

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

Dušan Borić<sup>1</sup> and Vesna Dimitrijević<sup>2</sup>

<sup>1</sup> University of Cambridge, UK, db231@cam.ac.uk

<sup>2</sup> 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 domestikatoev na to najdišče. Z direktnim datiranjem kosti domačih živali iz ohranjenega zbira favne iz Lepenskega Vira prikažemo, kdaj je najdišče dosegel popoln »neolitski paket« in interpretiramo značaj paleoeekonomske transformacije.

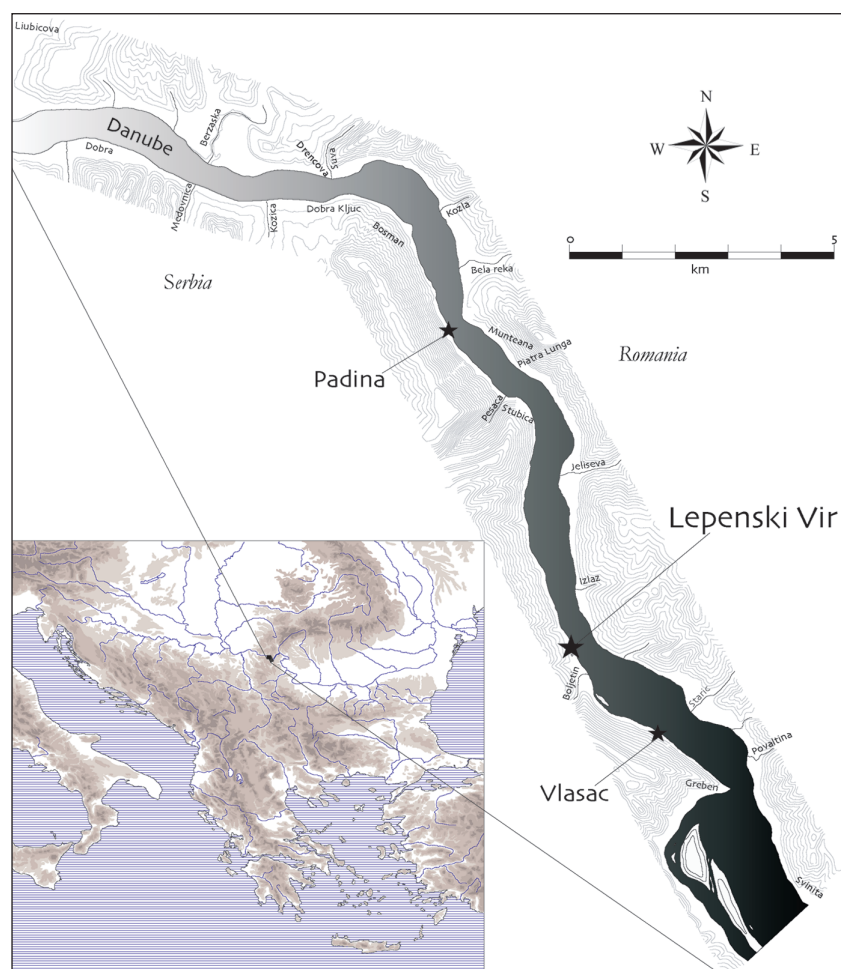
**KEY WORDS** – Lepenski Vir; domesticates; Mesolithic; Neolithic; AMS; Danube Gorges

## 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 ex-

cavation (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  $^{14}\text{C}$  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 build-

ings 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.<sup>1</sup> 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 carcasses, 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.<sup>2</sup> 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*).

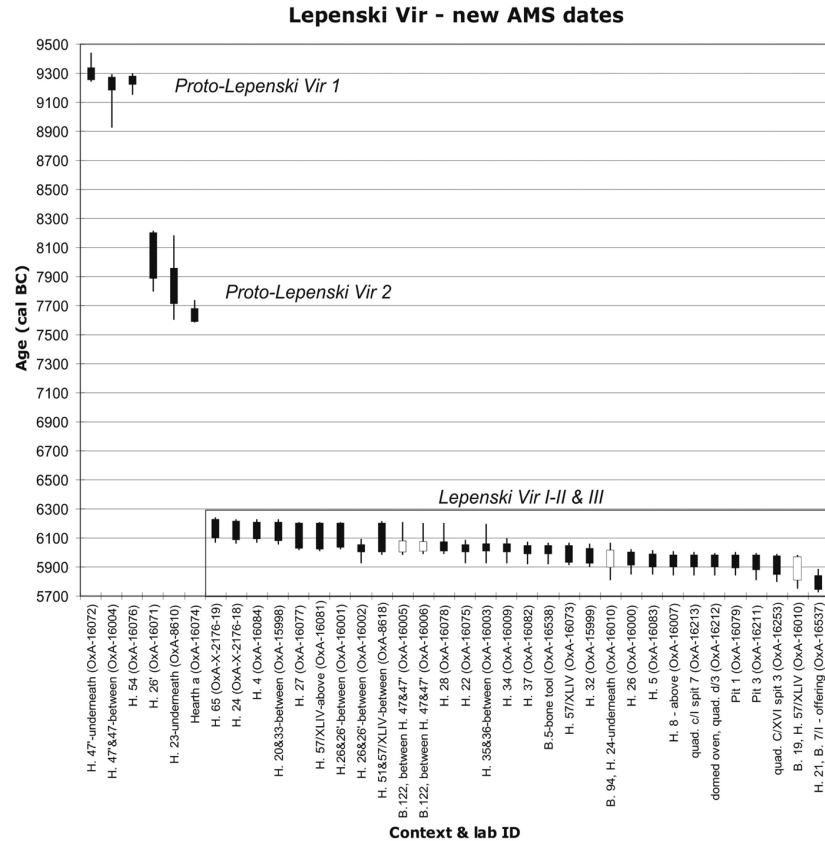
The phase with trapezoidal buildings probably starts only around 6300/6200 calBC, and most of the trapezoidal buildings might have been abandoned by

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  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  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  $^{14}\text{C}/^{12}\text{C}$  ratios than the atmosphere. In such environments, aquatic animal and plant species exhibit lower  $^{14}\text{C}$  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 Srejšević'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 Srejšević'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  $\nabla$ -supports around rectangular hearths as reliable chronological indicators (Borić & Dimitrijević 2005:45–46; *in press*; Borić 2002b).

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 Srejšević, 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<sup>3</sup>, 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



**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.**

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 (Srejšević 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,

<sup>3</sup> 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).

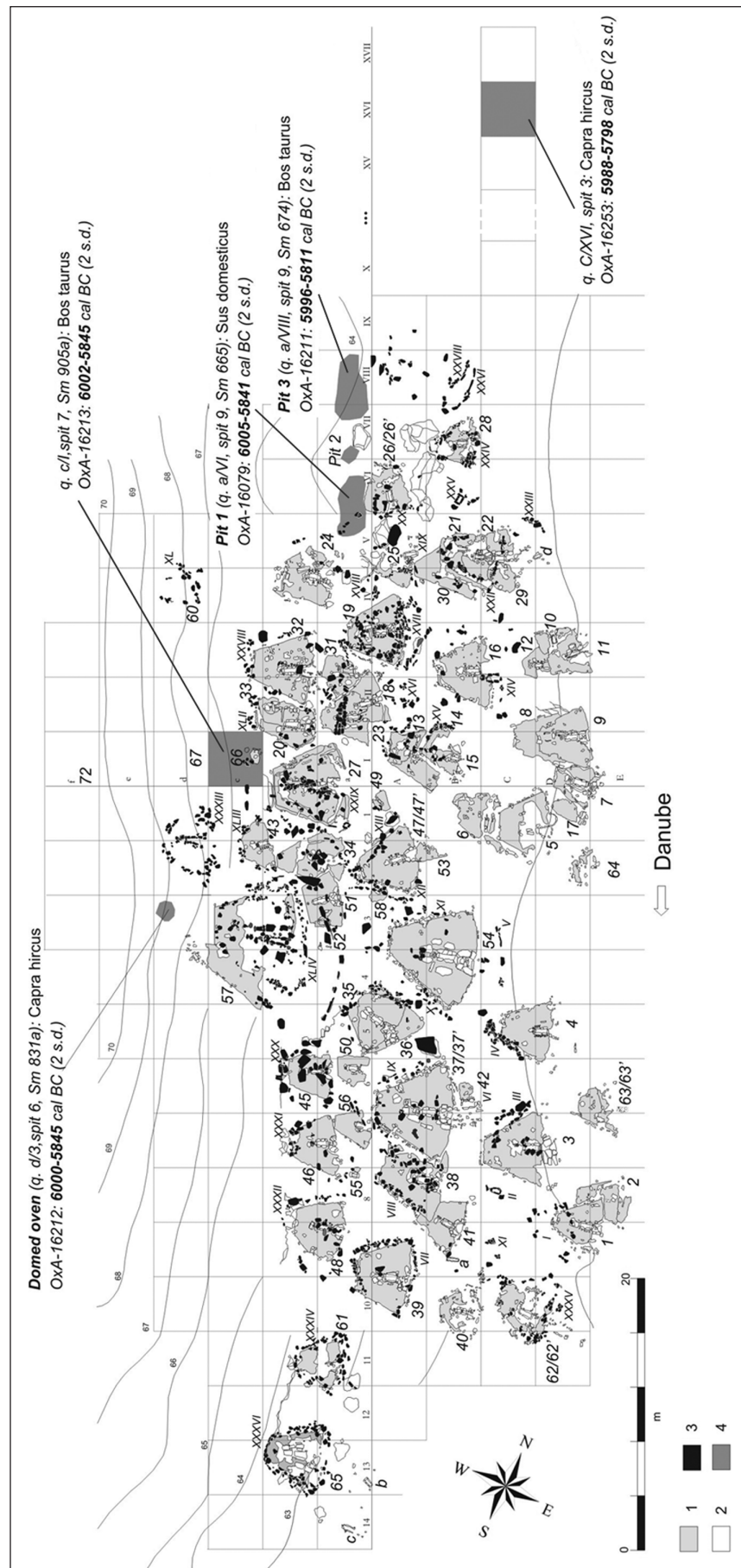


Fig. 4. Lepenski Vir – site plan of phase I-II, with some shaded features of phase III from where the AMS dated domestic bones originate. Overlapping trapezoidal buildings of Srećević's phase I (labelled with Arabic numerals) and construction stones of his phase II (labelled with Roman numerals) (after Srećević 1981, 20-1). 1 – limestone floors; 2 – construction stones attributed to phase I (acc. to Srećević); 3 – construction stones attributed to phase II (acc. to Srećević); 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<sup>4</sup>. 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 7/1 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 di-

rect 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-

<sup>4</sup> House XLIV is the largest structure found in the rear of the site (Fig. 4). It also contained the largest number of representational 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	$\delta^{13}\text{C}$ (‰)	$\delta^{15}\text{N}$ (‰)	species	element	cal BC
S#35	16079	Pit 1, quad. a/VI, spit 9 (665) (12/07/1968)	7037	39	−20.2	9.3	<i>Sus domesticus</i>	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	<i>Bos taurus</i>	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	<i>Capra hircus</i>	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	<i>Capra hircus</i>	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	<i>Bos taurus</i>	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  $^{13}\text{C}$  and  $^{15}\text{N}$  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.<sup>5</sup> 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 5<sup>th</sup> excavation spit in quadrant a/VI (July 10<sup>th</sup> 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 12<sup>th</sup>, 1968 records the following:

*“The bottom level of the 7<sup>th</sup> excavation spit was planned. In quadrants ab/V, VI, VII from the level of the 7<sup>th</sup> 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*

<sup>5</sup> 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 8<sup>th</sup> 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 8<sup>th</sup> excavation spit [of the pit fill], there are fragments of pottery and bones and 2 flint artefacts [p. 19–20].”

The excavation of the 8<sup>th</sup> and the 9<sup>th</sup> spits was finished on July 13<sup>th</sup>, 1968, when yellow virgin soil was reached.

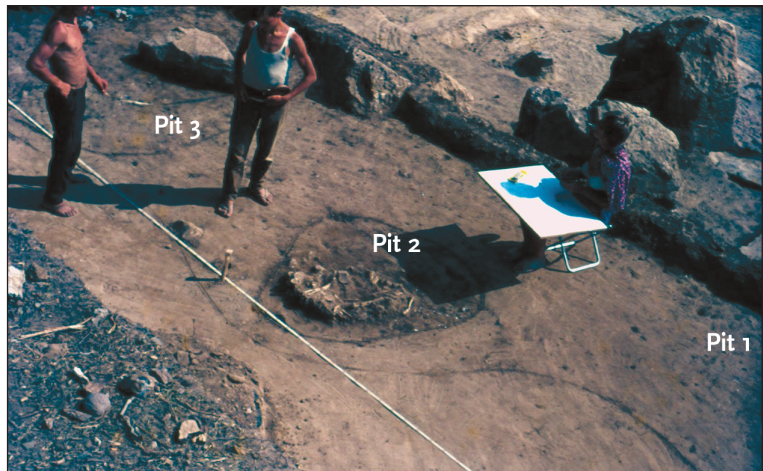
The bottom spit of this pit, from which comes the domestic bone we dated, contained pottery and animal bone [p. 23]. If one assumes that the backfilling of this pit took place over a period of time in the use of the site during phase III, the material we dated, found at its bottom, could be seen as a 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.



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

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, antero-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 7<sup>th</sup> spit was photographed with Burial 31, which was lifted [p. 20].

[15/07/1968] Pit 3 – the 8<sup>th</sup> spit contained a lot of pottery and animal bones. Next to the section, a globular pot was found in a concentration of stones. The 9<sup>th</sup> 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 10<sup>th</sup> spit contained similar materials. (...) The 11<sup>th</sup> 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 7<sup>th</sup> 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, the 12<sup>th</sup> 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 12<sup>th</sup> 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 12<sup>th</sup> excavation spit. [The cut off] 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, antero-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 26<sup>th</sup>, 1968, this domed oven was at first recognized as a contour of red burned soil in the 2<sup>nd</sup> excavation spit in quadrant d/3, and this situation was planned. The field diary entry dated on July 30<sup>th</sup>, 1968, mentions that during the excavation of the 8<sup>th</sup> 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 31<sup>th</sup>, 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 8<sup>th</sup> spit. The 9<sup>th</sup> 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 8<sup>th</sup> spit. The line dividing the grey and yellow soils runs approximately through the middle of these quadrants [along x axis]. In the 9<sup>th</sup> spit, in the same soil, there were numerous finds of pottery and bones. A [whole] pot was removed from the 8<sup>th</sup> 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 9<sup>th</sup> 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 2<sup>nd</sup>, 1968, which clarifies its construction details:

*“In quadrant d/3, a zone with red soil was first noticed in the 2<sup>nd</sup> 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.

### Faunal description

OxA-16212 dates a right proximal metacarpal of domestic goat *Capra hircus* (medio-lateral breadth = 28.9, antero-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 antero-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 antero-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.



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



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

### Context description

This context relates to a long transect 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 7<sup>th</sup>, 1968. According to the field diary, on August 8<sup>th</sup>, 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 1<sup>st</sup> excavation spit in this quadrant [p. 76]. The excavation of quadrant C/XVI, from which the sample we dated originates, took place on August 9<sup>th</sup>, 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 2<sup>nd</sup> 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 10<sup>th</sup>, 1968, the 3<sup>rd</sup> 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 4<sup>th</sup> 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 6<sup>th</sup> 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 5<sup>th</sup> and 6<sup>th</sup> spits [p. 88]. Also, in the 7<sup>th</sup> spit, a large rock (bedrock?) was already reached in quad-

rant 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 8<sup>th</sup> 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 9<sup>th</sup> 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 5<sup>th</sup> 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 7<sup>th</sup>, 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

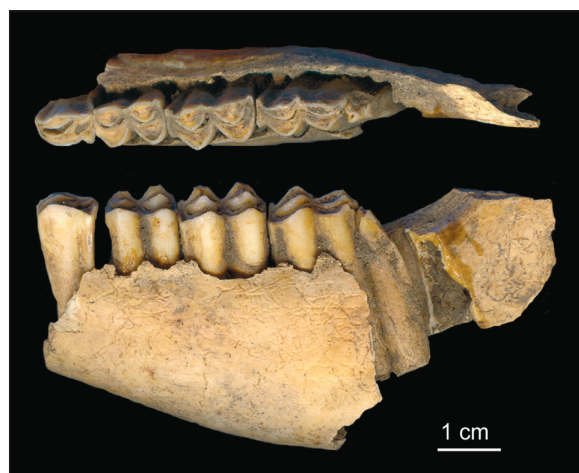
deposits of hill wash were first removed in the line of d quadrants in order to facilitate digging in quadrants in line c. The first pottery finds in the line of c quadrants were encountered on July 10<sup>th</sup>, 1968. Here, among animal bones and pottery fragments, 4 fragments of fine pottery with a black painted ornament on the red surface were found in the 1<sup>st</sup> 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 2<sup>nd</sup> 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 4<sup>th</sup> 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 3<sup>rd</sup> 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 5<sup>th</sup> 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 4<sup>th</sup>

spit, while the rest of the body was found in the 6<sup>th</sup> 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.

In quadrant c/I, from which our dated sample originates, an Early Neolithic fire installation was recognized in the 5<sup>th</sup> 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 8<sup>th</sup> spit. Pottery was found beneath the hearth [p. 75].

In the 6<sup>th</sup> 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 7<sup>th</sup> 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



**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.

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/I respectively.

One could assume that the previously mentioned Burial 32 is stratigraphically younger (5<sup>th</sup> excavation spit) than our dated domestic cattle horncore (7<sup>th</sup> 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 10<sup>th</sup> 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, probably 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 11<sup>th</sup> 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 se-

parating 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 (medio-lateral 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 sub-horizontal 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 stratigraphic 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 these 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.<sup>6</sup> 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-

<sup>6</sup> 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.<sup>7</sup>

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 1<sup>st</sup> 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 Salkuța 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

<sup>7</sup> Evidence of body traumas from violent conflicts in the Danube Gorges is abundant for the Late Mesolithic (c. 7200–6600 BC) period (Boroneanț 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, <i>Spondylus</i> 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
Late Mesolithic (c. 7500–6300 BC)	–	–	Non-existent at LV?		Ia–e
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.

## ACKNOWLEDGEMENTS

*We acknowledge the funding for the dating project provided through the Oxford Radiocarbon Accelerator Dating Service NERC-AHRC programme. We are also grateful to the Ministry of Science and Environmental Protection of the Republic of Serbia for funding the project 'Kultura Lepenskog Vira: kulturni procesi i transformacije u periodu od IX do VI milenijuma p.n.e.', in the scope of which animal bones were analysed. We thank Jay Stock and Alasdair Whittle for their useful comments on earlier drafts of this paper. We would also like to express our thanks to Mihael Budja for his superb organization of the 13<sup>th</sup> Neolithic seminar in Ljubljana, where this paper was presented.*



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). Do-

mestic 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.

∴

## REFERENCES

- ANTONOVIC D. 2006. *Stone tools from Lepenski Vir*. Arheološki institut. Beograd.
- BÖKÖNYI S. 1969. Kičmenjaci (prethodni izveštaj). In D. Srejsović (ed.), *Lepenski Vir. Nova praistorijska kultura u Podunavlju*. Srpska književna zadruga. Beograd: 224–228.
1972. The Vertebrate Fauna. In D. Srejsović (ed.), *Europe's First Monumental Sculpture: New Discoveries at Lepenski Vir*. Thames and Hudson. London: 186–189.
1974. *History of Domestic Mammals in Central and Eastern Europe*. Akadémiai Kiado. Budapest.
- BONSALL C., LENNON R., MCSWEENEY K., STEWART C., HARKNESS D., BORONEANȚ V., BARTOSIEWICZ L., PAYTON R. and CHAPMAN J. 1997. Mesolithic and early Neolithic in the Iron Gates: a palaeodietary perspective. *Journal of European Archaeology* 5(1): 50–92.
- BONSALL C., COOK G., LENNON R., HARKNESS D., SCOTT M., BARTOSIEWICZ L. and MCSWEENEY K. 2000. Stable Isotopes, Radiocarbon and the Mesolithic-Neolithic Transition in the Iron Gate. In M. Budja (ed.), *7th Neolithic Studies. Documenta Praehistorica* 27: 119–132.
- BONSALL C., COOK G. T., HEDGES R. E. M., HIGHAM T. F. G., PICKARD C. and RADOVANOVIĆ I. 2004. Radiocarbon and stable isotope evidence of dietary changes from the Mesolithic to the Middle Ages in the Iron Gates: new results from Lepenski Vir. *Radiocarbon* 46(1): 293–300.
- BORIĆ D. 1999. Places that created time in the Danube Gorges and beyond, c. 9000–5500 cal BC. In M. Budja (ed.), *6th Neolithic Studies. Documenta praehistorica* 26: 47–70.
- 2002a. The Lepenski Vir conundrum: reinterpretation of the Mesolithic and Neolithic sequences in the Danube Gorges. *Antiquity* 76: 1026–1039.
- 2002b. Seasons, life cycles and memory in the Danube Gorges, c. 10000–5500 BC. Unpublished Ph.D. Dissertation. University of Cambridge.
- 2005a. Deconstructing essentialisms: unsettling frontiers of the Mesolithic-Neolithic Balkans. In D. Bailey, A. Whittle and V. Cummings (eds.), *(un)settling the Neolithic*. Oxbow Books. Oxford: 16–31.
- 2005b. Fuzzy horizons of change: Orientalism and the frontier model of the Meso-Neolithic transition, in N. Milner and P. Woodman (eds.), *Mesolithic Studies at the beginning of the 21st Century*. Oxbow Books. Oxford: 81–105.
- 2005c. Body Metamorphosis and Animality: Volatile Bodies and Boulder Artworks from Lepenski Vir. *Cambridge Archaeological Journal* 15(1): 35–69.
2006. New discoveries at the Mesolithic-Early Neolithic site of Vlasac: Preliminary notes. *Mesolithic Miscellany* 18(1): 7–14.
2007. Mesolithic-Neolithic interactions in the Danube Gorges. In J. K. Kozłowski and M. Nowak (eds.), *Mesolithic-Neolithic Interactions in the Danube Basin*. British Archaeological Reports, Int. Ser. (in press). Archaeopress. Oxford.
- BORIĆ D. and MIRACLE P. 2004. Mesolithic and Neolithic (dis)continuities in the Danube Gorges: New AMS dates from Padina and Hajdučka Vodenica (Serbia). *Oxford Journal of Archaeology* 23(4): 341–371.

- BORIĆ D., GRUPE G., PETERS J. and MIKIĆ Ž. 2004. Is the Mesolithic-Neolithic subsistence dichotomy real? New stable isotope evidence from the Danube Gorges. *European Journal of Archaeology* 7(3): 221–248.
- BORIĆ D. and DIMITRIJEVIĆ V. 2005. Continuity of foraging strategies in Mesolithic-Neolithic transformations: Dating faunal patterns at Lepenski Vir (Serbia). *Atti della Società per la preistoria e protoistoria della regione Friuli-Venezia Giulia XV (2004–05)*: 33–107.
- in press. Apsolutna hronologija i stratigrafija Lepenskog Vira (Absolute Chronology and Stratigraphy of Lepenski Vir). *Starinar*.
- BORONEANȚ V. 1993. Nouvelles données sur découvertes anthropologiques de Schela Cladovei a Drobeta Turnu Severin (Roumanie). *L'Anthropologie (Paris)* 97(2/3): 511–514.
- BOSOLD K. 1968. Geschlechts- und Gattungsunterschiede an Metapodien und Phalangen mitteleuropäischen Wildwiederkäuer. *Säugetierkundliche Mitteilungen* 16(2): 93–153.
- BRONK RAMSEY C. 1995. Radiocarbon calibration and analysis of stratigraphy: the OxCal Program. *Radiocarbon* 37(2): 425–430.
2001. Development of the radiocarbon program OxCal. *Radiocarbon* 43(2A): 355–363.
- CHAPMAN J. C. 1994. The origins of farming in South East Europe. *Préhistoire Européenne* 6: 133–156.
2000. *Fragmentation in Archaeology. People, places and broken objects in the prehistory of south-eastern Europe*. Routledge. London and New York.
- COOK G., BONSALE C., HEDGES R. E. M., MCSWEENEY K., BORONEANȚ V., BARTOSIEWICZ L. and PETTIT P. B. 2002. Problems of dating human bones from the Iron Gates. *Antiquity* 76: 77–85.
- DIMITRIJEVIĆ V. 2000. The Lepenski Vir fauna: bones in houses and between houses. In M. Budja (ed.), *7<sup>th</sup> Neolithic Studies. Documenta Praehistorica* 27: 101–117.
2005. Vertebrate fauna from Tabula Traian Cave. Unpublished manuscript.
- in press. Lepenski Vir animal bones: what was left in the houses? Proceeding of the Conference "The Iron Gates in Prehistory: New Perspectives", Edinburgh, 30 March – 2 April 2000.
- forthcoming. Vinča – Belo Brdo, campaigns 1998–2003, vertebrate fauna. Unpublished manuscript.
- DRIECH VON DEN A. 1976. *A Guide to the Measurement of animal bones from archeological sites. Peabody Museum Bulletin 1*. Harvard University. Cambridge.
- GARAŠANIN M. and RADOVANOVIĆ I. 2001. A pot in house 54 at Lepenski Vir I. *Antiquity* 75(287): 118–125.
- GIMBUTAS M. 1976. Chronology. In M. Gimbutas (ed.), *Neolithic Macedonia: as reflected by excavation at Anza, southeast Yugoslavia*. The Institute of Archaeology, University of California at Los Angeles. Los Angeles: 29–77.
- GRUPE G., MANHART H., MIKIĆ Ž. and PETERS J. 2003. Vertebrate food webs and subsistence strategies of Meso- and Neolithic populations of central Europe. In G. Grupe and J. Peters (eds.), *Documenta Archaeobiologiae 1. Yearbook of the State Collection of Anthropology and Palaeoanatomy, München, Germany*. Verlag M. Leidorf. Rahden/Westf.: 193–213.
- JOVANOVIĆ B. 1969. Chronological Frames of the Iron Gate Group of the Early Neolithic Period. *Archaeologica Jugoslavica* 10: 23–38.
1987. Die Architektur und Keramik der Siedlung Padina B am Eisernen Tor, Jugoslawien. *Germania* 65(1): 1–16.
- LANTING J. N. and VAN DER PLICHT J. 1998. Reservoir effects and apparent ages. *The Journal of Irish Archaeology* 9: 151–165.
- LETICA Z. 1970. Grob Salkuša kulture sa Lepenskog Vira. *Starinar* XXI: 117–124.
- MILISAUSKAS S. 1978. *European Prehistory*. Academic Press. New York.
- PERLÈS C. 2001. The Early Neolithic in Greece. The first farming communities in Europe. Cambridge University Press. Cambridge.
- PERIĆ S. and NIKOLIĆ D. 2004. Stratigraphic, Cultural and Chronological Characteristics of the Pottery from Lepenski Vir – 1965 Excavations. In S. Perić (ed.), *The Central Pomoravlje in Neolithisation of South-East Europe. The Neolithic in the Middle Morava Valley 1*. Archaeological Institute. Belgrade: 157–217.
- PRAT F. 1966. Les Capridé. In Lavocat R. (ed.), *Atlas de Préhistoire, Tome III, Faunes et flores préhistoriques de l'Europe Occidentale*. Editions N. Boubée et Cie. Paris: 279–321.
- PRICE T. D. and BORIĆ D. forthcoming. Mobility in the Mesolithic-Neolithic Danube Gorges: Strontium Isotope Analyses. *Journal of Anthropological Archaeology*.

- QUITTA H. 1975. Die Radiocarbonaten und ihre historische Interpretation. In D. Srejšović (ed.), *Lepenski Vir. Eine vorgeschichtliche Geburtsstätte europäischer Kultur*. Gustav Lühbe Verlag, Bergisch Gladbach: 272–285.
- RADOVANOVIĆ I. 1996a. *The Iron Gates Mesolithic*. International Monographs in Prehistory. Ann Arbor. Michigan.
- 1996b. Mesolithic/Neolithic contacts: a case of the Iron Gates region. *Poročilo o raziskovanju paleolitika, neolitika in eneolitika v Sloveniji* 23: 39–48.
2000. Houses and burials at Lepenski Vir. *European Journal of Archaeology* 3(3): 330–349.
2006. Further notes on Mesolithic-Neolithic contacts in the Iron Gates Region and the Central Balkans. In M. Budja (ed.), *13<sup>th</sup> Neolithic Studies. Documenta Praehistorica* 33: 111–128.
- ROKSANDIĆ M. 2004. Contextualizing the evidence of violent death in the Mesolithic: Burials associated with victims of violence in the Iron Gates Gorge. In M. Roksandić (ed.), *Evidence and meaning of violent interactions in Mesolithic Europe*. Archaeopress. Oxford: 53–74.
- RUSSELL N. 1993. *Hunting, herding and feasting: Human use of animals in Neolithic southeast of Europe*. UMI Dissertation Services.
- SREJŠOVIĆ D. 1969. *Lepenski Vir – Nova praistorijska kultura u Podunavlju*. Srpska književna zadruga. Beograd.
1972. *Europe's First Monumental Sculpture: New Discoveries at Lepenski Vir*. Thames and Hudson. London.
- SREJŠOVIĆ D. and BABOVIĆ L. 1983. *Umetnost Lepenskog Vira*. Beograd. Jugoslavija.
- SZAKMÁNY G., STARNINI E. and RAUCSIK B. 2005. A preliminary Archeometric Investigation of Early-Neolithic Pottery from the Körös Culture (S. Hungary). In H. Kars and E. Burke (eds.), *Proceedings of the 33<sup>rd</sup> International Symposium on Archaeometry, 22–26 April 2002*, Amsterdam (Geological and Biological Studies, Vol. 3, 2005).
- TASIĆ N. N. 1992. A review of the C14 series of dates from Đerdap. *Balkanica (Hommage a Nikola Tasić. A l'occasion de ses soixante ans)* XXIII: 89–98.
- TRINGHAM R. 2000. Southeastern Europe in the transition to agriculture in Europe: bridge, buffer or mosaic. In T. D. Price (ed.), *Europe's first farmers*. Cambridge University Press. Cambridge: 19–56.
- VAN ANDEL T. and RUNNELS C. 1995. The earliest farmers in Europe. *Antiquity* 69: 481–500.
- WHITTLE A. 1998. Fish, faces and fingers: presences and symbolic identities in the Mesolithic-Neolithic transition in the Carpathian Basin. In M. Budja (ed.), *5<sup>th</sup> Neolithic Studies. Documenta praehistorica* 25: 133–150.
- WHITTLE A., BARTOSIEWICZ L., BORIĆ D., PETTIT P. and RICHARDS M. 2002. In the beginning: new radiocarbon dates for the Early Neolithic in northern Serbia and south-east Hungary. *Antaeus* 25: 63–117.
2005. New radiocarbon dates for the Early Neolithic in northern Serbia and south-east Hungary. *Antaeus* 28: 347–355.