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THE ORIGIN AND EXCHANGE OF OBSIDIAN FROM VINČA – BELO BRDO

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Abstract: Since the time of the revolutionary characterisation of obsidian in the 1960's only a small number of artefacts from the Serbian sites have been analysed, of which at least seven samples come from the site of Vinča. These results showed that obsidian was coming from Carpathian sources, disproving old romantic ideas of the existence of local obsidian sources in the central Balkans. These results allowed for the development of ideas about exchange networks of interregional importance during the Late Neolithic in which obsidian was an integral component. In this paper we will be discussing the results of the characterisation of 60 obsidian samples, representing ca. 4% of the entire obsidian assemblage from the site. The samples were taken from the whole Neolithic sequence at Vinča selecting macroscopically different obsidian types.

Key words: Obsidian, Vinča, characterisation, ED-XRF, Carpathian 1, exchange.

Introduction

Since the beginning of the 20th century very few sites have enjoyed such undivided attention of experts and wider public alike as the site of Belo Brdo (white hill) in Vinča. Located on the right bank of the Danube, some 14 kilometres southeast of Belgrade, the site of Belo Brdo was the first extensively excavated prehistoric settlement in the Central Balkans. It yielded almost 10 meters of cultural strata with sequences ranging from the Neolithic to the late Medieval period.[1] The life of the Neolithic settlement can be dated between 5500 and 4600 BC,[2] presenting us with a continuum of change in styles and typologies of material culture, technological advances and innovations within the regional context of southeast Europe.[3] Since the time of Miloje Vasić, the first excavator of the site,[4] various types of artefacts were periodically singled out from the almost inexhaustible collection and studied in detail. To name but a few: ground and chipped stone tools;[5] pottery;[6] small copper and malachite implements;[7] bone and marine shell tools and jewellery[8] and still, the possibilities for additional study of the site do not cease.[9]

1 Srejović *et al.* 1984.
2 Gläser 1996; Schier 1996; Borić 2009.
3 Garašanin 1951; Garašanin 1979; Garašanin 1990; Chapman 1981.
4 Vassits 1910; Васић 1932; Васић 1936a; Васић 1936b; Васић 1936c.
5 Srejović, Jovanović 1957; Radovanović *et al.* 1984; Antonović 1992.
6 Schier 1996.
7 Antonović 2004.
8 Srejović, Jovanović 1959; Dimitrijević, Tripković 2003; Dimitrijević, Tripković 2006; Tripković 2006.
9 Tasić, Ignjatović 2008.

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The regional importance of Vinča – Belo Brdo and its active role in networks of intercultural exchange is probably best reflected in the large number of exotica found in virtually all Vinča culture sequences at the site.[10] While copper implements and marine shell jewellery have recently been studied in detail, research into obsidian, one of the essential symbols of communication and contacts of inter-regional importance,[11] has remained limited to typological analysis.[12] On the other hand, despite being one of the three largest obsidian collections in modern day Serbia, and by far the most numerous one south of the rivers Sava and Danube,[13] the value of the assemblage from Vinča suffers from poor contextual records. This problem is best reflected by the absence of precise excavation data relating to the stratigraphic context of most chipped stone artefacts. This situation is the case for most categories of artefacts recovered from the site, leaving us with many open questions regarding their association with specific houses (i.e. households) or the manner of their deposition. Still, because of the meticulous work of Miloje Vasić for his time, precise data of artefact coordinates and relative frequency exists for the Vinča obsidians. It is of much importance to emphasize this, as vertical and layered sequences of the settlements at Vinča allow us to evaluate not only the frequency of obsidian through time, but also facilitates comparison with other imported or locally crafted goods. In contrast to this there is little or no contextual data for other settlements located in the area around Vršac (Potporanj, At, Kozluk) where large quantities of obsidian have been recovered.[14] At Vinča we can thus trace routes and historical contexts through which obsidian and other goods of regional and intercultural significance appear at this important site of prehistoric Europe.

Some 46% of the chipped stone industry, or at least 1488 obsidian pieces, were discovered in the 1929 to 1934 excavations at the site.[15] The greatest quantity of obsidian from the deep stratigraphic sequence of Vinča was recovered from between ▼9.0 and ▼7.0 meters depth, accounting for 69.9% of the recovered chipped stone industry. Above this, obsidian is found more sporadically disappearing completely just above the 4 meter mark. The latest known obsidian artefact is recorded at ▼3.8 meters.[16] The absence of obsidian in the later phases in Vinča could be related to the excavation methodology employed in the early campaigns. The modern surface of Vinča settlement is uneven so that the identical relative depth of some obsidian pieces does not necessarily mean that they belong to the same cultural horizon.[17] Data published on the excavations between 1929 and 1934 show that only 13 chipped stone artefacts in total were recovered from above ▼4.0 meters,[18] a number disproportionate with the size of the excavated area. In light of the recent excavations at Vinča (1978-1986; 1998-2008) and the modern excavation methodology including soil sieving and the collection of very small finds, sporadic presence of obsidian pieces even in the latest phases of the Neolithic settlement. This proves the more or less continuous use of obsidian between the middle of the 6th and 5th millennia BC.[19]

Previous characterization

The first studies of the chemical composition of geological and archaeological obsidians were conducted in the 1960's by Renfrew and colleagues.[20] Numerous characterization methods based on the identical chemical composition of obsidians along the entire lava flow have been developed and refined over time. The basic chemical components of obsidian are silica dioxide (SiO_2) consisting of between 70 and 75%, aluminium oxide (Al_2O_3) with 10-15%, sodium oxide (Na_2O) with 3-5%, potassium oxide (K_2O) with 2-5% and Iron oxide (Fe_2O_3) constituting 1-5%.[21] Other components are present as trace elements and differ depending on the source origin, enabling us to distinguish various types of obsidian on the basis of measurement of their relative concentrations.

Only a small number of samples found in archaeological sites in modern-day Serbia (out of which at

10 Chapman 1981; Dimitrijević, Tripković 2006.
11 Tripković 2001; Tripković 2004a.
12 Radovanović *et al.* 1984.
13 Chapman 1981: 80; Tripković 2004.
14 Milleker 1938; up. Joanovič 1982, 8.
15 Typological and technological analysis of the chipped stone industries at Vinča from the seasons 1929-1934 have been done by I. Radovanović (1984). This assemblage is stored in the Archaeological Collection at the Faculty of Philosophy in Belgrade. Obsidian artefacts found during excavations 1908-1924 kept in the stores of the National Museum in Belgrade have never been analyzed and the number of these artefacts remain unknown. A number of artefacts from Vinča, including obsidian are stored in the Museum in Birmingham (Renfrew, Cann and Dixon 1965).
16 Srejović, Jovanović 1957; Radovanović *et al.* 1984.
17 The relative depth in which obsidian was found was taken from 'point zero' which remained the same for all seasons of excavation before the Second World War (1908, 1910-1913, 1924, 1929-1934).
18 Radovanović *et al.* 1984.
19 During seasons 1978-1986 the final phases of the settlements were explored and the obsidian from these levels was sampled.
20 Cann & Renfrew 1964; Renfrew, Dixon and Cann 1966; Renfrew, Dixon and Cann 1968; Cann, Dixon and Renfrew 1969.
21 Glascock, Braswell and Cobean 1998.

least seven were from Vinča) have undergone chemical analysis since the characterization work in the 1960's. In their first article Cann and Renfrew used optical spectography, to characterise one blade from Vinča (from ▼8.7 meters) among their 115 samples, and placed it in their group Ia on the basis of trace elements and other attributes, denoting a Carpathian origin of the sample.[22] Spectroscopic analysis of three more blades (from ▼4.1 m, ▼8.5 and ▼8.7 m) have yielded the same results.[23] Over the next four decades Neutron Activation Analysis (NAA) was used to characterize at least three more artefacts from the site showing that two originate from Central Europe[24] and at least one to be from the Carpathian 1 source in present day Slovakia.[25]

Existing results prove that obsidian from the Central Balkans originates in Carpathian sources which represents a good basis for the rejection of earlier ideas of the existence of local sources of obsidian somewhere in the Central Balkans area.[26] Furthermore this data offers a sound foundation for the idea of significant inter-regional trade networks in the late Neolithic period in which obsidian exchange played a very important role.[27] It is important to emphasise that these pioneering characterizations were performed on a statistically inadequate number of samples. This emphasizes the necessity to use a statistically validated number of characterized obsidian samples to interpret complex stratigraphic sequences of the settlement history in Vinča and other nearby sites. An important project on the characterization of obsidian artefacts from the Central Balkans was therefore initiated in 2006, resulting in 60 samples (around 4% of the collection) from chipped stone industry of Vinča being analysed. In relation to the vast stratigraphic sequence of the site, a complex sampling strategy has been developed with clear methodological underpinnings: a) samples were chosen to represent the entire span of the Neolithic sequence and b) to test the possibility of a future macroscopic discrimination of obsidian artefact origins.

New characterisation: sampling strategy and analysis

The large number of obsidian artefacts and their different frequency within the long history of the tell required the development of a targeted sampling strategy prior to the chemical analysis. The criteria for sampling included: (a) visual characteristics of the raw materials, (b) technology and typology of the artefacts and (c) archaeological contexts in which the obsidians were found. The same method has been practiced during sampling of the obsidian material from the important Neolithic site of Çatalhöyük (Turkey). This proved to be important for the future macroscopic discrimination of different obsidian types.[28]

Visual characteristics. Macroscopic discrimination of the obsidians represented the key role within the sampling. The main aim in this was to enable identification of the obsidian source during excavation or techno-typological analysis of chipped stone tools, avoiding the need for expensive analytical techniques. Obsidian is a distinctive raw material within the lithics assemblages, but obsidians from different sources also show different visual properties. Obsidian colour and texture vary depending on the conditions under which lava cooled and the environment in which the obsidian was formed. A higher concentration of iron creates a reddish coloured obsidian while paralkaline obsidians have a distinctive green colour.[29] Occasionally obsidians contain spherulites which give them characteristic speckle appearance, as is the case for Aegean obsidian from Giali island.[30] Therefore, visual discrimination represents an important component for obsidian sampling and has been comprehensively applied to the Vinča assemblage. The raw materials were grouped into distinct types on a basis of colour, translucency, texture, banding and inclusions (Figure 1): (1) Completely transparent, (2) Transparent with dark lines, (3) Completely transparent with tinny white lines, (4) Completely transparent with dark stains, (5) Transparent dark sprinkled, (6) Transparent light sprinkled, (7) Grey cloudy with rough glossy surface.

22 The piece is assigned to group I, together with obsidians from Hungary, Slovakia, Melos, Armenia and south Anatolia, but on the basis of colour and translucency it was separated in group Ia, i.e. Carpathian source. The authors indicated that the sample was received from the Museum of Archaeology and Ethnology in Cambridge and was found during M. M. Vasić's excavations. The obsidian blade (No. 62) possibly belongs to the Starčevo culture; it is described as clear (white), translucent/transparent (Cann and Renfrew 1964: 126, 131, Table 1, Table II).

23 All three samples were assigned to Group I, supra note 22. Furthermore, on the basis of their physical properties (transparency and translucency) they were assigned to the Carpathian source (subgroup Ia). The samples were found during the excavations of M. M. Vasić and belong to the Museum in Birmingham. One of the artefacts was dated to the Starčevo culture (▼8.7). In the table, the samples from the depth of ▼4.1 and ▼8.7 metres are described as transparent, while the sample from the ▼8.5 meter is grey in colour (T. II, samples 151, 152 and 153) - Renfrew, Cann and Dixon 1965, 234-237, Fig. 1, Fig. 4.

24 Aspinall, Feather and Renfrew 1972: 334.

25 Williams-Thorpe, Warren and Nandris 1984. The article refers the origin of the obsidians, not the number of analyzed pieces.

26 see Tripković 2004.

27 Glišić 1968; Chapman 1981; Tripković 2004.

28 Carter *et al*. 2006.

29 Carter *et al*. 2008.

30 Warren 1969: 135-136; Betancourt 1997.

Fig. 1. Macroscopically defined obsidian types from Vinča – Belo Brdo: 1 – Completely transparent; 2 – Transparent with dark lines; 3 – Completely transparent with fine light lines; 4 – Completely transparent with dark stains; 5 – Transparent dark sprinkled; 6 – Transparent light sprinkled; 7 – Grey cloudy with rough glossy surface. Types of raw materials are represented with samples 38 (type 1), 28 (type 2), 37 (type 3), 39 (type 4), 13 (type 5), 17 (type 6), and 42 (type 7)

Сл. 1. Макроскопски дефинисани типови опсидијана са локалитета Винча – Бело Брдо: 1 – Потпуно прозиран; 2 – Прозиран са тамним линијама; 3 – Потпуно прозиран са танким светлим линијама; 4 – Прозиран са тамним мрљама; 5 – Прозиран, тамно „испрскан“; 6 – Прозиран, светло „испрскан“; 7 – Сив, маљичаст са грубом стакластом површином. Типови опсидијана представљени су узорцима 38 (тип 1), 28 (тип 2), 37 (тип 3), 39 (тип 4), 13 (тип 5), 17 (тип 6), и 42 (тип 7).

Technology and typology. The strategy employed required the selection of artefacts which were of a diagnostic nature. Our aim was to separate characteristic artefacts within the *chaîne opératoire* such as cores, waste debris, rejuvenation pieces, end-products (blades).[31] Sampled types are illustrated in Figures 2 and 3. This approach enabled us to identify in what form the obsidian was brought to the site; in the form of nodules which were then locally worked in the settlement or as end-products as part of the exchange processes. Previous techno-typological analyses showed that number of obsidian cores from the site is 22 which represents ca. 1,5% of the obsidian assemblage. The other technological categories are represented in forms of waste debris (20%) and blades (78,5%). On the basis of the large percentage of blades it has been suggested that the obsidian was imported to the site in ready-made form.[32] However, most of the cores, flakes and blades in Vinča were found in the earlier phases of the tell, at a depth of ▼7 m and lower.[33] Their existence together indicates the presence of the whole operational chaîne and production of the artefacts within the settlement at least during certain phases. It is also significant that a whole core tablet was revealed within House 6 which belonged to the final occupational phase of the settlement, dating 4689-4502 cal BC.[34] Thus, it is likely that obsidian was brought to Vinča as a more or less prepared raw material, in the form of non-cortical nodules which could be used for the manufacture of regular unipolar blade cores and in the end unipolar prismatic blades. Most of the cores are quite small in size (between 10-20mm in length) and exhausted which implies that they have been recovered in their last stage of reduction. The initial size of the nodules and cores in the form they entered the settlement unfortunately remains unknown.

Contexts. Since Belo Brdo represents a multi-period settlement, our aim was to sample artefacts that represent all phases of the site's history. The samples were separated on the basis of the relative depth as recorded and labelled during the excavation of M. M. Vasić (1929-1934). A small number of pieces that were found during 1978-1986 seasons were also possible to be included in our program. From each of

31 Due to ongoing techno-typological analysis of the obsidian assemblage from 1929-1934 seasons (by Mrs. Ljiljana Đuričić), our sample was limited to non-diagnostic and non-retouched pieces.
32 Radovanović *et al*. 1984.
33 Radovanović *et al.* 1984, 19.
34 Borić 2009.

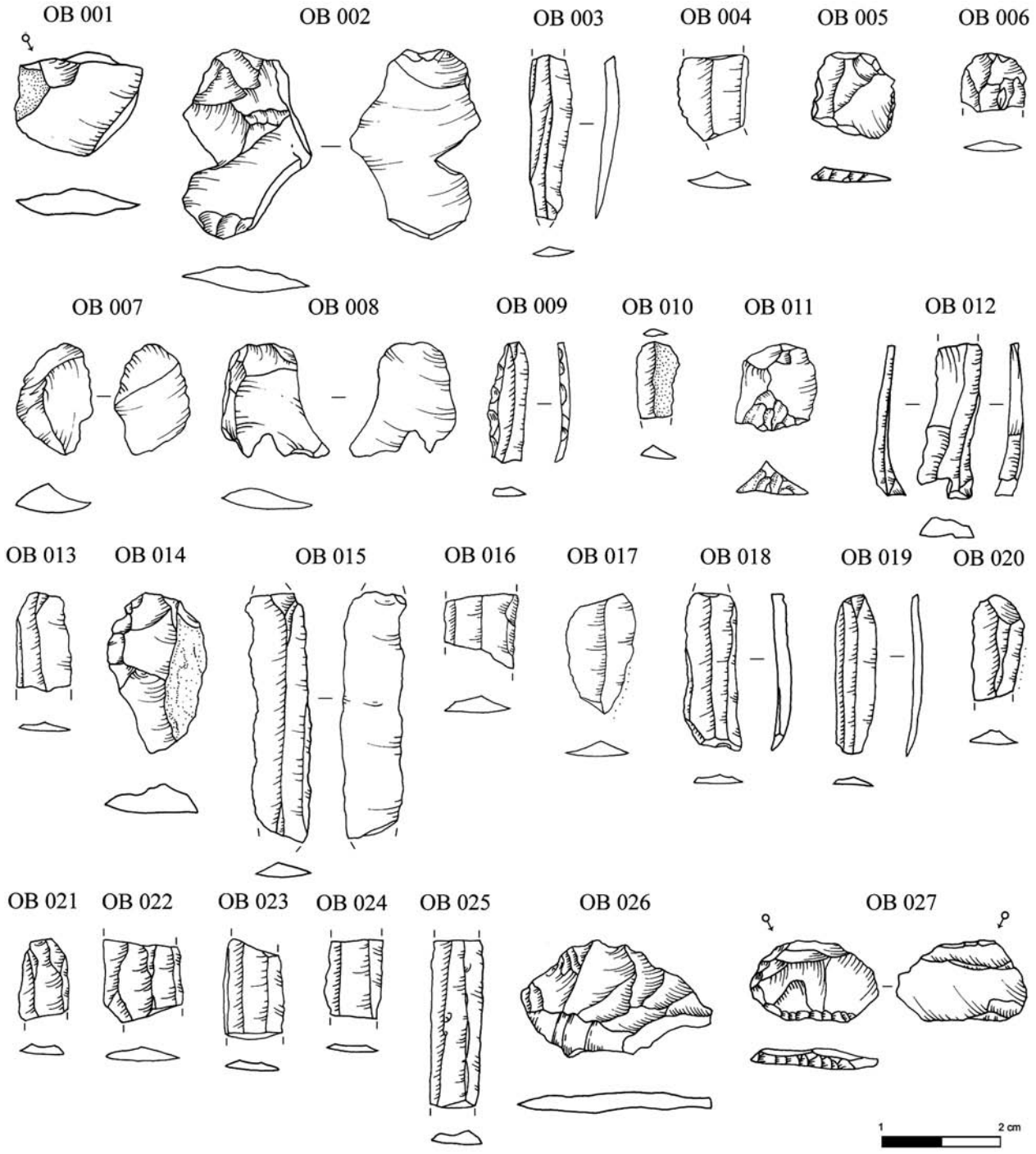

Fig. 2. Characterized artefacts from Vinča, samples 1 - 27.

Сл. 2. Карактеризани артефакти из Винче, узорци 1 – 27.

the levels we separated pieces that belonged to the above mentioned visual types or ones that existed in all of the depth ranges. The number of pieces depended on the size of the assemblage within each level, the largest of which was the sample taken from the phases at the ▼7,0 – ▼7,9 depth which were the richest in obsidian. The percentage of obsidian artefacts in the chipped stone assemblage from this depth totalled 69,9%[35]. Finally, the number of samples taken from

35 Number of pieces in all depths c.f. Radovanović *et al*. 1984, 14.

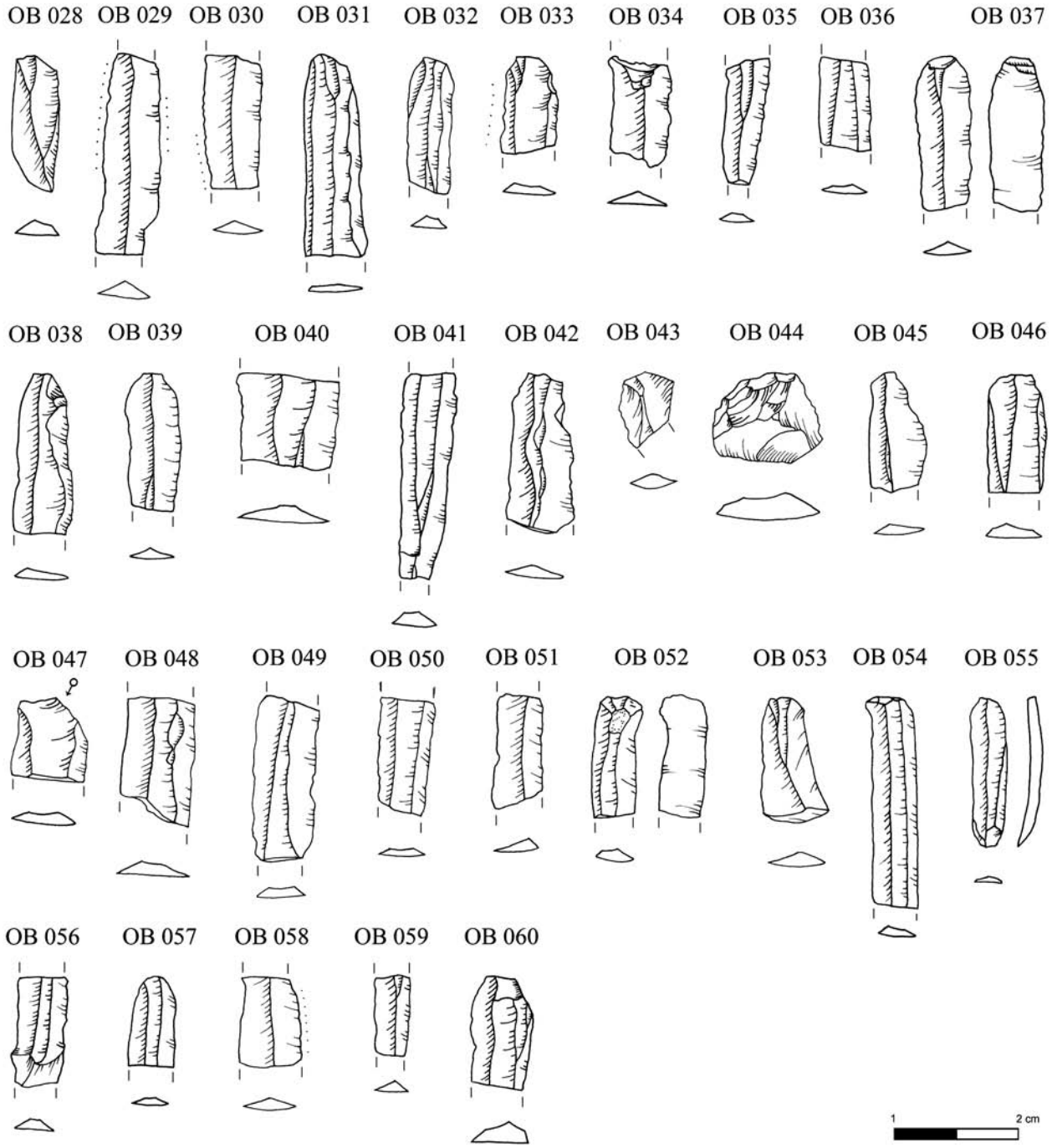

Fig. 3. Characterized artefacts from Vinča, samples 28 - 60.

Сл. 3. Карактеризани артефакти из Винче, узорци 28-60.

each phase was (Table 1): ▼3,0 - ▼3,9 – one piece; ▼4,0 - ▼4,9 – seven pieces; ▼5,0 - ▼5,9 – eight pieces; ▼6,0 - ▼6,9 – eight pieces; ▼7,0 - ▼7,9 – twelve pieces; ▼8,0 - ▼8,9 – eleven pieces; ▼9,0 - ▼9,9 – six pieces; ▼9,13 - ▼10,30 – one piece; seasons 1978-1986 (final occupational phase, Vinča D) – six pieces (Table 1, No. 1-6).

The obsidian samples were characterized using ED-XRF (*energy-dispersive X-ray fluorescence*) at the Geoarchaeological laboratory at Berkeley University, California. The technique is fast and non-destructive, and samples do not require any initial preparation (size should not be smaller than 10mm). The same method was used to analyse geological samples from

No.	Context	Description	Dimensions in cm	Obsidian type
1	Level 24	Medial fragment of a flake with 20% of cortex	1,62 x 2,3 x 0,38	2
2	House 6	Complete flake from core preparation	3,2 x 2,2 x 0,43	1
3	Level 6	Distal fragment of regular unipolar blade	2,78 x 0,74 x 0,19	7
4	Level 6	Medial fragment regular unipolar blade	1,4 x 1,11 x 0,28	1
5	Level 1	Proximal fragment of a flake unilaterally retouched on distal truncation	1,35 x 1,34 x 0,26	2
6	Level 10	Proximal fragment of a flake	1,02 x 1,07 x 0,2	1
7	3,8	Irregular flake	1,65 x 1,29 x 0,55	4
8	4,0-4,9	Complete flake	1,93 x 1,52 x 0,25	4
9	4,0-4,9	Complete regular unipolar blade modified with unilateral marginal retouch	1,98 x 0,61 x 0,15	5
10	4,0-4,9	Proximal fragment of regular unipolar blade with 60% of cortex	1,25 x 0,66 x 0,26	1
11	4,0-4,9	Complete flake	1,51 x 1,28 x 0,57	3
12	4,0-4,9	Distal fragment of a preparation piece from a blade core	2,61 x 0,94 x 0,23	1
13	4,3	Proximal fragment of a regular unipolar blade	1,65 x 0,85 x 0,18	5
14	4,0-4,9	Complete flake with 40% of cortex	2,7 x 1,63 x 0,53	2
15	5,2	Proximal fragment of a regular unipolar blade	4,21 x 0,99 x 0,23	1
16	5,0-5,9	Medial fragment of a regular unipolar blade	1,26 x 1,17 x 0,3	2
17	5,0-5,9	Complete flake	1,99 x 1,12 x 0,21	6
18	5,0-5,9	Proximal fragment of a regular unipolar blade	2,62 x 0,88 x 0,23	5
19	5,3	Complete regular unipolar blade	2,65 x 0,67 x 0,17	4
20	5,0-5,9	Proximal fragment of a regular unipolar blade	1,76 x 0,83 x 0,21	4
21	5,0-5,9	Proximal fragment of a regular unipolar blade	1,31 x 0,78 x 0,15	5
22	5,0-5,9	Medial fragment of a regular unipolar blade	1,42 x 1,3 x 0,21	2
23	6,6	Medial fragment of a regular unipolar blade	1,65 x 0,97 x 0,14	5
24	6,9	Medial fragment of a regular unipolar blade	1,33 x 0,9 x 0,1	5
25	6,0-6,9	Medial fragment of a regular unipolar blade	2,84 x 0,84 x 0,26	1
26	6,6	Complete preparation piece	1,95 x 3,24 x 0,36	5
27	6,6	Complete flake modified with unilateral marginal retouch	1,4 x 2,21 x 0,37	5
28	6,0-6,9	Complete blade-like-flake	2,17 x 0,75 x 0,25	2
29	6,5	Medial fragment of a regular unipolar blade	3,23 x 0,9 x 0,25	7
30	6,0-6,9	Medial fragment of a regular unipolar blade	2,18 x 0,89 x 0,21	2
31	7,7	Proximal fragment of a regular unipolar blade	3,28 x 0,87 x 0,15	4
32	7,7	Proximal fragment of a regular unipolar blade	2,14 x 0,69 x 0,19	7
33	7,8	Proximal fragment of a regular unipolar blade	1,54 x 0,83 x 0,15	4
34	7,8	Medial fragment r of a regular unipolar blade	1,72 x 0,97 x 0,27	5
35	7,4	Medial fragment of a regular unipolar blade	2,05 x 0,66 x 0,17	2
36	7,8	Medial fragment of a regular unipolar blade	1,46 x 0,79 x 0,16	5
37	7,0-7,9	Proximal fragment of a regular unipolar blade	2,47 x 0,89 x 0,25	3
38	7,8	Proximal fragment of a regular unipolar blade	2,58 x 0,95 x 0,18	1

No.	Context	Description	Dimensions in cm	Obsidian type
39	7,8	Proximal fragment of a regular unipolar blade	2,17 x 0,86 x 0,17	4
40	7,8	Medial fragment of a regular unipolar blade	1,46 x 1,67 x 0,25	2
41	7,7	Medial fragment of a regular unipolar blade	3,34 x 0,87 x 0,22	3
42	7,7	Proximal fragment of a regular unipolar blade	2,5 x 1,04 x 0,24	7
43	8,0-8,9	Proximal fragment of a flake	1,19 x 0,8 x 0,29	5
44	8,0-8,9	Complete flake	1,48 x 1,77 x 0,44	5
45	8,3	Proximal fragment of a regular unipolar blade	1,94 x 0,87 x 0,17	4
46	8,1	Proximal fragment of a regular unipolar blade	1,9 x 0,93 x 0,2	5
47	8,5	Proximal fragment of a regular unipolar blade	1,32 x 1,17 x 0,2	2
48	8,1	Medial fragment of a regular unipolar blade	2,08 x 1,1 x 0,29	7
49	8,4	Medial fragment of a regular unipolar blade	2,67 x 0,98 x 0,22	5
50	8,0-8,9	Medial fragment of a regular unipolar blade	1,79 x 0,82 x 0,16	2
51	8,4	Medial fragment of a regular unipolar blade	1,8 x 0,81 x 0,29	5
52	8,7	Proximal fragment of a bipolar blade with 5% of cortex	1,98 x 0,68 x 0,17	1
53	8,4	Distal fragment of a blade-like-flake	2,01 x 1,01 x 0,23	5
54	9,2	Proximal fragment of a regular unipolar blade	3,4 x 0,71 x 0,17	1
55	9,0-9,9	Complete regular unipolar blade	2,41 x 0,56 x 0,16	2
56	9,0-9,9	Medial fragment of a regular unipolar blade	1,73 x 0,8 x 0,2	5
57	9,0-9,9	Proximal fragment of a regular unipolar blade	1,44 x 0,69 x 0,14	5
58	9,0-9,9	Medial fragment of a regular unipolar blade	1,42 x 0,97 x 0,2	4
59	9,0-9,9	Medial fragment of a regular unipolar blade	1,27 x 0,55 x 0,2	3
60	9,13-10,30	Proximal fragment of a regular unipolar blade	1,77 x 0,94 x 0,35	7

Table 1. Obsidian samples from Belo Brdo in Vinča.

Табела 1. Узорци опсидијана са локалитета Винча – Бело Брдо

the Carpathian sources in Slovakia (Carpathian 1) and Hungary (Carpathian 2) in order to compare results of the composition of the archaeological artefacts with the geological samples. During prehistory obsidian from both sources was widely in use, though the Slovakian obsidian was more intensively exploited as the raw material was of better quality. Across the Danube, Neolithic communities from Southeast Pannonia also consumed the obsidian from Slovakian sources more frequently.

Results and comments

Following the analysis of the obsidian samples, the combination of three chemical elements has proven the most usable: Zirconium (Zr), Iron (Fe) and Strontium (Sr). The diagram (Figure 4) shows that all of the Vinča artefacts sampled can be grouped within one cluster, indicating the same origin. In comparison with the geological samples it is clear that all of the Vinča obsidians originate from Carpathian 1 source in present day Slovakia. These results are in full accordance with all of the previous characterizations of Vinča culture obsidian found in the region, including those from the Romanian Banat region.[36] Considering the number of characterized samples (4% of the entire number of artefacts) and the systematic sampling procedure, two analytical postulations can be made: (1) this work represents an important step towards the affirmation of the macroscopic discrimination of

36 Williams-Thorpe 1984; Biagi, Gratuze and Boucetta 2007; Biagi, De Francesco and Bocci 2007.

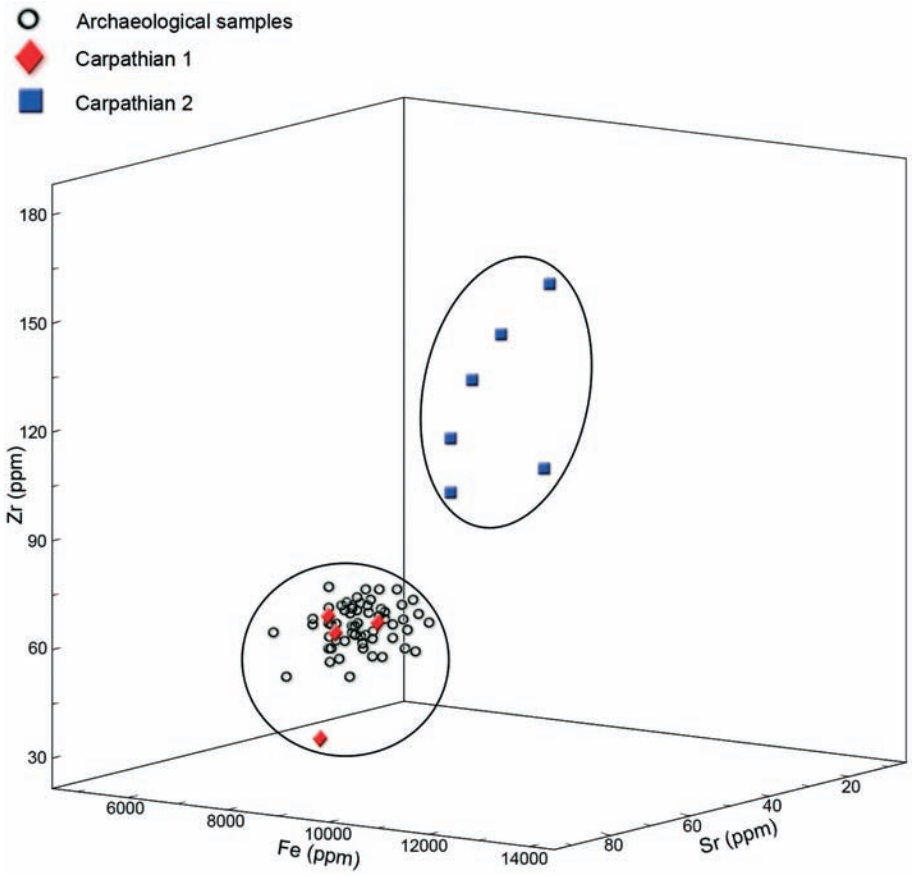

Fig. 4. Correlation between Fe (Iron), Zr (Zirconium) and Sr (Strontium) of archaeological and geological samples

Сл. 4. Корелација Fe (гвожђе), Zr (цирконијум) и Sr (стронцијум) у археолошким и геолошким узорцима

obsidians found in Central Balkans that originate from Carpathian 1 source, (2) the evidence indicates that the obsidian pieces from the Belo Brdo site in Vinča all originate from the same source. If the future shows the latter postulation to be true, then we may undoubtedly state that the Neolithic community of Vinča, as well as others in the vicinity,[37] have recognized, appreciated and valued mainly obsidian originating from the Carpathian 1 source.

In order to understand the number of obsidian artefacts and their origin, it is important to understand the nature of contacts of the Vinča community with communities located in the north through whom the obsidian was provided. Traditionally, it was assumed that the Vinča inhabitants have had intensive and long lasting inter-cultural contacts with the Tisza communities of the Carpathian basin. These contacts were evidenced not only in numerous obsidian artefacts, but also in the sporadic occurrence of the pottery and other materials that belong to Tisza cultural circle.[38] Aside from this, the wider area of the middle Danube including Vinča and southeast Pannonian basin is part of an interactive cultural zone in which other types of culturally non-specific items circulate, like alabaster, marble and marine shell jewellery.[39] Obsidian should almost certainly be regarded as one of the links and reasons for communication and contacts of Vinča and Tisza communities. With its dominance in the chipped stone industry at Vinča (located several hundred kilometres away from the source) it is a product of an efficient exchange network that was also manifested in the appearance of other exotic goods. One of the possible directions for further research into the extent of these contacts is the discovery of a monumental *Myres* pithos in Vinča (▼7.44 m), which coincides with a high frequency of obsidian artefacts. The primary assumption was that the size of the huge vessel (1,2 meter high) did not allow for its direct import from the Tisza culture region, thus making it plausible to be a local on-site production.[40] Furthermore it has been proposed that the creation of the pithos is the result of marriage connections between inhabitants of Vinča and Tisza communities, also manifested through a

37 Biagi, De Francesco and Bocci 2007.
38 Tripković 2004; Glišić 1968; Chapman 1981; Radovanović *et al.* 1984.
39 Chapman 1981; Korek 1988; Kalicz, Raczky 1987; Müller 1997.
40 Glišić 1968; Garašanin 1979.

high frequency of obsidian and other artefacts exotic to the origin.[41] Having in mind that these contacts were especially intensive in the last centuries of the 6th millennium BC, the appearance of a monumental pithos in Vinča most definitely represents the effects of the maximal extent of the exchange between these communities, whether as a result of marriage relationships, regional and regular movement of goods, or as a combination of all the things.

The sheer number of obsidian artefacts in Vinča raises an issue of the manner in which the procurement of mainly single-source obsidian has influenced its further distribution towards other parts of the Central Balkans. The total weight of obsidian artefacts found at Vinča, as has already been noted,[42] is relatively low. While the population of Vinča must have had some influence on the quantity of obsidian found in other settlements south of the rivers Sava and Danube, it remains questionable whether we can perceive an organized and socially stimulated exchange network functioning from the Danube region towards the inland Balkans. Obsidian artefacts on the sites located south of the Sava and the Danube, and especially in the valleys of the rivers Velika and Južna Morava, are being found only to a very limited extent, either as isolated examples or up to several dozen pieces per site, a fact that does not accord with Renfrew's old suggestion about the proportional decline of the numbers of obsidian within a "down the line" exchange model.[43] The accumulation of most of the obsidian in Vinča, and a limited exchange of blades (and/or cores?) may indicate the existence of several interactive levels within the exchange network, almost certainly leading to the total exclusion of some settlements from it. It must also be mentioned that, at the time the obsidian frequency in Vinča declines, other surrounding settlements yield a very limited number of obsidian artefacts (e.g. Gomolava,[44] Divostin,[45] Banjica[46]). This indicates a disturbance in active and long practiced exchange networks and possibly even reflecting wider social changes in the cultures of the Carpathian basin.[47] At the same time, most of the other settlements of the Central Balkan region, specifically those found south of the Sava and the Danube are focused on the use of easily available sources of raw material found in the close vicinity of the settlements.[48] A future review and characterization of obsidian collections originating from settlements other than Vinča may show the complexity of the exchange network during the late Neolithic in the Central Balkans.[49] For now, it would be wise to assume that the southernmost obsidian of the Carpathian region, discovered at the sites of Mandalo[50] in Aegean Macedonia and Žitkovac[51] in Kosovo represent alternative routes and patterns of movement of various goods, including the movement of individuals outside the usual flows of reciprocal exchange.

Conclusion

The characterization of 60 obsidian samples discovered at the Belo Brdo site in Vinča represents the largest collection characterized in the Central Balkans to date. The results of this program of sampling allows the creation of a framework to be applied in future studies which can provisionally discriminate the origin of raw materials macroscopically. Finally, the results of this research have shown that all of the samples originated in the Carpathian 1 source, though presently it is uncertain to which extent other Carpathian sources might have contributed to the influx of obsidian into the Central Balkans. The available data suggests that if this is the case, it represents a minimal percentage at best. The Neolithic community at Vinča engaged in dynamic and long lasting modes of contact with the communities of the Tisza region. These contacts most likely included the exchange of many other goods, not only obsidian, and important modals explaining the extent and the types of this exchange have been developed. The evidence clearly shows that large quantities of obsidian have been accrued at the site of Vinča in particular. Most of the other settlements, even those in close proximity contain remarkably limited quantities of this much valued 'black stone', representing peripheral manifestations of the obsidian exchange networks. Obsidian travelled great distances to reach this important Danubian site, and the historical circumstances that brought it there warrant continued exploration. Our greatest questions are therefore relate to where exactly did it come from and leading from this we can now begin to chart the processes which led to its use even at the very margins of its spatial distribution.

41 Glišić 1968; Chapman 1981.
42 Chapman 1996; Chapman 1998.
43 Chapman 1981, Fig. 109-110; Kaczanowska, Kozlowski 1990a, 36.
44 Kaczanowska, Kozlowski 1990b.
45 Tringham 1988.
46 Тодоровић, Церманović 1961; Трипковић 2007.
47 Takács-Biró 1991, 34; Biró 1998a; Biró 1998b; Tripković 2004; Kaczanowska, Kozlowski 1990,36.
48 Богосављевић-Петровић 1992; Богосављевић-Петровић 2001; Mihailović 2001; Radovanović 1987; Радовановић 1996; Antonović 1997; Antonović 2003; up. Tripković 2004, 171, Table 3.
49 Milić, Tripković: in prep.
50 Kilikoglou *et al.* 1996.
51 Chapman 1981, 302-303, Fig. 98.

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Резиме

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ПОРЕКЛО И РАЗМЕНА ОПСИДИЈАНА СА ЛОКАЛИТЕТА ВИНЧА – БЕЛО БРДО

Кључне речи: Опсидијан, Винча, карактеризација, ED-XRF, Карпатски 1, размена.

Регионални значај локалитета Бело брдо у Винчи и његова активна улога у мрежи размене најбоље се огледају у великом броју „егзотичних“ добара који у различитом степену карактеришу све винчанске нивое. И док су налази од бакра или накит од маринских шкољака у последње време детаљно проучавани, опсидијан је, као важан симбол комуникације и контаката надрегионалног значаја, остао ограничен на типолошку анализу унутар окресане индустрије насеља. Збирка опсидијана из Винче, међутим, представља једну од три најбројније збирке на територији данашње Србије, и далеко најбројнију збирку јужно од Саве и Дунава. Њени недостаци су више контекстуалне природе, огледајући се у непостојању прецизних истраживачких података о системском контексту већине артефаката, што је уосталом случај и са већином других објеката из Винче, и стога ће многа питања око њихове везаности за одређене објекте (односно домаћинства), или начина депозиције заувек остати отворена. Ипак, за разлику од насеља око Вршца у југоисточној Панонији, одакле за велике опсидијанске збирке постоји мало података о условима налаза, захваљујући студиозном раду Милоја Васића за налазе из Винче постоје прецизни подаци о стратиграфској позицији и, према томе, о релативној фреквентности артефаката кроз све стратиграфске нивое. То је важно нагласити, јер вертикалне и слојевите секвенце винчанског насеља дозвољавају поређење не само фреквентности опсидијана кроз време, већ и поређење са другим врстама импортованих или локално израђиваних добара, трасирајући путеве и историјски контекст којим су опсидијан и друга роба регионалног и интеркултурног значаја доспели на ово важно налазиште европске праисторије.

Од времена револуционарне карактеризације опсидијана шездесетих година 20. века, анализи хемијског састава подвргнут је тек незнатан број узорака са територије данашње Србије, од чега најмање седам из насеља у Винчи. Постојећи резултати указали су да опсидијан са централног Балкана води порекло из карпатских лежишта што, с једне стране, представља добру основу за одбацивање некадашњих романтичарских идеја о постојању локалних извора опсидијана негде на централном Балкану, нудећи, с друге стране, добро утемељење закључке о мрежи размене интеррегионалног значаја током касног неолита, чији је важан део био и опсидијан. Ипак, неопходно је приметити да досадашње карактеризације, урађене на неадекватном броју узорака, исказују потребу да се комплексне стратиграфске секвенце насеља у Винчи, али и других насеља у окружењу, протумаче и кроз одговарајући број карактерисаних опсидијанских узорака. Стога је 2006. покренут велики пројекат карактерисања опсидијанских артефаката са централног Балкана и у ту сврху, из окресане индустрије насеља у Винчи издвојено је 60 узорака, што представља око 4% референтне збирке. С обзиром на моћну стратиграфску секвенцу локалитета, направљена је комплексна стратегија селекције узорака, са јасним методолошким исходиштима: а) да издвојени узорци репрезентују целу неолитску секвенцу и б) да се тестира могућност будуће макроскопске аутопсије порекла опсидијанског артефакта.

Након анализе опсидијанских узорака EDXRF методом, показало се да сви артефакти из Винче потичу из лежишта Карпатски 1 у данашњој Словачкој (ДИЈАГРАМ 1), што је потпуно у складу са свим ранијим карактеризацијама винчанских опсидијана у региону, укључујући и оне из румунског дела Баната. С обзиром на број карактерисаних узорака и комплексну процедуру узорковања, створене су за даљи рад две важне аналитичке претпоставке: прва, искључиво техничке природе, представљала је важан корак ка афирмацији будуће макроскопске аутопсије опсидијана из извора Карпатски 1 на централном Балкану; и друга, у спекулативном смислу далекосежнија, да сви примерци из опсидијанске збирке са локалитета Бело брдо у Винчи потичу из само једног, дакле истог извора. Ако се друга претпоставка у будућности покаже као тачна, онда поседујемо недвосмислену потврду да је заједница у Винчи, уосталом као и друге заједнице у окружењу, препознавала, ценила и вредновала углавном опсидијан из данашњег лежишта Карпатски 1.

За разумевање броја опсидијанских артефаката и порекла сировине, најважнија су питања која се односе на карактер контаката заједнице из Винче са заједницама на северу, преко којих су тај опсидијан добављале. Традиционално се прихвата да су становници насеља у Винчи интензивне и дугорочне интеркултурне контакте одржавали са потиским заједницама у Карпатском басену, о чему сведоче не само многобројни опсидијански артефакти, него и спорадична појава керамике и другог материјала из потиског културног круга. Осим тога, шира зона средњег Подунавља, заједно са Винчом и југоисточном Панонијом, део је интерактивног културног круга, у коме циркулишу друге врсте културно неспецифичних артефаката, нпр. накит од алабастера, мермера и маринских шкољака. Опсидијан је свакако био једна од спона и разлог комуникације и контаката винчанске и заједница у Потисју, те се његова доминација у окресаној

индустрији Винче, неколико стотина километара од извора, може разумети као производ ефектне мреже размене, која је морала бити и била је манифестована и појавом других егзотичних добара.

Број опсидијанских артефаката у Винчи покреће питање на који начин је набавка опсидијана углавном из само једног извора утицала на његову даљу дистрибуцију у друге делове централног Балкана. Како је примећено, укупна тежина артефаката из Винче релативно је ниска и мада је насеље морало некако утицати на количине опсидијана у насељима јужно од Саве и Дунава, велико је питање да ли се може говорити о организованој и друштвено стимулисаној мрежи размене од Подунавља према унутрашњости Балкана. Опсидијански артефакти на локалитетима јужно од Саве и Дунава, нарочито у долинама Велике и Јужне Мораве, јављају се у ограниченом обиму, појединачно или до неколико десетина комада, не уклапајући се најбоље у стару идеју Колина Ренфруа о пропорционалном опадању броја опсидијана током „размене дуж пута“. Задржавање већине опсидијана у Винчи, као и даља размена веома ограниченог броја сечива (и/или језгара?) указују на то да је у мрежи размене постојало више интерактивних нивоа, те да су нека насеља свакако била искључена из ње. Такође, у време када фреквентност опсидијана у Винчи драстично опада, нека насеља садрже веома ограничен број опсидијанских артефаката (нпр. Гомолава, Дивостин, Бањица), што показује неки поремећај у активној и дуго времена практикованој мрежи размене, и можда рефлектује шире културне промене у карпатском басену. У исто време, већина других насеља на централном Балкану, нарочито она јужно од Саве и Дунава, окренута су употреби лако доступних извора камених сировина у непосредном окружењу насеља. Стога би у будућности преглед и карактеризација опсидијанских збирки из других насеља могли указати на комплексност деловања мреже размене током касног неолита на централном Балкану. За сада, не би било на одмет претпоставити да најјужнији опсидијани из Карпатске области, откривени у Мандало у Егејској Македонији и, вероватно, нешто севернije у Житковцу на Косову, репрезентују алтернативне руте и обрасце кретања различитих добара, укључујући и кретање појединаца ван уобичајених токова реципрочне размене.