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Raw Material for Making Chipped Stone Artefacts in Early and Middle Neolithic of Serbia

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Abstract: The artefact analysis of material from 20 Early and Middle Neolithic localities in Serbia pointed at a neccessity to check and verify past interpretations dealing with origin and primary deposits of so called "Balkan flint" and obsidian. In addition, time and space related to a greater use of so-called "white stones of different origin" are definied.

Key words: raw material, chipped stone artefacts, Neolithic, Starčevo Culture

Introduction

The central Balkan area, together with its all concurrent influences, has an extraordinary importance for development of Neolithization. Period of the earliest village communities on the territory of Serbia today is represented by artefacts related to Proto-Starčevo or Gura Bacului and Starčevo culture. These cultures denoted Early and Middle Neolithic and in the frame of absolute chronology on the basis of relatively small number of C^{14} analyses they start at the end of the VIII Millennium and beginning of VII Millennium before present. The end of the period of domination of representatives of these cultures is believed to be the boundary between the VII and VI Millennium before present (Tasić, 1988, 45-47).

This study is aimed to offer a more consistent answer to one of many questions related to chipped stone artefacts - in this case particularly to the question if all the chipped stone artefacts made of obsidian and so-called "Balkan flint", which were documented from some Early Neolithic localities in Serbia, are imported as a result of contacts between remote communities or, alternatively, they could have been of autochthonous origin, as well.

The chipped stone artefacts that were subjected to the analysis of raw material and its provenance arrived from 20 localities (Figure 1)[1]. Although the finding conditions were not identical, most material came from the localities at which systematic excavations had been carried out i.e. from Padina, Lepenski Vir, Ušće Kameničkog potoka, Knjepište, Donja strana-Velesnica, Blagotin, Vinogradi-Grabovac, Livade, Šalitrena pećina, Donja Branjevina, Golokut and Vojlovica.

Rock types

The oldest traces of, conditionally speaking, mining activities or exploitations of rocks suitable for making chipped stone artefacts are related to the locality of Kremenac, near the Rujnik village, close to Niš. The first data suggest that certain exploitation works on that locality were even in the Early Paleolithic (Kaluđerović, 1996, 289-290). The opal samples from the line Glavica-Krivo Polje, near Ramaća and close to Kragujevac, as well as traces of small open pits indicate that these deposits of raw material were used by inhabitants of Starčevo settlements, which were situated in the close vicinity during the Early and Middle Neolithic (Jovanović and Bogdanović, 1990, 82-84). Except at Lepenski Vir, where basalt and analogous igneous rocks are believed to have been used for chipped stone artefacts (Kozlowski and Kozlowski, 1984, 271), the raw material from all other localities may be classified as follows: *chert, quartzite, quartz, "white rocks of different origin" and obsidian.*

Abundances of all types of raw material reported in this study are presented in table 1 according to given archaeological localities.

In table 2 is given average contribution of five characteristic types of raw material from the localities that had undergone systematic excavations or recognizing and complete sampling without a selection. Hence, there exist unequivocal indications that these localities were in fact settlements at which no mixture of material from later cultures had occurred.

Chert is a siliceous sedimentary rock composed of chalcedony and quartz. It may also contain remnants of radiolarian (microorganisms with siliceous shells) and

[1] During the writing of this paper material from the locality of Padina was inaccessible for study. Namely it had been earlier transferred from the Center for Archaeological Research of the Faculty of Philosophy in Belgrade to the National Museum in Kladovo. All data used here were taken from the M.Sc. Thesis of Radovanović. However, the main topic of the mentioned Thesis were Mesolithic chipped stone artefacts while the artefacts of the Starčevo provenance were only partly investigated. Therefore, a direct comparison with other localities on the basis of raw material and principal types of tools was not possible.

silicified foraminifers (microorganisms with, most frequently, carbonate shells) and others[2].

Chert is very hard and brittle. It gives a characteristic conchoidal fracturing and is characterized by weakly to highly lustre surfaces and when thin it can be more or less transparent. It appears variously coloured depending on type and quantity of impurities. The impurities of Fe-oxides and hydroxides give rise to yellow colour, manganese gives greenish or blue greenish, clay minerals grey and traces of organic matter produces black colour of chert (Protić, 1984, 171).

It is inevitably clear that cherts of identical macroscopic characteristics may originate from a single, but also from two or more very remote deposits, and that, on the other hand, cherts of different macroscopic features can originate from considerably remote deposits but also from a single locality. This fact discredits classifications of raw material based on rocks colour as a decisive criterion. Concretion cherts (mostly originated by silicification of limestone) appear as concretion interlayers, lenses or nodules in a lithological column (Protić, 1975, 139). Such chert can be macroscopically very different both laterally and vertically. Petrological studies (e.g. x-ray diffraction, differential-thermic analysis, microscopic analysis), if they are not accompanied by control samples from the exactly located areas, in archaeological sense, do not give comparable results. A reliable petrological definition may determine geological units, which contain particular chert occurrences suggesting directions of further investigation of potentially primary appearances (Hodges, 1981).

Although there are different conceptions in the geological literature (Pettijohn, 1957, 431-444; Tomkeieff, 1983, 97) and the terms *flint, chert, silex, silexite, novaculite, jasper, hornstone* all are being used as synonyms, in this study only the name chert is exclusively used. It is because that incorporates all those rock types, which, according to the given definition, belong to the group of siliceous sedimentary rocks, irrespectively to colour, lustre or transparency.

Chert is the most abundant raw material and it dominates at all the localities except at Blagotin and Velesnica.

The problem of localization of so called "Balkan flint"

This chert may be variously coloured, from honey yellow to honey grey or milky grey, or may show lighter circular lines of greyish colour. For the last type Kozlowski and Kozlowski discuss: "*This raw-material did not appear in Iron Gate and was imported from Pre-Balkan Plateau, east of Iron Gates. Its exact localization, however, is not known*" (Kozlowski and Kozlowski, 1984, 267), a afterwards add: "*A peculiar thing is, that all analogies concerning certain types of artefacts like end-scrapers, retouched blades and flakes concern the whole region supplied with Balkan flint which also includes finds of Körös culture in Great Hungarian Plain*" (Kozlowski and Kozlowski, 1984, 275).

In her PhD Thesis Voytek noted: "*In addition, in Lepenski Vir IIIb, yellow spotted chert was used for the first time by the inhabitants. This material was found in blades and large flakes which were also located inside pots" (Voytek, 1985, 69), and: "Outcrops of Balkan flint are known from Dobrogea and the pre-balkan platform in northern Bulgaria (Tringham 1971, 153; Načev and Kančev 1984). In addition, it can be found in blocks along the river gravels on the left bank of the Danube, e.g., at Greaca and Suhaia (Comşa, 1976, 240)*" (Voytek, 1985, 129, 130).

In contrast to Kozlowski and Kozlowski, Voytek located the areas with primary occurrences of so called "Balkan flint" and related them to the "Pre-Balkan Plateau" i.e. to the area in North Bulgaria, westward from Varna and to the territory on the left banks of the Prut river in Dobrogea in Romania.

In her PhD Thesis Voytek presents the chert zone in Bulgaria (Figure 2 according to Voytek, 1985, Map IIIA.2). This zone is easy to follow along an E-W line, from the Black Sea coast to East Serbia. Comparing this sketch with the geological map in figure 3 (according to Dimitrijević, 1992) one should observe an absolute conformity to the zone denoted as Pre-Balkan.

Using the term "Pre-Balkan *Plateau*" is, from geological point of view, very problematic. This zone, which Kozlowski and Kozlowski, as well as Voytek, are referring to *Pre-Balkan Plateau*, according to geological data (Dimitrijević, 1992), in fact, belongs to a specific tectonic unit - *Pre-Balkan terrane* (not terrain!). This unit was recognized in the territory of Bulgaria, and further to the West it continues as the Vrška Čuka-Miroč terrane (East Serbia).

These are particular geological terms and their equalizing leads to misunderstandings both when using literature data or during consultations with specialists in geology.

The analysis of average contribution of so called "Balkan flint" to the material under this study shows that the number of these artefacts decreases going downstream the Danube river, from Lepenski Vir to Knjepište, which contradicts to the hypothesis for the location of primary deposits suggested by Kozlowski and Kozlowski and Voytek (Figure 4).

Accepting the concept of Voytek that those who first used "Balkan flint" were inhabitants of settlements of Lepenski Vir the Phase IIb, it remains unclear what is the provenance of the chipped stone artefacts made of identical raw material, which were found at localities more to the west from the Đerdap area, such as Toplik (Malo Crnuće), Orašje (Dubravica) and Blagotin (Poljna) all dated as earlier phases of the Starčevo culture.

On the other hand, at Blagotin, this type of chert amounts 14.34 %, whereas at considerably remote locali-

[2] In case that the radiolarian content is high (above 20%) the rock may be classified as radiolarite, i.e. an organic sedimentary rock that, according to general characteristics, could not be distinguished from chert.

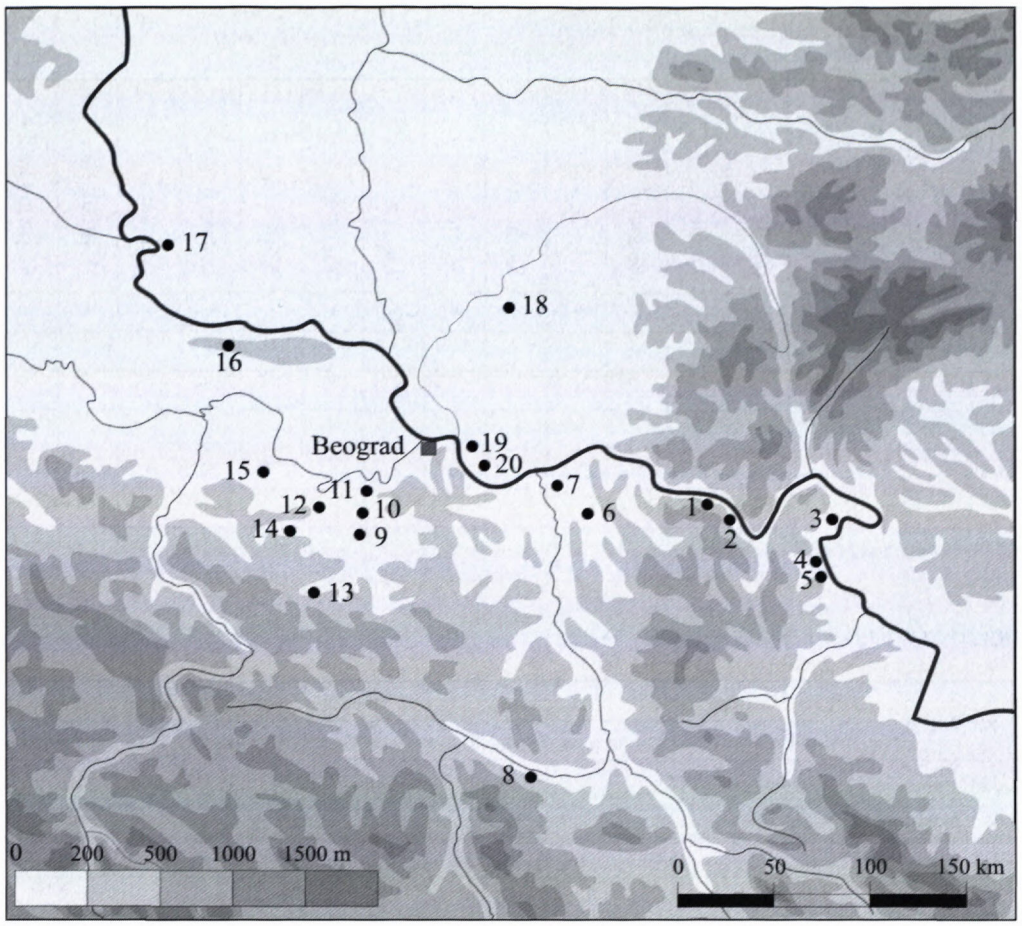

Fig. 1 Geographic position of the studied localities: 1. Padina (Donji Milanovac); 2. Lepenski Vir (Donji Milanovac); 3. Donja strana (Velesnica) ; 4. Ušće Kameničkog potoka (Novi Mihajlovac); 5. Knjepište (Mihajlovac); 6. Toplik (Malo Crniće); 7. Orašje (Dubravica); 8. Blagotin (Poljna); 9. Livade (Kalenić); 10. Novo Selo (Stubline); 11. Lug (Zvečka); 12. Vinogradi (Grabovac); 13. Šalitrena pećina (Brežđe); 14. Simića strana (Čučuge); 15. Popovića brdo (Zablaće); 16. Golokut (Vizić); 17. Donja Branjevina (Deronje); 18. Stari vinogradi (Banatska Dubica); 19. Rafinerija (Vojlovica); 20. Sedlar (Pančevo).

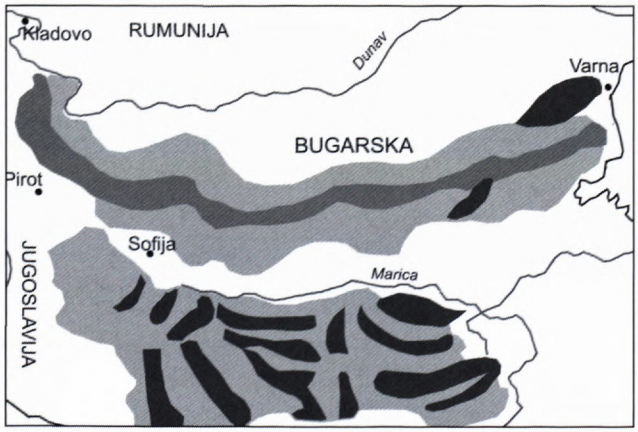

Fig. 2 Chert zone in Bulgaria according to Voytek

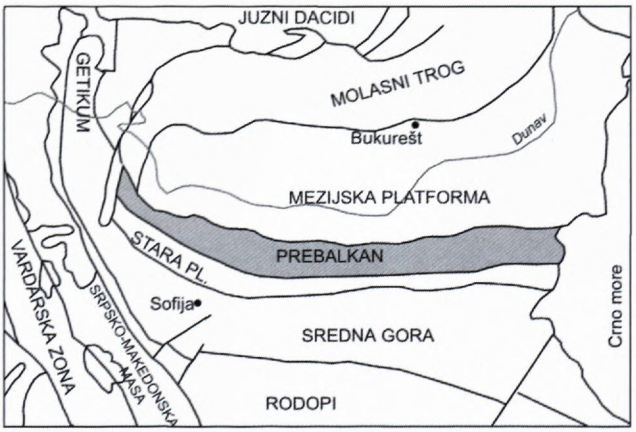

Fig. 3 The zone denoted as Prebalkan, according Dimitrijević

ty of Simića strana the abundance increases to 21.05 %, while at Popovića Brdo, a locality very close to the latter, chert is presented with only 0.88 %. At the locality of Donja Branjevina, which is most distant from the Đerdap area, this percentage increases to 11.05 %, reaching even 18.51 % at the locality of Golokut. It is noteworthy that between Golokut and Donja Branjevina a distance of around 35 km exist.

A disproportion in abundance of some types of raw material could be a result of chronological hiatus among

Table 1 - Abundances of basic raw material at given localities

	Lepenski Vir	Velesnica	U. Kam. potoka	Knjepište	Orašje	Toplik	Blagotin	Popovića brdo	Simića strana	Šalitrena pećina	Lug	Vinogradi	Novo selo	Livade	Golokut	D. Branjevina	Stari vinogradi	Rafinerija	Sedlar
chert	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
quartzite	•	•	•	•			•	•						•		•			
quartz	•						•	•											
WSDO						•	•	•	•	•				•					
obsidian	•					•	•	•	•					•	•	•	•		
other rocks	•																		

Abbreviation: WSDO - white stone of different origin

Table 2 - Percentage contribution of basic raw material

	chert		quartzite		quartz		WSDO		obsidian	
Localities:	pieces	%	pieces	%	pieces	%	pieces	%	pieces	%
Lepenski Vir IIIa-b	319	89.85	3	0.83	23	6.74	0	0	?	
U. Kamen. potoka, N.Mihajlovac	203	77.48	59	22.51	0	0	0	0	0	0
Knjepište, Mihajlovac	313	87.67	44	12.32	0	0	0	0	0	0
Donja strana, Velesnica	104	19.84	420	80.15	0	0	0	0	0	0
Blagotin, Trstenik	1004	42.47	1311	55.81	29	1.23	3	0.12	2	0.08
Livade, Kalenić	17	54.83	1	3.22	0	0	11	35.48	2	6.45
Šalitrena pećina, Brežđe	92	76.66	0	0	0	0	28	23.33	0	0
Simića strana, Čučuge	38	84.44	0	0	0	0	6	13.33	1	2.22
Popovića brdo, Zablaće	903	96.78	17	1.82	3	0.32	7	0.75	3	0.32
Golokut, Vizić	22	81.48	0	0	0	0	0	0	5	18.51
Donja Branjevina, Deronje	823	98.21	11	1.31	0	0	0	0	4	0.47
Abbreviation: WSDO - white stone of different origin										

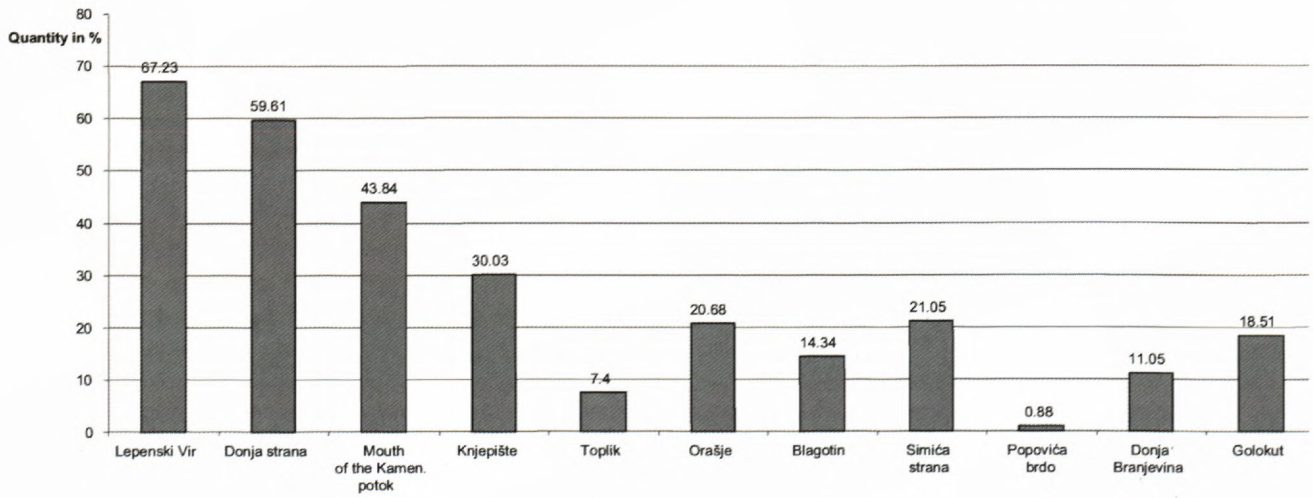

Fig. 4 Quantity of so called "Balkan flint" in compare with other types of chert

given deposits. It is logical that during longer time periods some deposits were exhausted and that simultaneously others were discovered. However, the chronological frames, inferred from dating of the localities of studied raw material, bear some characteristics that exclude their primary role in causing different abundance of so-called "Balkan flint".

In the area of Ključ, more precisely in the district of the Korbova village, is situated Zbradila, as a very important locality of the Vinča culture (Babović, 1984, 93-100; 1986, 95-98). The collection of chipped stone artefacts from this locality has a total of 1896 samples, among which the artefacts made of "Balkan flint" make 85.44 %. At certain artefacts made of this raw material a cortex of river pebble is preserved suggesting that the rocks were collected from secondary deposits - alluvions (Šarić, 2002). In case of this Late Neolithic locality chronological differences could have produced difference in abundances of artefacts made of so-called "Balkan flint", but the appearance of artefacts showing a cortex of river pebble are indeed very significant, because they indicate a local origin of the mentioned type of raw material.

The finding of three artefacts with a cortex of river pebble in Velesnica and Blagotin, along with numerous similar artefacts from the Late Neolithic locality of Zbradila, set some questions important for analysis of the origin of this type of chert:

Is it probable that such common and widespread raw material as chert could have been an object of barter and market even at such long distances as 700 km? In case of obsidian that distant market is, however, known given its tightly located deposits (in geographical sense) and quality that usually draws extraordinary attention of possible users.

Is it likely that the objects of the market and barter from the primary deposits were small river pebbles instead of large chert pieces of high quality?

Is the finding of artefacts with a cortex of river pebble indicates a collection of this raw material from redeposited primary deposits very close to Velesnica and Blagotin?

As it was underlined before, conditions of chert formation allow generation of cherts characterized by identical petrographical characteristics even formed at completely different places and this fact should be taken into account when attempting to locate primary deposits of so called "Balkan flint". Hence, even if we accept the concept about the location of primary deposits of this raw material in the area of non-precisely defined "Pre-Balkan Plateau", according to the mentioned authors, it is by no means certain that it was the only district where rocks of petrographic characteristics similar to "Balkan flint" could have been found.

Quartzite is a common metamorphic rock and when in form suitable for making chipped stone artefacts it was most frequently collected from alluvions. It is the fact that quartzite is commonly used for making tools and difficulties in recognition of such tools and their neglecting during excavations are main reasons that this industry is still poorly known. Therefore, I suppose that that the large differences in percentages of quartzites at certain localities did not cause by more or less expressed heritage of earlier periods, but in great extent they exist due to incomplete collections of artefacts. If we speak about locations characterized by inevitably complete inventory of chipped artefacts, then the difference of quartzite abundances may result from differences in accessibility of this raw material within a given environment. The best indicator for that is the fact that almost all samples with preserved cortexes, have cortexes of river pebble implying that they were collected from alluvions. The only exception is the locality of Blagotin, characterized by extraordinarily developed quartzite industry, where a majority of samples bears a cortex that suggests the exploitation from a primary deposit. Considering that at Blagotin do not exist traces of settlements of cultures older than Proto-Starčevo, it appears that the usage of quartzite was not influenced by possible Mesolithic traditions, but by the fact that in the close vicinity, within the rocky mountain massifs, easily accessible quartzite strata occurred.

Quartz - euhedral quartz crystals are often to be found in porous rocks as geodes and most famous varieties are citrine - yellow, amethyst - violet, morion - black, smoky quartz- dark brown. Beside single crystals, quartz appears also in monocrystalline and more often in polycrystalline granular aggregates (Ilić and Karamata, 1978). According to the Mohs' scale its hardness is 7, it shows conchoidal fracturing characterized by sharp edges on flakes. Therefore, colour is the only criteria for distinguishing between quartz and flakes of volcanic glass, especially when the artefacts are very thin and transparent.

Rock crystal is a colourless variety of low-temperature quartz that forms rombohedral prisms with pyramidal crystal faces at one or both sides. It seems that larger samples of quartz crystals suitable for chipping were relatively rarely found and therefore the artefacts of this raw material are exceptionally rare at our Early Neolithic localities. In the material under the study only at Popovića Brdo and Blagotin rare artefacts made of quartz were found.

Quartz is less abundant then chert and quartzite and this is the major reason that it was not being greatly used, while a small number of quartz artefacts found is due to the lack of enough large crystals suitable for handling. Quartz still remains as one of the most quality raw material and it is quite obvious from the quality of quartz artefacts from Blagotin. The presence of quartz at Blagotin (29 samples) could be related to the spatial position of this settlement, which is situated in the Zapadna Morava valley and rounded by mountains of Kotlenik, Jelica, Čemerno, Kopaonik, Požar Jastrebac, Ozren, Rtanj, Kučaj, Juhor and Gledići. More to the North is situated Rudnik Mt. where, along the line Prljuša-Mali Šturac, many traces of copper and quartz exploitation from the Iron Age are documented (Jovanović, 1988, 5-12). Amphibolite implements containing a characteristic ore paragenesis have been found in the dugout No. 07. Con-

siderable weight and well-polished surfaces of the amphibolite samples indicate that they most likely were brought as raw material for decorative objects. Generally, amphibolite is readily accompanied by quartz and it may be expected that at Blagotin quartz appeared due to the interest for different types of raw material and arrived there after subsequent organization of certain exploration campaigns.

"White stone of different origin" – this, unfortunately inadequate term, should denote artefacts made of silicified limestone, magnesite, porcelanite, tuff and diatomaceous earth (Antonović, 1988, 26)[3], at least if we speak about tools made by polishing (Antonović, 1997, 33-39, 1998, 24-28). Antonović pointed out that they predominantly correspond to silicified magnesite. Although magnesite should not be named a "light white stone", due to rather high density of 3 g/cm^3, the author suggested this term to be retained arguing that "....it has been far accepted in the literature.....". Bogosavljević-Petrović proposed the phrase "soft white stone" (Bogosavljević-Petrović, 1991, 5-36, 1998, 155-166). Once accepted, such formulations for a group of stones of various origin and different physical properties, among which neither light nor soft stone dominates, i.e. silicified magnesite, may produce a line of confusion and bewilderment that are later not easy to eradicate. In this study, though not entirely suitable, the term "white stone of different origin", mainly in order to mitigate the inconsistency, which emphasized even the authors who proposed the other two expressions are being used.

Raw material that is comprised by this study and that correspond to "white stone of different origin", occur, albeit very rarely, at the localities of Livade (Kalenić), Simića strana (Čučuge), Toplik (Malo Crniće), Šalitrena pećina (Brežđe), Popovića brdo (Zablaće) and Blagotin (Poljna). Based on thin section studies exclusively it may be concluded, although not unequivocally, that in most cases the raw material is silicified tuff, while there are some samples of silicified marl and wood (at Blagotin). Taking into account the type of activity that chipped stone artefacts were assigned to and assuming that tuff is less hard then chert, i.e. more liable to failures even in contact with weaker material, it seems surprising to have this raw material used for chipped artefacts. The possibility that chipped artefacts made of "white stone of different origin" are, in fact, by-products in processes of polishing, as it was the case at Divostin could not be excluded (Tringham et al., 1988, 202-253).

"White stone of different origin", like quartz, represent subsidiary raw material for making chipped stone artefacts. Such artefacts are represented by rare samples and usually they are non-retouched and low-quality flakes and blades. It is apparent that four localities (Popovića brdo, Simića strana, Šalitrena pećina and Livade) are situated in a narrow geographical area between the Sava river in the North, Drina in the West, Kolubara in the East and Ribnica in the South, whereas Blagotin and Toplik are located in central and East Serbia, on the banks of the Zapadna Morava and Mlava rivers, respectively. Toplik is dated as Proto-Starčevo, Livade, without close determination, as Starčevo, while for Popovića brdo, Simića strana, Šalitrena pećina and Blagotin the phase Starčevo II is suggested. Geographical position of all the places and appropriate periods of the last four localities could indicate the time and space of first usage of "white stone of different origin", which culminated during Early Neolithic in the frame of the Vinča Culture.

Obsidian is amorphous mass, i.e. volcanic glass that originates by quenching of lava during some volcanic eruptions. It can be often found as interstitial groundmass in some volcanic rocks (Tomkeieff, 1983). There are different volcanic glasses according to their chemical composition (especially water content) and textural/structural characteristics. On the basis of these criteria we may distinguish following varieties: obsidian, pitchstone, perlite and pumice (Đorđević et al., 1991). Obsidian and pitchstone cannot be distinguished by naked eyes observation, whereas perlite and pumice are easy to recognize due to their characteristic perlitic cracks and porous structure, respectively.

Obsidian is a volcanic glass with composition varying from rhyolite to andesite and with a water content up to 1 % (Huang, 1967, 148). Flat and shiny surfaces and conchoidal fracturing as well as grey, grey black and totally black colour are characteristic (Protić, 1984, 108). Sometimes finely dispersed hematite can give dark red or brown colour to obsidian (Huang, 1967, 147). This rock shows hardness of around 6.5 according to the Mohs' scale, hence traces of usage on obsidian surfaces are much easily formed then in case of cherts.

Examples of distribution of obsidian are very interesting especially if we regard this rock as specific raw material, which primary deposits are regionally located within narrow areas.

For central and Southeastern Europe the Tokaj-Prešov (Slovakia) district and Hedalya Mt. in Hungary are characteristic. There appears obsidian mainly in green and light green colour but grey, black, brown and rarely red obsidian may be found, too (Titov, 1980, 220). Occurrences of obsidian in Romania are also documented but they were regarded as not suitable for making chipped stone artefacts (Nandris, 1975, 71-94), whereas Williams and Nandris give evidence of primary deposits of obsidian in Northeast Hungary, in the area of Zemplen Mt. and in Southeast Slovakia (Williams and Nandris, 1977, 207-219)[4].

[3] In her thesis Antonović as raw material mentioned diatomaceous earth, which as a loose (unconsolidated) sedimentary rock could not have had any usable value. It is highly probable that the author was thinking of diatomite chert.

[4] This obsidian is also non suitable for making chipped stone artefacts but it is still important as an example of the primary occurrence that is today observable in the field.

According to the conclusions of Renfrew, mainly on the basis of etnoarchaeological investigations of recent primitive communities, the ware objects of obsidian probably acted as presents among friends and merchants and on the basis of reciprocity, what would exclude the existence of an open market (Renfrew, 1973). Renfrew and Bahn came to the same conclusion for distribution of Anatolian and Jermenian obsidian, distinguishing a supplying zone, which covers primary deposits in a circle of up to 320 km in diameter, and its contact zone (Renfrew and Bahn, 1991, 325-326). In such supplying zone inhabitants of some settlements alone provide themselves with raw material, while in the contact zone there is barter for given ware, without participation of specialized merchants. In the contact zone there is a regularity - the more distant settlement from the supplying zone, the smaller the number of obsidian artefacts.

Accepting this model, the Tokaj-Prešov district can be regarded as a supplying zone, whereas archaeological localities in the territory of Serbia would represent part of a contact zone. Unfortunately, incomplete study of the material found up to recently makes no clear picture about decreasing of the number of chipped obsidian artefacts with increasing the distance between an archaeological locality and supplying zone. Williams and Nandris argue that, during the field work in 1975 in the area of Zemplen Mt., in the great quantity of archaeological and geological material they did not find samples of green, red or red yellow obsidian (Williams and Nandris, 1977), which, on the other hand, were mentioned by Roska (Roska, 1925, 168-170 and Janšák, 1935). More recent investigation shows that obsidian from the Tokaj-Prešov district and Mt. Hedalya is mostly characterized by green and light green colour, and that it much rarely appears as grey, black, brown or red (Titov, 1980, 220). If all the obsidian from the archaeological localities in Serbia has its provenance from the supplying zone, and all the samples found are black or grey, it is a logical question why none green sample was found although this colour dominates in the territory of primary deposits or why any sample of brown or red colour does not exist?

Williams and Nandris (Williams and Nandris, 1977) reported findings of black obsidian with the largest dimensions of 3,3 cm from Hungary (Tolcsva) and 7,5 cm from Slovakia (Malá Toroňa), while Titov (Titov, 1980, 220) mentioned findings of obsidian cores as long as 15 cm from the locality of the Bükk culture in Hungary. Differences in these data inevitably show that the areas of primary occurrences of obsidian were not geologically studied, what subsequently causes further negative implications during archaeological research. Only a detail knowledge of primary deposits and thorough analyses of their samples will enable formation of control series that may help in interpretation of the provenance of obsidian artefacts from Neolithic localities of Southeast Europe, as well as from the Proto-Starčevo and Starčevo localities in Serbia. Before reaching this level of knowledge, the existence of primary deposits in the territory of Serbia has to be considered as possible, implying that all the obsidian in archaeological sense should not be interpreted as exclusively imported material. During the Tertiary the territory of Serbia was place of very strong volcanism, predominantly acid to intermediate in character and some of these activities were related to the formation of various types of volcanic glass (Cvetković, 1997). Local obsidian occurrences of presumed importance for exploitation in the Neolithic could have been rather small and mined out at that time and later on, during the last millenniums, and subsequently buried by Quaternary sediments and therefore inaccessible and unknown. The finds of a black obsidian pebble in the valley of the Onjeg potok on the northern slopes of Rudnik Mt. argue in favour of this hypothesis (Jež, 1998)[5].

Obsidian is raw material without much importance for making chipped stone artefacts in Early and Middle Neolithic in the territory of Serbia. Only quartz is less abundant than obsidian. The earliest appearances are related to Lepenski Vir and Toplik, both dated as Proto-Starčevo and Blagotin that is considered to be Proto-Starčevo II. All other finds correspond to the Starčevo phases II and III, whereas the artefacts from Donja Branjevina, Golokut and Stari Vinogradi, with a great probability, can be regarded as imported material. For all other localities the problem of provenance of obsidian remains an open question.

Given the data from the Explanatory Sheets of the Basic Geological Map SFRY 1:100.000 the following regions may be distinguished as potential primary deposits of volcanic glass: Timok Eruptive Complex (Bogdanović and Rakić, 1980), Turonian-Senonian volcanics in the close Bor area (Kalenić et al., 1976), volcaniclastic rocks in the Ibar valley (Urošević et al., 1973), Tertiary lacustrine basin Čačak-Kraljevo (Marković et al., 1968) and volcanic area Barajevo-Ripanj (Filipović and Rodin, 1980). The appearances of obsidian pebbles in the Onjeg potok, on the Northern slopes of Rudnik Mt., and occurrences of hyaloclastic rocks with obsidian within the Borač Eruptive Complex (Cvetković, 1997) should be emphasized.

Conclusion

This level of knowledge compels that many possible conclusions have to remain in a hypothetical sphere. They are mostly controlled by number of investigated archaeological localities, quantity of found chipped stone artefacts, extent of technical documentation about excavations, number and type of undertaken petrological analyses, but also by inconsistencies in using of specific terms and by inadequately argumented hypothesis that can be later traced from author to author.

[5] Although the mention of obsidian pebbles is lacking in the paper, I was personally told about the finds by Jež who had previously been informed by Ing. Geol. Čitaković.

Locating of potential primary deposits of raw material used in manufacturing of chipped artefacts may and should be a basis for a detailed field prospection in cooperation with experts in geology. With respect to real hypotheses about the local origin for at least a part of used obsidian and so called "Balkan flint" the acquired results could be very interesting and indicative. They may provide a partial correction of nowadays opinions about the processes and directions of communication among representatives of the Neolithic culture in the territory of Serbia.

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