OBIDIAN DEPOSITS IN THE CENTRAL BALKANS?
TESTED AGAINST ARCHAEOLOGICAL EVIDENCE

Abstract. – Finds of obsidian artefacts on sites distant from the presumed primary source have often received a romantic note in the history of archaeology, manifested in the idea about local exploitation as a form of procurement and archaeologists’ search for as yet undetected deposits of this raw material. In due course, such concepts have found their way into Serbian archaeology as well. The main objective of this contribution, therefore, is to reconsider the current knowledge about obsidian in the central and north Balkans, to test how well founded the idea about the use of local sources is, as well as to indicate some possible directions for future research.

Keywords. – obsidian, Neolithic, central and north Balkans, chipped stone industry

SOURCES AND DISTRIBUTION ZONES.
ROLE AND IMPORTANCE OF OBSIDIAN

Since the beginning of the twentieth century, when the importance of obsidian for the prehistory of Europe only began to be recognized, obsidian studies have taken on an increasingly interdisciplinary character and now constitute a discipline in its own right. Interest in this raw material has been reinforced by its exotic origin and the small number of potential sources, mostly limited to the areas of past volcanic activity. The formation of obsidian mainly depends on conditions that are not directly connected with those leading to a volcanic eruption. Central to its formation is the lava containing over 65 percent silica and a specific rhythm of its cooling.1 As a result, obsidian deposits are restricted to a small number of locations. In the Near East, Anatolia and Europe – areas showing wide cultural contacts in the Neolithic and Eneolithic (Chalcolithic) as the period of the widest and the most significant distribution of obsidian finds – its natural occurrences are limited to few locations (Fig. 1):

1. Central and east Anatolia. A few significant sources of obsidian are known to have been exploited and the raw material distributed over great distances through an exchange network.2 In recent times new deposits have been detected, but the research still being in its initial stage, their role and importance in the life of prehistoric communities are as yet unknown.3

2. The Aegean. Obsidian deposits occur in the islands of Antiparos, Giali and Melos, but Neolithic populations exploited only the high-quality obsidian from Melos, some 100 km off the coast of mainland Greece.4 The obsidian from Antiparos is of exceptionally low quality and was not used in the Aegean; the obsidian from Giali, being of inferior quality, was used for tools only in the islands in the proximity of the deposits, where easy access and regular supply was possible.5

3. The Central Mediterranean. Obsidian sources occur in the islands of Palmarola, Pantelleria, Sardinia

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1 I am thankful to my colleagues Vera Bogosavljević-Petrović, Josip Šarić and Vesna Dimitrijević for their comments on the original version of this text and helpful information; all responsibility for the ideas and conclusions herein proposed is, of course, entirely mine.
2 Cann, Dixon & Renfrew 1969: 580.
6 The obsidian from the island of Giali containing white spherulites is aesthetically pleasing and was used particularly during the Bronze Age not only for knapping tools but also for carving vases and seals (Betancourt 1997; Warren 1969: 135–136)
4. The Carpathian Basin. Deposits occur in southeast Slovakia and northeast Hungary, in the Tokaj–Prešov area. Obsidian from both sources is found in the same territory but, being of better quality, the Slovakian is much more frequent. Interestingly, characterization of certain pieces has not shown the chemical composition specific to the known Carpathian deposits, which has led to the assumption about some as yet undetected sources.

In all obsidian distribution zones, regularity in artefact concentrations is observable: the highest occur in areas adjacent to a source and their frequency tends to decrease as the distance from the source increases. Generally speaking, that would mean that populations regulated their need for a lithic industry mainly at the level of the availability of resources. In terms of individual sites, however, such a generalization would certainly need to be modified given that the aforementioned regions have yielded relatively frequent sites where the obsidian component is not proportional to the distance from the source. Such situations only show that the procurement and use of obsidian was sometimes motivated by reasons other than strictly practical and that its value may have been defined and maintained in different ways.

Given the number of studies dealing with obsidian in the past hundred odd years, its importance and role can best be judged from the epithets applied to it by archaeologists. Speaking of the deposits and distribution of obsidian in the Late Neolithic of the Carpathian Basin, K. Biró describes it as the »Hungarian most famous raw material«. In order to explain its role and value R. Tykot

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6 Tykot 1996: 42–43.
makes use of the metaphor «black gold» as the most appropriate term. These metaphors coined by members of the archaeological community in fact contain paradigms of understanding obsidian in a cultural context wherein it is seen either as an exotic, highly prized and prestigious commodity or as a raw material intended for everyday use only.

These paradigms stem from an approach imposed by obsidian studies themselves, through looking at obsidian in isolation from specific chronological or cultural contexts and a simplified understanding of its role as remaining unchanged over time. Such an approach, however, is not in correlation with some basic analytical parameters – the continuity and extent of use. Namely, once it came into use in an area, obsidian remained in use, with varying degrees of frequency, almost to the end of prehistory. The fact that in some areas this continuity means tens of thousands of years is a major obstacle to understanding obsidian and the attitude of prehistoric communities towards this raw material. Therefore a prerequisite for understanding its role is to perceive its exploitation, processing and distribution according to specific cultural and historical sequences, and particular local contexts. Analysis of the sociohistorical context of its use in the Neolithic has led to the conclusion that its role cannot be seen as simple. It may have been manifold: the utility value was emphasized through the quality and technical characteristics facilitating the processing of the raw material; its economic value was defined through exchange where obsidian represented both the means and the end; its social value was defined through conveying the message about unknown lands and different times.

The widest distribution of obsidian takes place during the Neolithic; obsidian finds occur widely around a source, sometimes at a distance of nearly one thousand kilometres. If prehistoric communities did not have direct access to one of the nearest sources, the mechanism of procurement was limited to their participation in an exchange network, where multiple interactions arise naturally: between man and a raw material/artefact, man and the environment, and man and man. In that sense, the importance of obsidian, as a means of cultural integration of distant territories, is indisputable. On the other hand, in the history of archaeology obsidian finds on sites distant from the presumed primary source have often received a romantic note, manifested in the idea about local exploitation as a form of procurement and archaeologists’ search for as yet undetected deposits of this raw material. In due course, they have found their way into Serbian archaeology as well. The main objective of this contribution therefore is to reconsider the current knowledge about obsidian in the central and north Balkans, to test how well founded the idea about the use of local sources is, as well as to indicate some possible directions for future research.

OBSIDIAN IN THE CENTRAL BALKANS: THE ISSUE OF ITS ORIGIN

Obsidian finds in the central Balkans were first observed as early as the late nineteenth and early twentieth centuries, when Neolithic sites began to be excavated. Its source was usually looked for in Melos, one of the Cyclades or, as it was believed at the time, in the Bükk Mountains in Hungary. Today, some hundred years later, a detailed study of the obsidian finds has not been made yet. The accumulated evidence has served merely to mark out the approximate zone of their distribution.

During the Early and Middle Neolithic obsidian artefacts are found mostly on settlement sites in the Danube Basin (Fig. 2). And yet, in the flint industry of Starčevo settlements they occur in low percentages and can by no means be regarded as a relevant feature of the Starčevo culture (Table 1). Lack of statistical analyses has little influence on this inference, because recent research shows that the presence of obsidian is weak even on the sites whose chipped stone industry has been studied in detail. Only on two sites is this percentage relatively high (Golokut – 18.51 %, and Livade – 6.45 %), which, as the author himself observes, is likely the result of an unrepresentative sample.

The occurrence of obsidian in the central and north Balkans changes to an extent in Late Neolithic and

\[\text{\cite{10} Tykot 202.} \\
\text{\cite{11} Gopher, Barkai & Marder 1998; Balkan-Atli et al. 1999;} \\
\text{\cite{12} Ammerman & Polglase 1993; Renfrew & Bahn 1991.} \\
\text{\cite{13} Özdogan 1994.} \\
\text{\cite{14} Trijkovic 2003; Trijkovic: forthcoming.} \\
\text{\cite{15} Triploumou 2001; Trijkovic: forthcoming.} \\
\text{\cite{16} Kunov et al. 2003.} \\
\text{\cite{17} For a detailed history of archaeological research into Neolithic sites in the central and north Balkans, see Srećević (ed.) 1988.} \\
\text{\cite{18} It is certain today that the island of Melos is the main source of obsidian in the Aegean, but it is also certain that the source of obsidian for Central Europe is the Tokaj–Prosv region rather than the Bükk Mountains. The misapprehension has stemmed from associating the name of the Bükk culture with obsidian sources.} \\
\text{\cite{19} Chapman 1981; Greif 1995; Willms 1983.} \\
\text{\cite{20} Шаров 1992; Šarić 2002.} \]
Fig. 2. Sites with obsidian finds in the central and north Balkans;
- Starčevo culture; • – Vinča culture; ★ – Sopot–Lengyel culture;
1) Mesić Kanal; 2) Westrand; 3) Kozluk; 4) Aš; 5) Potporanje Granice; 6) Potporanj; 7) Opopo; 8) Vinča;
17) Simića Strana; 18) Popovića Brdo; 19) Gomolava; 20) Golokut; 21) Donja Branjevina; 22) Šamajovci

Vinča times. The distribution zone expands and the finds tend to concentrate on sites in the Tisa Valley, the
south Banat and the Morava Valley (see Fig. 2). By comparison with Starčevo settlements, there is also a
significant change in the number of obsidian finds. Their proportion in the chipped stone industry now
varies drastically from total absence to exceptionally strong presence (Table 2). On some south-Banat sites
(Potporansje Granice, Potporanj, At) significant assemblages of obsidian finds were collected as early as
the first half of the twentieth century. On the site of Belo Brdo at Vinča, in the period represented by the
layer of occupation at a depth of 9–7 m (Vinča A–B1), obsidian accounts for almost 70 percent of its chipped
stone industry. Then it abruptly decreases and in the overlying levels, above 5 m, obsidian is almost absent
from the settlement.

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21 The lithic assemblages were not obtained by systematic excavation, but the number of obsidian finds is by no means negli-
gible (Milleker 1938: 131).
22 Сржонов и др. 1957: 257; Радовановић и др. 1984; Триковар 2001. At Vinča, the youngest obsidian artefact is recorded at
a depth of 3.8 m; above that point, in later layers, no obsidian finds have been reported (Willms 1983: 338).
<table>
<thead>
<tr>
<th>Site</th>
<th>Chipped stone industry</th>
<th>Obsidian</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golokut, Vizić</td>
<td>27</td>
<td>18.51 %</td>
<td>Šarić 2002</td>
</tr>
<tr>
<td>Blagotin, Trstenik</td>
<td>2349</td>
<td>0.08 %</td>
<td>Šarić 2002</td>
</tr>
<tr>
<td>Livade, Kalenić</td>
<td>31</td>
<td>6.45 %</td>
<td>Šarić 2002</td>
</tr>
<tr>
<td>Simića Strana, Čučuge</td>
<td>45</td>
<td>2.22 %</td>
<td>Šarić 2002</td>
</tr>
<tr>
<td>Popovića Brdo, Zablace</td>
<td>933</td>
<td>0.32 %</td>
<td>Šarić 2002</td>
</tr>
<tr>
<td>Donja Branjevina, Deronje</td>
<td>838</td>
<td>0.47 %</td>
<td>Šarić 2002</td>
</tr>
</tbody>
</table>

Table 1. Proportion of obsidian in the chipped stone industry of the Starčevo culture

Significant obsidian assemblages have only been recovered from a few Vinča sites. On some well-explored sites such as Divostin, Selevac or Gomolava, the structure of chipped stone industry does not reveal a marked tendency towards the procurement and use of this raw material. At Divostin, in the layer corresponding to the culture’s final phase only 17 obsidian pieces have been found, which accounts for no more than about 1 percent of its chipped stone industry, while Gomolava has yielded only two finds. It is only at Selevac that the procurement of obsidian is more dynamic, varying over time but never exceeding 5 percent of the chipped stone industry in a single building level. It is clear therefore that obsidian does not form part of the usual cultural picture in the central Balkans, and that large assemblages known from south-Banat sites or Vinča are as a rule absent from many well-investigated sites. It is conspicuous, however, that variations in the frequency of obsidian occur between sites that share the same environment and belong to the same cultural variety, and therefore cannot be ascribed simply to the site’s remoteness from the raw material source.

The frequency of obsidian finds on some Vinča sites is not without significance for it directly suggests the possibility of local supply and the presence of obsidian deposits somewhere in the central Balkans. It is even more significant in that it occurs in a territory which, after the detection of Carpathian and Aegean deposits, has from force of habit been perceived as a zone lacking such sources. Thus the use of local obsidian deposits during the Neolithic suggested by some archaeologists and geologists in the second half of the twentieth century has passed relatively unnoticed in the scholarly community. These suggestions were usually expressed in a hypothetical form, but in a few cases possible obsidian sources were identified:

- In an analysis of the raw-material structure of chipped stone industry from the site of Banjica it has been suggested that its few obsidian finds probably came from Avala, a nearby mountain of volcanic origin, where obsidian is presumed to be associated with local rhyolitic veins. The site of Banjica belongs to the Vinča culture and is generally dated to a period of the late Vinča-Turdas to Vinča-Pločnik phases.

- On the site of Ilića Brdo near the village of Čučuge, obsidian has been found and its source detected at the bottom of Mt Cer. The settlement belongs to the Vinča culture and is generally dated to the period of the Gradac to Vinča-Pločnik I phases.

- On the site of Simića Strana near the village of Čučuge obsidian finds have been reported and attention drawn to its deposits in the valley of the Onjeg, a small local stream on the slopes of Mt Rudnik. The settlement belongs to the Starčevo culture.

- From a detailed study of the raw-material structure of the Early and Middle Neolithic chipped stone industry J. Šarić infers (pointing also to the presence of obsidian pebbles in the Onjeg) that in some areas of the central Balkans obsidian may have occurred in the form of smaller deposits which are now inaccessible or had already been exhausted during the Neolithic.

The data and assumptions about local occurrences of obsidian are very inspiring, especially in the light of evidence confirming that the central Balkan uplands (e.g. Avala and Rudnik) harboured exploitation centres for various important raw materials in the Neolithic. The dynamic of Neolithic communities, where mobile economies and impermanent settlement continued to

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23 Симич & Костич 1961: 68.
24 Тodorović & Пећанковић 1961.
26 Јевк 1998: 34, gives notice that the information about obsidian deposits in the Onjeg valley comes from S. Цитковић, a geologist with the Nemetali mine. In the following years, the archaeologist Жељко Жез has occasionally found obsidian pebbles himself (personal communication).
27 Šarić 2002.
play an important part, undoubtedly enabled visual control of a vast territory, the recognition of the environment’s resource potentials and the exchange of the acquired knowledge and experience. Human recognition of accessible obsidian deposits may have come as a result of some of these practices. It should be noted, however, that the chemical elements in the composition of an obsidian deposit occur in a proportion which is specific to a single source and therefore differentiates it from any other source in the world. Therefore characterization and comparison of finds (deposits and artefacts) identifies the origin of each artefact and establishes a reliable connection between the extraction site and the place of the artefact’s final deposition. As the only reliable method, it has been applied to certain obsidian finds from the central Balkans; in all cases, the results directly point to the Carpathians as their source.

Generally speaking, the data obtained by characterization in a way discourage any further search for local sources, suggesting that the dilemma »local origin or import« is definitively resolved. Viewed merely from the aspect of the technique of analysis, however, it should be remembered that it is based on a small sample and that the results obtained relate to the analyzed samples rather than the complete assemblages from these sites. Characterization of larger numbers of samples practised for other cultural zones (the central and west Mediterranean) has shown an extensive circulation of obsidian where the proximity of one source does not rule out its procurement from other sources. This adds weight to the dilemma about the possible existence of local deposits and requires further reconsideration. Was, then, obsidian from some as yet unidentified local source in use in the central Balkans?

**ARCHAEOLOGY AGAINST GEOLOGY**

In areas adjacent to a source, obsidian is normally a predominant or significant component in the rawmaterial structure of chipped stone industry. It is, therefore, the central Balkan zones of volcanic activity that may be expected to yield a larger number of obsidian finds. The geomorphology of the central Balkans does not contradict that possibility, the mountains being mostly of volcanic origin and particularly prominent in the western and eastern portions of present-day Serbia. Analysis of the frequency and distribution of obsidian shows, however, that its source might have been either in the south Pannonian Plain (Great Hungarian Plain), which is incompatible with the region’s relief and geological past, or much farther north, in the Carpathians, as indicated by the characterized samples.

31 Obsidian subjected to characterization, according to the published data, comes from the sites of Vinča (4 pieces), Poporanj (1), Poporanj/Kremenjak (1), Selevac (2), Divostin (1), Veliki Popović (10), Banjica (1), Gručar Bara (1), Belijin–Ravnice (2), Balta Sarata (1) and Ruginosu (1). No further information about the characterized pieces has been offered (Williams-Thorpe, Warren & Nandris 1984, fig. 8; Greif 1995: 89).
32 Tykot 1996.
33 Пеуковић 1982: 40.
That a strong obsidian component in the lithic assemblages from Neolithic sites does not necessarily implies its local origin is shown by many sites in the south Banat. Their chipped stone industry is largely based on obsidian, but their location in an eolian relief and non-volcanic mountains rules out the possibility of local sources. On the other hand, sources south of the Sava and Danube rivers would certainly have moderated drastic variations in the frequency of obsidian in the central and north Balkans. They would even have prevented the sites in that region, mostly with little or no obsidian, from being in an inferior position to those in south Pannonia. Accordingly, if the small number of known sites and, generally, an inadequate degree of investigation may account for the lack of obsidian of local origin in some areas (e.g. east Serbia), such an explanation cannot be applied to sites in the Iron Gate area (including those of a Mesolithic date), where obsidian is limited to one or few pieces, or in the Južna (South) Morava Valley or Kosovo, where obsidian has not even been registered in the Neolithic.

That obsidian may be a little more frequent in the areas of volcanic activity is shown by the site of Slevac near Smederevska Palanka, gravitating towards the Kopaonik–Rudnik zone of volcanic relief, and Vinča near Belgrade, situated at its northern edge. To the inhabitants of these and nearby settlements most of the necessary raw materials were available in a broader settlement area and they indeed were obtained mostly within 50 km. Consequently, potential obsidian deposits on the nearest volcanic formations, for example on Rudnik, Bukulja, Kosmaj and Avala, might have been exploited, if they were known. At Slevac, however, the frequency of obsidian never exceeds 5 percent, and on the adjacent sites is even reduced to isolated finds. Obsidian is much more frequent at Vinča, but its presence is strictly limited to the initial phases of occupation. From about 70 percent, its proportion in the chipped stone industry abruptly decreases and in later periods becomes reduced to isolated finds or is completely absent.

At this point it seems interesting to draw attention to the sites of Banjica, Simića Strana and Ilica Brdo, explicitly presumed to possess obsidian from local sources. From a monograph on Banjica follows that obsidian participates in its chipped stone industry with a few small pieces, and this proportion does not seem to alter in subsequent excavations. It may be inferred therefore that obsidian does not exceed a few percent at Banjica. The settlement sites of Simića Strana and Ilica Brdo are in the village of Ćučuge near Ub and likely to have exploited the same obsidian source, if there was any. The lithics from Simića Strana result from a survey, and among the collected artefacts only one obsidian blade is reported, or a total of 2.22 percent. The situation at the site of Ilica Brdo is somewhat different. Its raw-material structure cannot be deduced with precision from the published report, but it makes an important reference to a large number of flint tools, cores and flakes and a few larger obsidian cores. It is certain that the lithic assemblages from central Balkan Neolithic sites confirm neither a source exploited in an organized manner nor the raw material distributed further to other settlements through an exchange network. But, on the other hand, they do not negate the possibility of a local origin for some finds, especially because the discovery of obsidian pebbles in the brook Onjeg and the detection by geologists of obsidian deposits on Mt Cer must not be ignored. A solution to this dilemma probably lies in the elucidation of the regularity in obsidian distribution; in the Neolithic it primarily depends on the quality of the raw material, its suitability for tool production and the utility of the tool itself. That is the case in the Carpathian Basin where the Slovakian better-quality obsidian was much more in use than the second-class Hungarian; that is the case in the central Mediterranean where the best-quality obsidian from the Lipari had the widest distribution. In the Aegean, the low-quality obsidian from Antiparos was not used, and that from Giali, also hardly suitable for tools, was barely used in the Neolithic. Consequently, if the knapping of obsidian produces inadequate tools, its use will be of local significance and on a negligible scale, or such obsidian will simply not be used at all.

The frequency of obsidian finds, on the other hand, is not a reliable method for marking out the raw material's source area. Their frequent presence needs not necessarily be understood in terms of a nearby source, just as isolated finds need not necessarily be an import. From a geological and archaeological perspective,

34 Бугарски 1989: 30–32.
36 Глипт 1968.
38 Толорович & Черниковић 1961: 50–52.
39 In her monograph Predmeti od kosti, roga i kamena, S. Perić published only 10 flaked stone artefacts without specifically referring to obsidian (1984: 10).
42 Шарић 2002: 22.
obsidian deposits somewhere in the central Balkans are by all means possible, but that implies:
- a deposit of limited quality, which was not exploited or was exploited only to an extent; regardless of the intensity of exploitation, such obsidian is completely absent from the exchange network and its finds are restricted to sites near the source, or
- minor primary occurrences whose size does not lead to intense cultural manipulation; by virtue of its exclusivity, such obsidian is included in the exchange network along with other prized commodities, but is manifested only in isolated finds and, possibly, specific contexts.

There is yet another possibility for the sites with a small number of obsidian finds. It concerns the capacity to recognize the raw material itself and amounts to the question: is macroscopic identification of obsidian always enough? In most cases it certainly is, because obsidian's glassy structure and color allows easy recognition, sometimes even its association with a particular source. But this is not a rule, because it has been shown in practice that some volcanic glasses and other raw materials of a predominantly siliceous composition and darker color can be mistaken for obsidian. Misidentification of obsidian is possible and it poses a problem mostly for sites with isolated finds, that is, if the finds were recognized as obsidian before the development of obsidian studies. There are even examples that the characterization of «obsidian» carried out in order to identify the source has contested the original identification. With no intention to imply that characterization of finds from some Vinča and Starčevo sites might show that obsidian is absent or poorly present, we shall make use of a few examples to simply call attention to the possibility of confusing obsidian with some other raw materials.

In addition to obsidian, finds other volcanic glasses are known from the central Balkans. Such artefacts were found on the site of Trsine near Čačak and they were not in association with obsidian. The site yielded only local raw materials, and the source of the volcanic glass was identified in the settlement's immediate vicinity.

A few artefacts greatly similar to obsidian have recently been discovered at Vinča. During the last excavation campaign (2003), in Vinča D layers, which had not yielded obsidian thus far, a flake was registered whose transparency and color may be indicative of obsidian, but also of »smoky« quartz; similarly to obsidian, the latter is of good quality but, by contrast, it certainly is of local origin. In this particular case macroscopic identification was not sufficient.

Perhaps the best example is offered by the Vinča settlement at Banjica near Belgrade. Obsidian finds from this site with its five occupation layers were reported sporadically and in low percentages by comparison to the rest of the chipped stone industry. On the floor of House 6 in Level 3 a few »obsidian pieces« were discovered. However, macroscopic analysis by petrologists showed that the material, at least in the case of two end-scrapers, was »siliceous rocks of a predominantly opaline composition«.

CULTURAL AND HISTORICAL CONTEXT OF THE USE OF RAW MATERIALS IN THE CENTRAL AND NORTH BALKAN

The possibility of obsidian sources or the use of imported obsidian in the central Balkans need not necessarily be assessed only through comparing the frequency of obsidian and the region’s geological past. The answer may be found in a roundabout way, through analyzing the contents that directly indicate the potential for the procurement of obsidian. Were the Neolithic settlements in the central and north Balkans involved in an exchange network? Is the employed range of raw materials dominated by imported or local products? Can a settlement showing a clear tendency to rely on local resources be expected to yield obsidian as a known »local« resource? What is the relation between obsidian and other kinds of imported or local raw materials? In this respect, it is important that the whole problem may be viewed in the context of a site whose chipped stone industry shows no evidence of obsidian.

The chipped stone industries of the Vinča and Starčevo cultures show artefacts manufactured both from local and imported raw materials, occurring in varying ratios (Table 3). The use of local resources as a rule takes place as confirmation of man’s familiarity with the local environment, but the intensity of their use and

43 The obsidian from the islands of Giali and Pantelleria is identifiable macroscopically.
46 Borovancu-Perpona 1991: 7.
47 The latest phase of excavation at Vinča has been going on since 1998. It is directed by Dr. N. N. Tasic on behalf of the Archaeological Committee of the Serbian Academy of Sciences and Arts.
48 Radovanovic et al. 1984: 14, Fig. 6.
49 I would like to thank V. Bogosavljevic-Petrovic for imparting this information to me.
50 Todorovic & Penev 1961.
51 Babovic 1984: 166.
<table>
<thead>
<tr>
<th>Site</th>
<th>Chipped stone industry*</th>
<th>Availability of raw materials</th>
<th>Mode of procurement</th>
<th>Obsidian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opopo</td>
<td>Chert, chalcedony, opal</td>
<td>No resources in the immediate vicinity, supply zone at a distance of 30–45 km</td>
<td>Direct access and/or exchange</td>
<td>over 6 %</td>
</tr>
<tr>
<td>Vinča</td>
<td>Siliceous rock varieties</td>
<td>Deposits in a wider area around the site</td>
<td>Transport from a distance**</td>
<td>up to 69.5 %</td>
</tr>
<tr>
<td>Gomolava</td>
<td>Flint, radiolarite</td>
<td>No nearby deposits, the nearest at a distance of 40 km</td>
<td>Use of secondary deposits and transport from considerable distances</td>
<td>0.8 %</td>
</tr>
<tr>
<td>Divostin</td>
<td>Chert, flint</td>
<td>Primary deposits within 25 km, secondary deposits in nearby streams</td>
<td>Exploitation of deposits and collecting of river pebbles</td>
<td>0.7 %</td>
</tr>
<tr>
<td>Selevac</td>
<td>Various cherts, chalcedony</td>
<td>Primary deposits within 45 km, secondary deposits in the form of fluvial deposits</td>
<td>Locally obtained raw materials, mostly from stream deposits</td>
<td>up to 5 %</td>
</tr>
<tr>
<td>Divlje Polje</td>
<td>Opal, light white stone, chalcedony</td>
<td>In the surrounding area</td>
<td>Extraction from deposits, collecting of fluvial deposits</td>
<td>–</td>
</tr>
<tr>
<td>Trsine</td>
<td>Magnesite, opal, flint</td>
<td>Sources in the immediate vicinity, the farthest at a distance of 20 km</td>
<td>Exploitation of deposits, collecting of stream deposits</td>
<td>–</td>
</tr>
<tr>
<td>Petnica</td>
<td>White opal varieties</td>
<td>No data</td>
<td>Exploitation of local deposits***</td>
<td>–</td>
</tr>
<tr>
<td>Anatema</td>
<td>Magnesite, jasper, low-quality brown flint</td>
<td>In the surrounding area</td>
<td>Locally obtained raw materials</td>
<td>–</td>
</tr>
</tbody>
</table>


Their proportions in the chipped stone industry mostly depended on the quality of raw materials and the possibility of obtaining alternative, better-quality raw materials. The chipped stone industry of the Vinča settlements at Divlje Polje, Trsine, Petnica, Divostin and Anatema is based on local resources. Is it indicative that this fact is also manifested in the total absence or negligible presence (Divostin) of obsidian? The current archaeological evidence from the sites of Belo Brdo at Vinča and Opovo, where most raw materials were supplied from distant areas, reveals no similarity to the aforementioned sites. Therefore, in solving the problem of the origin of obsidian in the central and north Balkans it is not irrelevant that it is on those sites that obsidian constitutes a significant portion of their lithic assemblages.

The supply of larger quantities of obsidian to the central Balkans is certainly related to the operative mechanisms of exchange. This may also be seen from the finds of imported raw materials or artefacts such as those manufactured from Spondylus, a mussel of Mediterranean or Black Sea origin.52 During the Starčevo

and Vinča cultures artefacts made of *Spondylus* shells are imported into the central Balkans, but with varying intensity.\textsuperscript{53} They are not a characteristic feature of the Starčevo culture, occurring as individual finds and on few sites. The situation changes during the Vinča culture, when such finds become part of the standard cultural picture and occur in large numbers on some sites.

It is not irrelevant that the most intense distribution of obsidian in the central and north Balkans coincides with the widest spread of the exchange network, as additionally evidenced by the presence of other kinds of exotic goods. Therefore, an explanation for the low frequency of obsidian in the Starčevo culture resides in understanding the geographical and historical background of its occurrence and the relationship between central- and north-Balkan Early Neolithic communities and the neighbouring, Carpathian, cultures. Namely, as a raw material of exotic provenance, obsidian was obtainable either through direct access to a source or through participating in exchange. The direct access option is likely to be dismissed because at the time the Starčevo culture emerged and lived the north of the Carpathian Basin with its obsidian deposits had not yet been Neolithized and no traces of Neolithic outposts have been discovered in their vicinity. In that period, the sources were beyond the reach of the Neolithic cultures and it seems much more likely that they obtained obsidian through contacts with Mesolithic communities in the Middle Tisza Valley which were familiar with and employed this raw material.\textsuperscript{54}

The circulation of obsidian in the central Balkans was at its peak in a period of intense contacts with the cultures of the Carpathian Basin. It may be seen from the exchange of exotic goods, but also from the appearance of the Tisza pottery on Vinča settlement sites in the southeast Pannonian Plain.\textsuperscript{55} The most serious obstacle to accepting the idea about a local origin of obsidian, however, is a discontinuity in its use. It is observable not only from the shift in its occurrence from isolated finds in the Starčevo culture to a very high frequency at the beginning of the Vinča culture, but also from drastic oscillations marking the Late Neolithic. After the initial phases of the Vinča culture (Vinča A–B1), when obsidian occurs in large quantities on some sites, it seems reasonable to expect that cultural continuity should also be manifested in the continuous use of best-quality raw materials such as obsidian. By contrast, in later Vinča phases, when chipped stone industry depends mostly on local resources, obsidian is not in use any more. Therefore it seems almost impossible that obsidian deposits, if there were any around a settlement, were not known and exploited.

The lack of imported obsidian in the central Balkans south of the Sava and Danube rivers in the Vinča-Pločnik phase certainly does not imply the region’s isolation or expulsion from the exchange network. In the past decade a systematic study of the excavated assemblages, archaeological prospecting for surface finds and the collecting of lithics have provided ample data about the complex relationship between large settlements in the valleys of major rivers and a series of smaller Neolithic outposts on the fringe of mountain massifs. They have been interpreted as an indication of the interdependence of Vinča settlements at regional level, from outlying extraction or production sites in the vicinity of a raw material source to large and long-lived Neolithic centres in agricultural areas at lower altitudes.\textsuperscript{56} To judge from their frequency, raw materials such as white opal (chipped stone industry) and light white stone (chipped and polished stone industries) were extracted from primary deposits, providing a significant supplement to the use of pebbles collected from riverbeds.\textsuperscript{57} Their presence on a number of settlement sites in a wider or narrower area around the source and their significant proportions in the relatively invariable range of raw materials used in that period confirm the assumption about an organized procurement, processing and exchange of raw materials at regional level.\textsuperscript{58}

Some of these raw materials were in use sporadically even in the previous period, and it is interesting that they sometimes occur in association with obsidian. For instance, it has been observed that on Starčevo settlement sites south of the Sava and Danube rivers light white stone and obsidian are relatively often found in association.\textsuperscript{59} Both raw materials usually account for a very low percentage of the chipped stone industry. The presence of light white stone flakes on

\textsuperscript{53} Dimitrijević & Tripković 2003.
\textsuperscript{54} Kertesz 1996; Makay 1996.
\textsuperscript{55} Chapman 1981; Garašnin 1979.
\textsuperscript{56} Bogovgjević-Petrović 2001b; Bogosavljević-Petrović 1998.
\textsuperscript{57} Bogosavljević-Petrović 2001a:143.
\textsuperscript{58} Voytek 1990; Voytek 1996: 291; Bogosavljević-Petrović 1998.
\textsuperscript{59} Šarić 2002: 23 The terms used interchangeably are magnesite, diatomaceous earth, porcellanite, soft white stone, white stone of different origins etc. For more details about the presence of this raw material in chipped and polished stone industries, see: Anto­nović 1997; Antonović 2001; Bogosavljević-Petrović 2001a; Šarić 2002.
some of these settlement sites has been explained by the process of polished tool production where they occur as by-products.\textsuperscript{60} It is unclear, however, whether this association of obsidian with light white stone is to be seen as interdependence. Extensive studies of the raw-material structure show that light white stone was not a prominent characteristic of Starčevo sites in the central Balkan Neolithic. Its use in chipped and polished stone industries is much more intense in the later stage of the Vinča culture,\textsuperscript{61} when obsidian is no more found in the central and north Balkans.\textsuperscript{62} In that period (latter half of the fifth millennium BC), Late Vinča settlements obtained most of the necessary raw materials in their immediate surroundings, by extracting from nearby deposits or collecting from secondary stream deposits. For that reason, at this point obsidian and light white stone cannot be seen as interdependent, even on the sites where their association has been attested.

From the analyzed data it is clear that obsidian reached the central Balkans from the Carpathians by exchange. Why is it, then, that it does not occur in the later phases of the Vinča culture? Could that, as in the case of the Starčevo culture, be explained by the geographical and historical context where the control of access to resources plays the most important part? In the Carpathian Basin, at a time when obsidian ceases to play a part in the raw-material structure of Vinča settlements, a cultural and territorial reconfiguration is taking place, affecting, among other things, the exploitation and exchange of this raw material. It has been observed that after the end of the Bükk culture in the north Carpathian Basin, the amount of obsidian drastically decreases on Tisza sites in Pannonia, occurs in low percentages in southeast Pannonia and almost entirely disappears on Vinča settlement sites south of the Sava and Danube rivers.\textsuperscript{63} The territorial expansion of the Lengyel culture and new settlement in the vicinity of the Carpathian sources should undoubtedly be seen as factors initiating the coming change. The new settlements are specialized sites for the extraction and processing of obsidian, and they are directly responsible for the diverted route of its distribution.\textsuperscript{64} Obsidian is now mostly directed towards other Lengyel settlements, especially towards Transdanubia, where it occurs in larger quantities for the first time. From that point onwards, the changed socioeconomic setting and the introduction of a new obsidian route are reflected in the significantly reduced amounts of obsidian in the Tisza culture area and southeast Pannonia. Thus most Vinča communities, especially those to the south of the Danube and the Sava, are denied the opportunity to procure it through the exchange network functioning for centuries. For central- and north-Balkan communities it certainly does not entail the end of involvement in the interregional exchange network. Exotic raw materials and artefacts, the procurement of which is not affected by the changes in the Carpathian Basin, continue for a long time to form part of the usual cultural picture both in Pannonia and in the central Balkans.\textsuperscript{65} Only obsidian is missing. It remains to be seen if, and to what extent, Vinča communities of the period were able to obtain obsidian via the Sopot–Lengyel settlements between the Sava and the Drava. Some of the latter, such as Šamotovci near Osijek (Croatia), are very rich in obsidian, and extensive cultural and commercial contacts between the two cultures form part of the traditional interpretation of their relationship.\textsuperscript{66} There is no doubt, however, that the progressive use of other raw materials, copper above all, and the introduction of new technologies now render obsidian less attractive as a raw material than it was before.

\begin{center}
\textbf{OBSIDIAN DEPOSITS IN THE CENTRAL BALKANS? WHY AN AFFIRMATIVE ANSWER IS NOT ENOUGH.}
\end{center}

There are many volcanic mountains in the central Balkans, but the adjacent sites have yielded no obsidian; the characterized obsidian finds suggest a Carpathian origin, but the sample is not representative; geologists have drawn attention to «local» sources, but sites show little or no obsidian. These statements constitute a sort of double evidence and in fact have no bearing to the solution to the dilemma. It has been shown, however, that the dilemma is not as obvious when it comes to understanding the dynamic of the cultural and economic setting in the Carpathian Basin. Obsidian disappears from central Balkan settlements at a time when new territorial and economic relations begin to be established.

\textsuperscript{60} Šarić 2002: 20.

\textsuperscript{61} Antonović 2003: 20–21; Antonović 1997; Богословљевић-Петровић 2001a; Bogosavljević-Petrović 2001b: 37.

\textsuperscript{62} Tripković 2001.


\textsuperscript{64} Takács-Biró 1991: 34; Biró 1998a; Biró 1998b.

\textsuperscript{65} Dimitrijević & Tripković 2003.

in the Carpathian Basin, with the exchange network, originally orientated towards central and southeast Pannonia, somewhat ebbing away.

What appears to be the conclusion?

Minor primary occurrences of obsidian in the central Balkans, as originally presumed, are not to be ruled out. The fact, however, must not be overlooked that reliable identification of sources is possible and that the deposits registered so far are not the only ones. Still, a definitive answer is expected to be provided by geology, while archaeology may considerably contribute indirectly, by characterizing as many samples as possible and by prospecting for artefacts whose chemical composition would not match any known source. Considering that such obsidian finds have been registered in certain areas, the discovery of as yet unknown sources may certainly be expected. Experiences from Hungary, Romania and Turkey are quite instructive in that respect, and such discovery is the objective to be pursued in the future. And yet, regardless of the final outcome, the question: Are there obsidian deposits in the central Balkans? Should doubtless be rephrased into the only one of interest to archaeology: Which obsidian deposits were known to man and how extensively were they exploited? From the cited examples it may be seen that the availability of resources and Neolithic man’s awareness of it were not the exclusive motive for their exploitation. The quality of a raw material, mainly measured in terms of its suitability for tools, determined the intensity of exploitation of certain resources. Let us remember that in the central Mediterranean, the Aegean and the Carpathian region good-quality obsidian (from the Lipari, Melos and Slovakia) was predominantly in use in contrast with that of poorer quality or with obsidian that was not even exploited (Antiparos). Hence we undoubtedly should accept that possible obsidian deposits in the central Balkans were either unexploited or exploited on a negligible scale by Neolithic communities. Such a picture cannot be modified significantly by future research; it may be modified to an extent only for poorly investigated areas such as east Serbia, a prospect contradicted by the finds from that area and west Bulgaria.67

BIBLIOGRAPHY:


Богослављевић-Петровић, В., 2001a. – Винчанска кремена индустрија Проблем употребе и дистрибуције сиропива са освртом на долину Западне Мораве, у: Н. Тасић, Е. Радуловић (ур.) Археолошка налазишта Крушевца и околине, Крушевец–Београд: Народни Музеj Крушевца и Балканолошки институт САНУ, 139–150.


Garašanin, M. 1979. – Centrainobalkanska zona, u A. Benac (ur.) Praisorija jugoslovenskih zemalja 2, Sarajevo, 79–212.


Михаиловић, Б., 2001. – Окresarana камена инду- стрија са локалитета Атамана. Зборник Народног Музеја 17–1, 37–51.


Šarić, J., 2002. – Stone as material for production of chipped artifacts in Early and Middle Neolithic of Serbia. *Stininar* 52, 11–26


Налази опсисијана на налазиштима која су удаљена од примарно претпостављеног извора су, у историји археологије, често добијала романтичарску ноту, кроз идеје о локалној експлоатацији као начину снабдевања, а кроз потрагу археолошке непознатим лежиштима ове сировине. Током времена, оне нису замишљене ни њихову археологију. Сега је основан ти овог рада пренесениство постојећих сазнања о опсисијана на централном и северном Балкану, провера утемељености идеја о употреби локалних извора као и претрага могућих праваца за даља изучавања.

Извештај је да би различе окрсне индустрије са неолитичких налазишта централног Балкана не пострију постојаће извора који је организовано експлоатисан, а сировина даље кроз мрежу размене дистрибуирана до других насеља. Оне, међутим, не негирају могућност локалног порекла појединих налаза, нарочито због тога што се налази опсисијансих областима у потоку Овчег и сазнања геолошких постојања лежишта на планинама Цер не смеју запаметити. Фрактравеност опсисијанских налаза, са друге стране, не представља поуздана метода за генерисање изворног подручја сировине. Њихова учеоци појава не мора ништа бити схватања кроз постојање извора у окружењу, исто као што и на изолованим налазе не могуће представити импорт. Из геошколе и археолошке перспективе, постојање лежишта опсисијана негде на централном Балкану је свакако могуће, али подразумева:

- лежиште релукованог квалитета, које није експлоатирано или је експлоатисано само до одређених степена; без обзира на експлоатације овај опсисијан је потпуно искусечен из мреже размене, а његови налази су ограниче них на налазишта у близини извора, или
- примарне појаве малых размера чија величина не дозво додатне културне манифестације; због своје ексклузивности, овај опсисијан у мрежи размене партиципира са другим вредним робама, али се манифестује искусечно појединим низама и, могуће, специфичним контекствима.

Коли налазишта са малим бројем опсисијског извора постоји још једна могућност. Она се локалних степена пренесениности саме сировине и садржаја је у питању да ли је маракоскопска идентификација опсисијана увек довољна? У највећем броју случајева свакако јесте, јер његов структура и боја опсисијана могуће даако препознава након чек и повезивање са одређеним извором. Ипак, то није правило, јер је у првом доказано да се нека вулканска стања као и друге сировине претежно силицијског састава и тамног боја могу погрешно идентификовано као опсисијан. Погрешна идентификација опсисијана је могуће, као проблем се поставља угледом код локалитета са изолованим налазима, односно ако су налази као опсисијан препознати у време када опсисијанске студије још нису биле развијене. Познати су чак и примери да је карактерисање "опсисијана", извршено радо утврђивања извора, негирало промевити идентификацију сировине.

О постојању извора на централном Балкану или употреби импортованог опсисијана мора се сматрати само кроз поређење фрактравености опсисијана и геошколе пропостије подручја. Договора о се доприносе посредници путем, кроз анализу садржаја који директно указују на потенцијал за набавку опсисијана. Да ли су неолитска насеља на централном и северном Балкану употребљавале у време размене? Да ли у употребљаваном сировинском спектру добијала импортовани или локални произвођачи? Да ли се, у случају насеља која је тога поштова генетичка доприноси? Како нижег "локалног" ресурса? Како је специфичност опсисијана са другим врстама импортированих и локалних сировина?

Најистинитивија циркулација опсисијана на централном Балкану забележена је у време када су постојала интензивне везе са култумрама Карпатског басена. Те се, се, кроз размену етнолошке добра, уочава и у појави керамичког материјала Тиса културе на врховима насељеним у југрачкој Јаношини. Највећи проблем је прихваћање идеја о локалном пољевом коришћењу опсисијана, измислицем, дис- континуитет његове употребе. Он се не види само у прелазу од појединих примера у стварности археологије до илустративне фрактравености појединих врста сировина, већ је приметан и у растрачним археолошким керамикама које карактеришу касни неолит. Након почетних фаза вршачког света (Винча А–В1), када се на појединим локалитетима уочавају великаколичине опсисијана, нередно је очекивати да се код археолошка континуитет не манифестује и континуитет употребе најкарактеристичнијих локалних сировина како је опсисијан. Насупрот томе, у касним фазама вршачке културе, када је употребљена индустрија примарно указана у њену локалну базу, опсисијана се више употребљава. Због тога, изгледа готово невероватно да лежишта опсисијана, ако су постојала у окружењу насеља, нису била позната и кориштена.

Из анализа различних података директно се види да је опсисијан на подручју централног Балкана досељео разменом из Карпатских област. Зашто, међутим, није заступљен и у касним фазама вршачке културе? Да ли се, као у случају стања, могу објаснити географски-исто ријском контекстом у коме контролира присутност извора италијачког локалност употреба? У Карпатском басену се, у време када опсисијан више није учествује у сировинском археолошком контексту, у немачку културу у северном делу Карпатског басена, количина опсисијана на локалитетима Тиса културе у Јаношини драстично редукована, се се у југосточној Јаношини јавља у невеликом процену и да готово у популности ипчезава из насеља.
винчанске културе јужно од Саве и Дунава. Територијална екстензија лепељске културе и оснивање у близини карпатских извора, нових насеља свакако се морају посматра- ти као инциденти наступајућих промена. Нова насеља су представљала специјализоване локације за експлоатацију и обраду опсизијана и директно су одговорна за измену тра- seo његове дистрибуције. Описијан је сада усмераван прет- тежно ка другим насељима лепељске културе, нарочито ка Трансдоњу, где се сада први пут јавља у већим количи- нама. Од тог тренутка, изменени друштвено-економски амби- јент и установљене нове опсизијанског пута рефлексују се и на површине Тиса културе и југозападну Панонију кроз битно умањење количине опсизијана. Највећи број винчан- ских заједница, нарочито оне јужно од Саве и Дунава, на тај начин је ускраћен ка његову набавку кроз постојећу, неко- вима одржавању мреже размене. То за заједнице на цент- ралном и северном Балкану свакако не значи и претпостав- ка партиципирања у интеррегионалној мрежи размене. Сиро- вине и предмети егзотичног порекла, чија набавка није афек- тоvalama променама у карпатахима, још угао времена представљају део уобичајене културе сличне и у Панонији и на централном Балкану. Једини опсизијан недостаје. Остаје да се будућим истраживањима види даки ли су, и у ко- јој мери, винчанске заједнице опсизијана могле добаљачи преко насеља лепељске културе у северско-дравском на це- руљу. Некада од њих, на пример Шаматовић код Осијека, ве- ома су богата опсизијанама, а значајан културно-економски саобраћај део је традиционалних интерпретација односна две културе. Насумно је, међутим, да прогресивна упо- треба других сировина, пре свега бавра, и нове технологије њене образа, која сада ступају на историјску позицију, не чине опсизијан више тако атрактивним материјалом. Недостатак импорта опсизијана на централном Балка- ну, јужно од Саве и Дунава у фази Винча-Плачоч, свакако не све од ове долази у објаснавању ли изопотенности тог поручија из мраза размене. Систематска обрада постојећих збори, позивишне просеке и прикупљање окрсенонах артефак- та изградили су, током редељење, људу потања о комплексном односу великих насеља у долинама значајних речних токова и из низа мањих неолитских станица, локица- них на ободима дрвених масина. Они су интерпрети- коци као индикација непосредне међусобности винчанских насеља на регионалном нивоу, од постојања помоћних насе- ља радионичког или рударског карактера, у близини извора сировина, до великих и луготрејних неолитских центара у агрокултурним површинама, из нижим накожским висинама. Судећи по заступљености, сировина као бели опал (у окрсенонах индустрији) и тако бели камен (у окрсенонах и гла- чаној индустрији) екстракован се руда дрвени из примар- них депозита и представљају значајну допуну употреби облука из речних корита. Њихова појава на нивоу насеља у близој и широј зони лежишта, и значајно учеће у ре- лативно ниској сировинском спектру период, потвр- дују претпоставку организованог храбрања, обраде и размене сировина на регионалном нивоу

Појаве опсизијана примарног типа и мањих размера, онако како је првобитно претпостављено, на централном Балкану свакако не треба исключити. Не сме се, нико, прет- тежко чињенице да је поуздано одређење извора могуће као и да до сада евалуирања лежишта и нису јашна по- стоећа. Дефинитиван одговор, очекује се, ипак, од геоло- је, а археолошко може да пружи значајан допринос посред- но, карактерисање што неће брода узраза и очекиваним да се појаве артефакти чија хемијска композиција не одго- вара неком од познатих лежишта. С обзиром да су у неким површинама такви примери опсизијана уочени, у будућно- сти се свакако може очекуја на откривање нових извора ове сировине. Искуства из Мађарске, Румуније и Турске су у том смислу довољно инструментална и њихово откривање је није које в будућности треба тежити. Ипак, без обзира на начин на који овај проблем било решен, постојаће питање «Да ли се лежишта опсизијана налазе на централном Балкану» свакако се мора преформулисати у ово једино значај- но археолошко: «Која су лежишта опсизијана била позната човеку и у којој су мери експлоатисана». Из изложеног при- мета се видело да доступност лежишта и идентifikовање значајних културних човека његовом постојању нису били искуствени разлог експлоатације. Квалитет сировина, мерен, пре свега, посеб- ношћу за израду алата одређено је степен искоришћености појединих ресурса. Да посматриме, да на централном Меди- теону, у Егеји и Карпатах употреби преобаразу- ју квалитетни опсизијан (сл. Лигара, Мелоса и Спавалке), најбоакотиеришу ње мање квалитетних сировина и оних које стекли нису ни експлоатисане (Антиполис). Због тога би свакако требало прихватити да потенцинално постојећа ле- жишта опсизијана на централном Балкану неисточне зајед- нице нису користите, или су их користите у неизнатној мери. Нова истраживања, тако могу, у време које следи, овакву сировину и зове нивоу изнаждавају, величине којег може тако да се сакупије изнаждавају.