS – *Prehistory; cults; rites; Italy*

It is not easy to deal with the ideological aspects of prehistory, as this is a subject on which researchers of the highest level have worked from 1880 to the present time. The first problem to face is a misunderstanding that is often created by the definition of a religious happening, which is often confused with witchcraft. It is not always possible to distinguish what lies within the realm of ordinary daily life from what, on the other hand, is an integral part of the ideological world and which has reached us in the form of signs and symbols which, at present, are incomprehensible, or only partially understandable. Moreover, it is also difficult to avoid confusion between religious phenomena, funeral rites and magical happenings while we try to understand, at least in part, some aspects of the ideological world of the past.

The polemics on this subject are extensive and the attempt to elaborate a picture of primitive religion has been the object of several studies and hypotheses of classification. Mainly by the second half of the nineteenth century ethnologists were trying – by comparing the religious beliefs of contemporary 'primitives' – to understand those of prehistoric people (*Grifoni Cremonesi 2004a.167–177; Grifoni Cremonesi and Martini in press*). This problem was also faced in the nineteen hundreds following other models, from the culturalists to the structuralists, with several methodological approaches and with more detailed analysis, at least as regards the domain of cultural anthropology (*Lewis 1986; Whitehouse 1992; Wasilewska 1994.62–75*). As regards prehistory, the problem still remains undefined, and at this time models of 'Ethno-archaeology' are in use, which unfortunately are often badly applied.

For this reason it is necessary that the interpretation of phenomena that may be defined as cultural should be treated with the utmost prudence, by excluding any suggestion or hypothesis which is often based on generic comparisons with the domains of ethnography and of the history of religion, or on non-specific ideas and pre-formed theoretical models. These are often applied with a faulty knowledge of the contexts, of the cultures and of the relevant literature, without taking into due consideration the concrete information to be obtained from the sites themselves (*Grifoni Cremonesi 1986.265–269; 1996.78–91; Di Fraia, Grifoni Cremonesi 1996*).

Often, indeed, each cave has been given a specific cultic function, based on the simple equation: cave equals sacred site; and a magic-religious meaning has been attributed to every complex or object to which a functional meaning could not be given. In particular, as far as the study of this problem in Italy is concerned, interest in these phenomena was not strong until a short time ago. But Radmilli – following a strong tradition dating from the late nineteen century and the beginning of the twentieth (*Rellini 1916.557–622*), and continued thereafter by Blanc (*1945*) – raised again, in the 1960's, the problem of cults, starting from data pertaining to some of the Abruzzi caves. He also pointed out, the first so to do, questions created by the presence of cult pits and circles in the cave deposits (*Radmilli 1963; 1975.175–184; Grifoni and Radmilli 1964*). The excavations he made and the discovery of several burial sites or monuments, such as the circles of the Pigeon's Cave (*Cremonesi 1976; 1985–90.465–474*), permitted him to hypothesise some modes of funeral rituals and some particular contexts that he tried to relate to the other similar examples. He also tried to find possible relations between cultic patterns and funeral rites in a general picture, from which could emerge an ideology connected with the agricultural world and to the vegetation cycle, death and resurrection. He did this partly by following the guidelines of the historical cultural school, but always keeping in mind the realities of the archaeological data. Unfortunately, his work, like that of many others on the subject, has generally been neglected, perhaps – as I have indicated – because questions of cults never aroused much interest. Only in recent years has it become more popular, perhaps following some recent publications by English authors.

It is often difficult to differentiate the real aspect of a cult from burial rites. This is because the two aspects can often interpenetrate, and also because our knowledge of the effective relations between the various elements of a ritual context are scant. Moreover, if we consider that many excavations lack detailed reports, maps and layouts of burial sites, analysis of living spaces or spaces dedicated to ideological functions, one may easily understand that interpretation must proceed with the utmost prudence, even if there are multiple and tempting suggestions. If we examine the problem of cults in the Italian peninsula, we can ascertain that, with the coming of the Neolithic, we may see a series of deep changes in the expression of artistic and cultish forms.

The naturalistic art of the Palaeolithic is substituted by schematic and abstract displays that had begun already in the final phases of the Palaeolithic and Mesolithic, and the human figure becomes more important if compared to the Palaeolithic representations of animals. Artistic production declined: the Palaeolithic drawings disappear and there is practically nothing between the western and eastern areas, if we except the hunting scenes of Catal Hüyük, those of the Spanish Levant, and in Italy the Grotta dei Cervi in Porto Badisco. Feminine statuettes predominate, alongside more rare animals or male statuettes. On ceramics, the signs imprinted, scratched, engraved or painted often have a symbolic value (*Coppola 1999–2000.67–126; Grifoni Cremonesi 2004a. 17–32*) that can be related to zoomorphic schematisations, to combinations of triangles, rhombuses, zigzags, spirals, variously interpreted as feminine sexual symbols, water symbols, or of the process of becoming, and from which Maria Gimbutas tried to identify a complex pantheon of divinities (*Gimbutas 1974; 1991; Berggren and Harrods 1996.70–73*). According to Paolo Graziosi (*1973; 1980*), the appearance of new iconographic schemes in the Neolithic is a symptom of a sacred value attributed to the implements of daily life. This is within an ample and articulated daily life that extends sacred symbolism to aspects of which the cultic values are not evident today.

The feminine statuettes can generally be related to the Mother Goddess concept, or at least to some forms of feminine deities, and we should note that the production of feminine idols, very abundant in the near east and in the Balkan world is less so in the Italian peninsula, and is practically absent in the western world (*Bagolini 1978.41–47; Bagolini and Cremonesi 1992.39–44; Grifoni Cremonesi 2004a. 17–32*). The statuettes can be found both in villages and burial sites, and this fact raises the problem of their real meaning within a domestic religiosity, and of a connection with the world of the dead. The complexity of the Neolithic ideological world manifests itself in aspects of rituals which can be referred in a certain way to agriculture and which are often intertwined with funeral rites. They mainly consist of pits excavated in cave deposits and which contain pots, offerings of cereals or of fruits, grindstones, or offerings of sacrificed domestic animals (*Grifoni Cremonesi 1969.78/91; 1986.256/268; 1996; Grifoni Cremonesi, Di Fraia 1996*).

The grindstones are also often found in burials (*Bagolini, Grifoni Cremonesi 1994.139–170; Grifoni Cremonesi 2006; Grifoni Cremonesi, Radmilli 2000–2001.63–120*). It is thus possible to hypothesize a link between life and death which can be identified in the death-resurrection cycle of plants, as we know it, or in other various and complex forms in a great many Mediterranean religions, even if it is not possible to hypothesize a continuity between these and Neolithic cultish forms. The sacred aspect of some places within the elapse of time is quite evident in some caves where burials in pits continue into the metal age and reach the historical age, with the deposition of votive 'stipi' in the same sites (*Grifoni, Radmilli 1964; Di Fraia, Grifoni Cremonesi 1996*).

Also important are stone circles containing offerings, which are known in several caves of central and southern Italy. They appear to belong to the same concept as the pits, which is to delimit a space that is somehow sacred. The best known are those of the Grotta dei Piccioni in the Abruzzi region belonging to the Ripoli culture, with the remains of infants and valuable artefacts, *i.e.* painted ceramic vessels, a trumpet made from a charonia shell, the numerous bones of anatids, with small balls of ochre and clay on one end and a clay imitation of one of the pebbles (*Cremonesi 1976*).

We also have traces of foundation rites, with pits excavated in villages, containing in one instance a zoomorphic vase, and in another, a human skull (*Radi 2004.337–341; Geniola and Mallegni 1975.239–249*). We also know of inverted vessels (perhaps a way to communicate with the chthonian world) and ritual fragmentation. There are also – in the final Neolithic with the Serra d'Alto culture (*Lo Porto 1989*) – two evident altars of stones in two caves, the Cala Scizzo and Grotta Pacelli near Bari (*Striccoli 1998; Geniola and Tunzi 1980.125–146*), and the great cultic hypogeum Manfredi, the first example of Neolithic hypogeism, with skulls of deer and roebuck, and painted pottery placed along the sides (*Geniola 1979.52–93; 1987.771–781*). These three sites can be considered real shrines. The Grotta dei Cervi of Porto Badisco must have been another important shrine, the only known example of parietal art of this period; its graphemes have been interpreted by Graziosi (*1980*) as extreme stylisations of the human form.

From this we reach the abstract symbols which are identical to those found on the painted ceramics of Masseria La Quercia and of Serra d'Alto. The funeral rites, which are extremely simple in the ancient Neolithic – with the deceased buried in simple holes with rare examples of offerings (grindstones and cereals) – become more complex with the painted ceramics and with the square mouthed vase culture. Ceramic vessels, ornaments and valuable objects appear, the graves are sometimes encircled by stones, and next to the villages, spaces are dedicated to the dead, thus creating a real necropolis (*Grifoni Cremonesi 2001; 2004b.17–32; 2006*). The first hypogea and megalithic cysts appear at the end of the Neolithic, and are a prelude to the great phenomenon of the hypogeism that will develop at the end of the third millennium.

In the Neolithic period, cults dedicated to water are also known. Water has always been considered a fundamental element of life, and from the Palaeolithic we can see traces of the veneration of water in its various aspects (liquid, solid as concretions, gaseous) (*Whitehouse 1992*). But it is with the Neolithic that water becomes even more important to people beginning to practise agriculture, for whom water was a force of nature with vivifying and sometimes medicinal properties (*Grifoni Cremonesi 1996; Bernabei and Grifoni Cremonesi 1995–1996.331–366*).

Cultish forms in this period are known from labyrinthine caves, with depositions of vessels near small lakes or subterranean springs, often connected with particular concretions or notable dripping sources. The Italian caves with Neolithic complexes that can be connected to water cults are Grotta Scaloria Bassa (Manfredonia), Pozzi della Piana (Orvieto), Grotta dei Meri (Monte Soratte), Grotta Zinzulusa (Castro Marina) and, probably, the Grotta Verde of Alghero.

The Scaloria Bassa is a lower hall pertaining to the Grotta Scaloria of Manfredonia, discovered in 1967: it is a large hall rich in concretions, at the bottom of which there is a small lake. The Neolithic people that utilized this area left ceramic vessels around the stalactites or on the top of intentionally broken stalactites. In a recess near the pool, a human skull and other bones were deposited, and there was a fireplace nearby, with the remains of partly burned animal bones. The vessels, about sixty, belong to the cultic context of the ceramics painted with red bands that was prevalent in southern Italy in the first half of the fourth millennium BC. They are all interpreted as figuline ceramics of a particular value, painted with red bands and brown margins inserted with a particular 'negatively applied' technique. It looks certain, for this particular cave, that the cult consisted exclusively of collecting the water which was dripping and was difficult to take outside, as most of the vessels have open mouths. The fact of intentionally breaking the stalactites in order to place the pots may tempt one to hypothesize some sort of veneration in this phenomenon. Obviously, it is impossible to say whether the water was collected for religious, magical or therapeutic uses. The Neolithic people also carved a small basin in the rock and did not place vessels contiguous to the nearby lake, so that the cult was directed to the dripping sources and not to the 'normal' water. Pertaining to the same period of the Scaloria Bassa, but belonging to the Tuscan and Latium period of engraved lines ceramics, are the depositions of ceramic vessels in the Grotta dei Meri at the Monte Soratte and in the Pozzi of the Orvieto plain. In both cases the caves consist of large complexes of labyrinthine galleries difficult of access. In the Grotta dei Meri (*Segre 1951–52.136–139*) a jar was placed under a source of dripping water at the end of a long gallery. It is reached from one of the access wells and placed at the crossroads of several underground passages. Also, in this case it is a clear example of the collection of particular waters secretly, which appears to exclude a supply of a functional kind.

At the Pozzi Della Piana there is a more complicated context (*Passeri 1970.225–251*). Lithic and ceramic material has been found on the floors of various galleries and halls that are developed on three levels or in natural recesses on the sides. In particular, some cups, 5 to 7 centimetres high, were placed upturned in cracks of the rocks around a large pool surrounded by stalagmites and stalactites. Flask-shaped vessels were placed within other small pools of water, partly protected by concretions. A circular pit, 40 centimetres wide and 50 deep, dug in the rocky floor, was filled with ochre clods and grindstones. The grindstones in caves were often associated with burials or placed in pits.

In the final Neolithic in Apulia, at about the end of the fourth or beginning of the third millennium BC we have another deposit of vessels around a water pool in the Grotta Zinzulusa of Castro Marina (Lecce): eleven vessels, consisting of assorted bowls and flask-shaped pots, were placed along the banks of a small lake situated at the end of a cave labyrinthine and rich in concretions, and which is reached after a sharp descent (*Zezza 1984.69–81*).

The case of the Grotta Verde of Alghero is peculiar: the cave opens at 75 m above sea level and develops into a hall that reaches a small lake of brackish water which is at sea level. By means of a well six metres deep, one can reach another hall rich in stalagmite concretions, and in which there were human remains. Again, from this place one reaches, through a narrow tunnel, a large hall situated at minus ten metres and full of underlying sea water which has an upper layer of fresh water about two to six meters deep. There have been several finds here of impressa ceramic belonging to the upper Neolithic which can be dated to the fourth millennium BC, which were placed either in the tunnel or in the undersea cavity. They are mostly flasks, perhaps used to draw water (*Tanda 1978.45–94*), but it is difficult to determine if the vessels were connected with rituals performed in the cave, or if they were simply used to collect fresh water. The latter hypothesis is less convincing given the difficulty of reaching the pool.

In all these instances we have deposits of vessels, often of a peculiar shape, placed near water surfaces or under dripping water sources, in labyrinthine caves of difficult access. It appears that we are dealing with a particular phenomenon that excludes the collecting of water for everyday use by the fact of the peculiarity of the sites and the type of deposits, and that these phenomena appear to belong more to the domain of ritual. The cults appear to be addressed more to the underground waters, so that we may infer a particular importance of these kinds of waters, perhaps considered sacred, therapeutic or magical. On the other hand, up to the present day the collecting of milky water from the caves has continued in caves dedicated to St Michael, or in the 'Lattaie' (Milky) caves, which women unable to lactate used to visit (*Di Fraia, Grifoni Cremonesi 1996*).

It appears that there are no other connections with other forms of Neolithic ritual, such as offerings of vegetables or of peculiar objects, human remains, excluding the pit in the Pozzi della Piana. The phenomenon of collecting drip waters is proved again in Italy at the end of the Copper Age (end of the third to the beginning of the second millennium BC) at the Buca del Rospo on Mt Cetona, near Chiusi. In this instance also, two vessels were found partly inserted into the stalagmite in areas of intense dripping, having being taken through a deep well that makes access to the final part of the cave very difficult (*Zanini 1988.184–190*). Notwithstanding the scarcity of documents, it is still possible to guess at some common forms and symbols which recur throughout the Neolithic, even if with local variants.

The votive pits, the stone circles, the feminine and zoomorphic statuettes – which connect us to the Balkans – the offerings of cereal grains and of grindstones, the hypogeic water cults, the sacredness of some sites – confirmed by the continuity of the cults up to the historical era – allow us to hypothesize the existence of a religious ideology based on the importance of agriculture and on the dominance of the feminine element, a fact which we may perceive from some decorations on ceramics. I do not believe that it is possible to accept the attribution of the various Neolithic symbols to the divinities of later pantheons, as Ms. Gimbutas has. We may only distinguish the various exterior forms of cults that remain unknown to us in their essence and only set forth hypotheses. We cannot conceal a certain envy for the certainty with which some authors – whose knowledge of the Italian Neolithic is by the way quite limited – are able to reconstruct with assured exactness, ideologies, social systems, religions and rituals (*Brown 1997.184–194; Skeates 1991; 1995.122–134; 1997.79–86*).

Surely it is not easy to disentangle oneself from the complexities of the Italian Neolithic and even less in the intricate framework of the burial aspects and of the cultic phenomena (*Grifoni Cremonesi 2003. 259–274*). But, prior to beginning to elaborate theories and to manifest certainties on the social and ideological aspects of Neolithic people, we must carefully analyze the data at our disposal, which are too few – in our opinion – to allow us to do more than express some generalities. Without doubt we may relate the various form of funeral rituals and cults during the Neolithic period to some of the changes that we observe regarding economic typologies, with an increase of wealth and exchange, and we may also have a glimpse of some changes in ideologies, mainly between the middle and late Neolithic. But this is not enough to affirm with certainty the existence of definite powers – masculine or feminine – social hierarchies in a sort of mixture of examples borrowed from recent cultures, thereby misunderstanding the inputs that may be provided by ethnoarchaeology.

But it is difficult, also in the event of there being plentiful information, to interpret correctly everything related to the funerary and ideological domain. It is very difficult, if not impossible, to attempt to reconstruct full sequences of phenomena if these are isolated from their own context and reduced to single entities of particular objects, or bare skeletons, or heaps of bones. During the Copper Age further and more important changes appear on the ideological level, apart from the technological one. The more common symbols appear now to refer to a world in which the dominant element assumes masculine connotations: it consists of daggers, axes, halberds, necklaces, and cloaks, symbols which we find on stele statues and on the rock engravings of the Alps, and which are very widely diffused (*Casini 1994; Casini et al. 1995*). The comparison of these symbols with objects that were placed in masculine tombs is evident, and the simultaneous appearance of solar symbols has induced many researchers to hypothesize the existence of uranic cults. Those cults are typical, according to some, of masculine groups with a warrior dominance, even if feminine stele statues are present and also testimonials of the perseverance of agrarian rituals in some caves. With the testimonials of particular cults we should remember the pit with the remains of a horse covered with two puppies in Maccarese village near Rome (*Manfredini 2002*) and the burial of a bovid in an Eneolithic site near Florence, where a tumulus has been found within the inhabited area (*Sarti and Martini 1993*). It seems that small statuettes disappear and, apart from the splendid engravings at Monte Bego and Valcamonica, in the remaining part of the peninsula we have only scant evidence – which may be dated with difficulty – of schematic rock engravings in some caves and shelters. Also in decline are decorations found on ceramics, but particular motifs in 'stralucido' appear on some vessels of the Rinaldone culture, also with solar symbols.

During the Copper age, in the third millennium BC, the evidence for water cults is rarer, but often some rock engravings appear to be related to springs, sources or waterfalls (*De Lumley 1995*). On the other hand, the exploitation of therapeutic waters now begins, as is indicated by the Panighina Spring at Bertinoro, where a well has been dug and in which several vessels were found, probably offerings to the medicinal source (*Morico 1996.153–162*).

With the Bronze Age the explicit evidence is increasingly rare and there is no major artistic evidence, but we may note solar symbols (discs, crosses) on ceramics, to which are added the shapes of water birds, which symbolize the sun vessel (*Damiani 1992.81–94*). There are also equine statuettes, which are also connected to solar cults (*Bettelli 1997.720–741*). Agrarian cults are well evidenced, with offers of cereals and leguminous plants in the caves, which in some way continue the Neolithic cults, and instead, water cults are more common (*Bernabei and Grifoni Cremonesi 1995–96.331–366; Pacciarelli 1997*). During the Bronze Age and up to the Roman period, vessels were placed in the farthest halls of the Grotta dell'Orso at Sarteano (*Grifoni 1967.53–115; Cremonesi 1968*) and in the Grotta Tomba dei Polacchi near Bergamo (*Poggiani Keller 1979*). Again regarding the connection of people with waters, in the Middle Bronze age we have several examples of caves with vessels placed along inner creeks or near sources. The vessels are often associated with the remains of cereals, seeds and fruits, which are placed either in the vessels or on the ground. Sometimes they are associated with the human skeleton remains (*Guidi 1980.148–155; 1986.239–247; 1989–90. 403–414; 1991–92.427–437*).

Among the better known and more evident examples are Grotta Nuova and Grotta Misa in Latium. In the first the vessels were placed in the brook that flows through the cave. Some of them contain wheat and broad-beans, others are placed in invert position (*Cocchi Genick, Poggiani Keller 1984.31–65*). In Grotta Misa, which is also crossed by a streamlet, and which contained several vessels and a fireplace whose ashes had been widened into a circular shape in order to place – at the centre of the ash circle – small, precisely separated mounds of wheat, millet and broad-beans (*Negroni Catacchio et al. 1989–90. 579–597*). At the Val di Varri Cave in the Abruzzi there is a small lake and, during rainy periods, there is a torrential flow; it is very abundant in concretions, one of which has a peculiar anthropomorphic shape. Apart from several vessels, seven fireplaces have been found there which contained, as in the Grotta Misa, the remains of wheat and broad-beans (*Güller and Segre 1948.269–281*). The small Cave of the Water or of the Stipe near Corchiano (Latium) contains a source which was an object of veneration up to Roman times: the oldest findings are from the Middle Bronze age (*Rellini 1920.6–174*).

The cave giving the most important information is the Grotta Pertosa near Salerno. A river runs through it, filling the terminal part of the cave. Two pile-dwellings were built in the Middle Bronze Age, and apart from a great number of the pots, a deposit of 324 miniature vessels has been found in the farthest part of the cave, lined and piled up in a cavity in the wall. The assemblage is interpreted as a votive offering (*Carucci 1907; Trucco 1991*).

In Grotta del Mezzogiorno in the Sentino gorge (Marche), dripping water spring was associated with several 'Apennine' decorated ceramic vessels, and with the fireplace and small holes containing wheat and wee wiled broad beans. Similar scenario was hypothesised in Grotta dei Baffoni, Grotta del Prete and Grotta di Frasassi (*Pacciarelli 1997*).

A notable increase in votive offerings related to hypogeal waters is recognized in in the Middle Bronze Age. It differs from the Neolithic practices, related to agrarian rituals, and funeral rites we mentioned before. It is worth notice the interest moves to running waters or sources and away from underground pools, and the offerings are deposited more frequent in caves which are not labyrinthine and more easily accessible. There are also cases of dedications to surface waters such as at the Laghetto del Monsignore near Campoverde (Latium), where ceramic vessels were placed from the Middle Bronze Age until the sixth century BC, near spring pools (*Crescenzi 1978.51–55; Guidi 1980.148–155*).

All these data are from the Central and Southern Italy: instead, during the Bronze Age, in the northern regions, different types of water rite appear, which consist in offerings of bronze objects, mainly swords, in rivers, streams and lakes, from the middle Bronze Age till the Final Bronze Age.

Other kinds of phenomenon was linked with the more evident appearances of secondary volcanism, particularly sulphur springs, fumaroles, hot steam sources, thermal sources. Even if the research is still scant, it shows an interest which may be linked to some forms of rituals connected to the chthonian divinities, perhaps originating from the strangeness and the might of the volcanic phenomena. The Grotta dello Sventatoio in the Latium region is a cave with four halls connected by narrow passages reaching a depth of minus 30 metres. It is classified as a thermal cave (*Guidi 1991–92.427–437*) and – especially in winter – air currents and steam issue from it. Pottery fragments, deposited there, belong to about 400 vessels from Early and Middle Bronze age. They were associated with food morsels (including a cereal pancake) and containing seeds of wheat, barley and broad-beans. The remains of the skulls of three infants with traces of exposure to fire, and bones of pig, sheep and ox were deposited in the cave as well. The steam from the cave may have influenced the choice of the cave itself for the votive offerings.

Also connected to a cult of the chthonian world, we may relate the Bronze Age pits of the Capo Graziano culture of the Caldara of Panarea (Eolian Islands) in an area impossible to inhabit and where there is still volcanic activity. It is indeed an area near to the beach, with abundant fumaroles that also boil in the sea; the soil is so hot so that it is impossible to walk on it. Notwithstanding, it was used in the final Neolithic and in the Bronze Age: people dug small pits lined with pebbles cemented with sulphurous mud. The site was frequented also in the Hellenistic and Roman age and it is difficult to see it as a dwelling (*Bernabò Brea and Cavalier 1968*). To similar phenomena one may associate also the ceramic vessels deposited from the Early to the Late Bronze Age on the banks of the Pool of the Colonnelle at Guidonia near Tivoli (Rome): it is a sulphurous lake and the atmosphere of the place is very troubled by the vapours and by the noxious smell, but notwithstanding this, offerings were continuously made through the ages (*Guidi 1986.239–247*). On the other hand, the caves at Latronico (Potenza) are difficult to interpret. They are some distance from the hot sulphurous sources (the site is called, in effect, Calda, and there are thermal spas), which were frequented from the Mesolithic to the Bronze Age, and which Rellini (*1916*) interpreted as a site dedicated to a cult of the 'healing waters' during the Bronze Age.

More recent digs, however, show that the caves were mainly utilized as dwellings (*Cremonesi 1978.51–55; Bianco 1984*). Unfortunately, the older excavations did not take into account stratigraphy and the exact position of finds, so that the real connection between the sulphurous waters and the vessels full of cereals and of fruits that were found at the time is still an open problem. Offerings of vessels, arms, and jewels are confirmed also in other areas of secondary volcanic activity near fumaroles active along the dorsal of the Apennines (*Grifoni Cremonesi 1999.114–135; 2005.10–26*). Also important is the phenomenon of the deposition of swords, and also of jewels, in lakes and rivers.

The ideology appears to become more and more complex within societies that underwent – during the Bronze Age – noteworthy and important changes due to the continuous development of new technologies, of a well-developed agriculture also enriched by the new cultures of oil and wine, and to contacts with more developed societies, such as the Mycenae (*Peroni 1989; 1996*). These new aspects of the social structure obviously brought innovations in the ideological world, innovations which will take codified forms in the Iron Age and become institutionalized religions in the historical age. In any case, in these religions some archaic element will resist in the new context, even if in latent and secondary aspects of the new rites. They consist of agrarian cults, at which point we may remember the mundus of the Romans, the gardens of Adonis, the rite of the foundation furrow, but also cults dedicated to waters – which continue up to the present – with the dedication of caves, rivers, springs, first to the divinities of the Greek and Roman worlds and, after that, with Christianity, to saints or to the Virgin Mary. This is why we are far from able to give a definite solution to the problem: the domain of religious phenomena in prehistory can supply only hypotheses or brief fragments of intuition, which can be accepted only on the underlying condition that there is a correct analysis of the data and of the contexts. As regards the interpretation of all the phenomena that we could identify, the possibilities that are offered us are up to now too numerous and influenced by our way of thinking, and too tentative to connect our way of thinking to that of prehistoric peoples or, to cite De Martino, to think the present time unduly rendered antique.

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Digging the Neolithic stamp-seals of SE Europe from archaeological deposits, texts and mental constructs

Agni Prijatelj
Department of Archaeology, Faculty of Arts, University of Ljubljana, Slovenia
agni_prijatelj@yahoo.com

ABSTRACT – *The article presents the archaeological and experimental data on the Neolithic stamp-seals from phenomenological perspective. An alternative view to their production, consumption and symbolic values is proposed by employing concepts of affordances, constraints, icons, indexes and symbols. It is argued that the stamp-seal motifs probably conveyed specific information, while objects were included in various networks of meaning. Similar importance is given to the fact that the stamp-seals probably evolved a secondary mode of use.*

IZVLEČEK – *V članku so predstavljeni arheološki in eksperimentalni podatki o neolitskih pečatnikih-žigih s fenomenološke perspektive. S pomočjo konceptov ponujenosti, omejitev, ikon, indeksov in simbolov oblikujemo alternativni pogled na njihovo produkcijo, rabo in simbolične vrednosti. Zagovarjamo tezo, da so bili pečatniki-žigi vključeni v različne pomenske mreže, njihovi motivi pa so bili nosilci specifičnih informacij. Enako pomembno se nam zdi dejstvo, da so pečatniki-žigi razvili sekundarne oblike rabe.*

KEY WORDS – *stamp-seals; affordances/constraints; icons; indexes; symbols*

Introduction

This article represents an attempt to enliven one of most visually striking categories of artefacts within Neolithic materiality that has petrified under layers of problematic interpretations and misuses within archaeological literature. The act of reanimating Neolithic stamp-seals from SE Europe is carried out in two steps: first, we lift up the dusty veil of unconsciously regulated discourse from the patient. Second, we bring the patient back to life with intensive work on the vital functions (*i.e.* on the cultural biography of Neolithic stamp-seals of SE Europe).

Archaeology of the texts

The basic material we are following in this part of the article comprises not the Neolithic stamp-seals of SE Europe themselves, but texts by different authors devoted to this subject. Since the main goal of the archaeological process could be described as "*... linguistic transformation of the object into a word into a text*" (*Tilley 1998.141*), this part of the article deals with ways of transforming the material into the immaterial: with the help of 31 selected texts written by 21 different authors, we observe the relations between discourse, scientific thought and the observed phenomenon of the Neolithic stamp-seals of SE Europe. We use the following statement by C. Tilley (*1998.147*) as a methodological starting-point for the intended analysis:

"*... all archaeological texts are primarily literary constructions and can be analysed in an analogous manner to literary texts, bracketing aside the questions of truth, falsity, adequacy, or inadequacy in relation to the physical artefact world that are normally asked from the outset ... The concern might rather more pertinently be to do with the manner in which the language itself is structured and mobilised to create meaning and sense.*"

Within the Early Neolithic of Europe the phenomenon of stamp-seals is frequently taken advantage of as a fundamental argument to support an author's theoretical model of Neolithisation. We want to analyse the use of the term within different archaeological discourses. The main questions we tackle are: has the meaning of the term 'stamp-seal' shifted through time? How does the term capture the reality of the artefacts it is used to discuss? Could the function of the stamp-seals be different from those described by our authors? Do the presented uses of the term help towards a better understanding of the past?

The sample of literature consists of 60 years writing about the Neolithic stamp-seals of SE Europe. It includes all the major works dealing with the subject, a number of general surveys mentioning stamp-seals, as well as various book chapters and articles on stamp seals of different dates and of different styles of archaeological thinking. Thus texts, written within 'traditional', 'processual' and 'post-processual' discourse are presented within the sample.

No uniform terminology for the observed phenomenon is employed within the archaeological literature on the Neolithic stamp-seals of SE Europe. Since stamped/sealed material is not preserved, the use of the objects remains difficult to define. It has been suggested that these artefacts were used as pintaderas for adorning the human body (*e.g. Younger 1995.*

1. I. Kutzián (1944 and 1947), *The Körös Culture. Plates* and *Text*, 8
2. V. Gordon Childe (1950), *The Dawn of European Civilization*, sixth, revised edition, 25, 60–61, 81, 89, 91, 95, 103, 126, 135, 144–145
3. V. Gordon Childe (1959), *Der Mensch schafft sich selbst*, 180
4. John Nandris (1970), 'The development and relationships of the earlier Greek Neolithic' [22 pp.]
5. Marija Gimbutas (1984), *The Goddesses and Gods of Old Europe*, third edition, 91–92, 112–117
6. János Makkay (1984), *Early Stamp Seals in South-East Europe* [123 pp.]
7. Paul Halstead (1987), 'The economy has a normal surplus: economic stability and social change among early farming communities of Thessaly, Greece' [12 pp.]
8. Colin Renfrew (1987), 'Old Europe or Ancient East? The Clay Cylinders of Sitagroi' [33 pp.]
9. Colin Renfrew (1987), *Archaeology and Language. The Puzzle of Indo-European Origins*, 169–171
10. John G. Younger (1987), 'A Balkan-Aegean-Anatolian Glyptic Koine in the Neolithic and EBA Periods'
11. Marija Gimbutas (1989), *The Language of the Goddess*, 3, 13,19, 25, 75, 81, 83, 89, 100, 122–123, 144, 1 167, 308–309
12. Mihael Budja (1992), 'Pečatniki v slovenskih naselbinskih kontekstih' [12 pp.]
13. John G. Younger (1992), 'Seals? From Middle Helladic Greece' [19 pp.]
14. Henrieta Todorova, Ivan Vajsov (1993), *Novo kamenata epoha v Bulgarija*, 233–234
15. Elisabeth Ruttkay (1993/1994), 'Neue Tonstempel der Kanzianiberg-Lasinja Gruppe' [17 pp.]
16. Paul Halstead (1995), 'From sharing to hoarding: the Neolithic foundations of Aegean Bronze Age society?' [10 pp.]
17. Artemis Onassoglou (1996), 'Seals', 163–164
18. Mihael Budja (1998), 'Clay tokens – accounting before writing in Eurasia' [16 pp.]
19. Mehmet Özdögan (1999), North Western Turkey: Neolithic Cultures in Between the Balkans and Anatolia, 216, 219
20. Doglass W. Bailey (2000), *Balkan Prehistory. Exclusion, incorporation and identity*, 109–110, 112, 234, 282
21. John Chapman (2000), *Fragmentation in Archaeology*, 85–91, 225
22. Catherine Perlès (2001), *The Early Neolithic in Greece. The first farming communities in Europe*, 44, 54, 63, 221–223, 252–253, 285, 288–289, 296–297
23. Mihael Budja (2003), 'Seals, contracts and tokens in the Balkans Early Neolithic: where in the puzzle' [15 pp.]
24. Tanya Dzhanfezova (2003), 'Neolithic Pintaderas in Bulgaria' [11 pp.]
25. Emanuela Montagnary Kokelj (2003), 'Evidence of long distance connections at the edge of the Balkans: economic or symbolic value' [8 pp.]
26. Catherine Perlès (2003), 'An alternate (and old-fashioned) view of Neolithisation in Greece' [14 pp.]
27. Mihael Budja (2004), 'The transition to farming and the 'revolution' of symbols in the Balkans. From ornament to entoptic and external symbolic storage' [22 pp.]
28. Mihael Budja (2005), 'The process of Neolithisation in South-eastern Europe: from ceramic female figurines and cereal grains to entoptics and human nuclear DNA polymorphic markers' [20 pp.]
29. Çiler Çilingiroğlu (2005), 'The concept of the 'Neolithic package': considering its meaning and applicability' [13 pp.]
30. Clemens Lichter (2005), 'Western Anatolia in the Late Neolithic and Early Chalcolitic: the actual state of research' [15 pp.]
31. Catherine Perlès (2005), 'From the Near East to Greece: Let's reverse the focus. Cultural elements that didn't transfer' [15 pp.]

Tab. 1. The sample of analysed texts.

on-line; Chapman 2000; Montagnary Kokelj 2003; Çilingiroğlu 2005), perhaps as stamps for printing onto organic materials such as textile, leather, bread, maybe as tools for decorating walls, or even as devices for stamping live animals (*e.g. Makkay 1984.104; Chapman 2000.86; Perlès 2001.252; Montagnary Kokelj 2003.366*). Most of the writers agree upon the fact that Neolithic stamp-seals – contrary to practices in the Aegean, where stamps for decorating ceramics and hearth rims appear from EH and EC onwards (*Younger 1995.on-line*) – were not employed for ornamenting ceramics. The majority of the authors also agree that the stamp-seals were not used as true seals. Nevertheless, some archaeologists (*Bailey 1993.212; Onassoglou 1996a.163–164*) see them as a marker for the development of the concept of private property.

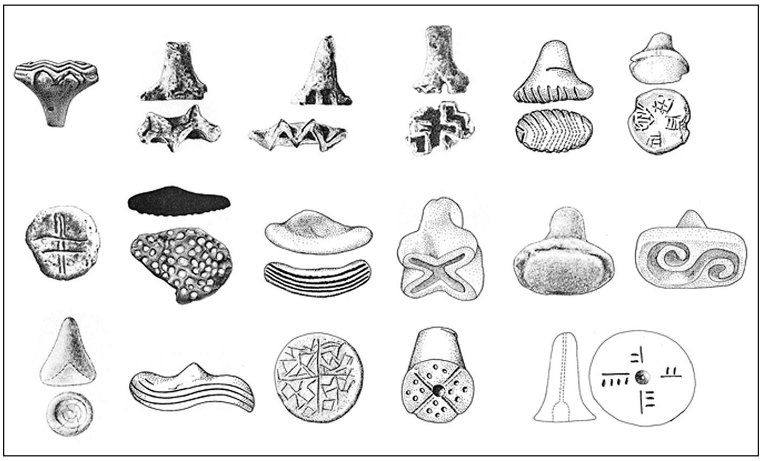

Fig. 1. A sample of Neolithic stamp-seals of SE Europe with differently modelled bases (*Makkay 1984.Fig. V: 10; Fig. VI: 1, 4, 9; Fig. VII: 1; Fig. X: 5, 9, 10, 13; Fig. XV: 3, 4, 6; Fig. XVI: 7; Fig. XXII: 8; Fig. XXIII: 6; Fig. XXVII: 5, 8*).

In addition to the lack of direct evidence (*i.e.* imprints) in the archaeological record, archaeologists manage to overlook even the meagre evidence available. The fact that the modelling of motifs varies on the stamp-seals is mentioned only in very few of the texts analysed: Perlès (*2001.252*) emphasizes that the majority of Greek stamp-seals has the high-relief motif and only a few specimens have low relief motif.[1] There are also some undecorated specimens modelled as cones that were interpreted as tokens by Budja (*1998; 2003*). The authors of the selected texts are very often prone to forget that the bases of the stamp-seals are modelled not only as flat, but sometimes as conical or convex surfaces (*cf. Makkay 1984.Fig.V: 10; Fig. X: 5, 9, 10, 13; Fig. XVI: 7; Fig. XXII: 8*). It remains ambiguous – similarly to the case of undecorated cones – whether the group of stamp-seals with concave bases was actually used for stamping. Perhaps the group of artefacts with ornaments interpreted as proto-writing symbols constitutes a special category (*e.g. Makkay 1984.Fig. XXIII: 1, 6*).

When closely examining how stamp-seals are modelled (Fig. 1), it becomes obvious that the monolithic category of stamp-seals artificially unifies artefacts that probably had separate functions. Why is this so? The answer can be sought in the dichotomy of archaeological thought.[2] Archaeological thought has a tendency to expose and privilege identity and unity above difference. An additional problem stems from the unconsciously regulated discourse which directs scientific thought, shapes explanatory models, and even constrains the development of new, unbiased interpretations.

The main weak points of the analysed texts could be summed up as the self-evidence of their terminology and as their operating within an unconsciously regulated discourse which guides the authors in their thinking, in formulating arguments and in forming their interpretations.

All archaeologists 'know' what the terms 'pintadera' and 'stamp-seal' mean. Hence, it happens regularly that authors unite artefacts with only general, broad similarities, and probably distinct functions within one category. Because the meaning of these terms is self-evident, authors rarely define them. Instead of being clear and consistent, the semantic level of the term remains elusive and shifting. For Dzhanfezova (*2003*) and Çilingiroğlu (*2005*) the pintaderas they discuss are no longer stamps used for decorating the human body. As Dzhanfezova (*2003.note 1*) states:

"*In this paper, the term [pintadera – our emph.] is not used in accordance with the functional defini-*

1 The first group is interpreted as stamps for decorating textiles by Perles (*2001.252*) and the second as true seals. The author does not define specifically what the second group sealed.

2 We are following the Derridean supposition of Western thought being based on dualities. There is no balance within dual pairs; one concept always has primacy over another. Some examples of such dualities: speech/writing, presence/absence, identity/difference (*Yates 1990.261*).

tion of the finds. Here pintadera denotes those kinds of ceramic objects called 'stamp seals' and having a handle, shaped body and 'decorated' base."

Thus the term pintadera becomes a terminological substitute for the term stamp-seal. The use of both terms unconsciously guides archaeologists on how and what to write about the artefacts discussed. Nowadays, the illusion of positivism in science is gone. The following quote from Tilley (*1998.152*) conveys the criticism of unconscious discourse with particular clarity:

"*... all writers ... including myself, inhabit a discourse, a series of largely anonymous and habitual rules and constraints for thinking and writing, that structures, in part, both what can be written and what can actually be thought. Because of the discourse we inhabit, and because it acts largely unconsciously, archaeologists are doomed to repeat it, whether in the form of the spatial structures of their narratives, the types of diagrams they employ, or the modes of explanation adopted.*"

The symptoms of unconsciously regulated discourse can also be recognized within the first group of analysed texts. This group consists of works that employ diffusionist models for the explanation of the earliest appearance of stamp-seals in Europe (*Kutzián 1947; Childe 1950; 1959; Nandris 1970; Makkay 1984; Özdögan 1999; Perlès 2001; 2003; 2005; Montagnary Kokelj 2003; Çilingiroğlu 2005; Lichter 2005*). In each of the listed works we observe one or more of the following characteristics: an obsession with origins, typological arrangements of stamp-seals, formulating the text as a grand narrative. Our aim is to show not only how diffusionist discourse leads authors unconsciously to the questions they raise, but also how it directs their line of thought and influences the way their thoughts are formulated.

Stamp-seals belong within diffusionist discourse – like figurines, red slipped and painted pottery, altars, M amulets, marble and stone bracelets, discs, beads, celts, fine stone bowls, polishers, belt hooks, *spatulae*, sling bullets and ear studs – among a group of small finds that represent the main component of the 'Neolithic package', along with domesticates (*Çilingiroğlu 2005.3*). The presence of the listed artefacts at European Neolithic sites is taken as a proof that these sites can be defined as Neolithic. Typological similarities between small finds from the European and Near Eastern sites are considered as an argument, supporting theories conditioning the beginning of the Neolithic in Europe with migration or the diffusion of cultural elements from the Near East (*cf. Makkay 1984; Perlès 2001*).

Diffusionist models in which stamp-seals appear as one of the main arguments supporting the Neolithisation scenario are formulated as grand narratives.[3] Authors from Childe to Perlès assume the existence of something linking European Neolithic stamp-seals both at the regional and inter-regional level. Within the diffusionist paradigm this something is, understood as a single origin and the same modes of use. An additional argument that should have supported those assumptions becomes in diffusionist models the narrative itself: authors tend to diminish the value of data that weaken their theories; hypotheses are often backed up with various tables listing elements of the 'Neolithic package' and with distribution maps, all with intent of proving that the elements of the 'Neolithic package' diffused from Anatolia to SE Europe (*cf. Renfrew 1987; Perlès 2001; 2003; 2005; Çilingiroğlu 2005; Lichter 2005*). The spatial and narrative courses are as essential as arguments themselves: authors define the earliest examples of stamp-seals (they are from Anatolia) and describe their motifs. They point to Nea Nikomedeia as a crucial European Neolithic site in the second step and then list all the types of motifs documented in both Anatolia and SE Europe, using them as proof of connections between the two regions (*cf. Makkay 1984; Özdögan 1999; Perlès 2001; 2003; 2005; Lichter 2005*). Thus narrative lines become implicit arguments supporting the basic premise of European Neolithic stamp-seals being linked to the Anatolian specimens.

Yet in their aspiration to unify and link the Neolithisation process in the Near East and Europe the authors are incapable of thinking, let alone accepting facts that they (in passing) mention, and which deconstruct diffusionist discourse. Archaeologists tend to 'overlook' the fact that Neolithic stamp-seals do not appear until painted pottery came in use, the fact that similar artefacts from the Near East and Europe are sometimes dated from several centuries or even millennia apart, and the fact that grounding

3 We observe the characteristics of grand narrative also in autochthonous models. However, since such models do not deal with stamp-seals, we leave them out of our analysis.

connections between Anatolia and Europe on the basis of stamp-seal motifs is extremely problematic.

Archaeological discussion of Neolithic stamp-seals is repeatedly threatened by doubts as to whether the artefacts so named are not disparate things after all. Archaeological writings on stamp-seals consist of constant definitions, redefinitions and modifications of terminology. Perlès (*2001.252*) writes of stamps and 'true' seals, while Budja (*1998*) eliminates undecorated cones and cylinders from the group and treats them as tokens. There are also some (*cf. Kutzián 1947; Barber 1991*) who express doubts as to whether cylindrical objects with incised decoration can be defined as stamp-seals at all.

As already stated, the simple act of closely examining how stamp-seals are modelled leads towards the recognition that only a superficially uniform group of artefacts consists of functionally disparate objects. Yet this cannot be accepted in the archaeological discourse. Why can we not assume that Neolithic stamp-seals comprise (like Neolithic figurines[4]) a group of multifunctional objects? Why can we not accept the supposition that the function, and equally the meaning, of an undecorated clay cone from Porodin-Tumba are essentially different from the function and meaning of a stone stamp-seal with a labyrinth motif from Achilleon? Furthermore, why can we not recognize the difference in meaning and function of stamp-seals having the same motifs? A response to these questions can be sought in the following quote from Tilley (*1998.155*):

"*Perhaps this is a failure to think and allow for difference, a desire to tame and domesticate the difference of the past within a single narrative structure.*"

The selected texts also share a tendency to link the SE European and Anatolian region together with the help of the typological similarities of stamp-seal motifs. This principle, of course, originates from studying ceramic typological sequences. 'Traditional' archaeology used these not only to set up relative chronologies, but also to define relations between neighbouring regions: typological sequences, along with style analysis, were supposed to help define the place of origin from where the influence in ceramic design dispersed to regions nearby. We find the described principle as applied to stamp-seals problematic, to say the least. True, designs on painted pottery, through their complexity, enable an opportunity to study social interactions among neighbouring as well as among distant communities.[5] In contrast, stamp-seal motifs remain simple geometrical designs. Arguing for diffusionist theories with the help of these is, in our opinion, questionable at least. Even though some stamp-seal motifs are documented in both regions, the designs are so simple that we find diffusionist models to explain their appearance in Europe unnecessary and redundant. Similarly to the case of entoptics (*Budja 2004; 2005*), the stamp-seal motifs are universal.

The idea of the stamp-seals sharing a single origin is represented in all of the texts from the first group. Through the 60 years of writing on the topic, perspectives shifted in that the place of origin, still defined as the Levant by Childe, was transposed to Anatolia: Mellaart's excavations in Central Anatolia (*i.e.* Çatal Höyük and Hacilar) caused a shift in the perception of the Anatolian region, formerly interpreted as peripheral to the Levant, and defined Anatolia as one of the centres of the 'Neolithic revolution'. Neolithic stamp-seals are interpreted within diffusionist discourse as an element of the 'Neolithic package' that came to Europe either with migrants or by cultural diffusion. Why arguing for the origin of European Neolithic stamp-seals in Anatolia on the grounds of their motifs is questionable to say the least has already been explained above.

Deconstructive claims that inhibit

In order to show how deconstructive elements inhibit the meaningfulness of the texts, we analytically read works by Makkay (*1984*) and Perlès (*2001; 2005*). Immediately after, we debate some texts in the second group (*Bailey 1993; 2000; Budja 1992; 1998; 2003; 2004; 2005; Chapman 2000; Dzhanfezova 2003*) which offer the opportunity of alternative readings of the phenomenon of the stamp-seals.

Although, even today, Makkay's work (*1984*) remains unsurpassed as a catalogue, it contains many contradictory claims that weaken and deconstruct the author's interpretative model. The analyzed text is written in diffusionist discourse and in a reductionist manner: the Neolithisation process is thus equated with defining the origins of the earliest Neolithic pottery of South East Europe and with defining courses of cultural diffusion. Since the paper is written with

4 *Cf.* Talalay (*1987; 1993*).
5 *Cf.* Plog (*1980*); Hodder (*1978; 1979; 1981*); Talalay (*1993*).

conviction, the Early Neolithic in Europe formed under Anatolian influences, Makkay (*1984.75–79*) introduces Europe as a secondary production centre for the clay stamp-seals. The production and use of stamp-seals would have reached this region by cultural diffusion simultaneously with the diffusion of painted pottery from Anatolia. The first cultural impulses should have reached the central and northern Balkans across the plains of Thrace and eastern Macedonia, where Nea Nikomedeia is situated. Since some of the stamp-seal motifs from Nea Nikomedeia are similar to the motifs from Çatal Höyük, while others share similarities with SE European stamp-seals, the site retains the utmost importance for theses aiming to prove cultural diffusion from Anatolia to SE Europe. The excavator of the site, R. J. Rodden (*1965.85*), who was the first to use the stamp-seals from Nea Nikomedeia (along with ear plugs, pins, belt-hooks, pottery decoration, architecture and the economy) as proof of similarities between SE Europe and the Anatolian region, wrote:

"*Nea Nikomedeia thus exhibits a distinct European character, although it has traits in common with sites as distant as Tepe Siyalk. This suggests that South-eastern Europe was not peripheral to the region within which the Neolithic revolution began, but was an integral part of it.*"

If Rodden (*1965*) used the listed artefacts and features to emphasize the equivalence of the SE European region and Anatolia, other authors exploited the same parallels to support their diffusionist and migratory models (*cf. Makkay 1984; Renfrew 1987b; Perlès 2001; 2003; 2005*).

Deconstructing elements appear in Makkay's work (*1984*) from the outset. Eighteen Early Neolithic stamp-seals from Nea Nikomedeia should prove the typological similarities and consequently chronological synchronicity of Nea Nikomedeia's stamp-seals with stamp seals from Çatal Höyük layers VI–II. Nevertheless, it gradually becomes obvious that the typological arguments are far weaker than the author would like them to be. Thus motifs, as the most important element of stamp-seals, do not connect the stamp-seals from Nea Nikomedeia and Çatal Höyük (Figs. 2, 3). It appears that the only characteristics they shared are the techniques used in their making and the material employed, or as Makkay (*1984. 73*) states:

"*All of the 21 stamp seals found in EN levels VI–II of Çatal Höyük were made of clay. Their material and characteristic features are very similar to some of the Nea Nikomedeia seals and suggest a real contemporaneity, or rather, a cultural connection. In fact, these similarities are apparent in shapes and decorative techniques (*i.e. *the deeply-cut incised lines) rather than in their patterns.*"

Could the same preferences for material and modelling techniques truly suffice to prove cultural connections between the two regions? Hence, Makkay's hypothesis deconstructs itself right at the point that is supposed to connect both regions: there are no typological similarities between the stamp-seals from Nea Nikomedeia and Çatal Höyük. On the other hand, Makkay's model lacks an explanation of the motifs appearing exclusively in the SE European region (*Makkay 1984.101–102*):

"*In the case of South-East European clay cylinders and stamp seals, one sees the result of direct or indirect influences, but at the same time, one witnesses the signs of a simplified technique and use. Early and Late Neolithic cultures adopted the manufacture of these artefacts and adapted them to their own heritage and needs. Accordingly, the EN stamp seals do not seem to have differed from their Anatolian parallels, either as regards their typology or their use.*"

Since parts of the motifs (*e.g.* some derivatives of a labyrinthine motif, zigzags, a motif of impressed shallow bosses on the oval base, a motif of 'barbotine'-like bosses) appear on European objects exclusively, the author's interpretation of European stamp-seals as identical with Anatolian specimens or as their simplified derivatives, strikes the eye even more strongly.

The interpretation of Greek stamp-seals represents a special problem within Makkay's model. Some of them, unlike other SE European specimens, are made of stone. Accordingly, the author puts forward the hypothesis that cultural impulses for the production and use of Greek stone stamp-seals came by a different route than for other SE European specimens. Since the Levant is defined as the oldest primary production centre for stone stamp-seals, Makkay (*1984.79–80*) argues that it was also from here that the production of stone stamp-seals spread into Thessaly:

" *... these Thessalian stone seals do not appear to be a local variant of the Anatolian Neolithic seals, associated with them as an influencing group from*

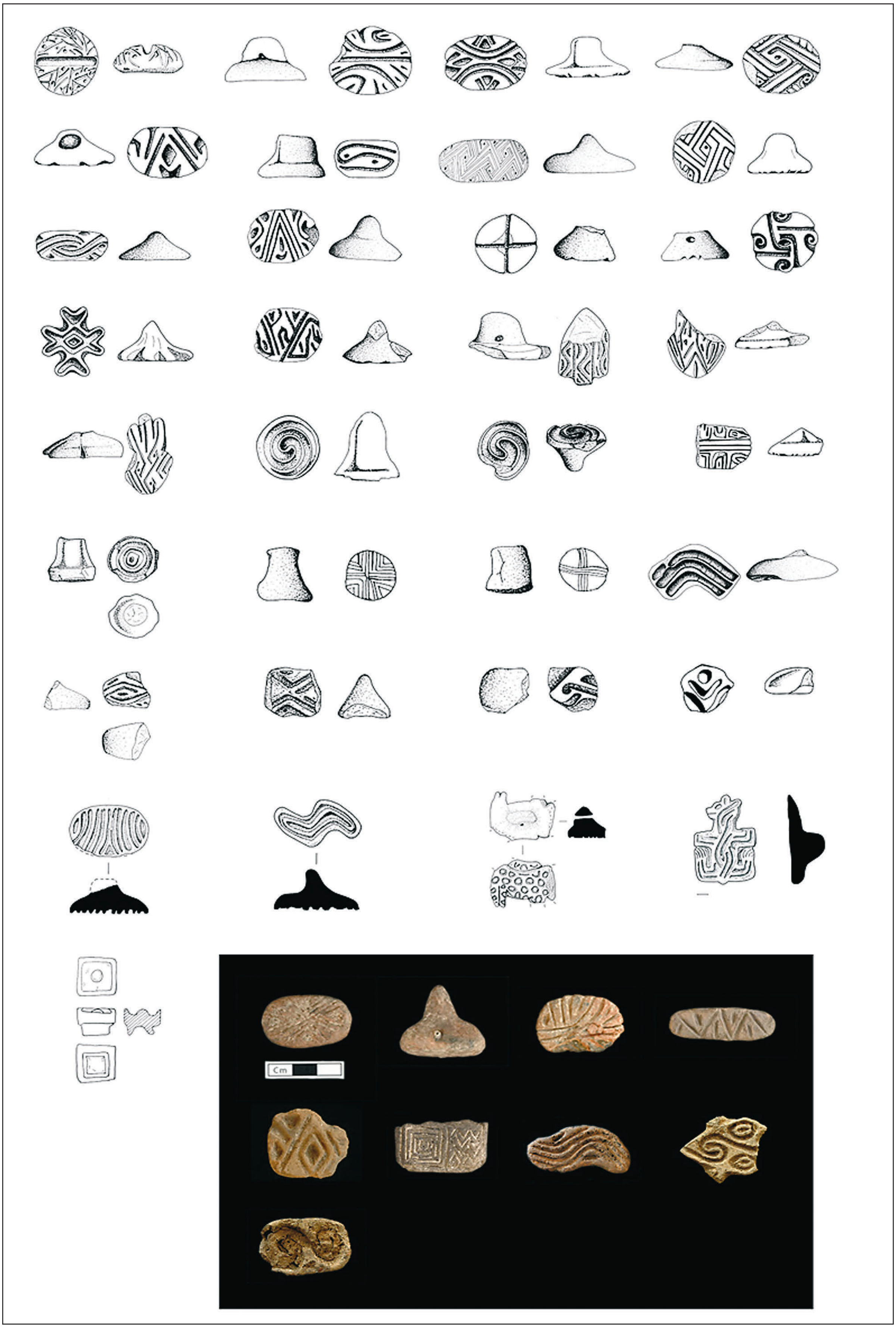

Fig. 2. Stamp-seals from Çatal Höyük (after* Türkcan 1997; 2003; 2004; 2005*).

the beginning. It may also be noted that a great part of these Thessalian seals – bearing very little resemblance to the Anatolian or Levantine Neolithic seals [our emph.] – cannot be securely dated ... The use of stone draws a distinction between the Greek, and the Karanovo and Körös-Starčevo seals ... But these differences could also indicate the existence of independent connections with Cyprus and the Levant, undiscovered as yet."

Makkay therefore anticipates the transmission of cultural impulses for production and use of stamp-seals in the Early Neolithic via two different routes: the first should have been a continental one, leading through the plains of Thrace and Eastern Macedonia; the second should have been maritime, connecting Anatolia or The Levant with Thessaly (*Makkay 1984. 81*). The described exposition of the genesis of Thessalian stamp seals contains several deconstructive statements: first, Makkay stresses a small typological similarity not only between Thessalian and Anatolian objects, but also between the Thessalian and Levantine specimens. Then, in spite of the stated, he conditions, merely because of the use of the same material, the appearance of stamp-seals in Thessaly with the cultural diffusion from Levant. Why this kind of hypothesis? The answer, of course, could be sought in diffusionist discourse that does not allow the author to consider, let alone mention, the possibility of stamp-seals having been independently invented in SE Europe.

The analyzed model represents Europe merely as a passive recipient of external influences. External impulses are not only seen as a trigger for the beginning of the production and use of stamp-seals in SE Europe, but also as a precondition. According to Makkay, in the Middle Neolithic, when there were no cultural impulses from Anatolia, the industry of stamp-seals in SE Europe almost died out. This kind of reasoning would make sense if author succeeded in proving continuing contacts between Anatolian and SE European Neolithic sites, in showing why these contacts were crucial for the production of stamp-seals in Europe, and in defining the role of stamp-seals for such contacts. Makkay's hypothesis contains none of these. Instead, the author merely mentions that the spread of stamp-seals along with painted pottery was a result of cultural diffusion from Anatolia.

Perlès' model of Neolithisation (*2001; 2005*) has some features of Makkay's scenario. Thus Perlès (*2005. 286*) also argues for the idea of two main routes (maritime for Greece, continental for the rest of SE Europe). Yet there are also some major differences between the models. Contrary to Makkay (*1984*), who builds his model upon idea of cultural diffusion, Perlès (*2001; 2005*) asserts that small groups of colonists settled in Europe. The author constructs her theoretical model not only with a comparison of ceramic sequences and typological similarities between the stamp-seals of both regions (as Makkay does), but also by paralleling other elements of the 'Neolithic package' within SE Europe and Anatolia. The main problem when citing small objects (such as sling bullets, discs, belt-hooks, ear studs, stamp-seals, stone bowls, bone *spatulae etc*.) from the 'Neolithic package' as evidence of diffusion lies in the fact that some of the similarities arise merely from the function of the objects (as in the case of sherd spindle whorls, sling bullets and axes). On the other hand, objects requiring particular technical knowledge, and stylistically distinctive artefacts (such as figurines, bone hooks, earstuds and stamp-seals), which could suggest connections between Europe and Anatolia/ Levant, are quite often dated several centuries apart. The contextual isolation of small objects is another big hindrance. These problems are recognized by author, yet they are immediately suppressed: Perlès (*2001.54*) supports her Neolithisation model exactly with those analogies

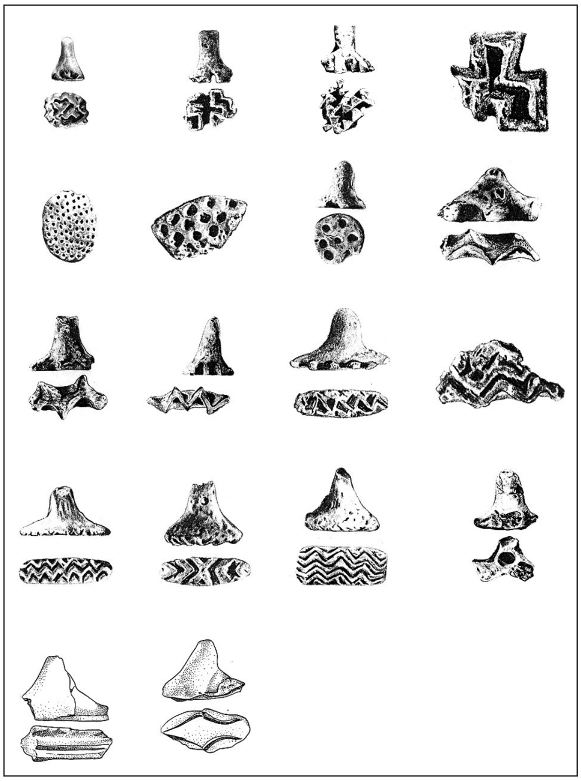

Fig. 3. Stamp-seals from Nea Nikomedeia (after **Makkay 1984.Fig. III: 10; Fig. IV: 2, 3, 4, 6, 7; Fig. VI: 1, 2, 4, 5, 8, 9, 10; Fig. X: 1, 7, 8, 12, 14*).***

previously described as problematic. Since the author is trying to solve the problem of the huge temporal discrepancies between similar elements of the 'Neolithic package' in the Levant, Anatolia and Europe, she introduces the idea of small groups repeatedly colonizing Greece (*Perlès 2005.280*):

"*I have already argued (*Perlès 2001*) that I viewed the colonisation of Greece as a maritime phenomenon, by small groups of different origins – mostly Levantine – and, I would now add, at different periods. Many stylistic and technical parallels can be underlined between the two regions ...*"

This hypothesis triggers the questions why would Levantine colonists abandon their homeland and migrate into Greece at different periods. If Perlès (*2001*) looked for the reasons for the departure of colonists within the PPNB exodus and the collapse of the ritual elite in the first place, the new variant of the model leaves many questions unanswered: did different communities abandon their land for the same reasons? What kinds of reasons were they? Over what kind of time span did these colonisations occur?

Deconstructive claims can be found in the case of stamp-seals also. Greek specimens are thus chronologically and typologically compared with Çatal Höyük stamp-seals. As Perlès (*2001.54*) writes: "*... the bone hooks, stamp-seals and ear studs from Thessaly undoubtedly strongly resemble those of Çatal Hüyük.*" Hence, interpretations by Perlès (*2001.54*) and by Makkay (*1984.79–80*) are diametrically opposite to each other. If Perlès (*2001.54*) compares Thessalian stamp-seals with objects from Çatal Hüyük, Makkay (*1984.79–80*) on the other hand, sees no typological similarities between Anatolian and Thessalian stamp-seals at all. Instead, he emphasizes resemblances between Levantine and Thessalian objects. Therefore, the case of Thessalian stamp-seals raises the question of scientific objectivity in searching for typological parallels between stamp-seals from different regions. Looking for the place of origin with the help of a typology of motifs is extremely problematic, since patterns on Neolithic stamp-seals consist of simple geometrical designs which are not culturally and chronologically specific. Perlès (*2001.288–289*), obviously aware of this fact, refers to it when writing about the problems of individual identification on the grounds of luxury stone stamp-seals:

"*Stone 'stamp-seals' are not only rare, but, on first reading, they would seem to be good candidates for individual identification. Unfortunately, this is the one interpretation that can be thoroughly rejected: the motifs consist of a small range of geometric patterns that can be found from the Indus to the Carpathians. There is clearly no attempt at any individualization of the motifs, and therefore, of their owner.*"

The author employs the universality of the motifs as an argument against the individualization of stamp-seals, yet she 'overlooks' the same argument the moment she uses stamp-seals to support her Neolithisation model.

Now, it is appropriate to note also some of the approaches that offer alternative perspectives on Neolithic stamp-seals of SE Europe. An analysis undertaken by Dzhanfezova (*2003*) has shown a correlation between the shapes of the bases and the types of motifs found on them. Equally significant is the fact one group of stamp-seals shares decorations with other categories of artefacts (particularly with contemporary ceramic vessels, figurines and 'altars'), while the other does not (*Dzhanfezova 2003.103–104*). Consequently, the author concludes that stamp-seals constitute a multifunctional group of artefacts, some of them carrying more specific types of information than others.

On the other hand, Chapman (*2000*) observes stamp-seals through the prism of fragmentation. Statistical analysis has shown the majority of the stamp-seals were not intentionally broken. Unlike the group of objects with 'incised signs', the purpose of stamp-seals was not to enchain information within two intentionally broken pieces, but to imprint the motif on some other kind of material.

We conclude this short review by summing up some points presented by Budja (*2003*). Stamp-seals are sometimes documented at Neolithic sites together with figurines, 'altars', pins, amulets, anthropomorphic and zoomorphic vessels, and painted pottery. Budja propose that these assemblages indicate the function of stamp-seals (*Budja 2003.124*).

While the majority of works treat stamp-seals as an element of the 'Neolithic package' and therefore as inactive material reflections of the Neolithisation process in SE Europe, as a typological fossil which should help locate their place of origin, as static, fixed entities within firmly defined social networks and last, but not least as the immovable foundation stones of meta-narratives, we strive towards alternative approach. In order to enliven the Neolithic stamp-seals of SE Europe, we employ a phenomenological approach towards material culture, expressed through the concept of the cultural biographies of artefacts (*cf. Hoskins 1998; Gosden, Marshal 1999; Tilley 2004; Knappett 2005; Hoskins 2006; Tilley 2006; Skeates 2007*). Cultural biographies of stamp-seals and therefore both their material and non-material attributes are thus presented through the concepts of affordances, constraints, semiotic triad, icon, index and symbol (*cf. Knappett 2005*).

Within networks of meaning

Affordances and constraints

Neolithic stamp-seals are first and foremost objects used for stamping; and therefore artefacts meant for reproducing the motifs they carried on their bases.[6] We shall prove this statement with an analysis of the *physical affordances*[7] of the objects. Since affordances derive from the material characteristics of artefacts, let us describe them first.

What we can observe directly in the case of stamp-seals, without using cultural knowledge, is that they are portable objects, having a decorated base, and a handle growing out vertically from the base. The surface of the base is usually flat, or sometimes slightly convex/concave. In all of the three cases, the centre of gravity of stamp-seals remains in the lower part of the object. The artefact therefore reaches optimal stability when placed on a flat surface in such a way that the base and surface are parallel. It is crucial to note that the motif, when in this position, despite being the most important constitutive element of a stamp-seal, is not visible (Fig. 4).

The majority of the documented objects (*Makkay 1984; 2005*) are of clay, although some stone specimens occur in Greece.[8] Both materials give solidity to the objects. Bases range in size from around 3 and 7 centimetres, while the height of the objects varies between 5 and 8 centimetres. Bases are modelled in various rectangular, circular, oval, rhomboidal forms, sometimes even in cross-like or foot-like forms.[9] They are decorated with geometrical motifs in high or low relief. Patterns include circles, dots, spirals, labyrinths, crosses, chevrons, triangles, and straight, curving and zigzag lines. Some handles are perforated. Since the handle is usually small and formed in a cone-like fashion, we reach optimal graspability if we handle it with the thumb and second finger, with the other fingers closed. If the handle is big enough, it can be grasped with all fingers forming a fist (Fig. 4).

The following four characteristics are reckoned among the physical affordances of stamp-seals: the affordance to stand in the most stable position on the level surface when the base is in parallel with the surface; the affordance to manipulate the stamp-seal easily when the handle is grasped; the affordance to imprint geometrical designs on various surfaces; the affordance to be suspended on a string as a pendant in the case of stamp-seals with perforated handles (Fig. 4).

The crucial affordance of stamp-seals to transfer geometrical designs to various materials originates from the following combination of physical affordances: that of having a handle, to imprint geometrical designs with the base of a stamp-seal on various surfaces and to stand in the most stable position on level surface when the base is parallel with the surface. Because of these, the principles of making images with stamp-seals differ greatly from those of making images with other types of tools. As Skeates (*2007. 194–195*) puts it:

6 However, this does not mean all stamp-seals were included in the same networks of meaning; neither did they share the same functions. We intend to demonstrate that stamp-seals gradually developed some secondary functions.

7 The concept of affordances was introduced by psychologist James Gibson (1979) when developing the notion of direct perception (*Knappett 2005.44–58*). The potential of objects for various forms of actions (*i.e.* affordance) was described by Gibson (*1979.139*) as follows: "*The observer may or may not perceive or attend to the affordance, according to his needs, but the affordance, being invariant, is always there to be perceived. An affordance is not bestowed upon an object by a need of an observer and his act of perceiving it. The object offers what it does because of what it is.*"

8 We list Greek Neolithic sites and the number of stone stamp-seals discovered on them. Achilleion: 1 (*Gimbutas 1989b.212*); Nemea: 1 (*Blegen 1975.272*); Nessonis: 3 (*Makkay 1984.41–42; Theocharis 1973.Fig. 272: e*); Pyrassos: 1 (*Makkay 1984.47*); Sesklo: 2 (*Arachoviti 1996a.333; 1996b.333*); Tsani magoula: 1 (*Makkay 1984.62*); Zerelia: 1 (*Makkay 1984.66*); a stamp-seal of unknown provenience from the museum in Larissa (*Onassoglou 1996b.332*). See Fig. 11.

9 Stamp-seals with a base in the form of a foot were documented at 4 Neolithic sites in SE Europe: Gura Vaii (Romania), Bikovo-Dončova mogila (Bolgaria), Nessonis (Greece), Szentes (Hungary) (*Makkay 1984.13, 26, 41, 70*). A handle in the form an animal head is the other special characteristic of a stamp-seal from Szentes.
The type of stamp-seals with a base shaped like a foot has wide chronological and geographical distribution. It appears not only at Neolithic sites in SE Europe, but also in the Neolithic Byblos, as well as at Minoan and Levantine Bronze Age sites (*cf. Younger 1995*).

Fig. 4. Physical affordances of stamp-seals. Photograph by B. Širca.

"*What sets such objects apart from other hand-held artistic tools, such as brushes, gouges and sharp points (which were also used in the Neolithic to produce similar images on a range of media), is their ability to reproduce – simply, quickly and manually – a large number of almost identical copies of an original graphic image …* "

Can we recognize some of the *constraints*[10] that represent decisive counterpart to the objects' affordances? First, let us describe some of the physical and logical constraints which can be defined through the undertaken experiment.

The experiment was undertaken with the aim of testing three different types of stamping techniques: stamping on unbaked, unleavened bread, stamping on textile, and printing on human skin. Therefore, some replicas of stamp-seals with high and low relief motifs were made.

When examining stamping on different materials, we came to the following conclusions: if stamping unbaked, unleavened bread, all types of motifs are clearly imprinted on it, no matter in what kind of relief they are designed. The major constraint of marks of this kind is thus not connected with the type of relief motif, but with the property of the unleavened bread. When unleavened bread is baking, air bubbles appear in the dough, therefore reducing the visibility of the motif (Fig. 5).

The main constraint, when stamping on textiles originates from the modelling bases of Neolithic stamp-seals. If the textile to be stamped is put on a solid flat surface, only the stamp-seals with completely level bases leave imprints on it. This condition is rarely fulfilled in the case of Neolithic stamp-seals, whether a motif is in high or low relief. The majority of objects has, as a consequence of manual modelling, a pattern on the slightly unevenly levelled surface of the base (*cf. Makkay 1984*).[11] Now, when examining stamping on textile, the following question should be asked: did the people of the Neolithic know how to fix dyes on textiles? Contrary to the recognized fact that people employed dyes made from minerals, plants or animals in the Neolithic (*Barber 1991.223–243*), the question as to whether people knew of a sub-

Fig. 5. Baked unleavened bread with imprinted motifs. (A, B, C) various types of motifs. Photograph by B. Širca.

10 Norman (*1998.82*) defines constraints as "*… whereas affordances suggest the range of possibilities, constraints limit the number of alternatives.*" We need to distinguish four types of constraint. Physical constraints are thus conditioned by the material and physical characteristics of an object; semantic and logical constraints rely upon the meaning of the situation in which an object resides; while cultural restraints are preconditioned by cultural conventions (*Knappett 2005.52–54*).

11 We managed to get good quality imprints only when a soft backing (*i.e.* foam) was put under the textile (Fig. 4).

stance for fixing dyes and preventing discolouration when in contact with water, remains unanswered.[12]

Like bread, the skin is a type of soft material enabling good imprints of all types of motifs (Fig. 6). Therefore, constraints when stamping human skin are less conditioned by the physical properties of objects than by cultural contexts. Some of the cultural constraints could be associated with these questions: on what occasions do people decorate their skin with paintings? Do modes of decorating men and women differ? Who is allowed to decorate their skin with paintings? When printing on skin, how many pintaderas and colours are employed?

Fig. 6: Examples of the body paintings – done either with sharp points or with pintaderas – of the people of Kau and from the experiment. Photographs by Riefenstahl 1976; Širca.

Let us reiterate: due to the physical constraints we observed through experiment, it is very probable that stamp-seals were not used for stamping solid and flat surfaces (such as walls or textiles placed on solid surface). More probably, they were employed for stamping soft materials (*e.g.* bread, skin).

The semiotics of stamp-seals: iconicity, indexicality, symbolism

Since stamp-seals are primarily objects designed to carry and reproduce motifs on various surfaces, we should analyze the semiotics[13] of the imprints foremost. Inasmuch as imprints are not preserved, we can partially reconstruct their semiotics through the observation of motifs modelled on the bases of stamp-seals. However, we should not forget when defining networks of meaning between stamp-seals, people and other artefacts, that we are primarily defining relations between a type of tool, people and other objects. Some aspects of relations between imprints, objects and other people will remain unreachable.

Iconicity

When considering *iconicity*[14], we must ask what type of artefacts stamp-seals resembled. Since iconicity of stamp-seals resides primarily within their visual characteristics, various motifs, as the main components of analyzed objects, are the most important sources for the relation of visual similarity between Neolithic stamp-seals and other categories of objects.

In the case of cylinder seals and stamp-seals, the similarity of the motifs remains broad: both types share basic geometrical designs. Yet there are also some major differences. Motifs on cylinder seals are thus often executed in zones; moreover, rolling of the cylinder enables the filling of a larger surface continually than stamping itself (*cf. Collon 1990*).

It has been shown that similar patterns are shared by certain stamp-seals and other types of artefacts: synchronic vessels, figurines and 'altars' may be decorated with patterns of straight or curving parallel lines, zigzag lines, concentric circles, spirals, and meanders, or with deeply engraved or impressed dots, which appear on some stamp-seals (*Dzhanfezova 2003*). However, we can assume that motifs on stamp-seals exhibited a visual similarity with weaving, basketry decorations and wall paintings also.

12 Barber (*1991.175*) mentions a textile find from the site at Lago di Ledro which was described by the excavator as a textile decorated by stamping with resinous substances. Perhaps these substances were used to fix dyes.

13 When writing on the semiotics of artefacts, we employ a modified Peircean model (*cf. Pharies 1985; Peirce 2004; Knappett 2005*). Three different types of signs are thus acknowledged: an icon, an index and a symbol. Each of those signs is defined by specific relationship existing between object and a sign, which in Peirce words " *... stands for something, its object*" (*Pharies 1985.14*). According to Peircean model various things such as objects, animals, plants, people, emotions, when having a specific relationship with their object, become sign (*Prijatelj 2007.85–87*).

14 Peirce defines an icon with following words: "*I call a sign which stands for something merely because it resembles it, an icon.*" (*Pharies 1985.34*). Thus a portrait is an icon of the portrayed person (visual similarity), onomatopoetic words are icons for animal sounds or natural phenomena (aural similarity), a ship-like cloud is an icon for a ship (visual similarity), and artificial leather is an icon for genuine leather (visual and tactile similarity) (*cf. Knappett 2005.95–100; Prijatelj 2007.88*).

Since none of these are preserved, assumptions are grounded on ethnographic studies (*cf. Ortman 2000*) and excavations of Anatolian Neolithic sites. The excavated material from Haçilar, Can Hasan and Çatal Höyük yielded stamp-seals, pottery fragments, parts of wall paintings and wall reliefs with identical motifs of a rotating meander with a central dot, a vegetal motif, a hand, a bear, and a leopard (*Milojčić 1964. 59–62; Türkcan 2003.on-line; 2007. in this volume*) (Figs. 7, 8).

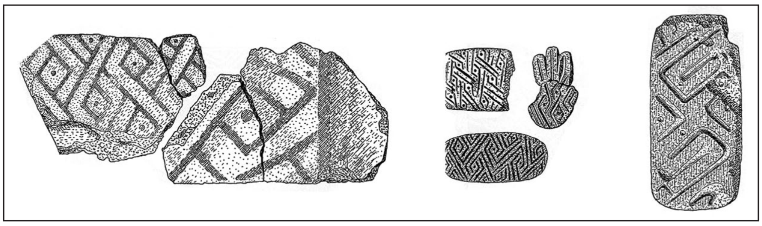

Fig. 7. Anatolian stamp-seals and fragments of wall paintings with identical motifs (after **Milojčić 1964.Abbs. 1, 2*).***

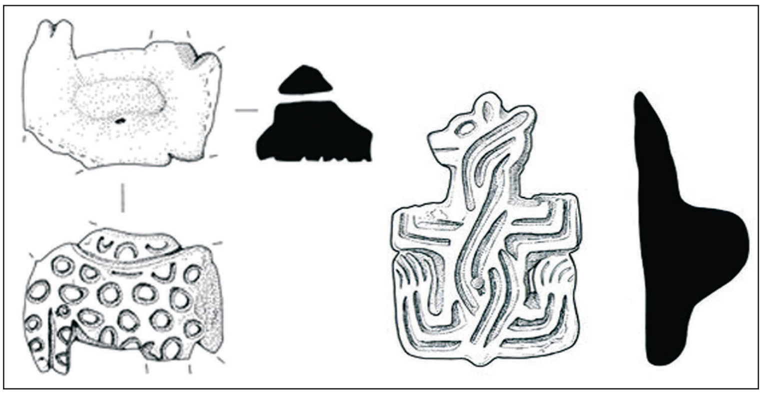

Fig. 8. Stamp-seals with leopard and bear from Çatal Höyük (after **Türkcan 2003.on-line*).***

A special form of visual similarity could be recognized among a few specimens of anthropomorphic, zoomorphic stamp-seals, people, animals and certain types of objects. Contrary to the majority of analyzed objects, having a base and handle modelled as a simple geometrical body, these specimens are characterized by a base or handle designed as part of human or animal figures.[15] That is why this particular group of Neolithic examples could be interpreted as icons for man or animal but also as icons for human, animal figurines, as well as anthropo- and zoomorphic vessels (Fig. 9).

Visual similarity represents the loosest mode of possible relationships between stamp-seals as icons and their objects. Hence, artefacts, corded together with visual similarity, share only associative connections. Stamp-seals can be therefore understood as icons of cylindrical seals, meaning, in the case of settlements where both types were used (*e.g.* Sitagroi) (*cf. Renfrew 2003*), the view of one could trigger an association of the other (and vice versa). Similarly, stamp-seals could also become icons of vessels, human and animal figurines, 'altars', textiles, basketry or wall paintings, when having identical motifs. Therefore, when seeing a stamp-seal with a specific motif, pots, figurines, 'altars', textiles, basketry or wall paintings with similar motifs could come to the mind of a Neolithic observer. Likewise, anthropo- and zoomorphic stamp-seals could become icons for people, animals or anthropo- and zoomorphic vessels and figurines. Again, the view of anthropo- and zoomorphic stamp-seals could initiate associations with other types of artefacts modelled on human or animal forms. Presumably, during associative lines of thought, not only objects come to mind due to their visual similarity with stamp-seals, but so do activities and ideas which are indivisibly connected with them (*cf. Knappett 2005.114*).

Fig. 9. Zoomorphic stamp-seal (after **Makkay 1984.Fig. XXX: 1*) and anthropomorhic examples (after*** **Makkay 1984.Fig. XII: 9; Gimbutas 1984. Fig. 47; Bilbija 1985.Fig. 3*).***

However, if we wish to define tighter connections between stamp-seals, people and other types of objects, we need to search for other modes of relationships between them.

15 The only known specimen of a stamp-seal with zoomorphic handle comes from Szentes, Hungary (*Makkay1984.70*). Five documented examples with anthropomorphic handles derive from Usoe, Bolgaria (*Makkay 1984.63*); the neighbouring area of Dikili Tash, Greece (*Makkay 1984.18*); Cerje-Govrelvo, Macedonia (*Bilbija 1985.36*); Zelenikovo-Slatina, Macedonia (*Makkay 1984.66*) and Smederevska Palanka, Serbia (*Gimbutas 1984.91*).

Indexicality

When exploring the *indexicality*[16] of stamp-seals, one must consider relationships of *contiguity*, *factorality* and *causality*. To recognize these we need to tackle the following questions: what kind of artefacts do we usually find in spatial contiguity with stamp-seals? To what extent is the stamp-seal an index for various other objects, activities and thoughts (*cf. Knappett 2005.114–115*)?

One of most obvious aspects of contiguity relates to the question of how stamp-seals were used for making imprints. Were colours applied to the bases of stamp-seals and then stamped on human skin, walls, textiles or wooden objects? Were stamp-seals merely impressed onto softer surfaces, or were they heated to stamp wood, human or animal skin? Even though imprints do not survive, different traces on the bases of stamp seals hint at various uses: several objects with traces of colour on the bases have been documented,[17] one with an extremely burnt base,[18] and some with heavily worn base surfaces have also been found. Considering the preserved traces on the bases of stamp-seals, as well as the results of the undertaken experiment, the Neolithic stamp-seals of SE Europe can be interpreted as indexes for the use of colours, and as indexes that speak against stamping on solid and flat surfaces.

A further aspect of indexicality relates to the modes of production of stamp-seals. The way it is modelled indicates the input of effort and work invested into the making of a specific object. Every stamp-seal could therefore be seen as index of all those activities that caused the artefact to take on its final form. Different levels of precision can be recognised in the modelling of stamp-seals.[19] The range in quality is most obvious in the modelling of motifs. While designs on clay objects vary from accurate to superficial, the execution of motifs on the stone specimens is extremely precise (Fig. 10).

Stone stamp seals (which derive exclusively from Greek Neolithic sites) could therefore be understood as causal indexes for the great skill, effort and time that were put into their production, most probably by craftsmen specialized in making stone objects (*cf. Perlès 2001.288–289*). These specimens (Fig. 11) share a magical quality, since they are produced with such technical virtuosity that they catch the observer's attention and enchant him/her (*cf. Gell 2006; Hoskins 2006*).

Given that stamp-seals are not only causal indexes for modes of their production, but also causal indexes for agents who used them, we need to pose the following question: were stamp-seals employed by specific gender, age or status groups? In order to approach the answers, we analyse the spatial contexts in which stamp-seals are embedded. First, we analyse the relationships between stamp-seals themselves within closed archaeological contexts. Second, we observe the associations between stamp-seals and other categories of objects within closed archaeological contexts. Finally, we analyse the intra- and intersite distribution of contemporary stamp-seals.

When dealing with the problem of the spatial contexts in which stamp-seals are embedded, one is confronted with several taphonomic filters: publications of archaeological sites usually quote only those archaeological layers in which stamp-seals were found, while data on archaeological features are usually missing. It may even happen (especially in older literature) that even facts on the archaeological layers in which stamp-seals were found are not presented.

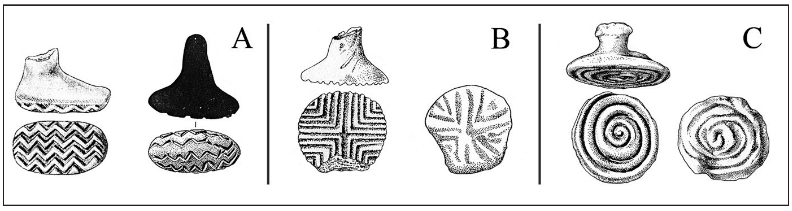

Fig. 10. Selected examples of differences in modelling the same motif. A: zigzag (after* Makkay 1984.Fig. IV: 1, 8*). B: cross (after* Makkay 1984. Fig. XV: 189; Fig. XXIII: 4*). C: spiral (after* Makkay 1984:Fig. XVIII: 1, 6*).

16 Peirce defines an index as a sign which "*signifies its object solely by virtue of being really connected with it. Of this nature are all natural signs and physical symptoms*" (*Pharies 1985.39*). An index can be in one or more of the following types of relationship with its object: contiguity, causality and factorality. Thus puddles are icons for rain (causal relationship), a market sign is an icon for a market (relationship of contiguity and factorality), and the smell of freshly baked bread is an icon for the bread (contiguity and causality) (*cf. Knappett 2005.91–95, 97–100; Prijatelj 2007.88–89*).

17 Traces of colour were discovered on the following objects: on 3 stamp-seals from Frumuşica-Cetăţuia (*Makkay 1984.23*), on a stamp-seal from Oltszem (*Makkay 1984.42*) and on a cylinder seal from Sitagroi (*Renfrew 1987b.343*).

18 Only one specimen from Frumuşica-Cetăţuia is mentioned within Makkay's catalogue as a stamp-seal with burnt base (*Makkay 1984.42*).

19 Modelling clay stamp-seals is not a demanding and time-consuming task. With only basic skills in modelling clay, one could make a stamp-seal within half an hour.

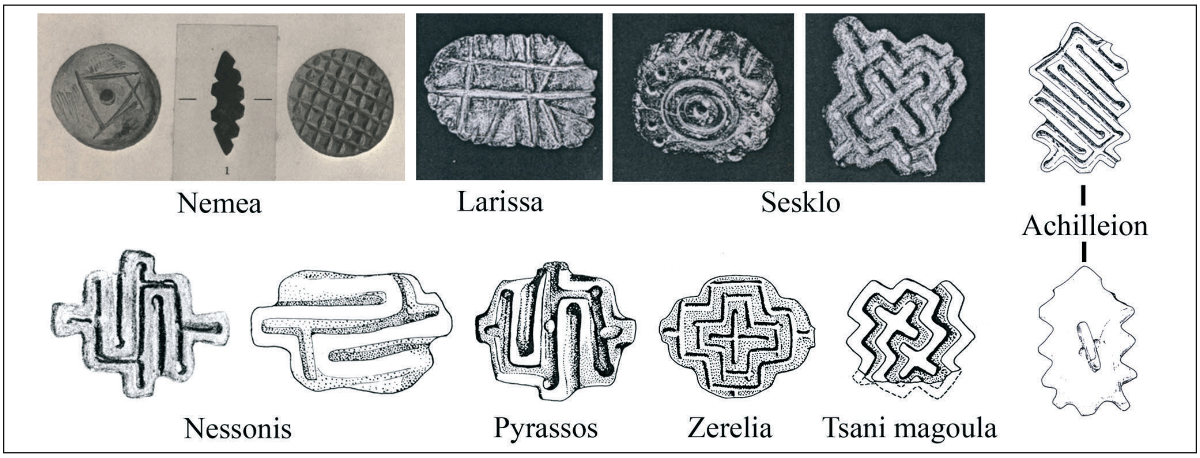

Fig. 11. Stone stamp-seals from Greek Neolithic sites (after* Blegen 1975.Plate 69: 1; Makkay 1984.Fig. III: 1, 3, 6; Fig. XII: 1, 2; Gimbutas 1989b.Fig. 7.73; Arachoviti 1996a.Fig. 280; 1996b.Fig. 281; Onassoglou 1996b. Fig. 278*).

The publications of the following sites Frumuşica-Cetăţuia, Gura Baciului (Romania); Karanovo, Rakitovo, Vinica-Kljisedjik (Bolgaria); Achilleion, Eutresis, Sesklo, Sitagroi (Greece); Cerje-Govrlevo (Macedonia); Grabovac-Vinogradi (Serbia), Endröd 39, Alpár-Nagyvárdomb and Hódmezövásárhely-Zsoldos (Hungary) are exceptions. These are sites at which stamp-seals were discovered, as well as documented, within closed archaeological contexts.[20] The listed sites yielded stamp-seals within buildings, working areas or waste pits (Tab. 2). Since the role of objects in waste pits as a filling is secondary, we focus primarily on other archaeological features.

We must stress that stamp-seals appear within buildings and working areas regularly as one specimen and only exceptionally as two or three specimens, which is the most indicative fact that can be extracted from Table 2. All archaeological features, from the platform in Gura Baciului, the burnt building in Karanovo, the sanctuary and public building in Rakitovo, the building in Vinica-Kljisedik, the clay bench and street near to one of the buildings in Achilleion, the working space in Sitagroi, the building in Govrlevo up to the building in Grabovac-Vinogradi, yielded only one stamp-seal (Tab. 2). The number of stamp-seals differs only in two cases: two were discovered within the area of a lower platform near to one of the hearths at Frumuşica-Cetăţuia, while three stamp-seals were found in House A in Sesklo (Tab. 2). Even though the number is higher in the cases mentioned above, the motif remains the same: both examples from Frumuşica-Cetăţuia shared a spiral design, while all three examples from House A in Sesklo are decorated with concentric circles.

This pattern is typical of the Anatolian site at Çatal Höyük also. Even though the stamp-seal contexts within the site are more diverse and include, besides dwellings and waste material, shrines and burials (*Türkcan 1997.on-line; 2003.on-line; 2004.on-line; 2005.on-line*), the distribution pattern of one stamp-seal within a building (either a dwelling or a shrine) (*cf. Milojčić 1964.61*) remains similar to the SE European pattern.

Recognized distribution patterns (Tab. 2) indicate that specific motifs were connected with particular Neolithic households and were therefore used as identification signs for those households. Although this hypothesis needs further examination through an analysis of the spatial distribution of synchronic stamp-seals within a site, the fact that several from the same closed context shared the same motif, sustains it for the moment.

Now let us observe the relationship of contiguity between stamp-seals and other categories of objects within closed archaeological contexts (Tab. 3).

While doing so, we need to consider the following: the available examples from sites at Gura Baciului,

20 We list the complete literature on analysed closed archaeological contexts: Frumusica-Cetătuia (*Makkay 1984.23*); Gura Bacuilui (*Lazarovici 1995.368, 396*); Rakitovo (*Radunčeva et al. 2002.17–22, 26–30; Matsanova 2003.65*), Karanovo (*Makkay 1984.31*), Vinica-Kljisedjik (*Makkay 1984.64*); Achilleion (*Winn, Shimabuku 1989.53–54, 63–64; Gimbutas 1989b.212, 215, 217*), Eutresis (*Makkay 1984.21–22*), Sesklo (*Kotsakis 1981*), Sitagroi (*Renfrew 1986.212–217; 2003.416; Nikolaidou, Elster 2003.456–458*); Cerje Govrlevo (*Bilbija 1985.35–36*); Grabovac-Vinogradi (*Makkay 1984.24*); Endröd 39 (*Makkay 1984.19–20*), Alpár-Nagyvárdomb (*Makkay 1984.10*); Hódmezövásárhely-Zsoldos (*Makkay 1984.28*).

Site	Dat.	Cultural feature	Closed context /all documented stamp-seals	motif: zigzag	conc. circles	spiral	impressed dots	labyrinth	conc. squares	square with parallel lines	grid	parallel lines	unusual signs	Anthropomorph. s.
Frumuşica-Cetăţuia	**LN** Cucuteni A	dwelling lower platform near the hearth	2/8			● ●								
Gura Baciului	**EN** Starčevo-Criş IVA	dwelling Platform 6a (horizon IV)	1/1				●							
Karanovo	**LN** Karanovo VI	dwelling burnt building	1/9										●	
Rakitovo	**EN** Karanovo I-II	sanctuary? House 8 (phase I)	1/2				●							
Rakitovo	**EN** Karanovo I-II	public building? House 10 (phase I)	1/2	●										
Vinica-Kljisedik	**LN/En**	dwelling House 3	1/1		●									
Achilleion	**MN** Achilleion IIIb/Sesklo	clay bench near to large, circular hearth	1/2					●						
Achilleion	**MN** Achilleion IVb/Sesklo	dwelling/ courtyard/ street? at E wall	1/2		○									
Eutresis	**LN**	waste pit Upper filling of pit Z	1/2						●					
Sesklo	**MN III**	dwelling	3		● ● ●									
Sitagroi	**LN** Sitagroi III	dwelling/outer working area burnt building; square MM, layers MM 17, 21-50	1/6			●								
Cerje-Govrlevo	**MN** Anzabegovo-Vršnik IV	dwelling House 2 (horizon IV)	1/1											●
Grabovac-Vinogradi	**EN/MN** Starčevo	dwelling? pit 1	1/2						●					
Endröd 39	**EN/MN** Körös	waste pit pit 1, upper ashy layer	3/5	● ●				●						
Alpár-Nagyvárdomb	**EN/MN** Körös	waste pit	1/1							●				
Hódmezövásárhely-Zsoldos	**EN/MN** Körös	waste pit	1/2	●										

Tab. 2. Types of stamp-seals appearing within closed archaeological contexts.

Rakitovo, Achilleion, Sitagroi and Govrlevo differ in their chronology, cultural group affiliation, size of settlement, spatial organization, and way of life. Hence, there are major differences between the listed sites according to the variety and amount of excavated material. Acknowledging mentioned, the search for patterns within closed archaeological contexts remains a demanding and even a somewhat problematic task.

However, when analyzing the listed examples, we notice the following: there are several examples of buildings in Rakitovo, Sitagroi and Govrlevo, which due to the excavated material, are described as objects with special functions. All four buildings from the sites mentioned above yielded artefacts which are rare in other parts of settlements (Tab. 3). The sanctuary in Rakitovo (House 8, Phase I) is thus where both anthropomorphic vessels from the site were discovered, as well as twelve bucrania from the thirty within the site's documented specimens (Fig. 12). House 8 also yielded an unusual structure, perhaps an altar, without known analogies and great quantities of painted pottery (*Matsanova 1996; Radunčeva et al. 2002; Matsanova 2003*). A special status for House 10 in Rakitovo has been assumed due to its spatial organization (*Macanova 2000.60; Radunčeva et al. 2002*). A peculiar character for

Site	Dat.	Cult. feature.	Nr. of stamp-seals	Artefacts from closed archaeological deposits								
				painted pottery	anthropomorph. pottery	zoomorph. pottery	figurines	animal figurines	altars	amulets/bucrania	obsidian tools	other
Gura Baciului	**EN** Starčevo-Criş IVA	**dwelling** platform 6a (horizon IV)	1								● (3)	Stone tools, pottery
Rakitovo	**EN** Karanovo I-II	**dwelling** House 8 (phase I)	1	●	● (2)				● (1)	● (12)		Stone, polished and bone tools, biconoid and round sling bullets, pottery
Rakitovo	**EN** Karanovo I-II	**public b.?** House10 (Phase I)	1	●								Stone, polished and bone tools, biconoid and round sling bullets, pottery, bobbins, loom-weights
Achilleion	**MN** Achilleion IIIb/Sesklo	**clay bench** near to the large, circular hearth	1	●			● (7)		● (1)		●	axe, grinders, querns, fine pottery, ladle
Achilleion	**MN** Achilleion IVb/Sesklo	**dwelling/ courtyard/ street?** near E waln	1		● (1)		● (7)					broken stone tools, grinders, querns
Sitagroi	**LN** Sitagroi III	**dwelling/ outer working area** burnt building; square MM, layers MM 17, 21-50	1	●		● (2)	● (29)		● (6)			Stone, polished and bone tools, querns, pottery, ladles, spindle whorls, miniatures, ornaments (spondylus bracelet)
Govrlevo	**MN** Anzabegovo-Vršnik IV	**dwelling** House 2 (horizon IV)	1	●	● (1)				● (1)			Stone and bone tools, quern, askos

Tab. 3. Stamp-seals and other categories of objects within closed archaeological contexts.

House 2 in Govrlevo is suspected because of an anthropomorphic vessel found there, or perhaps a figurine, also with no known parallels and because of the anthropomorphic altar, which is one of the specifics of the Anzabegovo-Vršnik cultural group (*Bilbija 1985.35–36; Zdravkovski 2006.109*) (Fig. 13). While the described buildings at Rakitovo and Govrelvo are marked as shrines by excavators, a burnt house from phase III at Sitagroi (Fig. 14) is defined as a place for extracting copper ore. Special finds excavated within the building include plastic vessels, a stone vessel, fourteen miniature models (of houses, hearths, vessels, furniture and axes), and objects used as mnemonic devices (*Elster, Nikoladiou 2003.441–442; Nikoladiou, Elster 2003.456–458*).

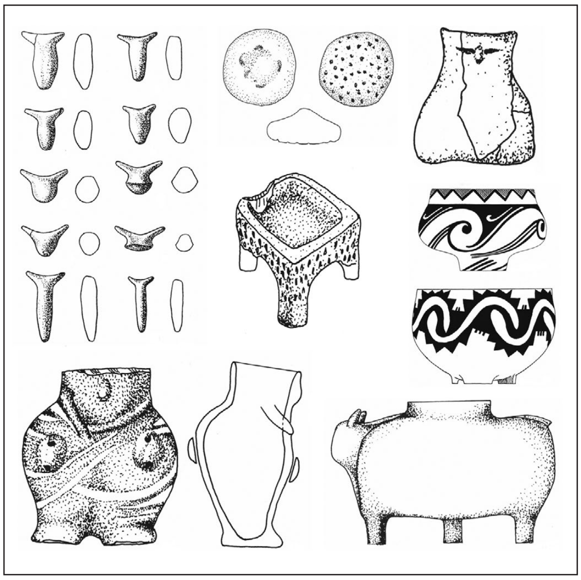

Fig. 12. Rakitovo, House 8, (Phase I). Selection of artefacts (after* Budja 2003.Fig. 7.1*).

The four cases described show stamp-seals appear within contexts with rare and exceptional ritual objects. Unlike figurines and altars connected with various cults and rituals, yet appearing in larger numbers at Neolithic sites, anthropo- and zoomorphic vessels, bucrania and miniature models are found in much smaller numbers. The presented pattern of spatial contiguity between stamp-seals and exceptional objects is confirmed once again in the two cases from Achilleion: there, a stone stamp-seal was found on a clay bench together with figurines, an altar and a ladle (Fig. 15). In a second case (Fig. 16), a clay stamp-seal was discovered with an anthropomorphic vessel (*Gimbutas 1989b.215, 217–218*).

However, there are also some contexts in which no spatial contiguity between stamp-seals and cult objects was documented. Such is the case of platform VIa at Gura Bacuilui (Fig. 17). Three obsidian blades might be pointed to as significant finds among the pottery, stone and bone tools excavated within the platform (*Lazarovici 1995. 368*).

These assemblages indicate that stamp-seals appear in a relationship of contiguity with cult objects. However, it is also evident that stamp-seals were discovered with a great number of everyday objects (*e.g.* coarse ware, stone and bone tools, grinders, querns, loom weights). Even though the analyzed sample allows the interpretation of stamp-seals along with cult objects as a factoral index, indicating complex rituals, further investigations of a larger sample are needed to confirm this.

Given that negative data are as important as positive data, when describing the spatial contiguity of stamp-seals and cult objects, we have to mention the absence of stamp-seals within the ritual building[21] at Nea Nikomedeia. The only building from the site with completely published material, consisting of 5 female figurines, 2 outsized axes, 2 unusually gourd-shaped pottery vessels, 2 large caches of unused flint blades and several hundred clay roundels (*Rodden 1964.114*), did not yield even one stamp-seal, although the site is known as one with the highest

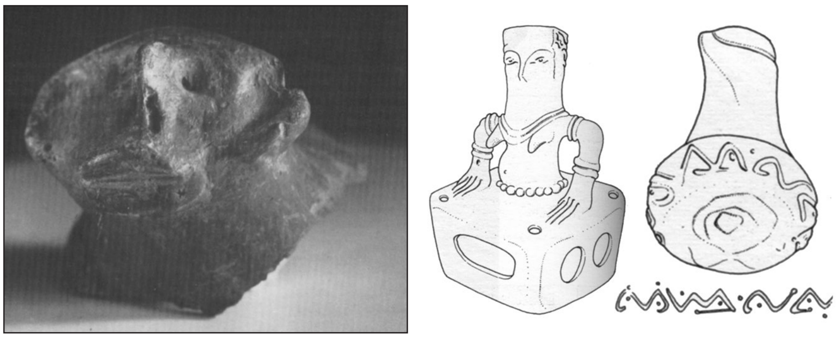

Fig. 13. Cerje Govrlevo, House 2. Selection of artefacts (after* Bilbija 1985.Fig. 2; 3, 4*).

21 Several interpretations are offered for the building of unusual size, ranging from its being a collective ritual building (*Rodden 1964; Pyke 1996*), the dwelling of a family involved in long-distance trade (Halstead 1995), to being a public place with economic and social functions (*Talalay 1993*).

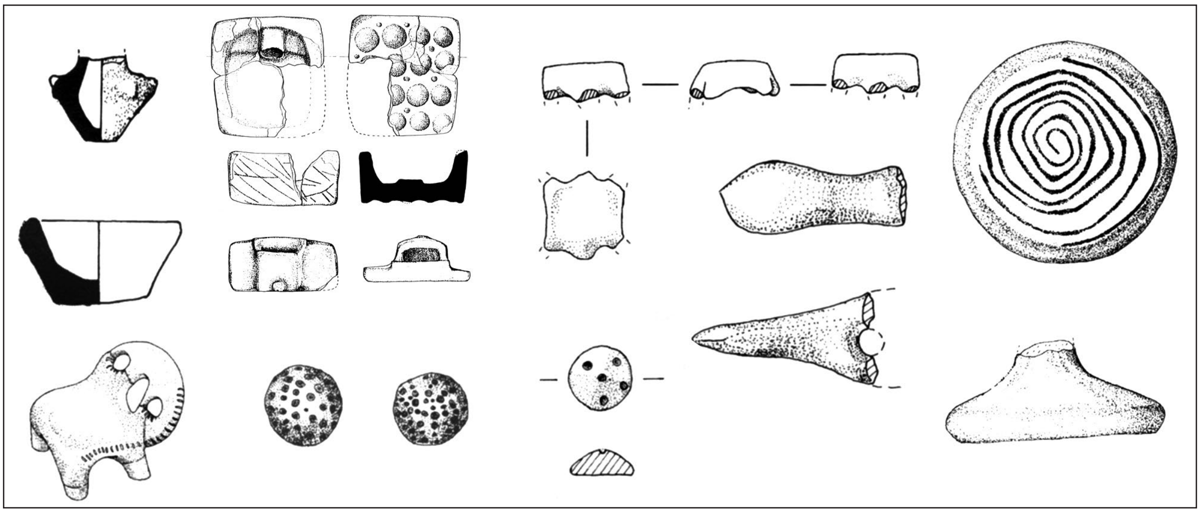

Fig. 14. Sitagroi, burnt house (phase III). Selection of artefacts (after* Renfrew 1986.Fig. 8.20; Elster, Nikolaidou 2003.Fig. 11.25; Fig. 11.34; Fig. 11.39; Fig. 11.45; Fig. 11.53; Renfrew 2003.Fig. 10.6; Fig. 10.7; Fig. 10.8*).

number of stamp-seals discovered.[22] Could it, therefore, be assumed that stamp-seals are indexes of people whose high status was not conditional upon material wealth or ritual leadership, but on other parameters? Since the relationship of factorality between stamp-seals and other objects from Nea Nikomedeia remains, due to (un)published data, unknown, these questions remain unanswered.

In continuing our discussion on factorality, we shall observe the spatial distribution of stamp-seals with same motifs at the regional level to discover what type of meaning networks conditioned with the use of stamp-seals existed between Neolithic settlements. We need to acknowledge when writing on the spatial distribution of motifs on a range of objects (*e.g.* stamp-seals, figurines, 'altars', vessels, wall paintings, textiles) that we are broaching the subject of style. Therefore, the recognized large-scale distribution of motifs of zigzag, labyrinth, impressed dots and spirals (*Halstead 1989; Bailey 2000; Perlès 2001; Budja 2003*) could be understood as a factoral index for the inner dynamics of the style or *common difference* (*cf. Wilk 1995; 2004*). It was actually common difference that influenced the selection of motifs in such a way that some were limited to small-scale distribution (*e.g.* motif of shallow impressed dots, labyrinth) while others (*e.g.* motif of zigzag, spiral) occurred across large areas of the Balkans. When analyzing the spatial distribution of motifs appearing over large areas, we have to consider large variations in their execution, as is most evident in the case of the zigzag and labyrinth (Figs. 18. 19).

That said, there are some stamp-seals with completely or nearly identically executed motifs. Now, let us allege some of those cases (*cf. Prijatelj 2007*). First, the most familiar and also the only one quoted in texts (*Halstead 1989; Perlès 2001*) is the motif of a complex linear labyrinth occuring on stone stamp-seals from Pyrassos, Nessonis and on a clay stamp-seal from Philia (Fig. 20).[23] There are only two slight differences in the execution of the motif. Thus lines of the labyrinth are wider on the specimen from Pyrassos, which is probably a consequence of using clay as raw material. The specimen from Nessonis lacks a central dot.

The similarity of the complex concentric labyrinth motif on a stone example from Sesklo and a clay specimen from Tsani magoula is inescapable (Fig. 21). The only difference in design derives from the fact that the Tsani magoula example has two concentric ways modelled around the central cross, while the Sesklo example has only one.

Stamp-seals with identical motifs occur outside Greece also. Thus we mention one from Transilvanian

22 While stamp-seals generally appear in small numbers, ranging between one and four per site (*cf. Makkay 1984*), higher numbers of specimens found were documented at the following sites: Tordos (15 stamp-seals), Kovačevo (15), Asprovalta (16), Sesklo (12), Nea Nikomedeia (21), Maliq (17) (*Makkay 1984, Korkuti 1995; Adam-Veleni et al. 2002; Dzhanfezova 2003*).

23 Halstead (*1989*) lists in this group a specimen from Tsangli. We excluded it from our analysis, since the similarity of the motif between the Tsangli stamp-seal and others is broad only.

Zăuan and two from Karanovo that share a motif of a plastically modelled zigzag base with zigzag incisions (Fig. 22).

Similar principles of modelling also connect three Bulgarian stamp-seals from Kirdžali, Separeva Banja and Kovačevo. All three specimens have a base with a plastically modelled zigzag edge and central hollow (Fig. 23).

We bring the list of examples with identical motifs to an end by citing two objects from the Copper Age Moravian site at Znojmo and a burial from the Hungarian site at Pilismarót-Basaharc, thereby going beyond the geographical and temporal framework of the article (Fig. 24) Both examples have a honeycomb motif with centrally impressed dots. The slight difference in the execution is in the number of centrally impressed dots: while the Moravian stamp-seal has four, the Hungarian example has three.

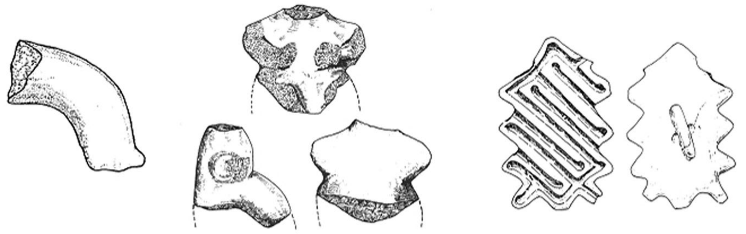

Fig. 15. Achilleion, clay bench near to large, circular hearth (phase IIIb). Selection of artefacts (after* Gimbutas 1989 b.Fig. 7.73: 1; Fig. 7.124; Fig. 7.125*).

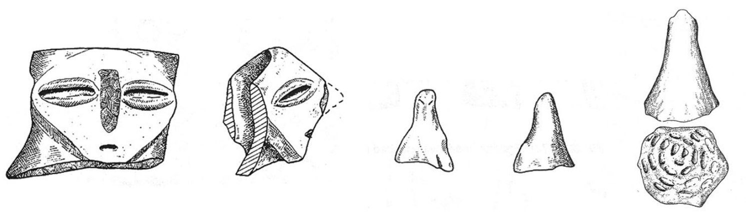

Fig. 16. Achilleion, street/courtyard? (phase IVb). Selection of artefacts (after* Gimbutas 1989b.Fig. 7.73; Fig. 7.23: 1; Fig. 7.54: 3*).

Fig. 17. Gura Baciului, platform VI a (after* Lazarovici1995.Fig. 17: 1, 17, 22; Fig. 30: 5*).

These examples with identical motifs might be understood as objects having the relationship of factorality. Consequently, stamp-seals could be – like split-leg figurines (*Talalay 1993*) – interpreted as indexes of social networks among Neolithic villages. Stamp-seals with identical motifs might take on a secondary function and therefore represent indexes for inter-settlement contacts such as alliances, obligations, exogamy or long-distance trade. Perhaps these stamp-seals could have been used to 'attach, reveal, reinforce and reproduce a range of culturally and personally significant concepts: of classification, identity, status, genealogy, production, ownership, order, authority, protection, fertility, potency, quality, authenticity, morality and value' (*Skeates 2007.195*), therefore defining relationships between individuals or whole distant communities. Of course, this hypothesis needs further testing. If other indexes of networks between the settlements as mentioned above are found, the proposed model of stamp-seals having secondary functions would gain weight too.

Symbolism

When writing of the *symbolism*[24] of stamp-seals, we join those authors (*e.g. Thomas 1996; Knappett 2005; Pinney 2006*) who do not separate the practical/functional and symbolic/communicative aspects of an object. We prefer to say that functional as well as symbolic and communicative characteristics can be recognised in any object.[25] While the functional attributes of objects are conditioned by their materiality and could be therefore recognized through defining the physical and logical affordances and

24 Peirce defines symbol as "*a sign which refers to the Object that it denotes by virtue of a law, usually an association of general ideas, which operates to cause the Symbol to be interpreted as referring to that Object ... The symbol is connected with its object by virtue of the idea of symbol-using mind, without which no such connection would exist*" (*Pharies 1985.40*). Paradigmatic examples of symbols (signs, having relationship of formal convention with their objects) are thus writing systems and numerals.

25 The following example conveys this with particular clarity: as late as in 1983, old people from Grgarske Ravne (Goriška) were telling how pagans around the time of the First World War were brandishing sickles in the air in order to cut through the storm clouds and lightning to chase away storms (*Medvešček 2006.135*).

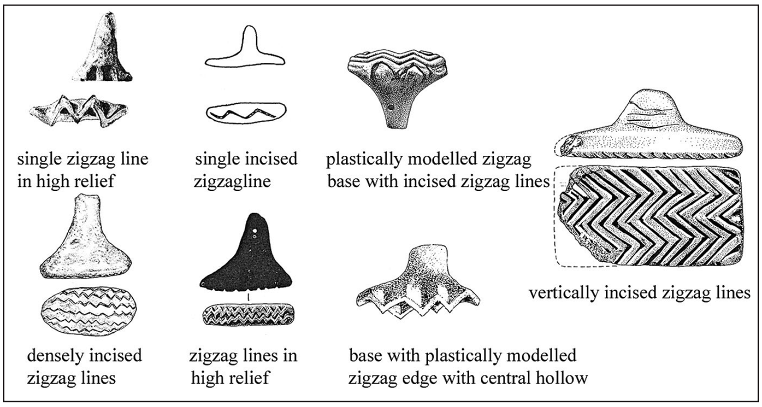

Fig. 18. Motif of zigzag, variants (after* Makkay 1984.Fig. IV: 9; Fig. V: 10, 11; Fig. VI: 3, 4; Fig. VII: 8; Fig. XXIX: 1*).

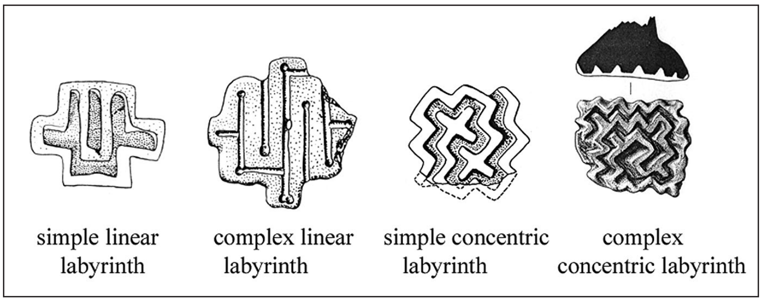

Fig. 19. Motif of labyrinth, variants (after Makkay 1984.Fig. III: 4, 5, 9; Fig. XII: 2).

constraints of an object, its attributes as a sign derive from networks of meaning in which objects and people are incorporated. Defining different types of relationships (*i.e.* similarity, contiguity, causality, factorality, formal convention) between objects or between objects and people, enables us to distinguish various semiotic levels – often unrecognized by archaeologists – within artefacts more clearly.

A symbol is a sign having a relationship of a formal convention or code with its object. Without knowing the formal convention or code, the interpretation of a sign remains problematic. Because access to cultural knowledge (*i.e.* to shared knowledge, forming codes) is severely limited, we shall define the elements of symbolism of stamp-seals without interpreting them.

Since the primary role of stamp-seals was to transfer motifs onto various surfaces, we first need to analyze the symbolism of imprints. The meaning and communicative characteristics of an imprint were constructed through a combination of motif, the colours used for printing and the type of stamped material. However, the act of stamping itself might also carry symbolic meaning.

Considering various designs, we would like to draw attention to a group of stamp-seals with motifs that are possibly equivalent to linguistic or numeral units. This group consists of stamp-seals from Emen Cave (*Makkay 1984.19*), Karanovo (*Makkay 1984.31*), Asprovalta (*Adam-Veleni et al. 2002.181*) and Němčice na Hanou (*Makkay 1984.40–41*) (Fig. 25). Motifs on these stamp-seals could be interpreted as lingustic or numerical signs, since they meet the following requirements: asymmetry of the motif, the use of the most basic abstract elements (lines and dots), and the use of vertical and horizontal dividing lines between individual signs (*cf. Merlini 2005.239–241*).

Now, let us ask ourselves how much the meaning of the motifs presented above differs from the meaning of other stamp-seal motifs? To paraphrase, how does one distinguish between the communicative value of numerical/linguistic signs on the one hand and the communicative value of ornamentation on the other? Could the majority of stamp-seal motifs be marked as ornaments at all, or do they have specific communicative value also? According to the fact that only one type of motif is presented within closed archaeological contexts, we can assume each motif on a Neolithic stamp-seal became a bearer of concrete information through formal convention.

The symbolic aspect of an imprint depended on the use of various types of colours also. From finds at Frumuşica-Cetăţuia, Oltszem and Sitagroi (*Makkay 1984, Renfrew 1987b*) we know that colours (red-

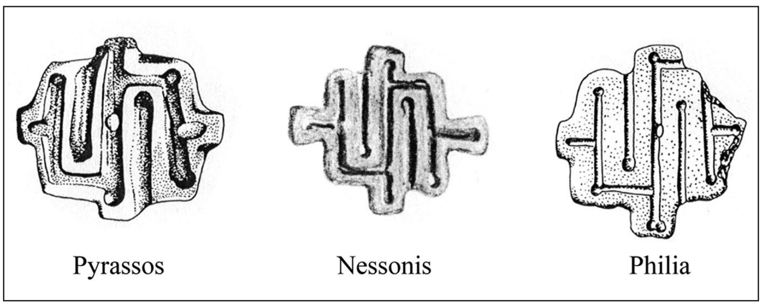

Fig. 20. Stamp-seals with identical motifs of a complex linear labyrinth (after* Makkay 1984.Fig. III: 1, 3, 4*).

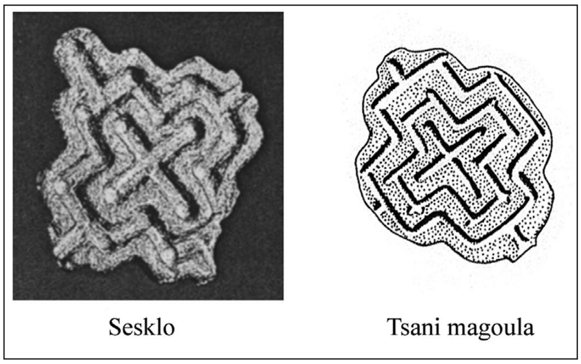

Fig. 21. Stamp-seals with identical motifs of a complex concentric labyrinth (after* Makkay 1984.Fig. XIII: 1; Arachoviti 1996.Fig. 280*).

dish yellow, red and white) were used for printing at least on some occasions. It has been stated that colours are communicative media, influencing the meaning of the ideas which they help to construct. Their meanings depend on the types and combinations of colour used, as well as on the colour relationship between base and imprints. Colours are able to cause emotional reactions, synaesthesia, or convey the specific social contexts of which they are part (*Young 2006.173–185*). Hence, we can assume this was also the case with colours used for stamping in the Neolithic.

However, thought must be also given to a secondary symbolic aspect of stamp-seals. According to factoral relationships between Neolithic stamp-seals with identical motifs, a hypothesis was advanced that stamp-seals could be seen as indexes of social relationships between various settlements at a regional level.

Conclusions

Stamp-seals constitute a multifunctional group of objects being used from the Neolithic up to the present. The grounding characteristic of a group nowadays uniting such various objects as official stamps, pintaderas for decorating the human body, stamps for marking bread, and stamps for decorating textiles, originates in the affordances and constraints of those objects. Those namely condition listed objects as tools, meant to transfer motifs onto various surfaces. While those objects are unified by the principle of stamping/sealing, they differ greatly from each other according to the networks of meaning in which they are incorporated.

The same holds for Neolithic stamp-seals. According to the various contexts in which they were found in Anatolia, SE Europe and Italy, we assume stamp-seals

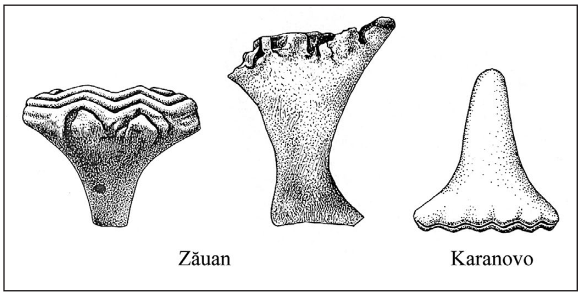

Fig. 22. Stamp-seals with identically modelled zigzag base with zigzag incisions (after* Makkay 1984. Fig. V: 10, 12, 13*).

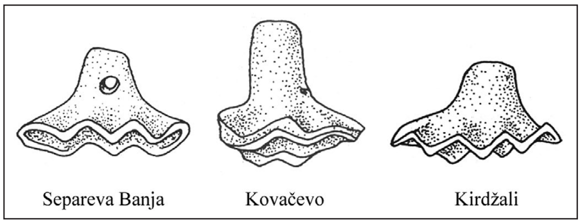

Fig. 23. Stamp-seals with identically modelled base with zigzag edge and central hollow (after* Todorova, Vajsov 1993.Fig. 167: 2, 4, 6*).

from these three regions were included in various networks of meaning (*cf. Prijatelj 2007*). Different traces on the bases of the stamp-seals show even these had different functions and meanings. Rather than for stamping solid and flat surfaces, they were employed for printing on soft materials (*e.g.* bread or skin), as indicated by experiments.

The analysis of the available data has shown only one stamp seal and one motif (in rare cases modelled on several stamp-seals) was connected with closed archaeological contexts. Hence, we might assume the motif on a stamp-seal was an index of a specific Neolithic household. That said, the value of the motif could not be merely decorative; they probably conveyed specific information.

We find the fact that stamp-seals probably evolved a secondary mode of use of similar importance. The

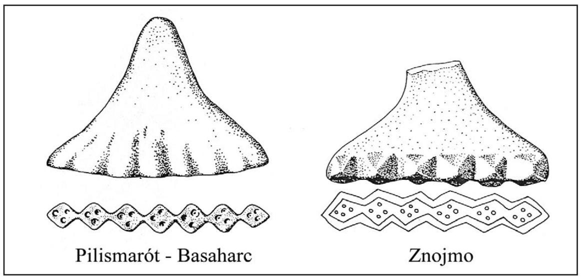

Fig. 24. Stamp-seals with identical honeycomb motif with centrally impressed dots (after* Makkay 1984. Fig. XXVIII: 10, 11*).

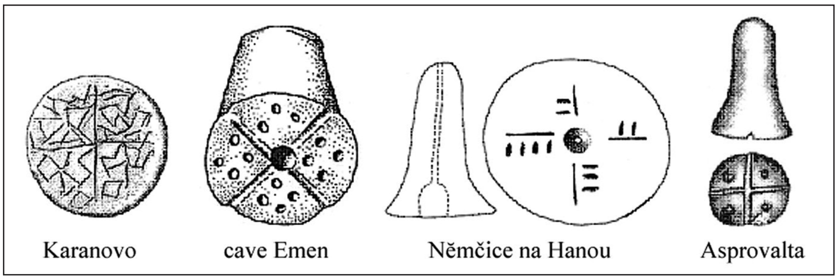

Fig. 25. Selected examples of stamp-seals with unusual motifs, numerical/ linguistic signs perhaps (?) (after* Makkay 1984.Fig. XXIII: 6; Fig. XXVII: 5, 8; Adam-Veleni 2002.Fig. 8*).

spatial distribution of stamp-seals with identical motifs indicates the analyzed objects might have become a symbol for various social interactions among Neolithic settlements. Ultimately, the presented hypotheses require further testing. The qualitative leap forward in the case of Neolithic stamp-seals of SE Europe will not be possible until archaeologists start trying to answer following questions: is the pattern of stamp-seal motif as an index for specific Neolithic households confirmed or negated by larger test samples of closed archaeological contexts? What kind of information could be extracted from the spatial distribution of synchronic stamp-seals within one site? Are there any other correlates beside stamp-seals with identical motifs confirming the existence of social networks between specific sites? We firmly believe these tasks for future research on stamp-seals, with the help of concepts of affordances, constraints, icons, indexes and symbols, should not be difficult ones.

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Is it goddess or bear? The role of Çatalhöyük animal seals in Neolithic symbolism

Ali Umut Türkcan
Anadolu Universitesi, Department of Archaeology, Eskişehir, TR
aturkcan@anadolu.edu.tr

ABSTRACT – *Two examples of stamp seals discovered in the 2003 and 2005 seasons, one depicting a leopard, the other, a bear (both unusual with respect to their uncommon amulet forms reminiscent of figurines, and their recurrence in wall reliefs) provide a key role in understanding the symbolism of Çatalhöyük, along with the complex relations between some distinctive animal groups and their ritual role in the settlement. They demonstrate that the depiction of animals seems not to be confined only to the walls at Çatalhöyük, but also appear as sacred symbols of the community on seals. The stamp in the form of a bear is another unique form that is also echoed in the large wall reliefs uncovered by Mellaart, which compels us to change some preconceptions about the ritual role of these wall reliefs, which have been interpreted as mother goddess images.*

IZVLEČEK – *Ključno vlogo pri razumevanju simbolike Çatalhöyüka predstavljata dva pečatnika-žiga, odkrita v sezonah raziskav 2003 in 2005. Umeščena sta v kompleks povezav med nekaterimi izrazitimi skupinami živali in njihovo vlogo v naselbini. Na enem pečatniku je upodobljen leopard, na drugem medved (oba sta nenavadna zaradi njunih neobičajnih amuletnih oblik, ki spominjajo na figure in njunega pojavljanja na stenskih reliefih). Pečatnika kažeta, da upodobitve živali niso bile omejene le na hišne stene Çatalhöyüka, temveč se kot sveti simboli skupnosti pojavljajo tudi na pečatnikih. Pečatnik v obliki medveda je druga izjemna oblika, ki se ponavlja tudi na velikih stenskih reliefih, ki jih je odkril Mellaart. Upodobitvi nas silita, da spremenimo nekatere predsodke glede ritualne vloge teh stenskih reliefov, ki so jih sicer interpretirali kot podobe boginje matere.*

KEY WORDS – *Anatolia; Neolithic Period; Çatalhöyük; stamp seals; wall reliefs; animal representations; fauna; symbolism*

The unusual examples of stamp seals, one depicting a leopard, and the other, a bear (both unusual with respect to their uncommon amulet forms reminiscent of figurines, and their repetition in wall reliefs) unearthed in the 2003 and 2005 seasons, seem to provide a key role in deciphering some ill-defined figures explained as 'mother goddesses' and give the seals a new role in the symbolism of Çatalhöyük, along with the complex relations between some distinctive animal groups and their ritual role in the settlement. They demonstrate that the animal representation seems to be reserved not only to the walls at Çatalhöyük, but also appeared as sacred symbols of the community on seals. This study aims to interpret these extraordinary seals within the context of wall paintings and reliefs and recent faunal data.

The Neolithic site of Çatalhöyük in Central Anatolia (Konya) was first discovered in the late 1950s, and excavated by James Mellaart in four excavation seasons between 1961 and 1965. The site rapidly became famous internationally due to the large size and dense occupation of the settlement, as well as the spectacular wall paintings and other objects uncovered inside the houses. The stamp seals were one of the unique assemblages found at Çatalhöyük. They were common artefacts that had been widely used or manufactured in every part of the settlements and probably most households of the Early Neolithic settlement of Çatalhöyük, dated to between the early 8^{th} millenium and the 2^{nd} quarter of the 7^{th} millennium BC The earliest examples of prehistoric stamp seals – or pintadera (painted seals) to use a New World archaeological term – have been found at the Neolithic site of Çatalhöyük. They are made of fired clay, and with their variety of motifs and forms comprise a significant and distinctive group among Neolithic stamp seals dating between 8000 and 5000 BC found at various settlements in the Near East. A total of 48 such seals have been found at Çatalhöyük, the majority during the excavations under Mellaart, and others during the most recent excavations. The latest examples were found in Level II, and the oldest in Level VII. The classification of the seals suggests that they might have been used on various different surfaces, including textiles, leather, clay, and loaves of bread, or even as tattoo. Actually, no seal impressions on clay have been found, neither at Çatalhöyük nor any other Neolithic settlements in Anatolia (*Türkcan 2006*).

The stamps in the form of hands and distinctive animals (leopard, bear) are also reflected in wall paintings and reliefs, as well as ones with complex abstract designs. Moreover, two unusual examples (both with respect to their unusual amulet forms reminiscent of figurines, and their recurrence in wall reliefs) discovered during the 2003 and subsequent excavation seasons demonstrate that the stamps played an important part in the symbolism of Çatalhöyük. The leopard is the most frequently represented animal form in wall reliefs at the site, but this is the first example of this motif on a stamp. Another stamp, in the form of a bear, discovered in 2005, is echoed in the large wall reliefs uncovered by Mellaart. Therefore, there is fresh evidence, which changes some preconceptions about the ritual role of these wall reliefs, hitherto interpreted as 'mother goddess' images.

It is a fact that the stamp's capacity of reproduction, which can be duplicated repeatedly on any convenient surface, seems to have transformed itself into an important ritual device. This can also be related to the transition of memory into mobile art objects on upper levels. As Ian Hodder remarked (*2006. 195*) that the house-based control of memory seen in the upper levels of the site, and symbols that had earlier only been used within the houses come to be used in media that can be exchanged between houses, so as the stamp seals take the wall designs into a new mobile context. Furthermore, they may be objects identitifying individuals of high rank in the society or symbols of some clans who were authorized to organize the religious and economic life of the settlers. However, even if they have any implications for status organization, these naturally remain obscure on the current evidence. The seals show that these cult images were also transferred to portable images like seals that can also duplicate the same images like bear, panther, hands, paws and floral forms on relevant surfaces.

The leopard, its presence in representations and Catalhöyük fauna

The earliest leopard representations in Anatolia are those comprising the main subject of representation among the Çatalhöyük reliefs. Therefore, it is also a renowned animal figure in Neolithic Çatalhöyük. Anatolian Leopards (*Panthera pardus tulliana*) are known to have lived in Central Anatolia and Southern Taurus Mountains until recent times (*Gürpınar 2000; Yalçın 2006*)[1]. The earliest leopard representation was found in one of the deep galleries of Chauvet Cave in southern France and dated to the Aurignacian period, to approximately 33 000 BP (*White 2003.79*). The earliest leopard scenes in the Neolithic Near East were first recovered on carved stone 'stelai' of probably rounded 'cult buildings' in Tell Abr in Northern Syria and dated to the PPNA period (*Yartah 2005.4–5*).

The leopard seal is (Fig. 1) the first of this type not only from Çatalhöyük, but also throughout the Neolithic period in Anatolia (*Türkcan 2003*). Early traces of leopards in Çatalhöyük are not first represented themselves, but only by their spotted skin, complete with tail, worn by many of the humans in Level V. In Level III, there are also humans wearing spotted skins. As understood, leopard skin garments, are very common in the paintings (*Russel and Meece 2006.215*). Leopards themselves occur first in a shrine for two levels, building VII.44 and VI.44., a so-called leopard shrine (Fig.2). It has a pair of facing leopards on the north wall and a single leopard on the east wall. There is another shrine directly overlying it (E.VI.44) with another pair of facing spotted leopards (*Mellaart 1964e.42. fig 5*). One

1 The Anatolian leopard (*Panthera pardus tulliana*) is a subspecies of leopard native to Anatolia. It is unknown whether any of these leopards still exist in the wild.. These animals once prowled the forest and hill regions of Aegean, West Mediterranean, East Mediterranean, and East Anatolia. Adults grow 200–250 centimeters long and may weigh up to 90 kg; their lifespan is approximately 20. The last official sighting of the Anatolian leopard was in 1974. The animal was killed after an attack on a woman in Bagozu village, 5 km from Beypazari in Ankara.

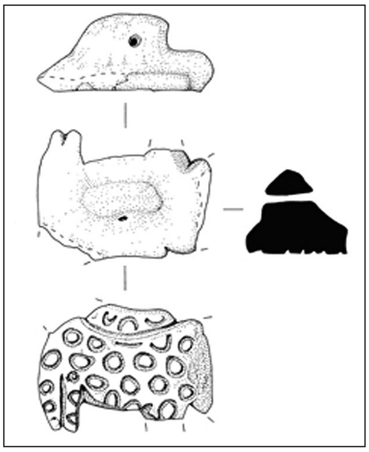

Fig. 1. Leopard seal (Çatalhöyük Research Project Archive).

more pair is found tail to tail in the northwest corner of building VI.80 (*Mellaart 1967.175–6*).

On the other hand, any leopard or any associated feline clay figurine could not be recognised among the animal figurines that occur almost entirely in Levels VI and VII. In neither Mellaart's excavations nor ongoing excavations could feline or leopard figurines be detected. Actually, the leopards are only represented by humans or deities on large sculptural pieces, as especially seen on woman seated on large felids, much probably leopards or male representaions riding sitting, riding leopards. As in Mellaart's classification (*1967.203–204, Pl. 73–76, 86, Fig. 49, Pl. 67, 68, fig. 50, Pl. 87*), there are 7 statuettes in the form of pairs of 'goddessses' or deities riding leopards seated with two leopard cubs, or wearing a leopard blouse. There are also male or 'gods' as stone carved statuettes, such as a boy riding a leopard and a seated god with a leopard cap. Among them, one piece from Level II is the most renowned: an enthroned goddess giving birth between two leopards.

On the other hand, the leopard was frequently the only animal that appeared in representations, but was totally absent from the faunal remains until its discovery in 2005. Therefore, this sort of absence in the fauna also seems worth consideration. This is particularly striking, since there are so many representations of leopards, that it was unthinkable to kill leopards. According to Russel and Meece (*2006.223*), if whole skins of leopards were brought back to the site, at least the feet should have been recovered so far, or if a skin had been processed into clothing, one or more bones should have been left on site. According to the paintings in Level V and level III., people at least wore leopard skins and thus used them in their daily life. Moreover, two figurines on the wall paintings from levels II and IV are wearing spotted garments that may well be leopard skins (*Mellaart 1967.Fig. 51, Pl. 87*).

Although leopards appear repeatedly in Çatalhöyük art, part of a specimen was only finally found in 2006:

Fig. 2. Leopard reliefs (*Mellaart 1967.Pl. VI*)

a claw that was probably pierced to be worn as a necklace or bracelet found in the burial of a woman holding a plastered human skull to her chest and face in 2004 (*Hodder 2006.260*). Therefore the special context of the find make it more interesting than other similar finds in as much as it is unique material. So the discovery of at least one bone in a remarkable context seems to confirm that there were leopards in the vicinity and were already familiar to the Çatalhöyük community at that time. Moreover, finding only one piece among 24 000 pieces classified to their taxon is also striking, suggesting that it was somehow a rare relic in the community.

The bear, its presence in representations and Catalhöyük fauna

In the search for bear representations in Çatalhöyük, only one could be identified, in a wall painting from Level V. However, apart from the paintings, various splayed figure types are important, whether they are bear or human representations, in a discussion of bear imagery and a probable bear cult in the settlement. Aside from the indeterminate quadruped heads, all splayed figure types are central to the discussion (Fig. 3). They comprise a wide representation group, which Mellaart believed (*1963d.61–67*) represented stylized human females and hence the 'mother goddess', with the outstretched and sometimes upturned limbs as an indication of the birth position. They were found in several buildings (9 buildings: VIA.50, VI.B 12, VI.31, VII 31, VII.1, VI.A.8, VIB.8, VII.A.8, VII.45, VII.23, VI.A.10, VI.B.10 'shrines'), with 15 representations, of which 3 are shown as twin 'goddesss' representations (*Mellaart 1967*). However, Ian Hodder (*1987.45*) was the first to question the real identity of the splayed figures as 'mother goddess' representations, and assumed that associations of humanoid reliefs are too ambigious to be regarded as women, much less as goddesses. Russel and Meece (*2006.215*) also suggested that the splayed figures are generally animals, because none of them have any indication of gender, in contrast to some figurines and painted figurines. They also add that the upturned legs create a position physically impossible for humans, and that the placement of the limbs suggests bears or some other quadrupeds. A similar relief figurine, but with a tail, was also found on limestone pillars at Göbekli tepe, and is interpreted as an animal (*Hauptmann 1999.52, Fig. 27; Schmidt 2005; Russel and Meece 2006.215*), probably a large lizard (*Varan varanus*) still found in the area.

At Çatalhöyük, the heads and usually the hands and sometimes feet of these splayed figurines were knocked off during the abandonment of the related spaces. One of them has faint indications of rounded animal ears. For Mellaart, it was merely a horned hairstyle (*1964.50*). Another has its feet outlined in red, which Mellaart compares to the similar treatment of the feet and tails of the leopard reliefs (*1964.45*). Russel and Meece (*2006.216*) assume that all of these features raise the strong possibility that the reliefs portray animals. The rounded heads suggest a carnivore, perhaps leopard and bear. On the other hand, some of these figures have a distinctly marked navel. This feature suggests that they were intended to be antropomorphic or theriantropic (human-bear?). Whether humanoid or animal, they recur as an important, reasonably standardized motif (*Russel and Meece 2006.216*). A possible human-bear therianthropic image somehow recalls a vision of shaman figures on the walls.

*Fig. 3. Splayed figure in shrine VII. 23 (*Mellaart 1967.Pl. VII*).*

As already mentioned, the heads and hands of the splayed plaster examples are always missing, so it was not easy to say whether the figures were humans or animals. It raises new

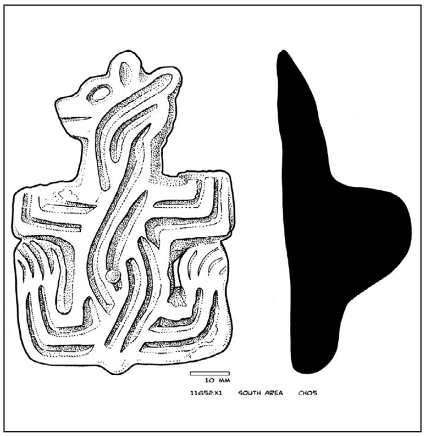

Fig. 4. Bear seal (11652.x1/Çatalhöyük Research Project Archive).

questions as much as it may illustrate existing arguments regarding the identification of the splayed figures on the walls. But now the bear stamp seal provides a key. Actually, the head and the hind paws of the seal are clearly recognizable as bear and identical with the splayed relief figures on the walls (Fig. 4). An almost complete clay bear (11 652.X1) from South Area, Building 44 & 56 (*Türkcan 2005*). Despite minor damage to the forelegs, it is possible to reconstruct the overall form. They seem to have been intentionally broken at the same point. The small tail is also emphasized between the legs. The overall form, the head, small tail and other features (the head and paws) all show that it is a bear representation. One tiny pebble is recognized as stuck just in the middle of the belly part. It makes a contrast with the flat and smooth surface of the seals face. It is also noteworthy that a similar spot is also emphasized on the bellies of upraised arm reliefs (in the spaces of VI.1, VII.31, VI.8, and VII.45. VI.B.8, VI.B.10; see *Mellaart 1967*).

Another aspect is that the proportions in which bears are represented symbolically differ from those in the faunal remains. The differences or contrasts between the representations and the taxa are interesting. Up to now, only one bear paw has been identified. This is an articulated bear paw with traces of plaster between the toes where it was found in the fill of space 159, Bldg 24, Level VII. This is also the antechamber of Mellaart's building VII.10 (*Russel and Meece 2006.221*) The plaster probably indicates that the paw or a hide to which it was attached was once part of an architectural feature (*Russel and Meece 2006.221*). This actual find of a specially treated bear paw also reinforces the idea that it could also be a fragment or part of a splayed figure on the walls, as we think that the heads and hands of all the plaster relief examples were always removed. All paws are empty and the head parts have been defaced. One is described clearly by Mellaart (*1967.114*):

"*VII.31 was one of the best preserved buildings on the site, even though it had lost the plaster of its entire north and more than half of the cast wall. It had been abandoned and filled in after its reliefs had been defaced... The first composition consisted of the familiar goddess-figure modeled in bold relief, the hands and feet of which appear to have been made separately and inserted into now empty sockets.*"

Moreover, the study which I made of the stamp seal assemblage in 1997, of a hand-shaped seal, with larger and bold digits in oval form, was already singled out (Level IV, Area E1; *Mellaart 1964.Fig. 41.4*), as it was considered as likely to be a bear paw as a human hand (*Türkcan 2005.Seal No. 19*). In earlier research, I was hesitant to say that it was a bear paw, but in the light of our bear representation, it can be called as a bear paw on the light of bear paw (Fig. 5).

The context of the bear stamp is also noteworthy regarding its deposition. It was at the center of the building deposit, equidistant from the walls and the northern edge of the hearth. It was placed face down, with head on house fill (Space 54) that was probably a backfill below the upper phase of the overlying building (Fig. 6). So the seal does not seem to have been deposited accidentally, but seems to have been left as a votive object before the abandonment of the space (space 54). It is clearly identi-

Fig. 5. Paw-shaped stamp seal (Ali Türkcan Archive).

fied in the report of Roddy Regan (*2005*), who excavated in Building 44 on the Summit Area:

"If seen in this light the impressive clay stamp unearthed in 'room-fill' deposit (11652) may also mark a transitional event within the construction of Building 44. In this case the end of backfilling and the beginning of constructional levelling. Of course, it could be argued that the stamp was just dumped as part of the backfilling process, its neatly clipped hands/paws suggesting that the object itself had undergone a transition. The stamp, however, was recovered from a deposit of relatively few finds and appeared to have been 'placed' face downwards, hinting at more than casual loss."

Fig. 6. In-situ position of bear seal (11 652.x1) on house fill of Building 44. on-line http://www.catalhoyuk. com/archive_reports/2005/ar05_14.html (Fig. 53).

Discussion

Neolithic studies are shifting away from rigid artefact analysis to an understanding of beliefs and rituals during one decade. Animal representations (wall paintings, figurines, bucranium projections, reliefs and rock paintings right coming through Upper Paleolithic tradition) and these animal groups' taxonomy on faunal evidence are becoming important in Neolithic Studies. The multiciplity of human-animal relations, their symbolism and association with the social domain, ritualised practises and classification systems have hardly been tackled in archaeological literature. They are predominantly understood within the framework of economic efficiency and the domestication process. However, anthropological and historical accounts point to the centrality of the cultural and social importance of animals for Neolithic communities, as well as for traditional herders.

The evidence from the stamp seals and probable splayed figures testify that the bear cult was another important ritual figure, as well as the leopard and bull cults throughout many levels among the Çatalhöyük Neolithic community. On the other hand, the cult of the bear was already a deeply rooted belief from the Middle Paleolithic (and until recent peoples in the Arctic). The first evidence of a bear cult is observed at a Middle Paleolithic site at Régourdou. Régourdou constitutes a case for some kind of bear-centered animal cult some 60 000–70 000 years ago (*Hayden 2005*). Ethnographically, bear cults are rather common in cold climates, from the Northern Coast to Finland and Siberia. Lajoux (*2002*) and Bonifay (*2002*) have drawn attention to the frequent importance of the bear as a symbol of death and resurrection (because of its hibernation and reemergence in spring), making it apt for rituals. These examples can also be multiplied in shamanic cultures in Central Asian and Native American cultures. Many large bear craniums, teeth were frequently employed as personal ornaments. In the Gravettian period, there is also a carved bear's head in Dolni Vestonice, and bear representations in Chauvet Cave (*White 2003*).

On the other hand, in comparisons of engravings and faunal taxa from various sites (La Vache, Limouil, La Madeleine) have also yeilded many representions of many carnivores such as fox, wolf, lion but no bear. It is even more striking to see the differences between the species represented and animal remains. In an analysis of engraved/painted subjects on the walls of rock shelters and caves, Gilles and Brigitte Delluc (*1991*) have tallied the different animal groups; bears are represented in the Aurignacian period, but not in any Gravettian deposits.

As stated before, animals were integral components of human existence in many more domains than today. Images of animals within Paleolithic cave paintings, for instance, may have functioned to cue the recall of ecological knowledge (*Mithen 1998.98*). Actually, depictions of what are probably supernatural beings (half-human, half-animal representations) provide some of the most intriguing images of prehistoric art. The earliest representations can be seen in examples like the half-man, half-lion Hohlenstein high carving dating to *c.* 33 000 years ago (*White 2003*), and the contemporary half-human, half-bison figures found in Chauvet Cave (*Chauvet et al. 1996*) and the famous 'Sorcerer' figure in Les Trois Fréres cave (*White 2003*), which is dated to the Magdaleneian period. They are important works that can be regarded as supernatural/mythical images of those kinds of hybrid representation. The examples can also be multiplied from the Upper Paleolithic to the Neolithic in the Near East. Actually, these images also seem to belong to the intertwined worlds of animal and human beings as reflected in the shamanic tradition of dedicating or connecting the soul to a predator such as wolf, bear, vulture and etc. According to Ingolds (*2000.121*), depictions of animals and humans in traditional societies are not representations of everyday activities, but rather of another plane of reality, where animals, ancestral beings, and humans relate to each other socially.

Verhoeven (*2002*) assumes that humans' relations with animals, especially wild animals, seem to be the key concept of the symbolic representations of PPNB Upper Mesopotamia. The absence of many carnivores which are otherwise dominant representational figures from the faunal taxonomy are also similar in the Upper Mesopotamian PPNB figurine assemblage. Among the many clay animal figurines from Çayönü and Nevali Çori sites, no carnivore representations that form the main repertoire of reliefs on pillars and sculptures along with humans were found. Among the many clay animal figurines from the Çayönü and Nevali Çori sites, no carnivores that composed the main repertoire of reliefs on pillars and sculptures along with humans have been found. According to some sources, (*Wengrow 2003; Morsch 2002*) over 70 % have been identified as horned quadropeds of some sort; the remaining minority are generally identified as mammalian forms. However, any felines, reptiles, or birds which would have been common feature in the landscape at that time appear to be almost or totally absent in the figurine assemblage. These wild specimens seem to be reserved for monumental reliefs on monolithic T-pillars and stone sculptures found in 'Cult Buildings'. Wengrow (*2003*) also assumes that the major presence of carnivores and birds reinforces at these sites a sense of a symbolic lanscape alien to the domestic household. In a way, in the light of the Nevali Çori and Göbekli tepe examples, a sense of wild landscape symbolism consisting of large carnivores and birds seems to be reserved to monumental reliefs in so-called monumental 'Cult Buildings', not in any house or house-based context (*Wengrrow 2003; Schmidt 2006*). In contrast, the clay animal figurines from Nevali Çori represent a different symbolic sphere seemingly reserved to the domestic area and more a part of daily rituals.

The absence of leopards and bears and other carnivores in the figurine assemblage at Çatalhöyük also seems worth considering. The predators and birds are never identified in the figurine assemblage, despite their dominant representations on monumental reliefs. Rather, domesticated species or bull figurines are the dominant figure in this assemblage, as well as in the Nevali Çori and Çayönü figurine assemblages. The different divisions and proportions of represented groups are noteworthy. In a way, in the light of the Upper Mesopotamian PPNB evidence from Nevali Çori and Göbekli tepe, a sense of wild landscape symbolism consisting of large carnivores and birds seem to be reserved to monumental reliefs in 'Cult Buildings'. In contrast, figurines of domestic animals or at least herbivores from Nevali Çori represent a different symbolic sphere seemingly reserved to the domestic area and more a part of daily rituals. Similarly, at Catalhoyuk no carnivore or wild animals were seen on any clay figurines except the stamp seals. So, it can be assumed that the symbolic landscape represented by wild animals on portable objects seems to have been reserved to the animal seals. Although the reason is obscure, it can be assumed that the representation of predators that are only seen in reliefs can also be related to the functions of the figurines, or to taboos that can not be deciphered.

Another absence has been detected in the bear's (<%1) and leopards' (? %) share in the taxonomy of faunal remains. Whereas the proportions betwen the representations and those animals' proportions in the taxonomy are not symmetrical. The proportions in which animals are represented symbolically differ from those in the faunal remains just as much as the differences between the media are assymetrical, and therefore interesting. These differences tend to suggest there could be a taboo about either bringing those animals onto the site, or hunting (*Hodder 2006.261*). Viewed from this perspective, the actual paw remains of a bear and the perforated leopard claw pendant testify that they are the result of special treatment, as well as to their special role in the community.

Another phenomenon that has been attested on splayed figures is the removal of the paws and head parts. It might be, therefore, as a result of an iconoclastic custom, as already stressed by Mellaart in particular cases (*1966.188*):

"*Were the heads destroyed intentionally before the paintings were covered with white plaster, like the* *deer's head in the level V shrine, the leopard's in Shrine VI. (0 or the heads, arms and legs of goddess reliefs in the shrines of level VII? The habit of religious iconoclasm at Çatalhöyük is well attested.*"

The bear seal's broken paws are likely to have shared the same fate and seem to be related to the same custom as seen on the splayed figurines, the paws of which are also broken. Despite the leopard seal's front part and some part of the tail being broken, its abraded condition and unclear context make it harder to speculate on whether it was broken deliberately.

The repetition or dominance of the associated representations is another phenomenon. The repetition of the same images between levels VI and VII in several buildings show that the splayed figures may have functioned as important deities. Besides that, the absence of leopard and bear figures in wall paintings also reinforces their different role in the ritual sphere of the community, as well as the redundancy of the same iconography of representations through many levels of habitation in the Çatalhöyük community. As Russel and Meece (*2006.229*) have stressed, the leopard and splayed figures display an episodic character and remain visible for longer periods. Thus they may also be tied to changing myths.

Fig. 7. 'Master of the animals', limestone figurine of a woman on a leopard (*Mellaart 1967.Pl. 75*)

Conclusions

The variable representation of bear and leopard on portable and reproductive media as seen on seals, reliefs and wall paintings seems to reinforce our argument that these are representations of mythical animals, along with paintings, reliefs and pendants and stone statuettes. With the possible decipherment of splayed figures as bear, the bear cult or a similar cult centered on bear was also an important ritual figure as well as the leopard and bull cult throughout many levels among Çatalhöyük Neolithic community.

As a result of evidence based on an analysis of faunal evidence and contextual evidence, as well as an iconographic comparison, it can be summarized as below:

❶ According to Russel and Meece (*2006.215*), they are generally animals, because none of them have any indication of any gender, in contrast to some figurines and painted figurines. Moreover, the upturned legs make a position physically impossible for humans. The placement of the limbs rather suggests bears or some other some quadruped animals. Moreover, one figure has faint indications of rounded animal ears. All of these features raise the strong possibility that the splayed reliefs portray animals. The rounded heads also suggest a carnivore, bear and perhaps even leopard. As they are compared to the seal's upturned legs and the more important head part, it is a point of fact that the splayed figures are generally bear.

❷ This actual find of a specially treated bear paw also reinforces the idea that it could also be a fragment as an lively apparatus on moulded relief of splayed figures on the walls as we think that heads and hands of the plaster relief examples were always cut off. At Çatalhöyük, the heads and usually the hands and sometimes the feet of these splayed figurines were knocked off upon the abandonment of the related spaces.

❸ As stated already, the bear seal's possible deposition as a votive object before the abandonment of the space fill (of space 54) (*Regan 2005*) suggests that the bear image had already been a valuable amulet before its deposition in the fill. Their forepaws are also broken, and this does not seem to be a post-depositional case. It seems instead to have been deliberately broken, as observed on the broken legs and forepaws of splayed figures at the end of the life cycle of the buildings where they were buried. Therefore, sharing similar application to what happened to the splayed figures during the abandonment of the buildings seems in a way to be identical with the same broken parts of the bear seal. Although the leopard seal is broken in the front part, including head and tail at the back, the abraded condition of the broken parts and the unclear context compel me to think it was probably discarded where it was deposited. On the other hand, the leopard reliefs seem to have been kept as they were in the shrines.

As far as depicting leopards in relief at Çatalhöyük is considered, it should not be surprising that the bear image is already growing clear. However, some hints of human features, like the concentric belly on one splayed figure, is still intriguing and is probably an indication of a pregnant belly; bear features are sufficiently dominant as to suggest it was once an animal deity. So it is probable that the splayed reliefs with upraised arms and legs do not seem to be antropomorphic 'goddesses' as Mellaart formulated (*1967*), but more probably bears or somewhat hybrid creatures in bear form.

Combining all the evidence, the splayed figures are much more likely to represent an animal deity, finally indicating that the splayed figures are images of bear, rather than humanoid goddess figurines, an important deity, like the leopard and bull. In a way, the combination of three representation groups (bull, bear and leopard) through many levels of habitation together in the same buildings ('shrines') suggests that they might have acted as a 'Holy Triad' in Çatalhöyük symbolism.

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‘Sheep are your mother’: rhyta and the interspecies politics in the Neolithic of the eastern Adriatic

Dimitrij Mlekuž
Department of Archaeology, Faculty of Arts, University of Ljubljana, SI
dimitrij.mlekuz@guest.arnes.si

ABSTRACT – *This paper explores the relations between humans and animals through material culture, or more specifically, four-footed vessels also called rhyta (sing. rhyton). I want to suggest that rhyta are not merely artistic representations of something or some kind of cult paraphernalia, but that they embody effective social agency. I place them in the context of human-animal or interspecies politics in the Neolithic of the eastern Adriatic.*

IZVLEČEK – *V članku raziskujem odnose med ljudmi in živalmi skozi materialno kulturo, preko štirinogih posod, imenovanih tudi ritoni. Ritoni niso le umetniške upodobitve nečesa ali nekaki kultni pripomočki, temveč utelešajo močno delovanje. Njihovo delovanje raziskujem v kontekstu politike odnosov med ljudmi in živalmi v neolitiku vzhodnega Jadrana.*

KEY WORDS – *rhyton; animals; archaeology; art; cult; Neolithic; east Adriatic*

Introduction

The four-legged ‘cult’ vessel or rhyton is a vessel of specific and distinctive shape, found in middle and late Neolithic contexts of the western Balkans. Its curious shape and decoration has puzzled many researches; most of them agree that their distinctive shape had a specific purpose.

Recent theories have suggested that artefacts are much more than just objects: they are active subjects in a web of relationships between persons and things (*Gell 1998; Latour 2005*). I develop the argument that ‘persons’ in the Neolithic of east Adriatic included not only humans, but also animals. Thus relationships between animals and humans must be understood as social relations. Animals also had the power to ‘act back’ and influence human lives, therefore making relations between species political.

I explore the role of rhyta in the politics of human-animal relations in the Neolithic of the western Balkans. The main issues I tackle are: what makes rhyta agents, and how they can transform and modify social relations between people and animals?

Traditional studies of rhyta

The origins of rhyta are blurred, and it is not my intention in this paper to make them any clearer (for more recent detailed discussion of the chronology and origins of rhyta see *Biagi 2003; Marijanović 2007*).

Rhyta are probably connected with the zoomorphic vessels and altars which are a common feature of the early Neolithic contexts of the southern and central Balkans, together with monochrome or painted pottery, figurines, zoomorphic amulets, clay tripods and stamp seals (Nea Nikomedeia in Greece Macedonia, Rakitovo in Bulgaria and Donja Branjevina in Serbia). This particular form of zoomorphic vessel, the rhyton, seems to appear after 6000 calBC somewhere in the southern or western Balkans.

Possibly the earliest dated fragment comes from Achileion, middle Neolithic phase IIIb, dated to around 6000 calBC (*Gimbutas et. al 1989.Fig. 7.69*). A few fragments of rhyta were found in eastern Albanian early Neolithic sites such as Vashtëmi (*Korkuti 1982.145; Korkuti 1995.Taf. 15*) and Barç (*Lera 1993.31*). Albanian rhyta are often found in contexts with Impressed Ware (suggesting Mediterranean influences) on the one hand, and painted pottery, clay tripods or cult tables, anthropomorphic and zoomorphic figurines, split-leg figurines, clay pins and stamp seals (assemblages common in the central and eastern Balkans; see for example *Budja 2003*) on the other.

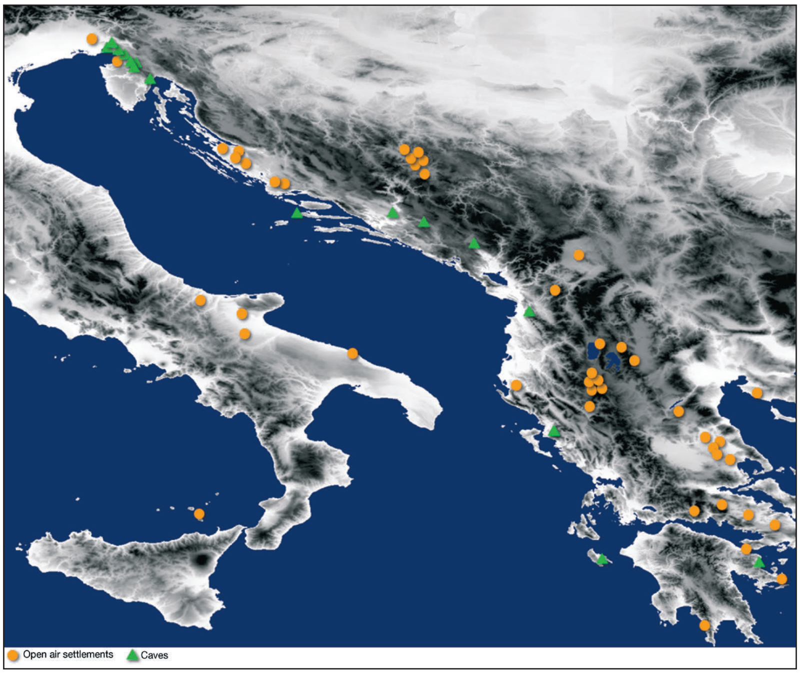

Fig. 1. Geographical distribution of rhyta.

Some recent finds of rhyta from early Neolithic Impressed Ware contexts from Dalmatia (Crno Vrilo; *Marijanović 2007*) and Italian Apulia (Caverna Elia, Le Macchie; *Biagi 2003*) are keeping the discussion of their origins alive.

In a few hundred years after 6000 calBC the rhyta became a characteristic element of the Middle Neolithic cultures of the western Balkans, such as Danilo and Kakanj on the eastern Adriatic coast and Bosnia, and Cakran, Dunavec and Topoljan in Albania. After 5600 calBC they can be found at a wide range of sites from the Peleponnese in the south to the Triestine Karst in the north, from Kosovo and central Bosnia in the east and the Italian mainland and the Lipari Islands to the west (Fig. 1).

Their curious shape has provoked many interpretations of their function. Almost every commentator on these vessels agrees that they have some specific purpose. They have been called scoops (*Ihde 1995*), salt-pots (*Chapman 1989*) or coal-scuttle vases (*Weinberg 1965*). However, most authors have granted them cult status, therefore calling them 'cult' rhyta or four-footed vessels.

Most authors put them in the context of fertility cults. Josip Korošec (*1958.55–59; 1964.73–74*) saw them as vessels used in libation-like rituals used in the worship of water, and later see them as stylized representation of the (human) female lower torso, and as female pendants to a male phallus cult. Šime Batović interpreted them as lamps used in the worship of ancestors. In his later works he points to the zoomorphic qualities of rhyta and connects them with pastoralists and animal fertility (*Batović 1958; 1979.560*). Alojz Benac (*1964.65–66; 1973.38; 1979.403–405*) saw them as symbols of life and fertility of animals and fields. He interprets ring handles as representations of curved animal horns. In the same way, Borivoj Čović (*1976.22–24*) explained them as instruments used in a cult of fertility of women, animals and land. The oval receptacle, often painted red, represents the uterus, where the legs stand for the teats of the udder. He believes that they are part of 'Near Eastern' mother goddess worship.

Slaviša Perić (1996), in his detailed interpretation of rhyta, follows the same line of thought. He sees them as a representation of the womb, udder and teats of different species of animals, especially sheep and goats, pigs and cattle. He uses the shape of the legs (which he interprets as teats) to differentiate the animals which were represented by the rhyta, such as cows (common in Kakanj culture) or sows (in Thessaly).

We might argue that the fact that researches have seen many things in them testify that they are not simple representation, but ambiguous depictions involving powerful imagery composed of elements composed of attributes animal/female/fertility/nurture attributes. But can this abundance of female/animal-fertility imagery condensed in rhyta be understood in simplistic terms of fertility rites and mother goddess worship? Their ambiguity suggests that are polyvalent and multi-referential; they mean not one thing, but can condense a whole range of different meanings (see *Thomas 2005*).

Researchers have sought to create trans-regional cultural connections based on the similarities of rhyta from a wide area. Their wide distribution is often seen as an effect of the seasonal or nomadic migrations of pastoralists (for example *Perić 1996; Montagnari Kokelj 2003*), an idea deriving from rich ethnographic data from the Balkans (such as Vlachs or Sarakatsani).

However, we might question the assumption that resemblance over a wide area necessarily means that they were used in the same way. Modern ethnographically documented pastoral practices, used to explain the distribution of rhyta, are not remnants from the deep past, or timeless adaptations to the Mediterranean landscape. Modern pastoralism is a complex result of adaptations to different natural and historical rhythms, economic conjectures, political processes and events, and above all, the emergence of capitalism. The projection of modern pastoral practices into the past to explain Neolithic social processes is therefore utter anachronism (see *Mlekuž 2003; 2005*).

East Adriatic Neolithic communities

Rhyta can be found in a variety of contexts along the eastern Adriatic coast. The Neolithic on the eastern Adriatic coast is not a homogenous and totalizing entity. It has different forms, the results of different historical processes which accompanied and modulated the adoption of novel resources and lifestyles. A useful heuristic device for distinguishing different historical processes along the east Adriatic coast is the division of sites into two groups: camps and villages (*Mlekuž 2005*).

Cave sites are located in mountainous hinterland, away from lowlands suitable for cultivation. They are marked by low densities of pottery and animal bone, the majority of which are ovicaprine. Cave sites are usually 'deep', with long occupational histories, often extending back into the Paleolithic. Caves can be interpreted as seasonal hunting or herding camps. Archaeological, geoarchaeological and archaeozoological data suggest that they were used as sheep pens and shelters for small, autarchic and very mobile (nomadic) groups, which relied heavily on large flocks of ovicaprines (*Mlekuž 2005*).

This archaeological record is in striking contrast to the lowland settlements located near water sources and land suitable for agriculture (*Müller 1994*). These sites usually yield evidence of architecture, large quantities of pottery, and domesticated plants and animals. They can be identified as villages, practicing a mixed farming subsistence economy. Lowlands are settled by predominately small-scale, dispersed settlement units, often abandoned or relocated (*Chapman et al. 1996.335–343*). Most Neolithic stock keeping in villages seems to have been small scale, involving localized movements around settlements, predominately in the lowlands. Although some faunal assemblages are dominated by smallstock, most display a mixture of livestock species more reminiscent of small-scale mixed farmers.

Interspecies politics

In contemporary western societies, the functions of raising, slaughtering, and consuming is usually subject to a division of labour, where the consumer of meat does not meet the slaughterer or the raiser of the livestock. But among Neolithic societies every person was a herder, sacrificer, slaughterer and consumer of the animal at the same time:

"*Neolithic lives and worlds were undoubtedly different from our own. Their relations with animals were closer, part of everyday life, a substantial part of economic/social relations. Relations with animals may have been mediated through relations with other persons (and vice versa), but the connections between one person and another, one person and their domestic animals or prey, may have been extremely important for the identity of that person (*e.g. *through food taboos, or through shared aspects of identity between people and certain animals). Neolithic personal experience may have been greatly shaped by the animals they bred, exchanged, hunted with, hunted, ate* (*Fowler 2001. 160*).

Our relations with animals are specific to our historical context, and rooted in Western ontological assumptions which distinguish between people (agents, subjects), animals (non-intentional, prey, predators, pets), and objects (non-sentient things) (*Nadasdy 2007.26*).

Human and non-human persons

Irving Hallowell observed that the Ojibwe, with whom he worked, thought of animals (not to mention inanimate objects) as sentient and intelligent persons. For the Ojibwe (and other circumpolar peoples) the concept of the person transcends human beings:

"*All animate beings of the person class are unified conceptually in Ojibwa thinking because they have a similar structure – an inner vital part that is enduring and an outward form (*e.g. *human, animal, stone, etc.) which can change. Vital personal attributes such as sentience, volition, memory, speech are not dependent on outward appearance, but upon the* **inner vital essence of being** (*Hallowell 1960.21*, my emphasis).

Hunting in these societies is a long-term relationship of reciprocal exchange between animals and humans. Hunter-gatherers believe that they can only catch animals when the animal gives itself to them voluntary. Hunting is understood as a rite of regeneration: consumption follows the killing of an animal, just as birth follows intercourse, and both acts are integral to the reproductive cycles of animals and humans. However, animals can be offended. They will not return to a hunter who has treated them badly in the past, and they can be offended if their meat is not properly shared among all those in the community who need it.

Regeneration of lifeworld depends upon a maintenance of balance in the reciprocal give-and-take of vital forces. Animals give life to humans, but humans should receive only what is offered, rather than seek to extract vitality by force (*Ingold 2000.123*).

Trust and domination

Robert Brightman (*1993*) argues that there exists a tension between two distinct and mutually contradictory principles governing human-animal relations among the Rock Cree. These are the principles of 'reciprocity' on one hand, and 'domination' on the other. He argues that although Cree hunters do subscribe to the notion that animals surrender themselves to hunters, at other times these same hunters think of themselves as locked in an advisory relationship with animals, who are conceived as powerful beings that must be overcome and dominated if the hunters are to survive (*Nadasdy 2007.27*).

Tim Ingold (*2000.61–76*) developed this idea in the mutually exclusive principles of 'trust' and 'domination'.

On the other hand, Paul Nadsady (*2007.26–28*) argues that there is no theoretical need to make such as distinction; moreover, to do so is to artificially separate aspects which form a coherent whole: they must be understood within a general theory of gift and exchange (for example *Mauss 1954; Godelier 1999*).

The notion that the principle of domination is somehow opposed to the principle of reciprocity is inconsistent with anthropological understandings of exchange. Altruistic giving is rare: gifts are neither spontaneous, nor freely given. There are many examples of reciprocal exchange systems that embroil their participants in unequal, competitive, and even adversary relations:

"*There is a tension, but it is a tension inherent in the gift relationship itself, rather than arising from a contradiction between two distinct principles of 'trust' and 'domination'. … animals must be viewed as powerful and dangerous trading partners*" (*Nadasdy 2007.28*).

Pastoralism

When hunters became pastoralists they began to relate to animals, and to one another, in different ways. The incorporation of tame animals in a human household, where animals gain the status of quasi-persons, is the first pre-condition for pastoralism. Tame animals are ubiquitous in hunter-gatherer societies, where they have the role of hunting assistants, transport animals, or decoys (*Ingold 1980. 95–112*). Pastoral property relations become explicit when the status of animals changes from agents of production to sources of food. It is also a change in the animals' status from quasi-persons to resources. Animals in the pastoral mode of production become means of reproducing the social relations of pastoral production. Reproduction and the multiplication of domestic animals make possible the accumulation of wealth (*Ingold 1980.144*). The slaughter of domestic animals frees people from the obligations of sharing that apply in the case of hunted animals. Social fragmentation into autonomous, self-sufficient domestic units is therefore not the cause, but the effect of drawing on domestic herds for subsistence.
Tim Ingold describes the new relations between humans and animals in pastoralism as 'domination':

"*It is the herdsman who takes life-or-death decisions concerning what are now 'his' animals, and* *who controls every other aspect of their welfare, acting as he does as both protector, guardian and executioneer. He sacrifies them; they do not sacrifice themselves to him*" (*Ingold 2000.72*).

But pastoral animals are not only good to eat or think, they are also – to follow Donna Harraway (*2003*) – good to live with. The social relations between domestic animals and people are different, but also much closer and intimate than relations with wild animals. Animals are not only socialized in human societies, but they also socialize people in their herds. This sociability affects both species, human and non-human, and new social forms emerge, with animal and human peoples' societies acting upon each other and creating new social relations.

Thus in the upland caves of the eastern Adriatic hinterland, humans and sheep shared living spaces, smells and sounds, and herds dictated the movement from cave to cave in search of pasture. However, live animals were probably less involved in the exchange and social relations between isolated and autarkic households.

This sociability might have been different in permanent lowland settlements, where animals were probably physically separated from humans, but more involved in relations between families through gifts or bridewealth.

Pastoralists, when asked about their animals, talk about them in the same way as hunters do. Navajo use the metaphor of mother, generalized reciprocity, when they speak about their sheep: "*those called sheep are your mother, sheep are life*" (*Witherspoon 1973.1442*). And even if we accept that there are elements of domination in human-animal relations under pastoralism, they are not prevalent. Animals and people are involved in tight social relations, and in order to maintain long term relationships, politics of reciprocity between humans and animals must be maintained.

Pastoralists depend on herds, their growth and accumulation. They live in constant fear of epidemics and natural disasters that might exterminate the herd (see *Ingold 1980.163–176*). To protect against future catastrophes and to maintain the reproduction and growth of herds, humans must rely on maintaining a balance in the reciprocal give-and-take of life-force (see *Witherspoon 1973*). Animals (or their spiritual masters) can be offended and they will not return herders who have treated them badly or wasted the life-force. This means that animals have the power to 'act back' and alter human life. Relations between animals and humans are therefore political. The politics between animals and humans is not based on human 'domination', but rather on balanced reciprocal relations derived from an animistic ontology of life-force flow.

The slaughter of an animal incurs a spiritual debt that must be repaid through the observance of a whole series of different ritual attitudes and practices. Thus among pastoralist, animals are never slaughtered, but sacrificed. Sacrifice, like hunting, is connected with many taboos and must be performed in the proper way, otherwise it might disrupt relations between humans and animals (see *Evans-Pritchard 1956.196–230; Abbink 2003*).

Animals are therefore simultaneously sacrificial victims (as cooked meat, consumed by the humans) and, among the sacrificial recipients, as the 'life-force' or 'inner vital essence of being' of sacrificed animal is returned to animals. This reciprocity often includes 'middle persons', such as the spirits and spiritual owners of animals; however, the principle of exchange of life-force is the same as in hunting.

This might have very deep implications for our understanding of Neolithic herd management strategies, as derived from faunal records and kill-off curves. Neolithic herd management might not have been aimed at 'optimizing' the production of meat or milk. Instead, it might have been based on the principle of the reciprocal flow of the 'life-force' and the idea that more (proper) slaughtering (*e.g.* sacrifice) produces more animals.

Hunting and pastoralism must be understood as a set of social relations not only among humans, but also between human and animal persons (*Nadasdy 2007.29*). These relations have profound political dimensions. In the following chapters I am going to develop the argument that rhyta were intertwined in this network of relations between people and animals, held it in place and modified it through their own agency.

Iconicity of rhyta

Main point of departure of this paper is to treat rhyta not as mere representations. They might have some – often ambigous – iconic resemblance to animals, humans, or body parts, but this resemblance is not in the function of representing them, but rather in revealing the hidden properties of animals and humans and their relations.

Depictions of animals

Tim Ingold, in his essay 'Totemism, Animism and the Depiction of Animals' (*Ingold 2000.111–131*) shows that depictions of animals by hunter-gatherers from Australia and the circumpolar North explain and can be explained by their respective totemic and animistic ontologies.

In the Australian totemic ontology, the life force is concentrated in the land, set down in the era of the 'Dreaming' by powerful ancestral beings who moved across landscape and deposited their life-force in the processes of creation and transformation of places. The land embodies the creative powers of the ancestors, and humans and animals relate primarily to the land.

By contrast, Ingold argues, the 'vital force' in animistic ontology is distributed among beings that inhabit the world. These beings are mutually engaged with one another, creating a complex network of reciprocal interdependence based on the exchange of substances and 'vital force'. The life of one being is predicated on the mortality of another, making the transformation and becoming essential for the maintenance of the flow of life.

The difference is also expressed in ceremonial practices and depictions of animals. In Australia, animals are portrayed as static and associated with the morphology of the landscape, "*a world which is already made, not in the making*" (*Ingold 2000.120*). Songs, dances and storytelling re-enact ancestral activity, stressing their co-substantiality with the ancestors. In the circumpolar north, carved wooden mask reveal the agencies of animals. They are not realistic representations of animals, but use distorted human features to capture the underlying character of the animal (*Ingold 2000.124*). Masks have the power to invoke the spirits of animals during rituals.

Rhyta as depictions

Rhyta are not aniconic. Rhyta imagery is composed of attributes and features of animal and human bodies. There is obviously a high degree of ambiguity present. Some rhyta are explicitly anthropomorphic. Most have zoomorphic qualities. Some are human-animal hybrids, and some resemble animals from one viewpoint, but can also be like part of an animal, perhaps the udder, from another (Fig. 2).

The most distinctive and recognizable features are the four legs which support the torso and ring handle. Legs can appear in many shapes, from thin and long to short and swollen. Some even have elaborated tips, shaped as animal hoofs or (rarely) as human feet. Wide voluminous legs are often pointed, ambiguously suggesting that they can also represent full teats.

There is a class of rhyta which is obviously anthropomorphic (Fig. 3). They represent part of the human torso in a kneeling or crouching position, with legs widely apart. An enormous rounded belly rests on thighs. The abdomen is opened. There is no upper torso; instead, a large ring is fixed on the back of the rhyta.

When a rhyton is positioned on a level surface in front of us, the legs are hidden from view, and only two features become prominent: the large ring and the empty volume of the interior of the abdomen. They clearly show what rhyta primarily display: the interior of the body or abdomen.

Alfred Gell (*1998.141–142*) states that 'idols' or sculptural works intended for cult use rather than mere representations are often merely hollow envelopes, possessing 'significant interiors'. He cites the

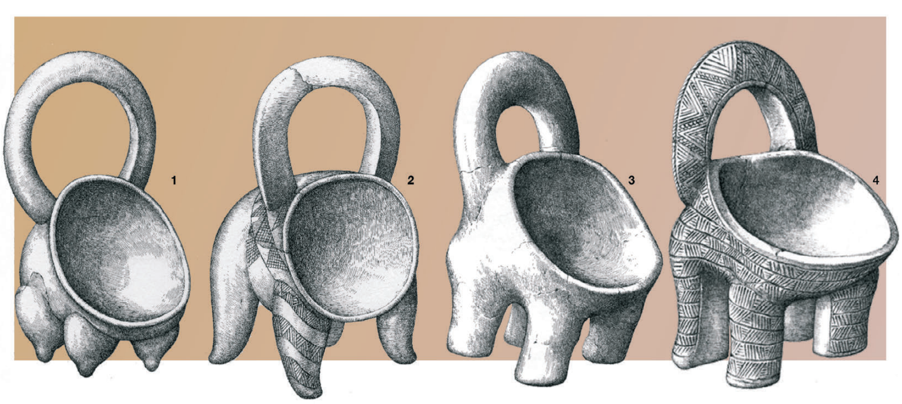

Fig. 2. Some examples of rhyta: 1, 2 – Obre I (*Benac 1979.Tab. LVIII*); 3, 4 – Smilčić (*Batović 1979.Tab. LXXXV*).

examples of hollow **mauri** stones, hollow sorcery-images, or a class of medieval sculptures called **vierges ouvrantes**, an image of the Virgin which can be opened to reveal a representation of the Trinity in her abdomen.

Also appropriate examples are the masks of circumpolar peoples (*Ingold 2000.111–131*, see above), with hinged doors that open to reveal a face, effecting a transformation which reveals the true face of the animal. Other masks achieve the same effect by exploiting ambiguous imagery using figure-ground reversal illusions. A mask may look realistic from one angle, but from another can show entirely different features and a different face (*Ingold 2000.124*). Again, it is the interior of the idol which hides the true face and the mask is merely a surface which keeps it contained until the dramatic event of transformation: "*[t]he metamorphosis is not covering up, but an opening up, of the person to the world* (*Ingold 2000.94*)."

Artefacts that resemble the body have the particular power to be attributed with agency. They achieve their effectiveness in invoking a projection of the mind through an iconicity of internality/externality. Rhyta can be seen as containers, skins around 'significant interiors'. Their agency is attributed through the invocation of an interior beyond the beyond the surface of the artefact. This correspond to the animistic view of personhood, where vital personal attributes such as sentience, volition, memory and speech are not dependent on outward appearances, but upon the inner vital essence of being.

The most important modes to communicate the property internal to the artefact are orifices and enclosures. Especially agentive are artefacts with eyes, a particularly effective icon of mind. Rhyta do not have eyes. Instead, they have a large ring, a circular opening that might resemble a vagina or wound, especially as the ring is often covered with red pigment (see below). Rings thus communicate an internal property of rhyta which can be connected to the inner vital essence of being.

However, containment is of little value if substances contained inside the container can not pass to the outside and vice versa. This opening might have a temporal dimension, as an act of opening, perhaps through the deliberate breaking of a rhyton. It can also be communicated through the iconicity of a rhyton. Anthropomorphic rhyta which depict women giving birth in a kneeling or crouching position therefore communicate the process of transformation or flow of life-force contained in a rhyton (Fig. 3).

Fig. 3. Anthropomorphic rhyton from Smilčić (**Batović 1979.Tab. XCII*****).***

Skins and envelopes

Rhyta can be therefore understood as 'skins' or enveleopes around 'significant interiors'. Some of them have bare skin, with smooth, polished surfaces. However, large numbers of rhyta are ornamented with incised decoration covering the whole surface (skin) of the vessel (Figs 4, 5). Some parts are omitted: inside parts of the legs, the interior of the receptacle, the interior part of the handle. The repertoire of motifs is shared with contemporary pottery, such as hatched triangles, spirals, chess-boards, zigzags, and running spirals etc. However, they are used in a different way than on pots, as they cover the whole surface and not only the perimeter of the pot. The ring receives special attention; it is emphasized with different decoration from the rest of the rhyta (Fig. 4).

According to Gell (*1996;1998.73–94*), ornamental art is much more than a function of aesthetic pleasure. Objects decorated with skilfully executed geometrical and decorative patterns appear animated in a 'non-representational way', as parts of the pattern relate to neighbouring motifs, thus testifying to the agency of the pattern and object as a whole. This 'dance' of complex patterns, their multiplicity and the difficulty we have in grasping the logic of interplay between them, draws our attention and catches it in the 'unfinished business' of deciphering its logic.

However, this 'unfinished business' of unravelling the geometric pattern causes us to relate to an artefact in a special way. The inexhaustible pattern, always in a state of being deciphered, creates a long-term, biographical relation between the decorated artefact and the person looking at it, in the same way as watching and contemplating animals create bond of domestication and close social relations. Evans Pritchard describes how the bond between the Nuer and their cattle is created and maintained through acts of looking:

Fig. 4. Geometric patterns on the rhyton fragments from Danilo (**Korošec 1964.Tab 9, 10, 11*****).***

"*The men wake about dawn at camp in the midst of their cattle and sit contentedly watching them till milking is finished. Then they … take them to pasture and spend the day watching them graze … When the cattle return in the evening they tether each beast … and sit in the windscreens to contemplate them and watch them being milked*" (*Evans-Pritchard 1940.36–37,* cited in *Ingold 1980.181*).

Complex geometric patterns can serve as 'mind-traps' and can be used in a apotropeic role as 'demon-traps' (*Gell 1996; 1998.86–90*).

Colour

The color of rhyta – made of fired clay – ranges from buff through brown to grey or almost black. However, it looks as if most, if not all, rhyta were painted with red pigment. In some cases the whole fragment (or perhaps the whole vessel) was painted. However, in most cases, only parts of the vessels were coloured. These include mainly the ring (or more precisely, the interior part of the ring), the receptacle, and the interior part of the legs (Fig. 5).

Again, colours are more than mere representation or decoration. They are agentive; capable of transforming things. Victor Turner, in his highly influential essay on red, white and black (*1967*) proposed that, based on a universal human organic experience, red has a universal significance related to blood. The association of red with blood has been much discussed in the literature. There are many examples which do not support Turner's universalist theory (see *Young 2006*). For example, red may also be associated with ambiguity, magical powers and transformation.

Instead of seeing colour as a static propriety of the vessel, we may try to consider its temporal aspects. Rhyta were covered with pigment after firing, as pigment rubs off easily. Painting the vessel may have been a part of its lifecycle and associated with special limnic events such as use in rituals or end of life – deliberate breaking.

A colour change might also be thought as transformation in itself, not only symbolically. Colour, or its material form, pigment, has an agency, transforming objects. Anthony Forge wrote of the yam cult, where all magical substances are classed as paint, and paint is a ceremonial medium through which initiates are turned into men (*Forge 1962*).

Fig. 5. Traces of red pigment on the rhyton leg from Smilčić (Archaeological Museum Zadar).

By the act of applying the dye to the surface and inside of the rhyton, it entered into a process of transformation. Here, the agency of red can create a whole network of analogies which place the rhyton in a web of relations between people and animals:

"*Killing, hunting, eating, and menstruation, sex, conception and birth are the constituents of a fundamental metaphor likening the provisioning of society to its reproduction. The explicit sex (women) and hunting (animals) likeness in dreams and verbal polysemy are the potent expression of this metaphor. Menstrual blood possesses multiple values in this scheme. A symbol of female fertility, because coextensive with it in the life cycle, menstrual blood is simultaneously the material cause of fertility as the substance out of which foetal flesh is formed. Some Cree men say that menstruating women are especially likely to conceive. Women biologically reproduce the human community, their ability to do so evidenced by the flow of blood that, however, in the event of conception, they begin to retain within their bodies. Human life is also visibly reproduced by killing and eating animals. Hunting and trapping are paradigmatically male occupations through which men enact a reproductive role complementing that of women. The animal blood spilled at kill sites and trap sets corresponds to menstrual blood, which is a precondition of female fertility.*" (*Brightman 1993.128–129*)

Red can serve as a marker and agent of transformation of a rhyton, but it can also have an apotropeic role. Red pigment can act as an additional layer of protection of vital body parts in the process of transformation; thus the interior of the recipient, 'the meaningful emptiness', the opening of the ring and interior part of the legs, and area around the genitalia. Borić (*2002.28*) cites many examples of the use of red in folk costumes associated with fertility and protection.

Thus red dye contains a powerful agency transforming the rhyta. It is a marker, agent and protector of transformation of the rhyta.

Fractal depictions

There are a few rhyta from lowland villages which are decorated with small animal heads, added to the body or ring of the rhyta. Those animal heads look like small animals sprouting from the rhyton's surface (Fig. 6).

Alfred Gell (*1998.137–141*) discusses the carving of the deity A'a by the Rurutu in the Austral Isles, where the features of the god are represented by small figures which repeat in miniature the overall form of the god as a whole. It is a 'fractal image', which displays self-similarity at different scales. Its body is depicted as composed of other bodies. A'a is not an individual in the sense that there is a clear boundary between it and others. Instead, it is a 'fractal person', represented as an aggregate of external relations instantiated in the 'inside' persons. There is no border between internal and external.

This notion of 'fractal person' is based on the anthropological analyses of Melanesian societies by Mary Strathern (*1988*) and Roy Wagner (*1991*). People, objects and non-human beings are therefore indexes of relations – they are made up of, or constituted by, their relations or connections. They are not so much individuals as 'dividuals': who they are and what they do is generated by their transactions with each other, with animals and with artefacts (see *Fowler 2001; 2004; Jones 2005*).

Animals are involved in social relations between humans through gifts or bridewealth. Animals circulate among households. Wealthy owners whose holdings exceed the maximum manageable size will find it mutually advantageous to loan or give some animals to other households. Conversely, if someone is short of animals, they may seek gifts or loans from the better-off (*Dahl and Hjort 1976.136–137; Ingold 1980*). Animals produce milk for the household where they are situated, irrespective of who owns a particular animal; however, the owner retains control over the slaughter of an animal and over its offspring. Alternatively, complementary types of animals allow poorer households to exploit the high reproductive potential of small stock to build their herds and then exchange them for larger stock (*Dahl and Hjort 1976.230–234*). Households spread their interests by distributing animals as gifts and loans to a range of stock-associates. Such herds typically consist of animals from a number of separate owners under the management of a single household. This establishes a network of social relations between households, which are reflected in herds. (*Ingold 1980.17; Evans-Pritchard 1940.66–67, 153–154*).

Thus someone's personhood is separable into relations with other persons, humans and animals. These are constitutive of people and animals, who are therefore composed of the sum of the relations between them. But it is not only the flow of animals and humans between households which constitutes personhood.

When an animal is sacrificed at a wedding, the meat is distributed on the same pattern as a bridewealth herd. Like the bridewealth herd, the sacrificial victim is the focus of multiple claims which derive from the cumulative history of prior transactions spanning generations of both humans and animals (*Evans-Pritchard 1951.66–67, 153–154*). Humans and animals are therefore mutually engaged with one another, creating a complex network of reciprocal interdependence based on the exchange of substances and 'vital force'. Thus when an animal is sacrificed, the object of sacrifice is not the 'individual' animal, but a fractal person who 'stands for' the whole network of animals and humans.

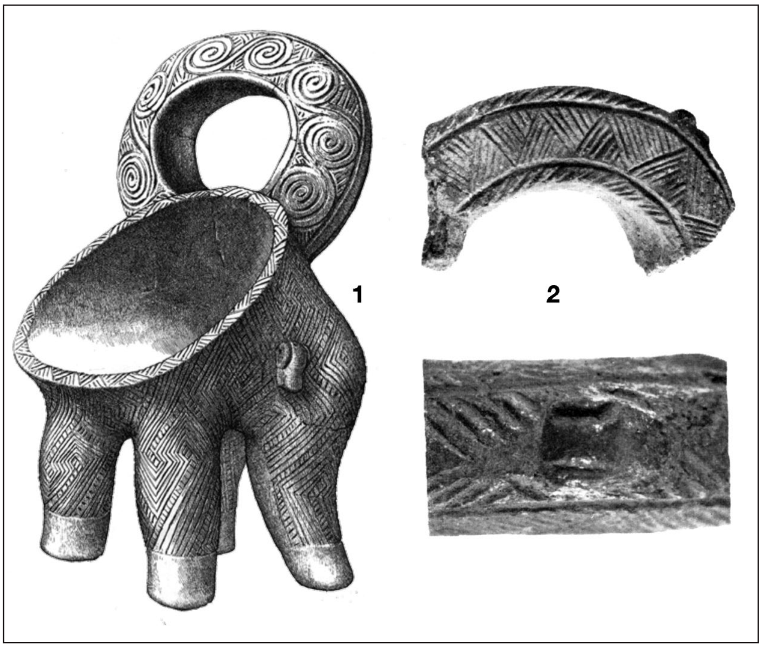

*Fig. 6. 'Fractal' rhyta. 1 – Smilčić (*Batović 1979.Tab. LXXXV*) and 2 – Danilo (*Korošec 1964.Tab 5.7, 6.3*).*

Rhyta are persons, too just like animals and humans – not individuals, but 'fractal persons' composed through many relations between people and animals, or mediated through animals.

Paradoxically, I have described rhyta as if they were whole, although no unbroken rhyta has been found yet. Only fragments, parts of rhyta are found in archaeological contexts. One can only agree with John Chapman's statement (*2000.67*) that the process of fragmentation is vital to their understanding.

Transformation, breaking and deposition

John Chapman's innovative study (*2000*) focused on the practices of fragmentation and accumulation in the Neolithic of Balkans as processes which link people to object through production, exchange and consumption.

Chapman has pointed out that rhyta are highly fragmented. He states that only about 8 % of published rhyta are complete. But even this is an overestimate, as most published 'whole' rhyta are reconstructions based on a few fragments. It is safe to state that most, if not all, rhyta are broken.

Open-air sites have yielded much higher number of rhyta; for example, in Smilčić, around 200 fragments of rhyta were excavated, while in the Caput Adriae caves only 22 fragments were found (*Montagnari Kokelj and Crismani 1993*).

Chapman explains the absence of whole rthyta and their low number in peripheral areas of rhyta distribution such as the Caput Adriae caves and Lipari, as a result of the down-the-line movement of fragments creating 'enchained relations' between people along the path.

However, the fragmentation analysis of rhyta from Smilčić and Caput Adriae caves shows that they are comparable (Fig. 7). Rhyta from the Caput Adriae caves are not more fragmented than those from open-air settlements at Smilčić. There are pieces that can be fitted together, and most fragments are broken at the 'weak point' at the junction of the body and leg. While in Smilčić there are more legs which were broken below the weak point, indicating that they were broken at least twice or took more effort to break.

Two provenance studies from Triestine karst caves (Edera; *Spataro 1999* and Mala Triglavca; *Žibrat Gašparič 2004*) have clearly demonstrated that rhyta were produced locally in the Karst plateau and not traded or brought from elsewhere, not even from coastal villages only a few kilometres away. On the other hand, based on one typological criteria, one fragment of a ring handle from the Bosnian site Obre I was identified as an "*import from the Adriatic coast*" (*Benac 1973.84, Fig. 16*).

The deliberate breaking of rhyta is an efective ritual, where it is transformed into something else. In the process of breaking, the 'significant interior', the 'vital force' of a rhyton, is revealed and released, while the rhyton is fragmented into parts. The resulting fragments may now have different quality as a whole rhyton, and may be circulated among the participants, perhaps in the same pattern as meat or a bridewealth herd. Births, marriages, deaths and epidemics may have formed the context for the deliberate breaking of rhyta.

Fragments of rhyta were then moved around the settlement (or camp) and deposited in the same deposits as the body parts of slaughtered animals and pottery fragments. Rhyta fragments in lowland villages are often associated with anthropomorphic and zoomorphic figurines and decorated 'lids' or phalluses (see *Batović 1968*).

Rhyta fragments from upland caves were most probably found in contexts which were the result of periodic cleaning of the cave interior (after or before visit of a herd), with pottery, animal and human bones mixed together in the sediment and deposited at the cave wall.

The metonymic qualities of many deposited objects (such as parts of rhyta, human and animal bones) suggest that they were concerned mainly with the maintenance of the flow of vital force and not with 'practicalities' of living floor maintenance (*Brück 1999; Chapman and Gaydarska 2006.71–79*). These deposits are not generalized, de facto refuse, but rather special, structured deposits, which maintain or established relations between humans and animal herds, place and previous occupations.

Conclusions

Rhyta are highly ambiguous depictions composed from many attributes derived from animals and humans, especially the female body. However, they are not mere depictions as such, or some kind of ritual or cult paraphernalia, but also powerful agents. They do not represent, they do, act, and change relations between persons.

Rhyta have a life history. They are modelled from clay, incised with decoration, fired. Their potency is created through the effective arrangement of iconic elements. In the process of being made, a rhyton is transformed from raw materials into an object of power.

But the rhyta are not only powerful by themselves: their potency is acted out and enhanced through ritual and performance. We have already noted the role of red pigment, which was applied after the firing, effectively starting and marking the process of transformation of rhyta. But the most powerful transformation of rhyta was their deliberate breaking when their 'vital force', contained in a 'significant interior' was released, and the resulting fragments were exchanged and deposited.

Animals in the Neolithic societies of eastern Adriatic are not just passive 'meat packages', waiting to be slaughtered and consumed. They are persons, involved in a complex network of exchange of substances and 'vital force' with other animals and humans. As such, they have power to 'act back' and alter human life. The politics between animals and humans is therefore not based on human 'domination', but rather on balanced reciprocal relations derived from the an animistic ontology of life-force flow. Doing good politics involves the maintenance of social relations. The making and deliberate breaking of rhyta might have been a way of reciprocating the flow of vital force. They invoke the presence of non-human sources of power, animal spirits, with which humans must perforce transact in order to keep vitality in circulation. Births, marriages, deaths, epidemics, points in the animal reproduction cycle or other events where the balance of vital force was disturbed, may have formed the context for the deliberate breaking of rhyta. There might be subtle differences in the context of breaking and deposition of rhyta, based on different social relations between humans and animals in the Neolithic communities of the east-

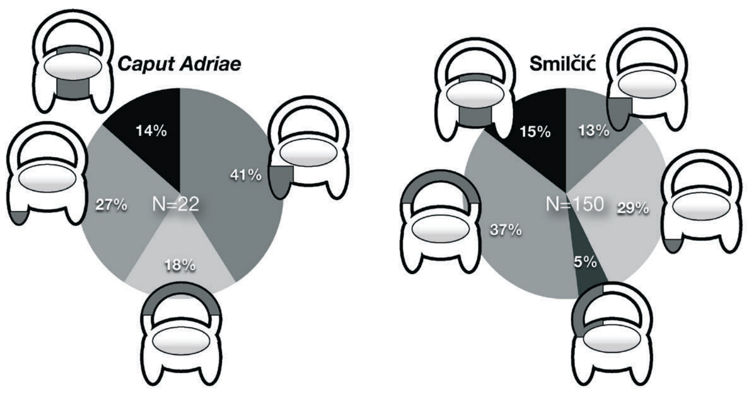

Fig. 7. Fragmentation analysis of rhyta from Caput Adriae (data from* Montagnari-Kokelj and Crismani 1993*) and Smilčić.

ern Adriatic. Thus rhyta from the lowlands emphasize the fractal nature of persons, humans and animals, created through the exchange of animals and persons, while upland pastoral communities might be focused more on the flow and exchange of vital force.

Rhyta are made by humans, and imbued with life through a variety of iconic properties and external activities. They embody complex belief about the connections between animals and humans. Rhyta are the human/animal politics made durable. They literally render the social negotiation between humans and non-humans visible and tangible.

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Phase and chemical composition analysis of pigments used in Cucuteni Neolithic painted ceramics

Bogdan Constantinescu[1], Roxana Bugoi[1], Emmanuel Pantos[2], Dragomir Popovici[3]
1 *'Horia Hulubei' National Institute of Nuclear Physics and Engineering, Bucharest, Romania*
bconst@nipne.ro
2 *CCLRC, Daresbury Laboratory, Warrington, UK*
3 *National Museum of Romania's History, Bucharest, Romania*

ABSTRACT – *Two analytical methods – ^{241}Am-based X-Ray Fluorescence (XRF) and Synchrotron Radiation X-ray Diffraction (SR-XRD) – were used to investigate the elemental and mineralogical composition of pigments which decorate some Cucuteni Neolithic ceramic sherds. Local hematite and local calcite were the main components for red and white pigments, respectively. For black pigments, iron oxides (*e.g. *magnetite) were used. They were often mixed with manganese oxides (*e.g. *jacobsite), which originated from Iacobeni manganese minerals deposits on the Bistriţa River. Taking into account the results of the experiments, several conclusions regarding manufacturing procedures employed, and potential trade routes during the Neolithic were drawn.*

IZVLEČEK – *Za določanje elementarne in mineraloške sestave pigmentov, s katerimi so okrašene nekatere keramične posode kulture Cucuteni, sta bili uporabljeni dve analitski metodi – ^{241}Am X-Ray Fluorescence (XRF) in Synchrotron Radiation X-ray Diffraction (SR-XRD). Lokalni hematit in kalcit sta bila glavni komponenti rdečih oziroma belih pigmentov. Za črne pigmente so uporabljali železove okside (magnetit). Pogosto so jih zmešali z manganovimi oksidi (jakobsitom), ki izvirajo iz Iacobeni manganovih mineralnih depozitov reke Bistrita. Če upoštevamo rezultate poizkusov, lahko potegnemo več zaključkov o uporabljenih proizvodnih postopkih in o možnih trgovskih poteh v času neolitika.*

KEY WORDS – *Cucuteni-Tripolye; ceramics; pigments; XRF; SR-XRD*

Cucuteni ceramics

The history of the V–IVth millennia BCE is marked by the flourishing of some great Eneolithical civilizations in the South-Eastern part of Europe: Vinča, Gumelniţa and Cucuteni-Tripolye, representing moments of high cultural evolution. Spread over a vast territory, with a total area of more than 300 000 km^2 in Romania, the Republic of Moldova and Ukraine, the Cucuteni (in Romania, Tripolye in Ukraine) culture is one of the last brilliant cultural expressions of the Copper Age. Cucuteni-Tripolye culture had a long evolution, being divided by specialists into three main phases: Cucuteni A, Cucuteni A–B and Cucuteni B. The skilful and ingenious use of all the natural resources allowed the Cucutenian communities to build solid and lasting houses, with resistant wooden structures covered with clay mixed with straw and hay. The craftsmen manufactured tools in either carved or polished stone (flint, opal, jasper, etc.), bone, horn or metal (copper), thus showing a high level of knowledge.

The 'Queen' of prehistoric pottery, the Cucutenian ceramics (Figs. 1, 2, 3) represent the most eloquent proof not only of a perfect mastery of pottery (production and temperature control and clay modelling), but also of an extremely well-developed aesthetic sense that gave birth to genuine and unrivalled prehistoric masterpieces. The decorations on this pottery is proof of a remarkable aesthetic sense and, at the same time, of a very complex spiritual life. The prehistoric craftsmen created characteristic decorations for each of the three evolutional stages of the culture, with the use of incised lines, flutings and colours (white, black and red), using the spiral as an essential decorative element on the external (and sometimes, internal) surface of the pots. It is almost certain that the colours had magical significance: red = life (blood), white = the good (light), and black = the evil (darkness).

In the following lines, the previous results obtained on Cucuteni ceramics by using X-Ray Fluorescence (XRF), X-Ray Diffraction (XRD), and other specific mineralogical methods will be reviewed. By means of the XRF and powder diffraction analysis of a number of Cucuteni sherds from the Poduri settlement (Bacău district – 50 km East of the Bistriţa River) were analyzed by Niculescu and Coltos (*Niculescu, Coltos and Popovici 1982.205–206*). They pointed out that the chromatophorous minerals of the white, red and dark brown pigments were calcium silicate, hematite, and jacobsite respectively, confirming the results obtained for other Cucuteni-Tripolye settlements by Stos-Gale and Rook (*1981.155– 161*).

Fig. 1. Cucuteni A pottery, excavated from Poduri site.

In a synthetic study of Cucuteni-Tripolye culture, Ellis (*1980.211–230*) made a technological characterization of the Cucutenian pottery. The X-ray diffraction and microscopic analyses were aimed at determining the mineralogical components of the ceramic composition, and the pigments used in the painting of the pottery. The results showed that the sources of clay were local; the black pigment came from manganese ores in the region, the red pigment from the alteration of the iron minerals, and the white from marls and kaolins. In late Cucuteni culture was fired in kilns with a controlled atmosphere, the temperatures in the kilns reaching 1000–1100 °C.

A comprehensive study of Cucuteni ceramics from Northern Moldova (including pigments issue) has been made by Gâţă in (*Marinescu-Bâlcu and Bolomey 2000.111–131*).

Summarizing the results from all the above references, it can be stated that the pigments used for the Cucuteni ceramics painting were mineral pigments including clay minerals, quartz, and feldspars, without iron and manganese oxides for the white chro-

Fig. 2. Cucuteni A pottery, excavated from Poduri site.

Fig. 3. Cucuteni A pottery (Romanian National History Museum).

mes, with iron oxides for the red chromes, and with manganese oxides for the brownish-black chromes. These pigments were prepared starting from different coloured clays as raw materials by powdering, dispersion in water, separation of the fine fraction by decantation, and drying. In general, the pigment particle dimensions were of 5–15 μm, based on the width at half intensity of the quartz line at 4.26 Å (Sherrer's law). The raw materials were cements and concretions with manganese oxides (birnesite and manganite – very often found in Iacobeni deposits) for the brownish-black chromes, iron and manganese concretions, cambic horizons or lehms (goethite – α-FOOH brown-red-brown-yellow colour and lepidocrocite) for the red chromes, and a loam without iron and manganese oxides for the white chrome. Through firing, the iron oxides, goethite and lepidocrocite, were transformed into hematite (Fe_2O_3 – reddish-grey-white colour) for the red chromes, the manganese oxides, birnesite and manganite, into bixbyite, and more rarely into jacobsite, depending on the iron and manganese content, and rarely into haussmanite. The firing of the clay minerals caused the predominant components to transform into oxides in the process of crystallization, and at a temperature of over 900 °C, γ Al_2O_3 appeared. The fineness of the pigment particles and their mineralogical composition indicate that the raw material for the pigments came from the proximity of the settlement, or from the region. The experimental preparation of pigments with brownish black and red chrome from cemented sand, iron and manganese concretions, and reddish clays, and the similar composition, chromes and fineness thus obtained proved that these were the sources for pigments.

White pigment was prepared from loam deprived of chromophorous oxides; analyses of white and of its sources were identical when the former had not undergone firing.

The firm adhesion of the pigments to the vessel walls was explained by their smectite content, a clay mineral that gives the required adhesion. Neither the clay, nor the pigments had calcareous concretions or noticeable amounts of carbonates dispersed in the fabric, and their source appeared to be a layer leached of carbonates. The grain conglomerate structure of the medium and course fabric, the large amounts of iron and manganese concretions and broken sherds in the ceramic mass, and the presence of remains from pigment preparation, indicated their employment as an admixture in the fabric of vessels with thicker walls.

Regarding the technological aspects of ceramics production, the pottery was fired in an oxidizing atmosphere, in kilns with a combustion chamber and firing chamber separated by a perforated grate. All Cucuteni ceramics in the settlement were invariably fired according to an imported program. When the temperature rose too quickly to the nominal firing temperature during the initial stage, fissures and firing cracks appeared in the ceramic mass. The continuous firing stage was thoroughly maintained at a nominal temperature of 800–900 °C, which could be assessed by the uniform and complete firing of most vessels. A slow cooling stage followed, lasting at least half a day, with draught reduced to a minimum, allowing the complete transformation of β quartz into α quartz. The hue of the brownish-black pigment, whose colour was rendered especially by manganese hydroxides (possibly birnesite and manganite), became more intense by firing, due to the formation of bixbyite in most of the cases, of jacobsite more rarely, and of hausmanite accidentally, according to the content of iron and manganese oxides and the firing temperature. Lepidocrocite and goethite in the red pigments always turned into hematite. Clay minerals in the white pigment were dehydroxylated, and the formation of γ Al_2O_3 occurred exclusively in the fragments fired at a temperature above 900 °C.

Experimental

For this study, two analytical methods were used: ^{241}Am based XRF and powder SR-XRD. The analyzed ceramics sherds were selected from the collection of the National Museum of Romanian History in Bucharest.

XRF is an analytical method used for the determination of elemental composition. It consists of the detection of the characteristic X-ray emitted by the analyzed object as a consequence of its bombardment with photons of suitable energy (tens of keV at most). The analytical method is sensitive (minimum detection limits in the order of parts per million – ppm), fast, and, most important when dealing with archaeological artefacts, non-destructive.

For the XRF measurements performed in this study, a spectrometer consisting of a 30 mCi ^{241}Am annular gamma-source and a Si(Li) detector (180 eV FWHM at 5.9 keV resolution) was used. The elemental intensities data were normalized to their total background spectrum counts – the sum of all characteristic X-rays intensities for the excitation source –

respectively, and subtracted from their corresponding normalized paste composition. Due to the pigments layers strong non-homogeneity and to avoid difficult calibration procedures, only the ratios of the main characteristic elements were used.

XRD is capable of providing qualitative and sometimes quantitative information on regarding the phases (*e.g.* compounds) composition. The analytical method is based on the fact that the wavelengths of X-rays are of the same order of magnitude as the distances between atoms or ions in a molecule or crystal (~ 1 Å $= 10^{-10}$ m). Therefore, a crystal – or a crystalline powder – diffracts an X-ray beam passing through it, producing beams at specific angles depending on the X-ray wavelength, the crystal orientation, and the structure of the crystal. By analyzing the resulting diffraction pattern, information on the phases present in the analyzed sample are obtained. However, XRD is a destructive method, a certain amount of sample (*e.g.* crystalline powder) being necessary for the analysis, the measurements taking place in transmission mode.

Using conventional XRD in pottery analysis, major phases can be identified. However, in the case of archaeological objects, when the amount of sample to be analyzed has to be as small as possible, it is necessary to use the best experimental facilities. The advent of synchrotron radiation sources promoted the method of Synchrotron Radiation-X Ray Diffraction (SR-XRD), which became a powerful tool for detailed structural determination and mineral phase studies (*Uda 2000.758–761*). Its success is due to the fact that minute amounts of sample can be analyzed in a very short time (*Tang 2001.1015–1024*).

In particular, this experiment was focused on finding the composition of the pigments used to decorate some Cucuteni ceramics sherds. As special case is the one of the black pigments, the main candidates belong to three categories: graphite, manganese minerals and/or iron compounds. From previous analyses reported in Dumitrescu (*1985*) it is known that for Gumelniţa (3500–2500 BC) culture, graphite, and for Petreşti (3500–2500 BC) culture magnetite were used.

The SR-XRD measurements were performed at two locations: at the Synchrotron Radiation Source (SRS), Daresbury Laboratory (DL), UK, and at MAX-lab, Lund, Sweden. Some of the SR-XRD data were taken at station 14.1 of the SRS, by employing X–ray of 1.488 Å wavelength, 0.2x0.2 mm beam size and a flux of 10^{13} photons/s. The detection of the diffraction pattern was performed using a Quantum 4 ADSC CCD detector, which collects two-dimensional diffraction patterns of 2304x2304 pixels. The measurements were performed in transmission mode with an acquisition time of 30 seconds.

The pigment powders were gently scratched from some tens of ceramics sherds using a diamond file. The pigments were taken from areas of different colours (white, red and brown/black), as well as from the clay. Clay powders from all the sherds were also measured in order to compare any contribution in the diffraction patterns of the pigments, taking into account the fact that the painted layers were very thin (tens of μm), and it was likely to have some powder from the ceramic body in the sample extracted from the decorated surface.

At DL the powders were put in a sample cassette having 36 holes, each of them having as a backing Scotch tape®. The powders were pressed onto the Scotch tape and the excess powder was removed in order to have only a thin layer of it on the tape. The overall acquisition time per sample was minimized by the fact the cassette position (*i.e.* from a hole to the neighboring one) was moved under computer control from outside the station hutch. Silicon powder was used as a standard mineral phase, in order to determine the distance between sample and detector and the centre of the diffraction pattern – both required in order to reduce the data to intensity versus 2θ angle graphs for further analysis.

The data reduction was performed by using the FIT-2D package (the integration of the diffraction rings). The mineral phase identification was carried out with the aid of the ICDD (International Centre for Diffraction Data) ®/JCPDS (Joint Committee for Powder Diffraction Studies) database, as well as the search-match procedures using the X'Pert HighScore Plus and XPLOT software available at DL. The tape background has been subtracted for all the spectra using X'Pert HighScore Plus software.

The MAX II measurements were performed at beam line 7.11 using the Huber G670 imaging-plate Guiner camera (*Ståhl 2000.394–396*) installed on crystallgraphy beamline I711 at the MAX II synchrotron, Lund, Sweden (*Cerenius et al. 2000.203–208*). The samples – powder on Scotch tape – were exposed for 1200 s each to synchrotron radiation of 1.364 Å wavelength.

The analysis of the experimental data began with the identification of the relevant pigments using the Diffrac Plus data base of mineralogical compounds at MAX II. Further analysis consisted of the construction of the diffraction pattern using the data base information, followed by comparison with the results obtained from measurements after background subtraction.

SR-XRD was used as a very accurate method to distinguish different clays and mineral pigments of various Neolithic pottery-producing centers located on Romanian territory, most of them belonging to Cucuteni-Tripolye painted Neolithic ceramics.

Ceramics sherds belonging to the following cultures: Criş-Starčevo (6000–4500 BC), the oldest Neolithical culture, which covered the whole Balkan Peninsula and Carpathian Basin, Vinča (4200–3500 BC), Tiszapolgar (4500–3500 BC), Petreşti (3500–2500 BC), Gumelniţa (3500–2500 BC), with its most spectacular archaeological site: the golden cemetery at Varna, were also studied. The extension of the study to other cultures was due to the fact that the type and quantity of clay minerals and non-plastic inclusions in the clay can vary from region to region and the composition can be altered by the preparation procedure and manufacturing process.

Results

Painted (red-white-brown-black) Cucuteni sherds (Cucuteni A period) found in Moldova in sites situated in Bistriţa Valley down the river (Izvoare, Calu, Caşăria, Ghelăieşti) were analyzed.

The XRF measurements revealed that for the black (dark brown or chocolate black) colour Mn and Fe were the main elements (see Fig. 4). For provenance studies, the Mn/Fe ratio is significant because, due to the very close energy values of the X-rays emitted from both atoms, the matrix effects due to the presence of major (and lighter) elements can be assumed to have the same effect on the numerator and denominator. Three groups of sherds were found: Mn/Fe = 1/20, 1/5, 1/3 (1/20 is a normal value for a common soil). In the area of Cucuteni culture there are two main Mn deposits: Iacobeni, up to the Bistriţa River 150 km north of our analyzed sites in Moldova, where the Mn/Fe ratio is under 3/10; and Krivoi Rog (Nikolaev) on the Dnepr River in Ukraine, where the Mn/Fe ratio is from 8/10 up to 10/10. The results obtained strongly suggest the use of Iacobeni Mn minerals.

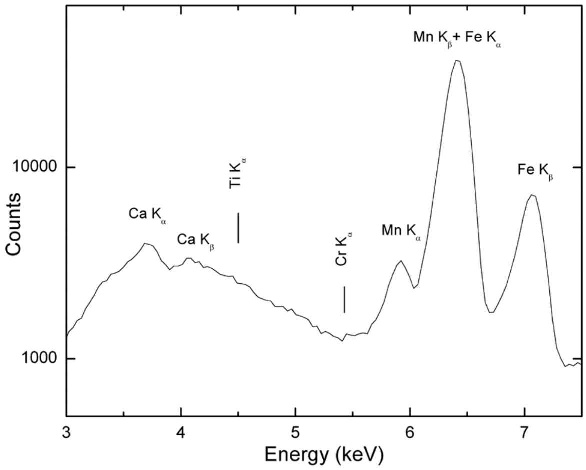

Fig. 4. Cucuteni black pigment XRF spectrum.

Concerning the white colour, Ca is the main element, the pigment raw material being a light clay (type kaolin) found relatively frequently in the region.

For the red colour we found Fe and Ti, concluding that the pigment is an iron-rich, clay-based one, with Ti used as reinforcing agent.

The analyzed clay was found to be of local provenances, with great variation in composition (*e.g.* a lot of Ca for the central region of Transylvania, a lot of Fe for Moldova and Banat, a lot of K in the North-East Transylvania). No clue regarding possible commercial exchanges was obtained from taking into account these results. When the black colour was close to dark brown, the compositional studies revealed Fe oxides in its content. Indications of the use of carbon from bones (Central Transylvania), but also from graphite (Gumelniţa culture), in which connections with the Neolithic graphite mines in North-East Bulgaria were revealed. The most interesting case is the site from Criş-Starčevo situated in Oltenia (Sălcuţa), where Mn was detected as pyrolusite. This mineral was abundant in the North of Greece and largely used in the 4^{th}–5^{th} centuries BC to produce the famous Attic black glass sherds. A possible commercial connection South-North in the Balkan Peninsula can thus be deduced. In order to confirm this hypothesis, other Neolithic sites in the area of the Carpathian Mountains– Danube ceramics have to be analyzed.

Regarding the SR-XRD data obtained at DL, UK, the diffraction pattern analysis led to the following conclusions:

- In some of the sherds with black decoration that showed the presence of Mn in XRF spectra, several varieties of jacobsite (Fe_2MnO_4) from the ICDD database fit the position and relative intensity of five of the peaks reasonably well. On the basis of the XRF data that showed a clear presence of Mn in these two samples, it was concluded that jacobsite is present in the black colour decoration of these samples, but with a slightly modified chemical formula where Fe and Mn are reduced in weight due to the presence of other metal atoms, such as Mg, that alter the crystal lattice slightly. Magnesian jacobsite showed the best fit for the position and relative intensity of the peaks in the data (see Fig. 5).

● In other sherds, the brown/black colour was due to the presence of magnetite (iron oxide Fe_3O^4).

● A considerable amount of time was spent trying to identify black pigment patterns other than jacobsite, such as graphite, and other Fe and Mn compounds, such as hausmannite, pyrite, pyrolusite, bixbyite, pyroxmangite, manganite, despujolsite, and rhodonite. Graphite is hard to resolve in the acquired diffraction patterns, since it exhibits a strong overlap at 3.4 Å with the quartz peak, which is situated at 3.34 Å; however, since the other peaks of graphite were not found in the black pigment diffraction patterns, the hypothesis of using carbon based pigments can not be supported. None of the above mentioned Fe and Mn minerals were found in any of the black pigment samples.

● Although the white colour was explained by the previous measurements on similar sherds as resulting either from calcite, kaolinite or from gypsum, the present data led to the conclusion that only in one of the sherds was some calcite found, as well as some augite (see Fig. 6).

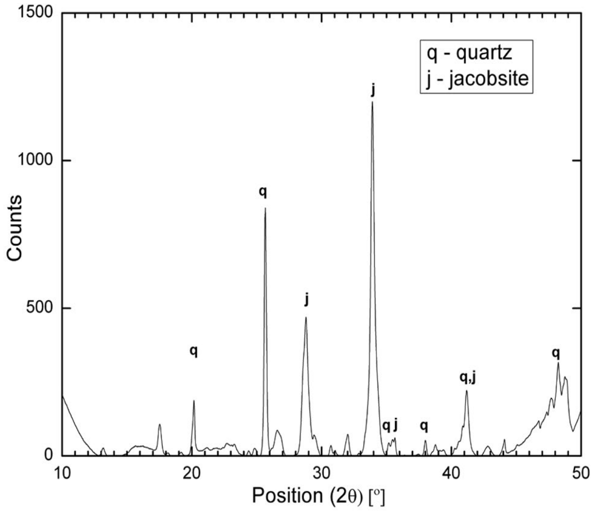

Fig. 5. Cucuteni black pigment SR-XRD spectrum.

● The red colour seems to come from the higher content in hematite of the powder (see Fig. 7). Hematite also seems to be a component of the corresponding ceramic body, but in much smaller amounts.

● The ceramic body samples contain silicates, diopside being identifying as a well matching phase in most of the samples.

The SR-XRD data obtained in Lund, Sweden, led to the clear identification of the black pigment composition from Cucuteni in Northern Moldavia and Ariuşd in South-Eastern Transylvania type pottery (6th–4th millennia BC): pyroxmangite (rodonite), an iron manganese silicate (Fe^{2+}, $Mn^{2+}{\cdot}CaMn_4[Si_5O_{15}]$) for high-temperature, ≥600 °C, fired pottery (the advanced Cucuteni ceramics types A and B), and a mixture of goethite (αFeO-OH), haussmanite ($MnMn_2O_4$), jacobsite (Fe_2MnO_4), bixbyite $(Mn, Fe)_2O_3$ and psilomelane ($MnO + MnO_2 + H_2O$ in variable proportions) for

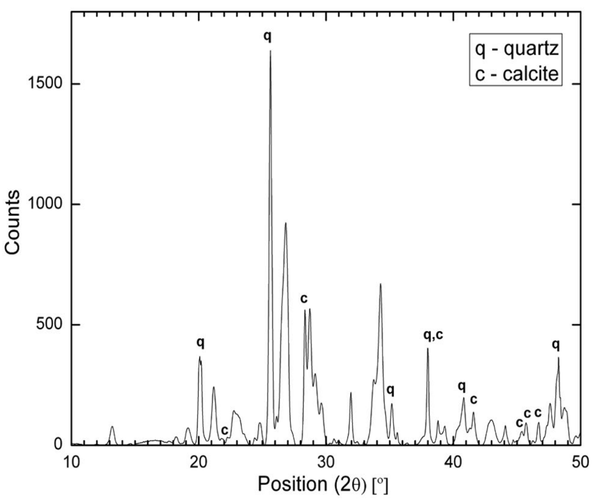

Fig. 6. Cucuteni white pigment SR-XRD spectrum.

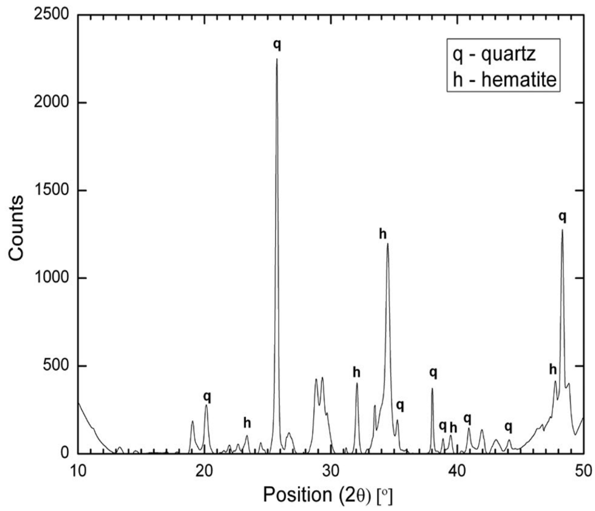

Fig. 7. Cucuteni red pigment SR-XRD spectrum.

pottery fired at low temperature (≤400 °C) (the primitive pre-Cucuteni type C).

Historically, all these minerals have their origin in the North Moldavian mineral deposits of Iacobeni, leading to the conclusion that Neolithic trade routes already existed, covering approximately 500 km with the crossing of the Carpathians along the Bistriţa River. In the same samples there was no evidence of pyrolusite (MnO_2) and manganite [MnO(OH)], the main components of Ukrainian Nikopol manganese deposit (used as black pigment source by contemporary Tripolye Neolithic culture). Other important results were the identification of magnetite (iron oxide Fe_3O_4) as the main component for the black pigments of the Central Transylvania Petreşti culture (4200–3500 BC), and the identification of graphite as black pigment for Oltenia Starčevo-Criş culture ceramics (6^{th}–5^{th} millennia BC), most probably from Northern Bulgaria graphite deposits. Finally, the black color of some carbon-based pigments is due to their organic origin (bone or wood) and it was quite challenging to identify them for several Cucuteni sherds from North-Eastern Moldavia.

We can suppose that the transportation from Iacobeni downriver of the Mn and Fe containing clays used as raw materials for pigments was done by raft (navigation on rafts made of conifers logs tied together using plant fibre ropes). In this area, rafting is a traditional means of transporting timber (wood used in carpentry and in house building), mentioned in documents as early as the 14^{th} century.

The white pigment composition appears as a combination of calcite ($CaCO_3$) for Cucuteni culture and as calcium silicates mixed with aluminum silicate-illite $\{(K,H_2))Al_2[(H_2O, OH)_2]AlSi_3O_{10}\}$ for Petreşti culture (Transylvania). As expected, the measurements have shown the presence of hematite (iron oxide Fe_2O_3) as the main component for red pigments for all the sherds examined. The clay examined for all the sherds was identified as of local provenance. It can be stated that the pigments used for the examined Neolithic ceramics painted sherds were mineral pigments including clay minerals, quartz and feldspars, with manganese oxides for the brownish-black chromes, with iron oxides for the red chromes, and without iron or manganese oxides for the white chromes. Through firing, the manganese oxides were transformed into bixbyite, and more rarely into jacobsite, depending on the iron and manganese content, and rarely into haussmanite at temperatures less than 400 °C, and into piroxmangite at temperatures higher than 600 °C. Correspondingly, the iron oxides were transformed into hematite for the red chromes.

Conclusions

The conclusion of this study is that the pigments used to decorate Cucuteni Neolithic ceramics were mainly based on iron oxides for the red hues, and calcium silicate and calcium carbonate for the white, while the black pigment was due to different iron and manganese compounds, such as magnetite and jacobsite. It is obvious that during this Neolithic period pottery workshops extended greatly over the present Romanian territory, local clays being mostly used. However, in the case of black pigments a type of primitive trade is evident. It is worth mentioning here that our findings are in good agreement with previous XRD and mineralogical studies, proving the use of the local manganese deposits from Iacobeni as black pigments sources for the Cucuteni ceramics in this area of Moldova.

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Unravelling ground stone life histories: the spatial organization of stone tools and human activities at LN Makriyalos, Greece

Christina Tsoraki
Department of Archaeology, University of Sheffield, UK
c.tsoraki@sheffield.ac.uk

ABSTRACT – *Unlike previous studies of ground stone technology in the Greek Neolithic, this paper follows a more contextualised approach by looking at contexts of deposition of ground stone from Late Neolithic Makriyalos, Northern Greece. The patterns attested in the distribution of ground stone objects between domestic and communal areas will be discussed in terms of the spatial and social contexts of tool use, curation and deposition, contributing to wider discussions about the way acts of production, consumption and discard were structured within different contexts of social practice.*

IZVLEČEK – *Ta članek se, v nasprotju s prejšnjimi študijami tehnologije brusov v grškem neolitiku, ukvarja z depozicijskimi konteksti mlajšeneolitskih brusov iz Makriyalosa v severni Grčiji. Vzorce distribucij brusov med družinskimi in komunalnimi območji analiziramo z vidika prostorskih in socialnih kontekstov uporabe ter hranjenja orodij. Razpravljamo o tem, kako so bili produkcija, potrošnja in odpad strukturirani v kontekstov različnih socialnih praks.*

KEY WORDS – *ground stone implements; contextual approach; Northern Greece; Late Neolithic Makriyalos; household; communal areas*

Introduction

In common with other technologies, ground stone objects must be studied contextually in order to gain insight into the way(s) they were used and perceived by their contemporary users. In the case of the Greek Neolithic, a key research issue is the nature of early farming society and, in particular, the suggested emergence of individual households and the interplay between domestic and communal scales of organisation (*Halstead 1999; Kotsakis 1999; Tomkins 2004*). A contextual analysis of ground stone thus has potential to contribute to the understanding not only of this class of artefacts, but also of the ways in which their production, consumption and discard were structured within different forms of social practice, within daily domestic activities *vs*. periodic gatherings of a more communal character, for example. To date, however, the nature of lithic technology and the value of lithic implements within Neolithic societies in Greece have been discussed in rather general terms (see *Perlès 1992*) and have not been explored at the scale of a single settlement. Systematic studies have not been undertaken of the contexts of deposition of ground stone artefacts and of their spatial association with other sets of material culture.

Studies of excavated ground stone assemblages from prehistoric sites in Greece have focussed mainly on typological and technological issues, at least in part because of the restrictions imposed by sample size (see, for instance, the assemblages from Achilleion in Thessaly [*Winn and Shimabuku 1989*] and Dikili Tash in Macedonia [*Sériadès 1992*]). In addition, some of the largest published assemblages come from multi-period surface survey projects and so offer neither chronological nor intra-site contextual control, as for example the 304 ground stone artefacts recorded by the Argolid Exploration Project (*Kardulias and Runnels 1995*) or the assemblage collected by the Lakonia Survey (*Carter and Ydo 1996*). The ground stone assemblage from large-scale excavations at Late Neolithic Makriyalos in Northern Greece is the largest such assemblage from prehistoric Greece (*c.* 8800 artefacts) and presents an exceptional opportunity for contextualised analysis to enhance understanding of both ground stone technology and human society in Neolithic Greece.

In this paper, the ground stone assemblage from Makriyalos will be placed in context, and the spatial distribution of tools and tool-related activities will be investigated. Contextual analysis of the Makriyalos assemblage, which is still in progress, has been conducted at various spatial scales, that may reflect different scales of social interaction (household, local community, regional community). To quote Jones (*2002.83*), 'what we are interested in, then, is how material culture is used to create and maintain meaningful social relations that affirm the definition of identity and belonging at individual, local and wider scales'.

The Site

The Neolithic site of Makriyalos is one of the largest flat-extended settlements in Macedonia, Northern Greece (Fig. 1). The estimated size of the settlement is *c.* 50 hectares, while the excavated area spreads over six hectares. Two phases of Late Neolithic occupation have been identified: Makriyalos I dated to the early Late Neolithic (5300–5000/4900 BC) and Makriyalos II dated to the later Late Neolithic (4900–4600/4500 BC) (*Pappa and Besios 1999b.177–180*). ***Makriyalos I*** was surrounded by a double ditch (Ditches Alpha & Beta) enclosing an area estimated at 28 ha, while a third ditch (Ditch Gamma) within this enclosure may represent an internal boundary. The enclosure was occupied by loose groups of pits, the larger of which have been interpreted mainly as pit-dwellings. Fire installations were found in separate pits outside the houses (*Pappa and Besios 1999a*). Another feature identified are borrow pits up to 30 m in diameter, used initially to mine bedrock (*Pappa et al. 2004*) (Fig. 2). ***Makriyalos II*** is characterised mainly by a densely occupied habitation area with pit structures, but also rectilinear buildings.

The ditches seem to have played a very important role in the communal life of Makriyalos I, because

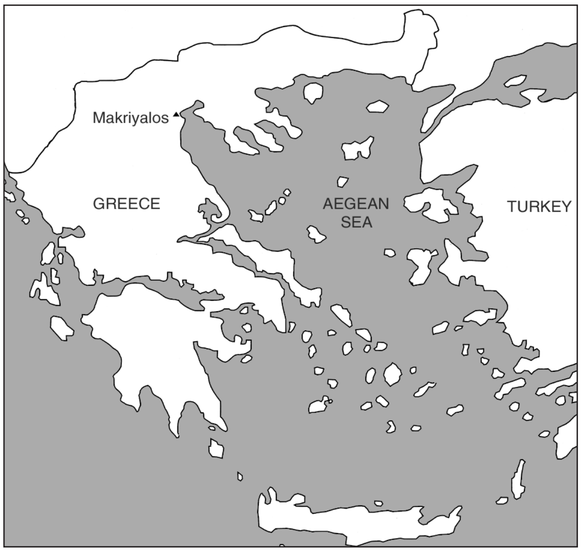

Fig. 1. Map of Greece showing the location of Makriyalos.

they define the boundaries of the settlement and also represent large scale earthworks that would have required the investment of large amounts of energy and probably the mobilisation of many people for their original construction and subsequent reworking (*Pappa and Besios 1999a*). Ditch A also represents the main burial ground in Makriyalos I (*Triantaphyllou 2001*), a function that perhaps stressed its communal character by 'defining symbolically a local community' (*Pappa et al. 2004.18*).

Borrow pits, similar to ditches, have been interpreted as loci of communal character due to the volume of material they have yielded. The study of stratigraphic, faunal and ceramic data from one of these borrow pits – Pit 212 – suggests that its exceptionally rich fill accumulated within months, or just a few years, perhaps from large-scale feasting episodes (*Pappa et al. 2004.22*). Pit 212 yielded 25 % of the ground stone objects from phase I and represents the largest concentration of ground stone artefacts within this phase. Both ditches and borrow pits thus seem to represent features of a communal character where community identities were forged and maintained.

Because Makriyalos I offers the clearest distinction between and most abundant evidence for both domestic and communal scales of activity, this paper will focus on the material that has been attributed to this phase.

Ground stone technology

The Makriyalos I ground stone assemblage consists of 5308 artefacts in total, which have been attributed to seven main categories: edge tools (17.6 %), grinding/abrasive tools (65.7 %), percussive tools (0.8 %), perforators (0.5 %), multiple-use tools (2.4 %), ornaments (0.8 %) and miscellaneous (1.2 %). Artefacts that survive in a fragmentary state and could not be attributed to a specific tool category have been recorded as 'indeterminate' (11.1 %) (Tab. 1).

The grinders from Makriyalos, the upper handheld mobile grinding tools, represent the products of an expedient technology; they are primarily made of marble cobbles and pebbles that come from nearby streams, and have no evidence of manufacture or modification. Grinding slabs, the lower passive grinding tools (*Wright 1992*), are made from more distant raw materials, mainly sandstone with well-cemented grains, schist and gneiss. They are roughly shaped and there is some evidence for rejuvenation by repecking of heavily used/worn-out use-faces (*Tsoraki in prep.*).

Edge tools, *i.e.* tools that have acquired an edge through deliberate modification (axes, adzes, chisels), are made of raw materials from non-local sources, mainly serpentinite and igneous rocks, and are the products of a formalised production sequence. Great time and effort was invested in the production of edge tools, as demonstrated by the high level of polishing on all tool surfaces, indicating that smooth and often lustrous surfaces were a desirable trait (*Tsoraki forthcoming*). Furthermore, edge tools are also the category with the greatest time invested in maintenance and repair, with evidence, often for more than one episode on the same tool, of the time-consuming processes of resharpening and sawing. Sawing was characterised by great attention to detail and precision, as indicated by the sequence of steps followed during the refashioning of edge tools using this technique. Unfinished examples in the Makriyalos assemblage indicate that initially a shallow groove was created, probably with a flint blade, to define where the tool would be cut. Then, using stone slabs and other abrasives (*e.g.*, quartz sand), the tool was sawn by grinding, and quite often two opposed grooves were created so as to control the eventual snapping of the tool in half (Fig. 3). Efforts to erase traces of sawing by re-polishing/re-grinding the remaining lips of the groove again imply interest in the visual appearance of these tools (*Tsoraki in prep.*).

Ground stone in private and public areas: comparison between habitation contexts, the ditch system and 'borrow pits'

As can be seen in Figure 4 most of the material attributed to Makriyalos I comes from stratified contexts, while all three general context types – habitation, ditches, borrow pits – have yielded large assemblages, allowing meaningful comparisons between private and public areas of activity. Of 5308 objects attributed to Makriyalos I, the vast majority (>80 %) comes from communal areas, whereas only 13.0 % of ground stone products have been attributed to habitation areas.

All seven general tool categories occur within ditches, borrow pits, and the habitation area, and in most cases they are distributed rather evenly among the different contexts (Fig. 5). Edge tools and grinding/abrasive tools, however, present distinct patterns of deposition. Edge tools occur more frequently in habitation areas and less frequently in borrow pits and ditches. Grinding/abrasive tools, on the other hand, are encountered mainly in the ditch system and borrow pits, making up almost 80 % of the material from these contexts, as compared with 60 % in domestic contexts (Fig. 5).

More interesting patterns emerge when edge and grinding/abrasive tools are broken down into sub-categories. All sub-categories of edge tools (axes, adzes, chisels) occur more frequently in habitation contexts, but grinding/abrasive tools present greater variation in contexts of deposition. Pestles and abraders, though admittedly the sample size is very small, are encountered more frequently within habitation contexts, whereas grinding slabs are relatively more frequent in borrow pits and the ditch system

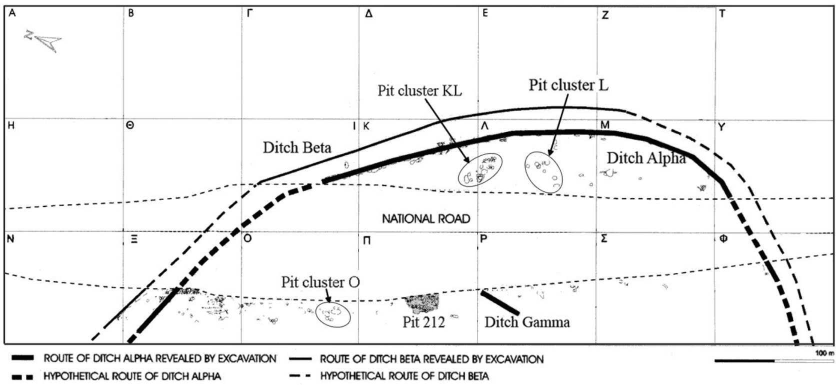

Fig. 2. Plan of Makriyalos I settlement, indicating the location of main features mentioned in the text (after* Pappa et al. 2004.17 fig. 2.1*).

than in the habitation area. Grinders, however, are attested twice as frequently in the ditch system as in domestic contexts (Fig. 6). It should also be noted that the only three mortars found in Phase I come from communal areas, two from borrow pit 212 and one from Ditch Gamma.

This evident preference for the deposition of certain tool types in certain areas of the settlement (edge tools in habitation; grinders in ditches; grinding slabs in communal areas) may be further explored in relation to other attributes such as raw materials, fragmentation patterns and degree of use.

Edge tools, grinding slabs and grinders differ little between the three context types in terms of dimensions, morphological characteristics, fragmentation patterns, and degree of use and maintenance. The raw materials used for edge tools, grinding slabs and grinders are also similar between domestic and communal contexts. Marble grinders occur more frequently in the ditch system and borrow pits, however, whilst the grinders from the habitation levels present greater variability in raw materials with quartz and igneous rocks appearing much more frequently here than in the other two context types. Although similar manufacturing techniques are encountered in all three context types, highly polished edge tools occur more frequently in the ditches, while tools with lower quality of polishing are more frequent in habitation contexts.

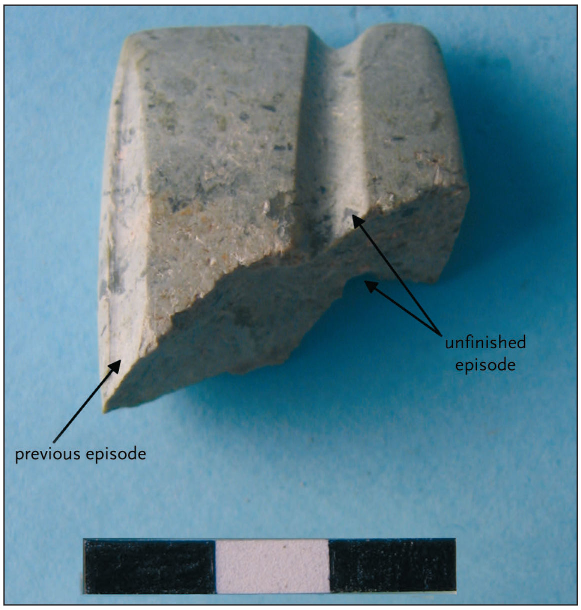

Fig. 3. Edge tool with evidence of two episodes of sawing.

Investigating activity related to ground stone within the domestic arena

Apart from the comparison between domestic and communal areas, the spatial analysis of the Makriyalos I assemblage was conducted at a finer level to explore how the production and consumption of ground stone was organised and practised within everyday life. 691 ground stone objects have been attributed to Makriyalos I habitation contexts. The vast majority has been attributed to specific pits, whilst only 144 objects come from units generally attributed to habitation areas (21.0 %). The pits could be grouped in clusters, the main ones being pit clusters Kappa-Lamda (KL), Lamda (L), and Omikron (O), with 123, 64 and 87 ground stone objects respectively (Fig. 2). In addition to these clusters, relatively large concentrations of materials have been attested in the single pits 251 (n = 50), 258 (n = 46) and 281 (n = 26).

Comparison of these sub-assemblages reveals a rather uniform picture: apart from the complete absence of perforators and extreme rarity of percussive tools, all general object categories are encountered in all pit clusters; edge tools and grinding/abrasive tools, in particular grinding slabs, are distributed relatively evenly between the three main clusters of pits, while the ground stone from the pit clusters also exhibit great similarity in terms of morphological characteristics, manufacturing techniques, degree of use and fragmentation patterns. In terms of raw materials, a wide range of rock types attributed to all three geological categories is witnessed in the three clusters and single pits. The presence of similar raw materials within the different clusters could potentially indicate that the different households exploited similar or even the same natural resources.

This homogeneity in the distribution of ground stone material reaffirms the excavators' interpretation of these spaces as places of analogous character (habitation areas). The implication that the same activities were practised in various areas within the site parallels a similar suggestion concerning the distribution of knapped stone tool types and tool-related activities between individual pits and/or pit clusters of the Makriyalos II habitation area (*Skourtopoulou 2006*).

Grinding activities seem to have been among the regular tasks practised in the small clusters of pits, probably within the pits or in close proximity to them. The portable character of the tools is indicated by the relatively small size of the grinding slabs that could easily have been moved, *e.g.*, from inside to outside or vice versa, depending on circumstances (*e.g.*, weather, tasks to be performed, the mood of the person to perform the task) (for a similar suggestion see also *Baysal and Wright 2005*). Grinding slabs could have been used for different grinding activities (grain processing, mineral processing, etc.), potentially accounting for the presence of more than one use-face on the same tool. In fact, a number of grinding tools show traces of red colour on their use-faces that could relate to the processing of minerals.

Edge tools represent the second most commonly attested category of objects within the clusters of pits. As with grinding slabs, edge tools are versatile and could have been used for a variety of tasks, such as light and heavier woodworking, tree felling and clearing shrubbery, butchery, and bone working, while other uses such as digging and bow-making cannot be excluded (*Blackwood 1950.23; Edmonds 1995. 53; Skeates 1995.288; Perlès 200.232*).

In addition, the presence of debitage, polishers and grooved abraders confirms that the habitation area was not restricted to the processing of edible substances, but was also used for the production and repair of tools and for the production of other types of material culture such as pottery and edge tools. This is further supported by the presence of tools that show evidence for on-going manufacture and maintenance processes (repecking, resharpening, sawing) within pits of phase I, such as pit 93–96 and pit 95–121 in pit-group O.

These observations are consistent with the organisation of grinding, woodworking and other activities by small social units or *households* in phase I Makri-

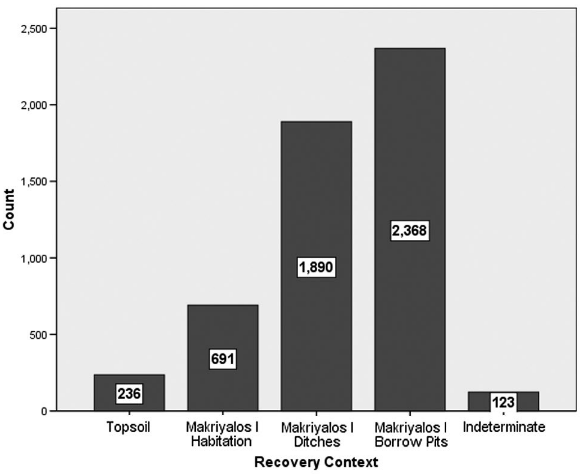

Fig. 4. The distribution of ground stone between the Makriyalos I recovery contexts.

GENERAL OBJECT CATEGORIES	Frequency	Percent
Indeterminate	589	11.1
Edge Tools	932	17.6
Percussive tools	43	.8
Perforators	28	.5
Grinding/Abrasive Tools	3486	65.7
Multiple-Use Tools	126	2.4
Ornaments	42	.8
Miscellaneous	62	1.2
Total	5308	100.0

Tab. 1. The frequency of all ground stone categories from Makriyalos I.

yalos (*Pappa et al. 2004*). Each *household* possessed a toolkit that supported a range of activities from plant processing to craft making. The small size of grinding slabs and of their use-faces indicates that only small amounts of plants/seeds could be processed at a time, suggesting the small scale and domestic character of these activities and of the social unit that used these tools.

Discussion

If the ground stone finds from Makriyalos I habitation contexts are compatible with the latter being arenas of domestic activity, how are the observed contrasts between habitation contexts, ditches and borrow pits to be interpreted? The spatial variation in the distribution of edge tools, grinding slabs and grinders might be interpreted in terms of discard practices, the location of different functions/activities, or patterns of curation and ownership.

Discard

In terms of discard practices, it might be expected that unbroken products of a formalised production sequence would be preferentially curated, perhaps in domestic contexts, while broken tools, those with worn-out use-faces and products of an expedient technology would be discarded, possibly in communal areas. Variation in the spatial distribution of ground stone tools would thus reflect variation in their use life.

This interpretation is consistent with the high proportions of expedient grinders in communal ditches and of carefully manufactured and maintained edge tools in habitation contexts.

Contrary to the expectations of the discard model, however, there is no difference between the three context types in levels of degree of wear or fragmentation, and indeed, the only three complete examples of grinding slabs in Makriyalos I come from public areas. Moreover, burnt edge tools appear with a similar frequency in all three context types. In addition, the distribution of specific tool types blurs the overall association between time investment/formality of production and depositional context: some products of a formal production sequence, such as maceheads and mortars, come only from contexts of a communal character, whereas expedient abraders and hammers are more frequent in domestic contexts. Likewise, among edge tools, those with highly polished surfaces – and thus with the greatest level of investment – are more common in the ditches than the domestic arena.

Furthermore, the study of pottery and animal bones has shown that the material accumulated in at least one of the borrow pits (Pit 212) comprises debris from particular episodes that lasted at most several months, and not long-term disposal areas, as may have been the case with the ditches (*Pappa et al. 2004.22*).

Location of activities

If the spatial distribution of different tool types does not represent the deposition of worn-out, broken and expedient items in selected discard areas, it might reflect the contrasting *loci* of different activities. Tools attest to a wide range of activities, of which grinding and the working of skin, bone and wood might all plausibly have taken place within domestic contexts, but heavy wood-working and digging may have taken place off-site. The presence of debitage in domestic contexts indicates that tool manufacture and maintenance might have been among the activities practiced in habitation contexts. A slightly higher proportion of multiple-use tools and more frequent finds of grinding slabs with wear from processing pigments offer possible hints that a wider range of activities took place in domestic than communal contexts, but both these observations are based on small samples. Overall, much the same range of tools and tasks is represented in domestic and communal contexts.

Grinding slabs were probably used not only for domestic processing of grain and minerals, but also for the large-scale processing of staple foods for communal 'feasts' taking place in or near the borrow pits. Faunal remains from Pit 212 indicate the preparation and consumption of animal-based foods on a huge scale (*Pappa et al 2004.32*), while the archaeobotanical data (*Valamoti 2001*) and the ground stone assemblage from this context might suggest the same for plant-based foods. Pit 212 accounts for 25 % of all ground stone objects from Makriyalos I, while tools that could have been employed in food processing make up more than 70 % of this sub-assemblage. The grinding tools may thus have been closely linked to the events taking place in or near Pit 212. The Makriyalos I grinding slabs are relatively small and hence portable and so may easily have been moved from a domestic to a communal area to meet the needs of a particular communal event (for an ethnographic parallel see *Graham 1994.53–54, 70*). Therefore, the value of grinding tools and the meaning of grinding activities during these events in which social relationships were forged and strengthened and group identities were shaped, can assume added connotations. Grinding activities, an otherwise everyday mundane task, acquire a different meaning when performed for larger groups of people in an event imbued with social and symbolic significance.

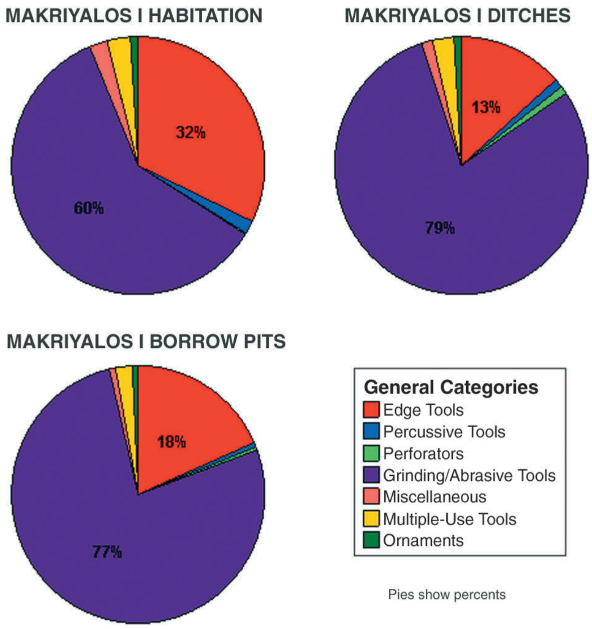

Fig. 5. The distribution of general object categories between the Makriyalos I recovery contexts.

To a significant degree, however, observed variations in the distribution of tools cannot be explained adequately in terms of the location of activities. For example, if spatial patterning of ground stone tools primarily reflected particular activity areas, the distribution of grinding slabs should resemble, rather than contrast with, that of grinders. Likewise, the distribution of stone mortars should perhaps match that of pestles, although the use of wooden pestles

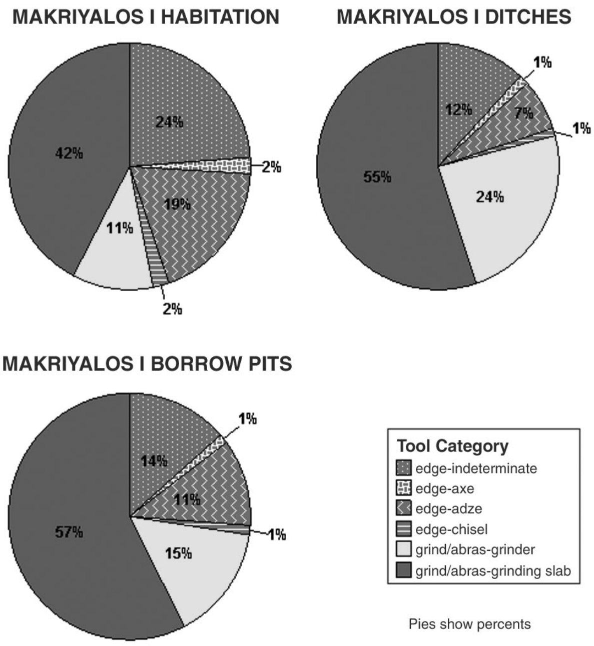

Fig. 6. The distribution of edge tools, grinding slabs and grinders between the Makriyalos I recovery contexts.

cannot be excluded. In practice, mortars occur only in communal areas, whereas pestles are encountered more frequently in habitation areas.

Patterns of ownership and curation

Another way to approach the differences in the distribution of edge and grinding tools is to consider ownership. Ethnographic studies suggest that the production and use of edge tools may be linked to individual owners (*Pétrequin and Pétrequin 1993*). Even worn-out or broken axes may be brought home for discard, because time invested in manufacture, aesthetic properties and multiplicity of uses engender a strong sense of attachment (*Toth et al. 1992. 70*). Grinding tools, on the other hand, are known ethnographically to have been shared between households (*Graham 1994*). The borrowing of hand-mills was fairly commonplace in modern Greek villages, not least because it was relatively easy for households to predict when these tools would be needed. At Makriyalos, edge tools exhibit higher levels of investment in production and refashioning than do grinding slabs and grinders, while differences in degree of polishing of edge tools may have been linked to personal aesthetics. Edge tools may also have been indispensable because they were used for a multiplicity of purposes, making them personalised objects also for practical reasons. For whatever reason, the Makriyalos assemblage includes edge tools with evidence of attempts to create a perforation – perhaps for hanging about the person. One of these cases is a broken tool and it is tempting to suggest that the owner decided when the tool broke, to remove it from its normal context of use and prolong its life by wearing it as a pendant. The transformation of edge tools into ornaments associated with 'the body, person and personality of particular individuals' (*Skeates 1995.291*) has been documented in other prehistoric contexts. At Makriyalos I, however, ornaments are distributed evenly among private and public areas, suggesting that varying degrees of individual ownership of tools does not explain satisfactorily the distribution of ground stone tools within Makriyalos I.

Summary

It seems that differences in the distribution of grinding and edge tools between 'habitation' and 'communal' areas cannot not be explained satisfactorily in terms of discard practices, activity areas or ownership patterns alone, but may well be understood in terms of a combination of these. In similar discussions, archaeologists have tended to approach the discard and thus deposition of artefacts in functional/practical terms, stressing 'utilitarian considerations such as the effort involved, physical hindrances, and reuse value' (*Baysal and Wright 2005.321*). Yet, the act of discard may be regulated by cultural ideas, *e.g.*, of what is regarded as waste, and socially-agreed modes of behaviour towards disposal and cleanliness (*cf. Baysal and Wright 2005*). Graham (*1994*) refers to the throwing away of still usable objects in the Rarámuri refuse area so that they can be retrieved at a later date when required. In effect, this act of disposal becomes a means of storage, and has been described as 'provisional discard' or 'passive storage' (*Graham 1994.72*).In addition, the value of different objects is not inherent, but can change over time according to what is perceived as culturally acceptable at that point in time. In that sense, the deposition and discard of artefacts should not be approached purely in practical or symbolic terms but, as demonstrated in the Makriyalos assemblage, as a combination of different elements and ideas that regulated the way this material was deposited.

Furthermore, we must keep in mind that the deposition of artefacts is the result of a series of episodes. These may relate to small scale localised events or to the residues of larger scale activities that either took place over a long period or involved a large number of participants. These objects represent the material culture employed in a palimpsest of specific events which gave a distinct character to the daily lives of the occupants of Makriyalos.

Conclusion

Unlike previous studies of ground stone technology in the Neolithic of Greece, this paper follows a more contextualised approach by looking at contexts of deposition of ground stone from Late Neolithic Makriyalos. The spatial distribution of the ground stone assemblage from phase I indicates that all types of ground stone are discarded in both 'domestic' and 'communal' contexts, although edge tools are more frequent in domestic contexts and grinding tools more frequent in communal areas. This contrast in distribution between private and public areas may be interpreted as the result of a combination of discard practices, activity areas and ownership patterns. This analysis of the spatial distribution of ground stone at Makriyalos has highlighted that the discard and use of ground stone cannot be approached simply in practical terms. Rather, the deposition of artefacts may also reflect cultural ideas about the value of objects and the way these should be discarded. Therefore, generalised suggestions about the character and value of these objects need to be replaced by context-specific studies that are sensitive to the particular characteristics of specific assemblages and the communities that used and deposited them.

The recurring deposition of the same tool types in different habitation pit-groups of Makriyalos I implies that grinding and craft-production activities were widely replicated within the habitation area. This observation, paralleled by the distribution of knapped stone products during the second phase of occupation at Makriyalos (*Skourtopoulou 2006*) is consistent with previous suggestions for the internal organisation of Greek Neolithic communities in small independent units (households?) (*Halstead 1999; Kotsakis 1999*).

It has been argued elsewhere, and on other grounds, that the deposits in the ditch system and the borrow pits are actively linked to the negotiation of a communal identity (*e.g., Kotsakis 1999; Triantaphyllou 1999*). They do so by deploying objects that are directly linked to aspects of daily life (*e.g.*, grinding activities) 'but provide them with a new emphasis' (*Bradley 2005.119–120*). In that sense, events of special significance (*e.g.*, communal feasts) do not need to be seen in contradiction to events of daily life, for 'rituals were constructed out of the materials of domestic life' (*Bradley 2005.119–120*).

Clearly, much work remains to be done, but results so far contradict previous suggestions for the predominantly utilitarian character of these tools that were supposedly 'free from symbolic connotations' (*Perlès 1992.149*). Only in-depth and contextualised analysis of ground stone tools will allow us to gain insight into their use lives and to unravel their complex biographies.

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The Lengyel culture settlement in Bučany (preliminary report on pottery processing)

Noémi Pažinová
Department of Archaeology, Faculty of Philosophy, Constantine University Nitra, Slovakia
npazinova@ukf.sk

ABSTRACT – *The paper presents the preliminary results of the numerous ceramic finds from the Lengyel Culture settlement, excavated between 1979 and 1981, with a circular object, probably of cult nature, in Bučany, county Trnava, Slovakia. The analysis focuses on a statistical method of numerical coding that simplifies working with huge data files and helps by exact description and classification of the finds. The starting pointing of this approach is recognition of connections and relations (in typological and decorated respects) of the ceramic material. The most suitable comparisons could be found in material from Neolithic sites of south-west Slovakia, Moravia and Austria.*

IZVLEČEK – *Tema predstavlja preliminarne rezultate številnega keramičnega materiala iz naselja lengyelske kulture, ki je bilo izkopano med leti 1979 in 1981 v kraju Bučany, okrožje Trnava na Slovaškem. Predstavljamo tudi okrogel objekt, verjetno kultne narave. Analiza se osredotoča na statistično metodo numerične kode, ki olajšuje delo z velikimi podatkovnimi datotekami in pomaga pri natančnem opisu in klasifikaciji najdb. Izhodišče pristopa je prepoznavanje tipoloških in ornamentalnih povezav in razmerij. Primerjave najdemo pri materialu iz neolitskih najdišč jugozahodne Slovaške, Moravske in Avstrije.*

KEY WORDS – *Neolithic settlement; Lengyel Culture stage I; pottery; relative chronology*

Introduction

The Lengyel Culture settlement in Bučany, county Trnava was discovered during research project work from 1978 to 1981 led by P. Romsauer and J. Bujna. The site of Bučany (location Kopanice) is situated on the high right-bank loess terrace of the River Dudváh. An area 530 m long and 60–200 m wide, about 6 ha, was explored during four research seasons. 193 settlement structures and 55 graves were uncovered in this area (*Bujna and Romsauer 1982; Bujna and Romsauuer 1986.27*). The following cultures were represented at the site: Lengyel Culture (Neolithic), Group Bajč-Retz (Cooper Age), Madarov Culture (Bronze Age), Kalenderberg Culture (Hallstatt), La Tène Culture group, and sporadic pottery finds from the late Middle Ages.

Lengyel settlement, supported with 33 exploitation and refuse pits, was located approximately in the north half of the explored area of some 200 x 250 m. The excavation of the entire ground plan of a circular feature, probably of a cult character, on the eastern edge of this area is one of the most important achievements. In spite of the fact that a considerable area was examined, the entire settlement was not uncovered and there was no success in uncovering its residential section (*Bujna and Romsauer 1981.59–60*).

The circular enclosure consisted of two concentric ditches, and an interior palisade comprising trench sections and post-holes (Fig. 1). The interior diameter reached 45.5 m and the exterior diameter reached 67–70 m. Two collateral acuminate ditches 2.6 m–3 m wide and 2.6 m deep were interrupted by gates on four opposite sides. A 10 m long outer ditch runs into two rectangular (pliers-like) arms from the point where the gate was located. Hence the maximum extent of the circular enclosure in the direction of the entrances reached 87 m. The inner ditch was also interrupted at gates locations. In this way the area created was narrowed by two trenches with the pair of stockade pits at their ends, which were probably the remains of the construction of an entrance gate to the inner fenced area. There was a ground plan of a two-room stockade building, 15 m x 7.5 m with, and three big pits in a triangular configuration in the north-eastern quadrant of object. The building was the same age as the circular structure belonging to the group of Lengyel structures (*Bujna and Romsauer 1980.56*).

At a distance of 100–120 m south-westward and even 200 m northward from the circular structure, skeleton graves were diagnosed, two of which are probably the same age as the Lengyel settlement, and two graves with no finds can be assigned to them on the basis of their orientation, as well as the positioning of the dead (*Bujna and Romsauer 1981.60*).

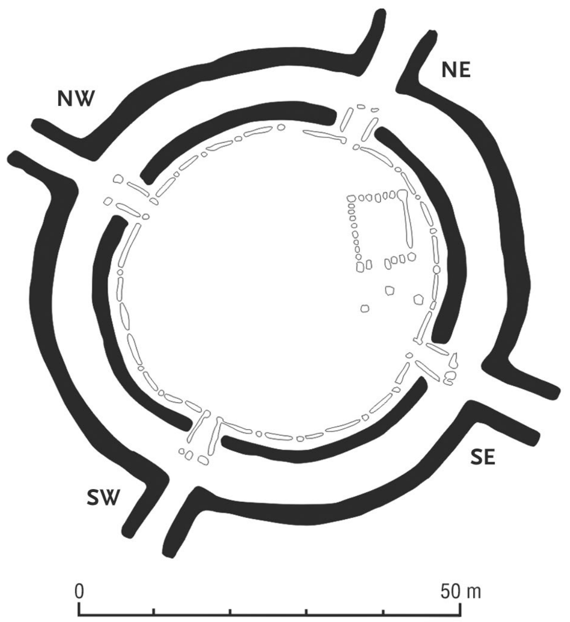

Fig. 1. Bučany–Kopanice circular enclosure ground plan (after* Bujna and Romsauer 1986.Fig.2*).

Bučany-Kopanice is categorized as a Lengyel Culture site of primary importance largely thanks to the discovery of circular enclosure which fits with evidence of buildings typical of a defined phase (early stages) of the Lengyel period of the cultural complex (including Moravian Painted Ware Culture – MMK and Austro-Moravian Painted Ware Group – MOG) and contemporary Stroked Pottery Culture in the broader regional sense. The circular enclosure in Bučany was built very functionally and gracefully, without any noticeable repairs which indicates that it probably followed some older pattern (*Karlovský 1999.119*). The very first circular buildings, the evidence of the oldest monumental architecture in central Europe, appeared as early as the period of Protolengyel in an area of Hungary west of the Danube (*Kalicz 1983–1984; Károlyi 1983–1984*).

The fortifications in Bučany-Kopanice consisted of a circular structure with two ditches, an inner palisade and four entrances of type 1–2, according to the classification of V. Podborský (*1988.243–245*). After Trnka's (*1991.312–315*) classification, the circular building belongs to the group of classical double-circle formations with the 3:2 ratio of outer and inner ditch, with four entrances and outward running arms in the outer ditch. In Slovakia, for example, the circular enclosures in Horné Otrokovce-Berinová, Trnava county (*Kuzma 1998.95, Fig.7; Tirpák 1997. 155–156*), and Podhorany-Mechenice in Nitra county (*Kuzma 2005.Fig. 6. B, C*) are assigned to the same type. The ground plan of ditches in Bylany, Czech Republic (*Zápotocká 1983.Fig. 6*), west of the Lengyel cultural circle, is practically identical with Bučany.

Bučany is an exception from the point of view of the traditional building process of circular enclosures. The outer ditch, usually markedly narrower than the inner ditch (*e.g.* Svodín – *Nemejcová-Pavúková 1995.63*), is 40 cm broader in the case of Bučany. Hence in Bučany it is not very reasonable to think of the outer ditch as of some complementary element in a certain sense, for example, to gain a bigger quantity of soil to build a bank, or for some other reasons (*Nemejcová-Pavúková 1997.105*). Moreover, Gerhard Trnka (*1991.308–316*) clearly claims that these circular buildings appeared in one stroke, *i.e.* the building and its exact appearance was designed in advance. In Bučany we do not even register the difference in the width between the outrunning rectangular arms of the outer ditch and the width at the gates of the inner ditch (as in the case of two NNW and WSW entrances, the difference is slightly discernible, but there is no difference in the other two).

While appraising the two-room stockade building, *i.e.* the house with one open part without a transverse wall in the inner area of circular architecture in Bučany, we must emphasize that its construction corresponds to buildings uncovered in a fenced area of a palisade circular enclosure in the settlement of Lengyel Culture (Lengyel II stage) in Žlkovce (*Pavúk 1991.350–354, Fig. 4; 1998*) on the same terrace as the settlement in Bučany, and only some 2.5 km distant. There are also two houses of 'megaron' type at

Database section	Rated category	Data type
A. General	Registration number of pot	Numeric
	Inventory number	Numeric
	Serial number of box	Numeric
	Year of field research	Numeric
	Feature number	Numeric
	Type of feature	Numerical code
	Layer of feature (cm)	Numeric
	Fragmentary remains (quantity)	Numeric
B. Typological	Pottery class (type)	Numerical code
	Pottery class (variant)	Numerical code
	Degree of pot conservation	Numerical code
	Form of the vessel rim	Numerical code
	Form of the neck	Numerical code
	Form of vessel collar	Numerical code
	Form of the lower half of vessel	Numerical code
	Profile of the bottom	Numerical code
	Form of the pedestal	Numerical code
	Profilation of vessel	Numerical code
C. Metric	Diameter of the rim (cm)	Numeric
	Diameter of the convexity (cm)	Numeric
	Diameter of the bottom (cm)	Numeric
	Diameter of the pedestal (base) (cm)	Numeric
	Thickness of the pot-wall (mm)	Numeric
	Thickness of the pot-wall	Numerical code
D. Technological and decorative	Pot-surface preparation, exterior	Numerical code
	Pot-surface preparation, interior	Numerical code
	Density of ceramic material	Numerical code
	Grade of grain classification	Numerical code
	Grain roundness	Numerical code
	Material roughness	Numerical code
	Addition to the ceramic material	Numerical code
	Surface color, exterior	Numerical code
	Surface color, interior	Numerical code
	Type of interior decoration	Numerical code
	Type of exterior decoration	Numerical code
	Incised decoration technique	Numerical code
	Placing of the exterior incised decoration	Numerical code
	Type of the exterior incised decoration	Numerical code
	Placing of the interior incised decoration	Numerical code
	Type of the interior incised decoration	Numerical code
	Placing of the plastic decoration	Numerical code
	Placing of the engraved decoration	Numerical code
	Type of plastic decoration/application	Numerical code
	Type of engraved decoration	Numerical code
	Multiplication of plastic decoration elements	Numerical code
	Plastic decoration or serviceable forms	Numerical code
	Placing of the exterior painted decoration	Numerical code
	Exterior color combination	Numerical code
	Exterior paint motif and its variants	Numerical code
	Placing of the interior painted decoration	Numerical code
	Interior color combination	Numerical code
	Interior paint motif and its variants	Numerical code

Tab. 1. Database structure of the Lengyel Culture pottery finds from Bučany.

Circular enclosure components (object 60)	Ceramic classes: Pots and pot-like types	Large-pitcher	Bowls and bowls on pedestal	Beakers	Special types	Small forms	Unidentified	Total
Outer ditch	9	2	1	3	1	0	13	**29**
Inner ditch	15	4	7	3	0	0	28	**57**
Outer entrance	13	6	7	1	0	1	20	**48**
Inner gate	5	2	1	0	0	0	7	**15**
Posthole-house	0	0	0	0	0	0	1	**1**
Palisade	0	0	0	0	0	0	2	**2**
Surface collection	3	0	1	3	0	0	2	**9**
Total	**45**	**14**	**17**	**10**	**1**	**1**	**73**	**161**

Fig. 2. Pot-quantity share of the basic pottery classes in the circular enclosure components.

the settlement in Santovka, synchronous with the Moravian Painted Ware Culture Ib–c phase in south Moravia (*Pavúk 1994*). The ground plans of such houses occurred then in the south-west of Slovakia during at least three pottery phases (Bučany, Santovka, Žlkovce).

Database structure of pottery finds

The centre of material found in the Lengyel settlement of Bučany is comprised of pottery, which is overall processed in database system. The basic structure of the pottery database (Tab. 1) partially arises from a detailed system made for the Moravian Painted Ware Culture (*Podborský et al. 1977*).

Lengyel settlement pits and pottery finds from Bučany form a rich source of information. Their analysis and evaluation is the condition for understanding the chronological and dimensional structure not only of the settlement itself, but also of the position of Lengyel village within the partial regional units. We decided to present the results of a pottery set analysis from the building complex with the circular architecture ground plan (Fig. 2) and from some selected settlement pits from Bučany (Fig. 3). These so-called common settlement pits generally contain the largest number of structures in Neolithic settlements. The pits are of approximately oval or irregular ground plan, with variously shaped walls, and flat, concave, or waved bottoms. Probably bigger sets of pits uncovered in Bučany can be interpreted as building clay pits which became dumps after fulfilling their function (*e.g.* structures 4 and 180). Also, smaller pits which were originated in relation to the need for clay for building purposes served for the purchase of clay. We have chosen to analyze the following structures: 1, 29, 82, 117, 153, and 155.

Object No.	Year of field research	Length/cm	Width/cm	Max. depth/cm	Pots and pot-like types	Large-pitcher	Mushroom	Bowls and bowls on pedestal	Beakers	Serviceable forms	Special types	Small ceramic forms	Unidentified fragments	Total
01	1978	450	200	80	10	6	0	11	13	0	0	0	15	**55**
04	1978	520	440	140	12	2	0	13	10	2	0	0	2	**41**
29	1978	450	340	80	10	4	0	5	10	0	0	1	12	**42**
82	1979	> 70	370	n.	13	0	0	29	13	1	0	0	28	**84**
117	1980	> Ø 200–220		65	5	1	0	3	3	1	1	0	12	**25**
153	1980	600	375	60	10	2	1	9	12	0	0	0	57	**91**
155	1980	380	350	100	11	1	0	14	9	2	0	0	17	**54**
180	1981	700	530	190	6	5	0	13	3	0	0	0	36	**63**
Total					**77**	**21**	**1**	**97**	**73**	**6**	**1**	**1**	**179**	**456**

Fig. 3. Representative Lengyel Culture structures: basic data and pot-quantity share in the pottery ensemble (n. – not detected).

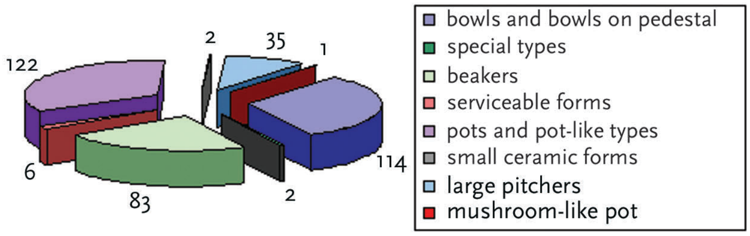

Fig. 4. Pot-quantity share of the basic pottery types in the pottery ensemble.

The selected pottery ensemble from Bučany-Kopanice includes 617 specimens. 365 (60 %) of them can be categorized into six basic types of pottery classes (Fig. 4), and each of them can be further categorized into variants of pottery classes enabling a shape diagnosis of particular vessels.

Pottery vessels were made of dough with a high content of sandy admixtures. Strong-wall pottery (more than 0.5 cm thick) is hence mostly grain and wholegrain, usually containing bigger pebbles and micas. The colour of the pot surfaces varies depending on the kind of burn: black, grey, here and there changing to brown, orange and yellow. Of the final surface design techniques, a natural surface fine-tuned by smoothing is prevalent. The surface of thin-wall pottery (up to 0.5 cm thick vessel walls) was usually tuned by polishing, and rarely painted with a special clay layer.

It is possible to divide the complex into four pottery groups according to wall thickness (Fig. 5):

a. thin-wall pottery (thick wall max. till 0,25 cm),
b. slightly halfrough-wall pottery (thick wall between 0,25 and 0,5 cm),
c. halfrough-wall pottery (thick wall between 0,5 and 1 cm),
d. rough-wall pottery (thick wall over 1 cm).

Forms of the vessels

Pots and pot-like types (Fig. 6). These two categories are unified, due to obvious fragmentation, which prevents further determination. It is possible to include 158 samples in this category. Large pitchers (35 pieces), for which horned ears are typical (Fig. 9.5.7) are markedly present here. Mushroom pots appear sporadically in this set (Fig. 9.1). Pots, other pot-like types and large pitchers, generally belong to the group of thick pottery, 20 % of which can be classified as slightly half rough-walled pottery, 64 % as half rough-walled pottery and 16 % as a rough-walled pottery. The oval-shaped rim obviously dominates (71 %) in the examined set. Extended horned ears with a hole mostly appear on the surface of large pitchers (37 %). An embossed design is also represented by simple vertically extended bosses and also by a variation with a horizontal hole, then asymmetrically projecting, hemispherical, conical, projecting and sporadically tongue-like bosses. Incised decoration appears on the surface of only eight specimens as true meander motifs, true (continuous multiple) spirals and zig-zag motifs. Painting is discernible in the case of 37 exemplars. The motif of vertical, horizontal or oblique bands appears repeatedly.

Bowls and bowls on hollow pedestals (Fig. 7). This pottery class is also very numerous, with 114 specimens. In many cases it was not even possible to decide reliably if it is a bowl or bowl on a hollow pedestal. 35 bowls on hollow pedestals appear in the set examined. Bowls are usually classified as rough-walled pottery, while 21 % of the set examined can be classified as slightly half rough-walled pottery, 72 % as half rough-walled pottery, and 7 % as rough-walled pottery. The set examined contained five main variations of bowls, from which the most numerous were bowls with symmetrical collars (13 %), then with opened (14 %) and inward-leaning collars (9 %), and finally conic bowls (7 %). Examining the form of the vessel rim, the oval-shaped rim which appears in the case of 60 specimens predominates. Narrow rims also appear relatively often (11x). The decoration was preserved on the surface of 65 % of fragments, on which painting was found in the case of 59 specimens – it is usually a motif of vertical, horizontal or oblique bands, 7x circle motif, and once a diagonal net motif. Engraved decoration does not occur. Plastic decoration is represented mainly by bosses. Hemispherical (11x), conical (8x) and projecting (5x) bosses are the most

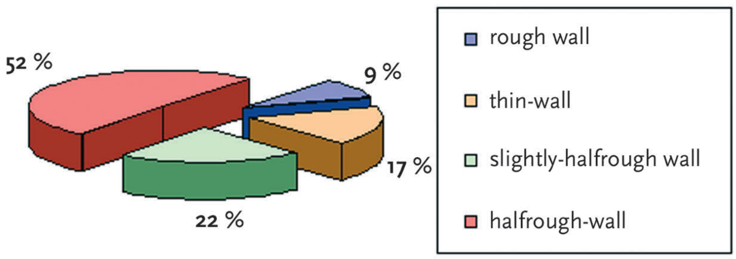

Fig. 5. Percentage shares of various pottery wall thickness groups.

commonly occurring. Incised decoration was diagnosed in the case of three exemplars. In the first case there is a zig-zag motif grouped in vertical stripes made with simple thin line; in the second case the exterior surface of bowl is decorated with a single fine incised line which created a convex-concave star shape motif aided by an incised net motif. The third bowl with incised decoration technique had true spiral motifs made with a group of fine lines on its exterior surface and continuous meanders with hooks on its internal surface.

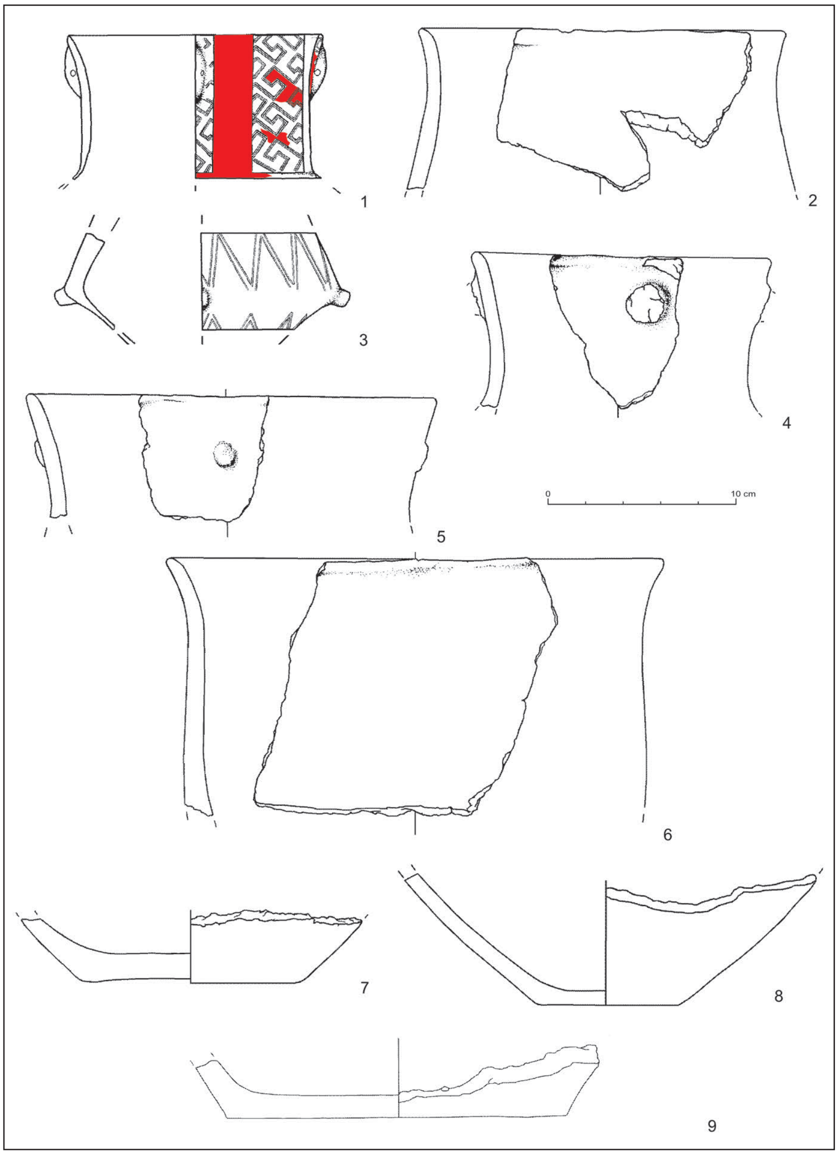

Fig. 6. Bučany-Kopanice. Pots and pot-like types: 1, 3 – structure 29; 2, 4, 7–9 – structure 60; 5, 6 – structure 153.

Beakers (Fig. 8). They belong to the category of thin-walled pottery (70 %), possibly to a slightly half rough-walled pottery (30 %). In the set of shapes identified they comprise one quarter. In the case of bigger fragments (34 %). We were successful in determining their variation. Beakers with biconical bodies predominate here (29 %), followed by beakers with a globular body (21 %), then by beakers with upper convexity and tall thin beakers with bent necks and biconical bodies, both types representing 14 % in the set. The most of the cups have an oval-shaped vessel rim (60 %), then narrowed (20 %), pointed (11 %), sharply accentuated (6 %), and, finally, one fragment has a bevelled rim. Decoration occurs on the surface of 77 cups. Incised decoration occurs on the exterior surface of 43 specimens. A double-thin line decoration technique dominates here (26x), but there is also a group of fine thin incised lines (11x) and simple thin lines (6x) in the ensemble. From the motifs of incised ornaments, mainly true spiral (63 %), meander (15 %), stripe (10 %) and zig-zag motifs (10 %) are applied in the case of cups. Plastic decoration in the form of bosses occurs on the surface of at least half the cups. Projecting out bosses predominate here (25 %), followed by hemispherical bosses (17 %), asymmetrically projecting bosses (16 %) and vertically projecting bosses (11 %). Painted decoration is frequently present on cups, as it occurs on the surface of 61 specimens, one of them being painted on the interior side of the neck only, and 21 fragments were painted on both sides. Within the colourful combinations on the surface of the cup ensemble purely red paint dominates (80 %). However, there occurred also a combination of red and yellow (15 %), as well as red and white (5 %). Horizontal monochrome bands, eventually a combination of horizontal and vertical bands on the interior neck surface, are the most common motifs of painted decoration applied on the surface. There were two examples of perpendicular plain red bands on the interior neck surface of cups lined with white bands. A circle motif (8x) applied also round the boss was a typical decoration of the exterior. The motif of a horizontal letter 'S' of multiple white was recognized on the surface of one beaker with a bent opened neck and lower convexity (Fig. 8.1). A plain red spiral motif was identified on the surface of two beakers.

Serviceable forms. Casks, lids and ladles belong to this category. In the set examined these forms are not widely represented. Only two casks with a wide mouth, two flat lids, one with an ear, and one ladle with socket applied at an angle (Fig. 9.2) were found within the ensemble.

Special forms. We defined two specimens belonging to this category. They are special forms of bowls with quadratic and oval bottoms, with plastic decoration on the edge in the form of button-like bosses. The forms resemble small tubs (Fig. 9.3, 4).

Small ceramic forms. Miniature vessels belong to this varying group. There are two exemplars in the set examined. One comes from the filling of clay pit 29. It is not clear of what shape it is; however, its surface is smooth natural, with plastic decoration (one small asymmetrically projecting boss on the convexity). Second presents a small mushroom-like pot with engraved and plastic decoration.

Relative chronology

The pottery ensemble from the Lengyel Culture settlement in Bučany is very interesting as it has typical features of a young phase of the first stage of this culture. Figure 10 denotes the division and synchronization of the first stage of the Lengyel cultural complex. Settlement corresponding to this dating has not been completely processed in Slovakia yet. But since the examined pottery set was studied and evaluated according to the Moravian Painted Ware Culture numerical code, it can be compared with other localities of the Lengyel cultural complex processed in similar way. In the process of comparing and evaluating, We took into consideration mostly the sites contemporary with the settlement in 'Kopanice' and those which enabled objective conclusions thanks to their extent and quality. The locality of Kamegg in Austria (*Doneus 2001*), Těšetice-Kyjovice (*Kazdová 1984*), Jaroměřice nad Rokytnou (*Košťuřík 1979*), Popůvky (*Pálečková 2004*) in Moravia, and finally Svodín (*Kličová 2004*) and Santovka (*Diškancová 2006*) in Slovakia met these conditions.

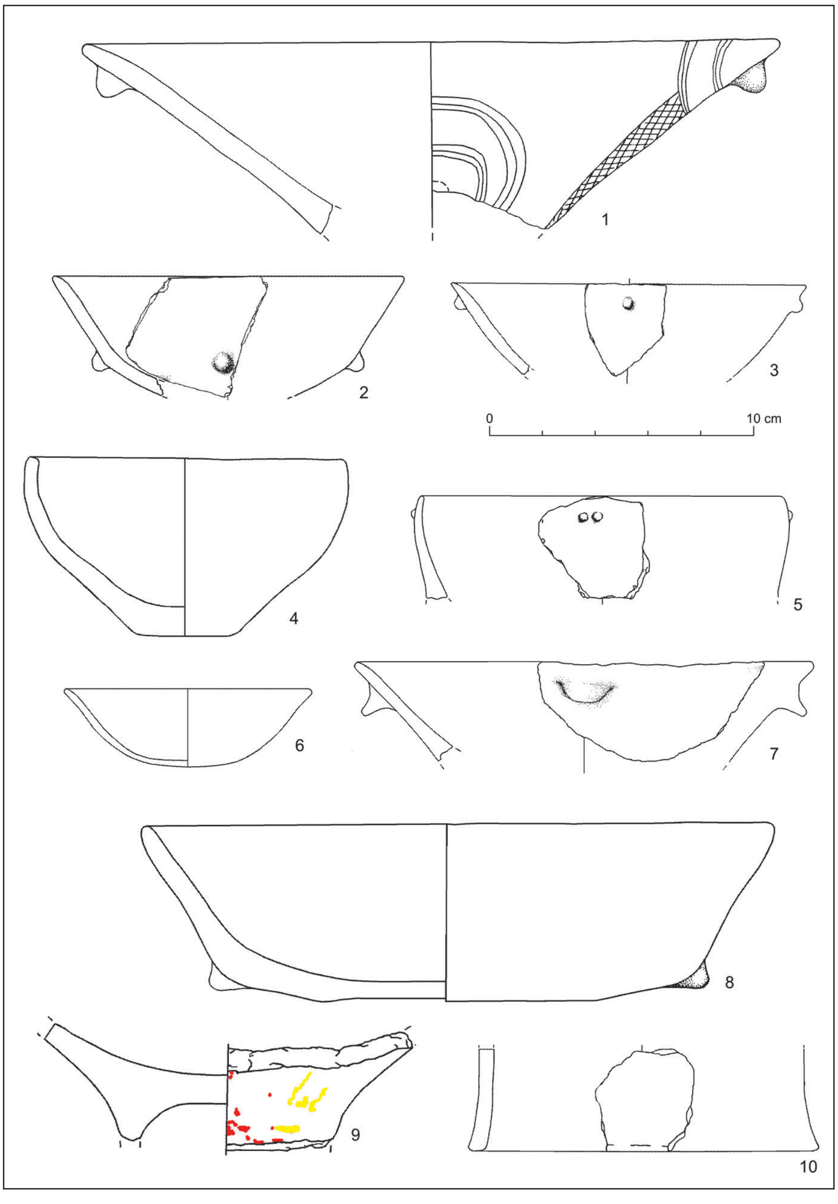

Fig. 7. Bučany-Kopanice. Bowls and bowls on hollow pedestals: 1, 6 – structure 04; 2, 3, 9 – structure 153; 4, 5, 10 – structure 60; 7 – structure 155; 8 – structure 117.

In our analysis we mostly examined the decoration of pottery which, however, has a higher evidentiary value for the older stage of Lengyel Culture. Painted decoration did not offer many possibilities for study as it is not well preserved. Particular patterns of decoration were often not readable at all, or we could determine them only in part. Considering this fact, the traces of painting (red, white, or yellow) could have been identified on the surface of 181 pieces. However, it was usually impossible to determine the particular type of decoration. The scale of colours is typical of classical Lengyel Culture first stage. The application of this painting predominated on the surface of beakers (39 %). The following two types of painting occurred in the set: simple paint decoration on the natural surface, and paint decoration with incions. Tracking the placement of painted decoration in particular parts of vessels was useless because there was a distortion caused by considerable fragmentation and poor remaining condition. Only a small number of discernible motifs remained from the original painted ornaments. Vertical, horizontal plain bands (stripes) and their mutual combinations are the most common. This motif has no specific value as evidence of chronology, as it does not occur evenly during the whole of the first chronological stage of Lengyel Culture.

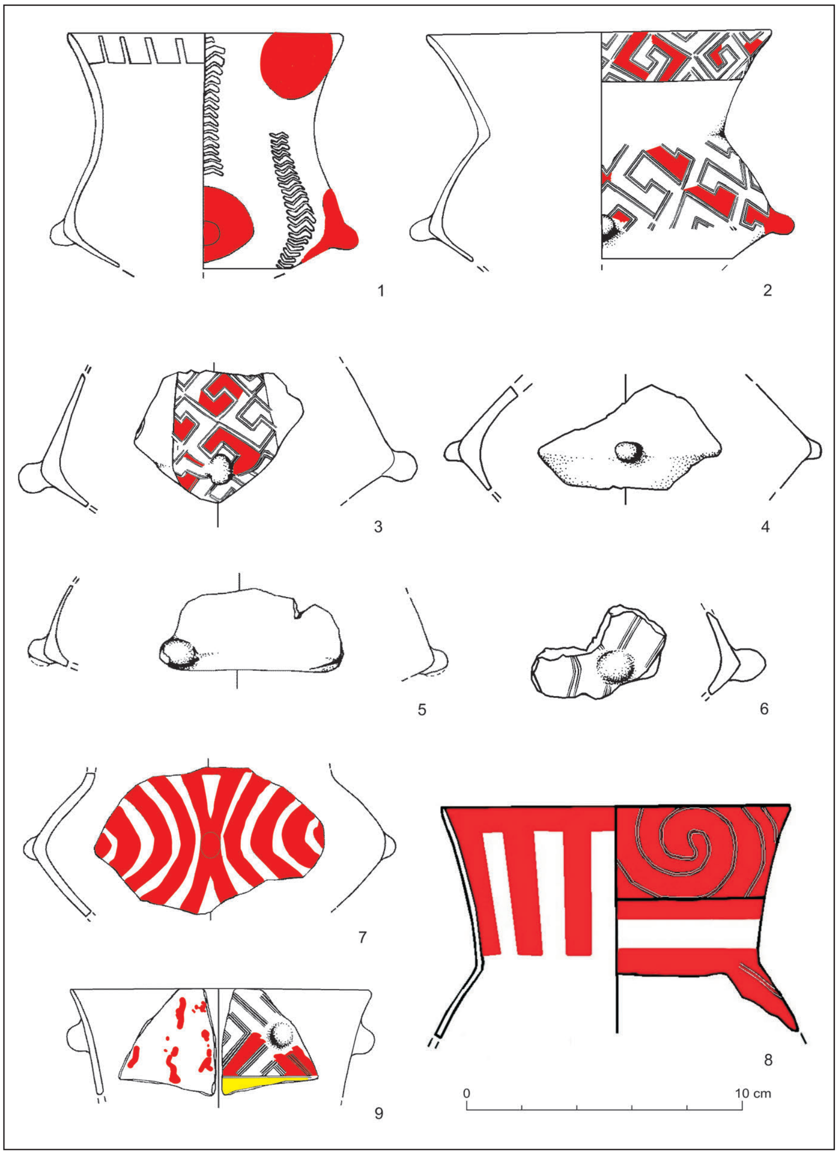

Fig. 8. Bučany-Kopanice. Beakers: 1, 2, 8 – structure 01; 3–6 – structure 60; 7 – structure 04; 9 – structure 153.

Incised ornaments, which have a better chance of remaining in their original condition than painting, are important for the building of a smooth relative chronology. Incised ornaments present on the pottery from Bučany-Kopanice are made either in the double-thin line decoration technique, or in groups of fine thin incised lines. While the first technique mentioned occurs on the material from the first as well as the second Lengyel stage settlements, and hence is of continuous character, the second technique is typical only of sites of the first stage. The smooth transition from multiple incised lines through a double, smoothly incised line, to the single incised line is a generally known trend observable in the incising decorative technique of the Lengyel I stage. The number of techniques used on objects is shown in Figure 11. One of the usual decorative elements was a strip, which was used in phase Ia of the Moravian Painted Ware Culture; it is not very common in phase Ib. Spirals and meanders were also frequently used, which corresponds to the situation of younger as well as older phases of the Moravian Painted Ware Culture. Zig-zag elements follow in popularity. Among the motifs on incised ornaments, the following occur most frequently: true spiral (31x), zig- zag grouped in vertical stripes (7x), true meander (5x), vertical stripe (3x), true diamond (2x).

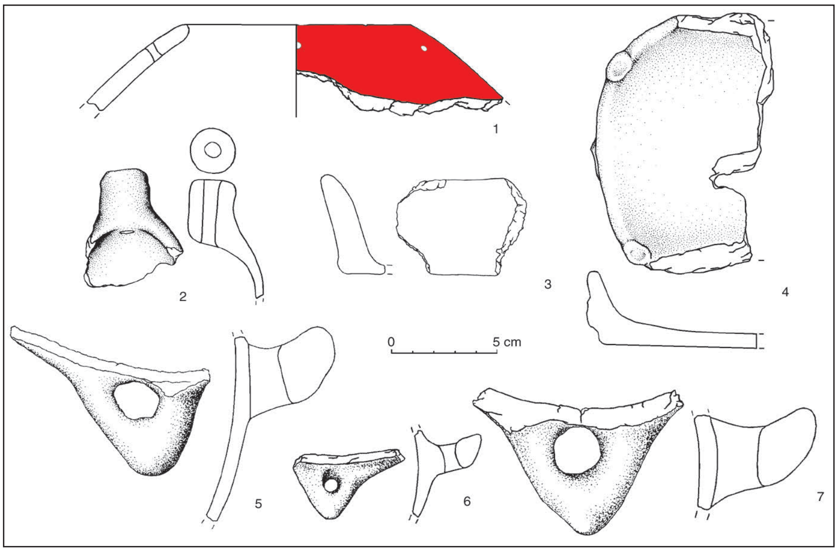

Fig. 9. Bučany-Kopanice. 1 – mushroom shaped vessel (structure 153); 2 – ladle with handle (structure 82); 3–4 – special bowls (3 – structure 117; 4 – structure 60); 5–7 – horned handles (5 – structure 155; 6,7 – structure 153).

A true spiral motif is used in phase Ia as well Ib of the Moravian Painted Ware Culture; a motif of continuous meanders with hooks (once in the ensemble) is very common in the phase Ib of the MMK (*Košťuřík 1979*); a zig-zag motif grouped in vertical stripes, is also very typical of phase MMK Ib. The relation of motifs and the incised decoration technique chosen is shown in Figure 12. It can be stated that the motifs which are typical of a certain phase are made with the technique typical of this phase.

The range of motifs mentioned above enriches the incised motif in the form of a net applied on the exterior surface of a conical bowl on a hollow pedestal, together with the element of an incised circle and half-arch (Fig. 7.1). It is formed with a simple thin line. Analogy to this kind of decoration can be found in the settlement of Santovka (*Diškancová 2006.Fig. 2.7,9; Pavúk 1981.Fig. 9.12; 1994.Fig. 3.3*), which represents the interim phase between the first and second stages of the Lengyel Culture in Slovakia. This interim phase corresponds to the chronological position of Moravian localities of phase Ib of the Moravian Painted Ware Culture. A sporadically simple incised net motif is registered also in the excavation context of the Lengyel II stage in Trakovice and Veľké Kostoľany (*Pavúk 1981.Fig. 9.3, 5*). An incised net is also documented in the oldest Lengyel pottery from Hungary, *e.g.* Aszód (*Kalicz 1985*).

In the set examined, plastic decorative and serviceable forms are present. They are applied in various pottery classes, together on the surface of 160 specimens, *i.e.* their representation in the entire set is 26 %. More than a quarter of the plastic elements occur on the surface of cups, as well as on bowls and bowls on hollow pedestals. Then pots and pot-like types follow (20 %), and 16 % decorates large-pitchers. In the foundation examined, bosses without a hole are definitely prevalent (thirteen variations recognized on the surface of 107 vessels altogether); their occurrence in percentage according to variations is shown in Figure 13. Bosses with a hole are in the second position. Two variations of these were identified in the set: vertically extended (2x) and circular (6x), both with a horizontal hole. These types are typical of the Ib phase of the Moravian Painted Ware Culture, but they occurred even before. Relief adjustment on the surface of edges occurred in the case of three pot-like vessels; two of them with overprinted edges, and the third one had an indented edge, or decorated with little notches. In the examined set of pottery with serviceable forms three variants of horned ears occur: extended with a hole (13x), compressed with a hole (6x) and smooth edged with a hole (2x). These shapes were chosen by Eliška Kazdová (*1984*) as chronologically important features of the Ia phase of the Moravian Painted Ware Culture pottery. A delicate chronological indicator is also the spread of plastic decoration on the vessel. The overwhelming majority of plastic shapes was placed on the convexity, and on the neck of cups, which is typical of Lengyel I.

Slovakia	Moravia (independently)			Moravia and Austria	
stage	culture	phase	Subphase	culture, phase	subphase
A	MMK	Ia	Ia1	MMK/MOG I	Ia1
Lengyel I			Ia2		Ia2
B			Ia3		Ia2/Ib(1)
phase Santovka		Ib	Ib1		Ib
			Ib2		
			Ib3		Ib/IIa
		Ic	Ic		

Fig. 10. Differentiation and synchronization of the first stage of the Lengyel cultural complex.

Conclusion

The pottery presented in the article is just a part (one third) of the whole assemblage excavated in Bučany-Kopanice. However, it reflects well the characteristics that are assumed relevant for the entire pottery ensemble of the site.

	Structure No.									Total
Incised decoration technique	01	04	29	60	82	117	153	155	180	
group of fine lines thin	1	0	4	1	3	0	2	5	0	16
double-thin line	6	4	6	4	4	0	7	1	0	32
simple thin line	1	2	3	0	2	0	2	0	1	11
Total	8	6	13	5	9	0	11	6	1	59

Fig. 11. The amount of incised decoration techniques used in selected structures.

After evaluating the pottery set from the building complex of circular architecture ground plan, and selected structures processed in a database system, the following conclusion can be stated:

The shapes of the set in general include bigger painted pot-like vessels, large-pitchers, profiled bowls on high and low hollow pedestals, bowls with opened collar and short lower half, and thin-walled cups with painted and incised decoration.

On the basis of pottery shape and decoration analysis, the typical features of the first stage of Lengyel Culture are discernible in the set examined (pottery decorated by incisions and polychromic painting – red, yellow and white, but not pastose). Classical Lengyel Culture, with a typical incising ornament and mostly red painting, which is best comparable to Moravian Painted Ware Culture pottery, was defined in Slovakia on the basis of pottery material from the settlements of Nitriansky Hrádok-Zámeček (*Točík and Lichardus 1966*), Veľké Hoste (*Lichardus 1961*), Koláre and Bardoňovo (*Urminský 1998*), and on the basis of comparable units from Svodín–Busahegy (*Lichardus and Šiška 1970; Nemejcová-Pavúková 1995*). According to Juraj Pavúk (*1981.270*), the finds from Veľké Hoste are younger; hence they will probably not belong to the Lengyel I phase. With the progressive increase of finds, a more detailed classification of stage Lengyel I seems to be more atractive because qualitative and quantitative differentiation is obvious in the comparison of finds. The processing of the pottery from the Lengyel settlement in Svodín in Slovakia (*Kličová 2004. 97–107*), Tešetice-Kyjovice in Moravia (*Kazdová 1984*) and Kamegg in Lower Austria (*Doneus 2001*) are among such attempts.

In the detailed analysis of incised ornaments on the pottery set from Bučany, the examined locality defies the frame of all the finds from Slovakia. From the point of view of quality, the occurrence of incised ornamentation, according to Juraj Pavúk (*1981. 270*), is even approaching the situation in southern Moravia, where the incised ornamentation is significantly more frequent than in the west part of Slovakia. In this case the presumption of the existence of a phase with a frequent occurrence of incised ornamentation in the south-west of Slovakia (from Koláre on Poiplie up to Bučany on Považie) could be possible. If we concentrate on particular excavation units, then after the Protolengyel group Lužianky, in which the incised ornament is absolutely absent, we must count with the developmental section without or only with rare occurrence of incised elements in Lengyel I stage. (*e.g.* in Bardoňovo and Svodín). After that, the developmental section characterized by regular or unusually frequent occurrence of incised ornamentation follows. So we can assume, as Pavúk (*1981.270*) claims, that the pottery in stage Lengyel

	Incised decoration motif (codes after *Podborský et al. 1977.179–188*)												
Incised decoration technique	21	23	24	31	31, 32	34	31, 41	41	53, 85	71	81	91	93
group of fine lines thin	2	0	1	1	0	0	1	8	0	0	0	0	0
double-thin line	1	1	0	3	1	0	0	22	0	0	2	1	0
simple thin line	0	0	0	0	0	1	0	0	1	1	0	0	7
Total	3	1	1	4	1	1	1	30	1	1	2	1	7

Fig. 12. The relation of the incised decoration technique and motif (21 – vertical stripe; 23 – fringe; 24 – ladder-like stripe; 31 – true meander; 32 – meandroid; 34 – continuous meanders with hooks; 41 – true spirals; 53 – convex-concave star-shape;71 – cross in "X"-form; 81 – true diamond; 85 – net; 91 – continuous multiple zig-zag; 93 – zig-zag grouped in vertical stripes).

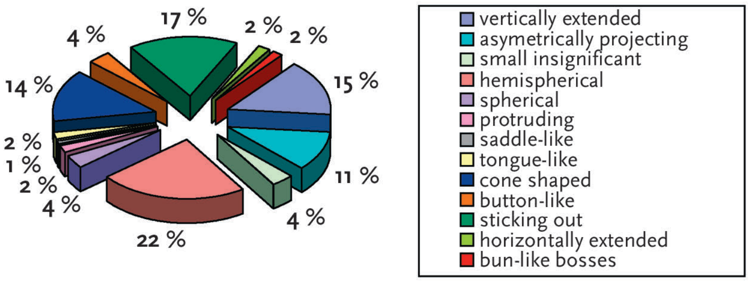

Fig. 13. Bosses without holes – occurrence in percentages according to variations.

I in the south-west of Slovakia underwent development from the phase without or only with rare occurrence of incised ornamentation, through a phase with regular and more frequent occurrence of incised decoration. The next developmental trends of the final phase of the Lengyel Culture first stage are evident in finds from Santovka (*Pavúk 1994*), where the rare occurrence of incised pottery is again, and, moreover, the ornament itself is changing, too.

From the point of view of the decorative richness of the pottery examined, besides incised and painted decoration, plastic elements are also dominant and presented by the rich shape and size scale of the various kinds of bosses. For the territory of Slovakia the following conclusion is notable: only after the not very widespread plastic decoration of the pottery of the Lužianky group does the older stage of Lengyel pottery include an elaborated system of plastic decoration placement in the form of bosses.

The examined locality of Bučany-Kopanice is of great importance for the disposal of contemporary cultures, mainly via their typical decoration. The situation of archaeological context in the area examined and the analysis of pottery in this site indicate continuous settlement during the younger section of the first chronological stage of Lengyel Culture – Lengyel IB phase. This phase can be more exactly synchronized with MMK/MOG Ia (Ia2 and 3 or Ia2/Ib1) in Moravia and Austria, with the Lengyel Ib stage in western Hungary, and with the younger IVa phase of the Stroked Pottery Culture in the Czech Republic, and at the same time continuously lock onto the transitional phase Santovka (Slovakia) – MMK/MOG Ib (Austria, Moravia) – Zengővárkony 3 – Mórágy-Tűzkődomb (Hungary).

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Graeme Barker

The Agricultural Revolution in Prehistory. Why did Foragers become Farmers? xvi+598 pages, 138 figures, 15 tables. 2006. Oxford: Oxford University Press; ISBN 0-19-928109-2; 978-0-19-928109-1

The Agricultural Revolution in Prehistory addresses some of the most debated questions as to why, how, when and where foraging societies decided that 'the advantages of food production outweighed the options available to them as foragers'. Graeme Barker first discussed these questions in his Cambridge PhD on the transition from hunting to farming in central Italy. Some years later he focused on the evolution of farming in Europe. His recent book is an attempt to bring to bear a global holistic approach to the problem of why foragers became farmers. The book is in ten parts: (1) Approaches to the Origins of Agriculture, (2) Understanding Foragers, (3) Identifying Foragers and Farmers, (4) The 'Hearth of Domestication'? Transitions to Farming in South-West Asia, (5) Central and South Asia: the Wheat/Rice Frontier, (6) Rice and Forest Farming in East and South-East Asia, (7) Weed, Tuber, and Maize Farming in the Americas, (8) Africa: Afro-Asiatic Pastoralists and Bantu farmers?, (9) Transitions to Farming in Europe: Ex Oriente Lux?, and (10) The Agricultural Revolution in Prehistory: Why did Foragers become Farmers?

In the context of a short review, the range and rich detail of this book precludes further summary, and to engage in debate on any one section would be invidious. Suffice to say that the author believes that the process of transition to farming demands a regionally comparative approach. For every region, he suggests, we need to understand "*changes in climate and environment, the nature of the plant and animal resources available, and how they were exploited by people on either side of the presumed transitional phase(s) from foraging to farming*". And, that "*if we are to understand why prehistoric foragers become farmers*" we have to "*imagine how they must have viewed their world and the challenges and choices available to them*". There is no reason not to agree with these postulates.

The author develops a strong case for the development of agricultural systems in many regions as transformations in the life-styles of indigenous forager societies, and hypothesises that these were as much changes in social norms and ideologies as in ways of obtaining food. He argues at the same time that the transition to farming was a process consisting of many unwise, foolish and fatal decisions, and that what actually happened was not the discovery nor the invention of food production, but a by-product of decisions made without an awareness of their consequences (p. 392, quoting *J. M. Diamond*).

The author surprises us by reviving two old concepts and models, agricultural revolution (*cf. V. G. Childe*) and acculturation (*cf. S. Piggott* [Ancient Europe. 1965], missing from the bibliography). He argues strongly against the concept of demic diffusion and/or the wave of advance model (*cf. A. J. Ammerman and L. L. Cavalli-Sforza*). For him, the main problem with the demic diffusion model is "*its focus on the transition to farming as some kind of unique sequence of movements in an otherwise static world.*" (p. 413).

By adopting a global perspective, the author integrates in the book a series of general and basic data that were discussed in the eighties and nineties in archaeology, anthropology, botany and zoology, climatology, and archaeogenetics. Unfortunately, he overlooks relevant information as much as the recent discussions of origins and diffusions of 'Mesolithichic' and 'Neolithic' Y-chromosomes and mitochondrial DNA haplogroups, and global human population trajectories in the context of the processes of the transition to farming. Human genetic studies show that the modern European paternal and maternal genetic landscape was not the result of farmers invading from the Near East, and that demic diffusion is not a realistic scenario for interpreting the transition to farming in either Europe or Central Asia. The lively debate on the '8.200 calBp climate event' – which undoubted correlates chronologically with the transition to farming on a global scale, and certainly affected environmental conditions – is not taken into account. How the event affected contemporary hunter-gatherers and farmers and the transition to farming still awaits an answer.

There is no question, however, that *The Agricultural Revolution in Prehistory* is a big step towards an unbiased interpretation of the processes of transition to farming in prehistory both regionally and globally.

Mihael Budja
University of Ljubljana

Preston T. Miracle and Stašo Forenbaher **(eds.)**
Prehistoric Herders of Northern Istria: the archaeology of Pupićina Cave, Volume 1/Pretpovjesni stočari sjeverne Istre: arheologija Pupićine peći, 1. svezak (Monografije i katalozi 14). 560 pages, 194 illustrations, 15 plates, 89 tables, 8 appendices. 2006. Pula. Arheološki muzej Istre; 953-6153-37-8 paperback.

This monograph documents the results of the excavation of the post-Mesolithic layers in Pupićina Cave in Northern Istria. Pupićina Cave contains a deep, albeit interrupted sequence, which covers the last 12 000 years of occupation, with significant Neolithic and Bronze Age deposits. This is the first volume in a series of monographs which is intended to cover the whole occupational sequence of the Cave.

This substantial monograph is a very welcome contribution to studies of the Neolithic and Bronze Age in the Northern Adriatic, which has been relatively intensively researched, but lacks well- excavated and dated assemblages, and which is plagued by a lack of detailed publications.

The most obvious contribution of the monographs lies in the detailed specialist studies of the whole line of evidence, both 'artefactual' and 'ecofactual', including stratigraphic, micromorphological, taphonomical, palaeobotanical etc. data. Thus, aside from an introductory article (*Miracle*) and two overview contributions, the monograph consists of a series of detailed specialist reports covering different lines of evidence.

Miracle and Fornbaher describe the methodology of excavation and the stratigraphy of the post-Mesolithic layers in the cave in full detail. The sequence of five occupation horizons is dated with eight radiocarbon dates. Particularly interesting is the geoarchaeological report (*Boschian*), which clearly demonstrates that the stratigraphic sequence is almost entirely the result of anthropogenic processes, mainly the periodic burning of animal dung and cleaning of cave floors. The micromorphological data provide clear evidence that the cave was used as a sheep pen. The pottery analysis (*Forenbaher and Kaiser*) provides evidence of sharp contrast in the use of pottery at the site between the Bronze Age and Neolithic, while the analysis of stone artefacts (*Forenbaher*) questions previous assumptions that the Neolithic lithic industry in the region is based on a prismatic blade technology industry. An important observation is the intensification of long-distance interactions during the Neolithic, which can be clearly seen in an expanded range of raw materials. Different uses of raw materials can be seen in a small collection of bone and antler artefacts (*Amatt and Miracle*). The report on vertebrate fauna (*Miracle and Pugsley*) clearly shows the major role in subsistence of herds of ovicaprines, thus complementing the micromorphological and stratigraphic evidence. The paper reveals substantial changes in cave use, animal management, during the Neolithic and Bronze Age.

The very small mollusc assemblage provides more evidence of site formation and taphonomical processes than of dietary or palaeo-environmental processes (*Laurie, Miracle and Poje*). The charcoal and phytolites analysis offer evidence of the utilisation of the landscape in the immediate enivrons of the cave (*Fletcher and Madella*) and thus complements a pollen analysis from an offsite core (*Andrič*), while the analysis of small vertebrate remains (*Steward and Parfitt*) focuses more on the formational processes which could have led to their accumulation in the cave. The specialist reports often include regional comparisons and set data within a wider regional context. Especially worth mentioning is the report on faunal assemblages (*Miracle and Pugsley*), which summarises zoo-archaeological data from the whole of the eastern Adriatic.

The last two chapters summarize the different lines of evidence and provide an overview and conclusion about the cave itself and its environment, and its position in the spread of farming in the eastern Adriatic.

The first synthetic contribution summarise changes in the activities in the cave and its immediate environs (*Miracle and Forenbaher*). Pupićina was a seasonally visited site, with changing patterns and intensity of use and occupation. It was used as a seasonal camp, with major periods of relatively intensive occupation during the second half of the 6th and the beginning of the 5th millennium BC (Middle Neolithic) and mid-second Millennium BC (Bronze Age).

The Middle Neolithic occupations were short; shepherds lived in the cave with their herds; animals were slaughtered and consumed on site. Although the authors admit that the data fits fairly well with J.-É. Brochier's 'habitat bergerie', an occupational site used by shepherds and their herds, they anyway conclude – in my opinion too hastily – that "*Pupićina may have been a special-purpose site attached to the nearby village*", and was therefore more a 'grotte bergerie', a seasonal transhumance site linked to the (hypothetical) lowland village. This might be true of the Middle Bronze Age, with the appearance of fortified hill-forts in northern Istria and the immediate vicinity of the site.

An important observation is the existence of 'gaps' in the deposition, a major one between the Mesolithic and Neolithic, and another between the Neolithic and Bronze Age, along with several others. These 'gaps' also occur in other caves in the region. Unfortunately, the research does not provide a final answer to this problem, although it seems to be crucial for understanding the transition from the Mesolithic to the Neolithic in the cave and the wider region, which is the topic of the second synthetic contribution (*Forenbaher and Miracle*). There is a hiatus in occupation of around 1800 years between the Mesolithic and Neolithic occupations of the cave, therefore the evidence of a Mesolithic-Neolithic transition and the transition to farming has not survived. Unfortunately, this renders the cave less suitable for a discussion of the process of neolithisation. The earliest Neolithic layers in Pupićina are at least a few hundred years younger than the first Neolithic evidence in the region. Therefore, we might not agree with the authors' conclusion that "*Pupićina has some of the strongest and clearest evidence of a new population of herders/farmers coming to the site in the Middle Neolithic*". Absence of evidence is not necessarily evidence of absence of absence of hunter-gatherers in the cave during the transitional period, especially when other lines of evidence (exclusive use of local lithic raw materials in the oldest Neolithic horizon) may suggest local ancestry of the first herders in the cave.

The first monograph in the series is a colossal contribution to Neolithic and Bronze Age studies in the area and sets high standards for future research and publications on the area. It is to be hoped that the quality of the research and publication seen in this monograph will be also reflected in publications by other researchers working in the area. I eagerly await further volumes from the series.

Dimitrij Mlekuž
University of Ljubljana

John Chapman and Bisserka Gaydarska
(with contributions from Ana Raduntcheva and Bistra Koleva)
Parts and Wholes: Fragmentation in Prehistoric Context. xiv+233, 4 appendices, 124 illustrations, 38 tables, 43 colour plates. 2007. Oxford: Oxbow Books, 978-1-84217-222-3 paperback.

The book *Parts and Wholes* is in many ways a supplement to Chapman's previous book, *The Fragmentation in Archaeology* (2000), but it is also a new, highly innovative and interesting book. It is an ambitious attempt to write an integrated study which combines archaeology, social anthropology and material culture studies.

Chapman's study focused on the complementary practices of fragmentation and accumulation, processes which link people to objects through production, exchange and consumption. He adopted an anthropological model of personhood, derived mainly from ethnographic analyses of Melanesian societies, where people are made up of the totality of their relations: they are not 'individuals' but 'dividuals', made up of their relations and transactions with each other, places and material culture.

This study was founded upon the 'fragmentation premise', an idea that many artefacts in the past were deliberately broken and then re-used as fragments after that break. A crucial practice connected with the creation of personhood is 'enchainment', a social relationship between people and people and objects which emerges from the exchange of fragments. A related, complementary process is 'accumulation', which creates a hoard of objects.

Fragments are tokens of relations between people, places and objects, and thus create personalities. This model of personhood seems to fit the evidence of fragmented objects, hoards and partial deposits of human bone from southeastern Europe.

In the present book Chapman and Gaydarska elaborate on many points and arguments from Chapman's previous book. In fact, the book addresses many criticisms of the first book and provides many case studies which support the theoretical issues raised in the both volumes.

The first two case studies are examples of the culturally specific creation of personhood, the first using whole pots and the principle of 'categorisation' (Chapter 1). The second study discusses the anthropomorphic figurines from Hamangia (Chapter 3). Observation of the various biographies of Hamangia figurines, which were androgynous when whole, but change their rendered identity to male, female or gender-neutral, or no-gender following the fragmented life history of the figurines. However, in graves, either complete figurines or fragments, which can be refitted to whole figurines, were deposited, which characterise "*a return to androgynous whole at death.*"

Two methodological studies focus on the correspondence between the mobility of objects and fragments and the archaeological record. The first one – wittily named "Schiffer visits the Balkans" – discusses 'rubbish' , the importance of deposition and disposal for the objects' biographies, the mobility of the fragments, the creation of context and the definition of 'activity areas' (Chapter 4).

Meanwhile, the second approach mobilises the re-fitting studies and *châine opératoire* approach to answer the key question in fragmentation studies: "Where are the missing parts?" The study traces the dispersion of fragments both on-site and off-site (Chapter 5).

The final two studies combine a biographical approach with re-fitting studies. The first approaches the large assemblage of fragmented figurines from the Final Copper Age layers of the Dolnoslav tell (Chapter 6). The complex pattern of deposition at Dolnoslav seems to suggest that the tell was an accumulation site for the fragments, while the pattern reflects diverse principles of personhood, and thus offers an interesting contrast to the study of Hamangia figurines in the third chapter.

The second traces the *châine opératoire* of *Spondylus* rings based on refitting studies of three sites (Chapter 7).

Chapman and Gaydarska succeed in demonstrating that the 'fragmentation premise' is well founded. The high level of object and fragment mobility – up to 80 % of objects' mass is missing on some sites – suggest that fragments travel across sites and landscapes. Even more, they show that fragmentation studies can offer an insight into the creation of personhood and identity.

What we miss in the book is an acknowledgement of the social importance of the act or performance of deliberate breaking. Deliberate breaking is first an extremely important event in the biography of the object, not just 'ritual killing'. It is an act of transformation, when a whole object is transformed into something other. The act of transformation – due to its visual or aural qualities – can bring people together and make the event an social one. Obvious examples are the 'ritual explosions' of figurines at Dolni Věstonice, Balkan celebrations involving the 'ritual' breaking of glass against walls, or Leslie Grinsell's funeral cited in the introduction to the book. In such events it is the performance of deliberate fragmentation which has important social implications; it binds people together, the resulting fragments make those relations merely visible and tangible.

All in all this is a mind-boggling book. Chapman and Gaydarskas' study is a highly innovative and stimulating one. It opens completely new lines of enquiry into Balkan (and wider) prehistory.

Dimitrij Mlekuž and Mihael Budja
University of Ljubljana

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