STONE AS MATERIAL FOR PRODUCTION
OF CHIPPED ARTIFACTS IN EARLY
AND MIDDLE NEOLITHIC OF SERBIA

Abstract. – In this work we studied artifacts from 20 Early and Middle Neolithic sites in Serbia. Stone used as raw material for production of chipped tools are defined and we pointed to inadequate usage of certain terms. By using of the data from geologic literature and statistical analysis of representation of certain stone at distinct sites we present assumption about location of primary occurrence of so called «Balkan flint» and obsidian in the territory of Serbia.

Key words. – chipped artifacts, chert, quartzite, quartz, white stone of different origin, obsidian, Early and Middle Neolithic, Serbia.

The territory of central Balkans with all the influences gathering there has special significance for developing of the neolithization. Period of the earliest agricultural communities in the territory of Serbia is represented today by artifacts related to Proto-Starčevo, that is Gura Bacului and Starčevo culture. These are the cultures that characterize Early and Middle Neolithic and which commenced in the end of 8th and the beginning of 7th millennium before present. These absolute dates are established according to relatively small number of C–14 measurement. The end of period in which bearers of these cultures dominated is related to the end of 7th and beginning of the 6th millennium before present.

Occurrence of the Vinča culture at the historical stage brought new aspects of material and probably spiritual culture but these changes were not such as to be essentially reflected on the basic procedure of production chipped stone artifacts.

Large and very important segment of unstudied archaeological finds of that period are just the artifacts of chipped stone. As segment of inventory used every day in various production processes and on various materials this kind of artifacts could offer abundant data related to comprehensive reconstruction of life in just one structure, one settlement or in a wider region inhabited by members of one larger ethnic agglomeration that we call today the region of certain cultural groups.

Ideally, the analysis of artifacts of chipped stone carried out in detail could provide following data:
– making of classic typology based mainly on morphological characteristics of artifacts,
– functional analysis by studying macroscopic and microscopic traces of use would make possible attribution of specific artifacts within distinct category,
– clear distinguishing of main categories that is types of tools complemented by characteristic traces of use would enable identification of certain types of activities within one settlement what is prerequisite for analysis of priority economy in the certain area.
– precise location of finds within one settlement, vertically as well as horizontally, would enable recording of working areas or actual workshops for production of chipped artifacts i.e. for working of other materials with chipped artifacts,
– petrographic analysis but conducted only by competent geological experts could to the certain extent to point to the origin of raw materials that is to primary occurrences and eventually to the possible routes along which were established contacts between more or less distant communities,
– and finally and it is often primary question for archaeology, the previous stages in the general shift

analysis would make possible, again only to the certain extent, the perception of links with previous cultures and defining of the degree of influence exercised directly or indirectly, in succession or with gap.

This work is an attempt to answer more comprehensively at least one of many questions posed by chipped artifacts – in this case the question whether all chipped artifacts made of obsidian and so called »Balkan flint« found at some of Early and Middle Neolithic sites in Serbia are imported as a result of contacts between distant communities or they could be of autochthonous origin.

Chipped stone artifacts used for the analysis of raw material and its provenance originate from 20 sites (Fig. 1). Finding conditions were not identical but most of material is from the sites where archaeological excavations had been conducted such as Padina, Lepenski Vir, Ušće Kameničkog potoka, Knjepšte, Donja strana–Velesnica, Blagotin, Vinogradi–Grabovac, Livade, Šalitrena pećina, Donja Branjevina, Golukut and Vojlovica. Artifact collections from the sites Lug,
Novo selo, Stari vinograd–Banatska Dubica and Sedlar are established as a result of test trenching. Chipped artifacts from the site Popovica brdo were partially collected during test trenching and mostly during site survey while collections from the sites Simica strana and Toplak were established only during site survey. Finds from the site Orašje resulted from systematic excavations but due to the loss of documentation they have the character of finds acquired by site surveying.

Complete site and technical documentation about finding conditions is of primary significance for interpretation of any kind of archaeological material and therefore also for the chipped stone artifacts. Unfortunately there are various reasons why such data are not complete or non-existent thus leaving many museum collections without possibility for carrying out necessary analyses.

Because of the incompleteness of information for the finds not coming from excavations these specimens were used as comparative series that would show that proportional incidence of certain basic types does not show relevant exceptions even in the case when there is possibility of mixing with the Late Neolithic material. It is the best indicator that evolutionary trends on a global plan do not show essential changes and that often changes noticeable in the chipped artifacts collections from many sites need not be the result of chronological difference but that they are of local character and related to either the type of raw material or type of economy or the individual skill in manufacture and that by all means should not be disregarded.

Small amount of artifacts from the sites Sedlar, Vojlovica, Stari vinograd, Novo selo, Vinograd and Lug makes these sites of secondary importance in establishing of complete typological scheme for chipped artifacts of the Early and Middle Neolithic in the territory of Serbia.

OBJECTIVE OF PETROGRAPHIC INVESTIGATIONS

The conclusions about raw material used for manufacturing of chipped artifacts as well as about the provenance of raw material were reached as a consequence of help and numerous consultations of colleagues from the Institute for Mineralogy, Crystallography, Petrology and Geochemistry of Faculty of Mining and Geology in Belgrade.³

The objective of petrographic investigations was twofold:

1. application of certain analyses that will provide satisfactory petrographic data necessary for archaeological considerations and

2. attempt to clarify and use accurately geological terms that are, we can easily say, traditionally used in archaeological literature but are from geological aspect imprecise, arbitrary and completely inadequate.

Problem of selection of analytical procedure is imposed in the first step by the fact that in most cases archaeological objects should not be damaged and also by the specific character of material itself. Thus the choice is most often limited to only a few undestructive methods first of all to macroscopic determination of mineral content, composition (structure and texture) of rocks as well as other physical characteristics of material (colour, streak, chippability, breakability, hardness according to Mohs and the like). To this should be added the process of determination of carbonate presence in the rock performed by the use of diluted (3:1) and cold hydrochloric acid.⁴

Studying of microphysiographic characteristics of rocks and minerals using the polarisation transmitted/reflected light microscope besides representing basic petrographic investigations after which are selected instrumental analyses to be conduct, could also offer adequate information for archaeological studies. These investigations are, however, possible only in the cases when it is possible to damage the material.

Other methods of investigation of rocks and minerals like X-ray diffraction of powder, differential-thermal analyses, geochemical investigations (determination of contents of macro- and microelements using instruments with various limits of detection) analysis by the electronic microprobe, then determination of physical (e.g. volume density) and technical characteristics of material (different types of hardness, resistance to fire, frost etc.) offer no doubt more details and could solve problems of origin and specifics of materials but only when there is good ground of geological data. This, first of all, concerns the establishing of reference series and simultaneous geological and archaeological investigations at the same site, which in this area and for the time being do not exist. Because of all the above-mentioned, following the suggestion of colleagues

³ I am particularly grateful to Prof. Dr. N. Vasic, who during consultations with his many advices and suggestions directed this work towards its final form.

⁴ Calcite (CaCO₃) reacts with cold and diluted HCl, in contrast to dolomite (CaMg(CO₃)₂) that reacts only with heated and diluted HCl or other carbonates, which do not react with such solution.
Table 1. Distribution of main stones within sites

<table>
<thead>
<tr>
<th>sites</th>
<th>raw material</th>
<th>chert</th>
<th>quartzite</th>
<th>quartz</th>
<th>white stones of different origin</th>
<th>obsidian</th>
<th>other stone</th>
</tr>
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<tbody>
<tr>
<td>Lepenski Vir</td>
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<td>Velesnica</td>
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<tr>
<td>Ušće Kameničkog potoka</td>
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<td>Blagotin</td>
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<td>Popovića brdo</td>
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<td>Simica strana</td>
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<td>Vinogradi</td>
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<td>Golokut</td>
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<td>Donja Branjevina</td>
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<td>Stari vinogradi</td>
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<td>Rabičevica</td>
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<td>Sedlar</td>
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</tbody>
</table>

from Institute for Mineralogy, Crystallography, Petrology and Geochemistry we carried out only macroscopic and microscopic investigations of the rocks with the possibility to undertake, in some of subsequent phases, more detailed and interdisciplinary investigation of the material not only from the sites studied here but also from other sites as well.

**TYPES OF STONES**

In the territory of Serbia the earliest traces of, conditionally speaking, mining that is exploitation of stone suitable for production of chipped artifacts are related to the area of Kremenac close to village Rujnik near Niš where first investigation results suggest possible activities already in the Early Paleolithic.5 Finds of opal in the area Glavica–Krivo Polje by Ramaca near Kragujevac and traces of strip mine represented by shallow pits are indicators that this deposit of raw material was used by inhabitants of Starčevo culture settlements, which were situated in the immediate surroundings during Early, that is Middle Neolithic.6 Except Lepenski Vir where it is quoted that for chipped artifacts were used also basalt and igneous rocks7 at all other sites it is possible to classify raw material as follows:

- chert
- quartzite
- quartz
- white stone of different origin
- obsidian

Distribution of all registered raw materials at archaeological sites from which comes the material studied in this work is presented on table 1.

On table 2 are data about proportional participation of five characteristic types of raw material at the sites

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<table>
<thead>
<tr>
<th>sites</th>
<th>raw material</th>
<th>chert</th>
<th>quartzite</th>
<th>quartz</th>
<th>white stones of different origin</th>
<th>obsidian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lepenški Vir</td>
<td>319 specimens = 89.85%</td>
<td>3 specimens = 0.83%</td>
<td>23 specimens = 6.74%</td>
<td>0</td>
<td>?</td>
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<tr>
<td>IIa–b</td>
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</tr>
<tr>
<td>Usće Kameničkog potoka, Novi Mihajlovac</td>
<td>203 specimens = 77.48%</td>
<td>59 specimens = 22.51%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Knjepište, Mihajlovac</td>
<td>313 specimens = 87.67%</td>
<td>44 specimens = 12.32%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Donja strana, Velesnica</td>
<td>104 specimens = 19.84%</td>
<td>420 specimens = 80.15%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Blagotin, Trstenik</td>
<td>1004 specimens = 42.47%</td>
<td>1311 specimens = 55.81%</td>
<td>29 specimens = 1.23%</td>
<td>3 specimens = 0.12%</td>
<td>2 specimens = 0.08%</td>
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</tr>
<tr>
<td>Livade, Kalenić</td>
<td>17 specimens = 54.83%</td>
<td>1 specimen = 3.22%</td>
<td>0</td>
<td>11 specimens = 35.48%</td>
<td>2 specimens = 6.45%</td>
<td></td>
</tr>
<tr>
<td>Šalitrena pecina, Brežde</td>
<td>92 specimens = 76.66%</td>
<td>0</td>
<td>0</td>
<td>28 specimens = 23.33%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Simica strana, Ćuđe</td>
<td>38 specimens = 84.44%</td>
<td>0</td>
<td>0</td>
<td>6 specimens = 13.33%</td>
<td>1 specimen = 2.22%</td>
<td></td>
</tr>
<tr>
<td>Popovića brdo, Zablace</td>
<td>903 specimens = 96.78%</td>
<td>17 specimens = 1.82%</td>
<td>3 specimens = 0.32%</td>
<td>7 specimens = 0.75%</td>
<td>3 specimens = 0.32%</td>
<td></td>
</tr>
<tr>
<td>Golokut, Vizije</td>
<td>22 specimens = 81.48%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5 specimens = 18.51%</td>
<td></td>
</tr>
<tr>
<td>Donja Branjevina, Deronje</td>
<td>823 specimens = 98.21%</td>
<td>11 specimens = 1.31%</td>
<td>0</td>
<td>0</td>
<td>4 specimens = 0.47%</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Proportional distribution of main stones

where systematic excavations were conducted that is site surveying in the course of which complete material was collected without triage and there are also reliable data that on these settlements material in question was not mixed with later material.

Cherts are silicate sediments consisting of chalcedony and quartz. They might contain remains of radiolarians (microorganisms with silica skeletons) and siliceous foraminifers (microorganisms with most often calcite skeleton) etc. ⁸

Chert is of great hardness but also brittleness and it has characteristic conchoidal fracture and its surface is most often slightly to very glossy and could be more or less translucent at thin sections. It could be very variegated depending on kind and quantity of admixtures. Admixtures of oxides or hydroxides of iron give yellow, brown, reddish and reddish-brown colour to the rock, manganese gives greenish or blue-green colour, clay minerals grey and organic material black.⁹ Usage of terms in our foreign archaeological literature is the result of ignorance and incorrect interpretation as a consequence of often uncritical and unstandardised use of certain terms among petrologists themselves.

Huang uses terms chert and flint with observation that flint is the black variation of chert and that this term is much better to use for prehistoric artifacts.¹⁰ Having in mind that cherts with macroscopically identical characteristics could come from one deposit but also from very distant ones as well as cherts with different macroscopical characteristics could come from very distant but also one deposit it causes suspicion that is justifiable to classify raw material according to colour as one of essential criterions. Concretion of cherts (as result of substitution most often of lime-

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⁸ If contents of radiolarians is high (over 20%) stone could be considered as radiolarite (organogenic sediment) that according to general characteristics does not differ from chert.
¹⁰ Huang T.W., Petrologija, Beograd 1967, 250.
stone) occur as concretional layers, lentis and nodes in one lithological column.\textsuperscript{11} Such cherts viewed laterally and vertically could differ greatly from microscopic point of view. All petrological investigations disregarding their type (X-ray, differential-thermal analysis, microscopic analysis) without control samples from precisely located areas of exploitation in prehistoric times from archaeological point of view do not offer comparable results. Exact definition in petrologic sense could suggest geological units within which this kind of chert occurs and thus point to the courses of investigation of potential primary occurrences.\textsuperscript{12}

Special attention in the investigations should be paid to distinguishing of chert and opal because cherts as sediments of biochemical and chemical origin could be very ancient while opals as chemical sediments are considerably later from small, rather localized sources often related to hydrothermal activities that could have decisive impact on archaeological interpretation.

Taking into account that there are different concepts in geological literature\textsuperscript{13} and that terms flint, chert, silexite, novaculite, jasper, chert are used as synonyms in this work the term chert will be exclusively used and it will include all the stone, which according the above mentioned definition belong to the group of silicate sediments disregarding color, gloss and transparency.

Cherts are the best represented raw material and predominate at all sites except at Blagotin and Velsenica. In future investigations attention should be paid to primary occurrence of chert that are also potential places of exploitation and at the same time areas where knowledge was acquired necessary for development of mining in the later periods. Following the data from Basic geological maps (scale 1:100,000) and their interpretations it could be noticed that primary occurrences of chert are registered in carbonate tuffs not far from Donji Milanovac (black chert) and in Cretaceous –Sinaia deposits of the Miroč zone\textsuperscript{14}, in Jurassic sediments of Timočka krajina (black chert) and Cretaceous volcanic-sediment rocks of Miroč\textsuperscript{15} in upper Jurassic horizons of Veliki vrh and Lomnica\textsuperscript{16} in Upper Jurassic flysch sediments in the area from Radjevstica to Lepevac and in the region of Mošut, Igros and Šljivovo,\textsuperscript{17} in sediment-volcanic series of Jurassic date in the area of Studenica and Polumir and Željin,\textsuperscript{18} in diabase-chert formation near Dragošvara, Gornja Sabanta, Trešnjevik and in the Lopatnika valley\textsuperscript{19} in Jurassic layers at Bela reka and Hâjuščki potok and near Ripanj,\textsuperscript{20} in Jurassic limestones of the complex Maglieš, Čubrica and Blagulja, diabase-cherts formations of Jurassic date on Little and Middle Povlen, across Medvednik and Pobja to the northern slopes of Maljen,\textsuperscript{21} in Mesozoic marls and sandstones with layers of limestone on the western and southwestern slopes of Avala, in carbonate sediments on top and on northern slopes of Avala and in tornotian limestones near Lestani.\textsuperscript{22}

Of course this is not by all means the complete list of regions of possible primary exploitation of cherts as the data were taken from small-scale maps and thus small occurrences of certain rock types are not represented. As there is still no complex joint project of geological and archaeological team that could solve in a satisfactory way the question of provenance of chert at the archaeological sites dating from the Early and Middle Neolithic most of the conclusions will remain hypothetical for the time being.

**PROBLEM OF LOCATION OF PRIMARY OCCURRENCE OF SO CALLED »BALKAN FLINT«**

In addition the problem of location of so called »Balkan flint« should be considered. This is the chert,\textsuperscript{11} Protic M., (editor), Geološka terminologija i nomenklatura IV, Petrologija, Beograd 1975, 139. Crnč B., Neka zapazanja o dijapaz-rožačkoj formaciji Oharida, Vesnik XI, Zavod za geološka i geofizička istraživanja Srbije, Beograd 1954, 31–88.


\textsuperscript{15} Kalenić M., Đorđević M., Krušić B., Bogdanović P., Miloša-


\textsuperscript{19} Urošević M., Pavlović Z., Klišić M., Malešević M., Stefa-


\textsuperscript{22} Filipović I., Redin V., *Tumač za Osnovnu geološku kartu, list Obrenovac*, Beograd 1980.


which color could be honey to honey-gray or milky-gray with lighter circular spots of grayish color and for it Kozłowski and Kozłowski say: »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« and then add: »A peculiar thing is that all analogies concerning certain types of artifacts like end-scrapers, retouched blades and flakes concern the whole region supplied with Balkan flint which also include finds of Körös culture in Great Hungarian Plain«.

In her dissertation Voytek said: »In addition, in Lepenski Vir IIIb, the inhabitants used yellow spotted chert for the first time. This material was found in blocks and large flakes which were also located inside pots and also »Outcrops of Balkan flint are known from Dobrogea and the pre-Balkan platform in northern Bulgaria (Tringham 1971, 153; Nacev and Kancev 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 (Comsa, 1976, 240)«.

Contrary to Kozłowski and Voytek, located areas with primary occurrence of »Balkan flint« connecting them also to »Pre-Balkan Plateau«. It is the area in northern Bulgaria to the west of Varna and the area on the left bank of the Prut in Dobrogea in Romania. Distance between these areas is approximately 450 km.

In her dissertation B. Voytek defines zones of chert in Bulgaria (Fig. 2). Zone spreading in east-west direction from Black Sea coast to the eastern Serbia could be clearly distinguished. When we compare this outline with geological map in figure 3 we can recognize absolute correspondence with the zone identified as Pre-Balkan.

The used term »Pre-Balkan Plateau« is from geological point of view (in this context) highly problematic. This zone mentioned by Kozłowski and Kozłowski as well as by Voytek and which they call Pre-Balkan Plateau according to the data from geological literature corresponds to terrane (not terrain) identified as Pre-Balkan in the territory of Bulgaria and further westwards extends in the terrane Vrška Čuka-Miroć (eastern Serbia).

These are distinct geological terms so their regard as identical leads to confusion as in using literature as in consultations with colleagues geologists.

Analysis of proportional representation of »Balkan flint« in the material studied in this work indicates that going downstream along the Danube from Lepenski Vir towards Knjepište number of artifacts of this raw material decreases and that would be illogical if we accept the assumption about primary occurrences/outcrops as explained by Kozłowski and Kozłowski and Voytek (Fig. 4).

If we accept explanation of Voytek about first use of »Balkan flint« only by the inhabitants of Lepenski Vir IIIb settlement question could be asked where are from the specimens of chipped stone artifacts made of identical raw material at the sites located much more to the west of the Iron Gates like Toplik (Malо Crnićе), Orašе (Dubravica) and Blagotin (Poljа) that are dated into earlier phases of the Starčevo culture?

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24 Ibid. 275
26 Ibid. 129,130
On the other hand this type of chert is represented at Blagotin by 14.34% (distance from the zone in Romania is about 680 km and from zone in Bulgaria about 500 km) while at notably more distant site Simića strana ratio increases to 21.05% (distance from the zone in Romania is about 720 km and from zone in Bulgaria about 600 km) but at rather close settlement Popovice brdo decreases to only 0.88%. At the site Donja Branjevina, the most distant site in relation to the Iron Gates area, (distance from the zone in Romania about 750 km and from zone in Bulgaria about 700 km) the ratio increases again to 11.05% and at site Golokut ratio reaches even 18.51%. And Golokut is only 35 km far from Donja Branjevina (distance from zone in Romania about 730 km and from zone in Bulgaria about 660 km).

Disproportion in use of certain types of raw material could be the result also of chronological gap between outcrops from which particular material originates. It is logical that during longer time periods smaller primary deposits became exhausted as well as the new ones were probably discovered. However, chronological framework of the sites from which studied material comes is such that they do not have principal role in establishing proportional aspect of »Balkan flint«.

In the Ključ region, within the area of village Korbovo, is situated Zbradila, very important site of the Vinča culture. Collection of chipped stone artifacts from this site contain 1896 specimens and when raw material is considered even 85.44% are specimens made of »Balkan flint«. Some of these artifacts made of this type of rock have a cortex of river pebble that suggests the practice of using rocks from secondary sediments – river deposits. In the case of this Late Neolithic site we could argue about the chronological difference that caused the difference in the ratio of material made of »Balkan flint« but it is very significant that there were artifacts which having the river pebble cortex suggest the local origin of this particular kind of raw material.

Investigations carried out in Poland also offer information about distribution of high quality chert and there were discovered authentic mining activities in the region of primary deposits. So called »Jurassic flint« (Jurassic–Cracow flint) from the Cracow area was distributed at a distance from 260 up to maximal 475 km. Thus, not even so popular raw material in Linear Bandkeramik culture was not transported as far as 750 km what is the distance between Donja Branjevina and zone with »Balkan flint« in Dobrogea. We should keep in mind that apart from the sites in the Iron Gates and Ključ region all other sites with substantial amount of

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artifacts made of »Balkan flint« are more than 475 km far from the potential primary deposits of this raw material in Bulgaria and Romania.

Find of three artifacts with river pebble cortex in Velesnica and Blagotin as well as large amount of such artifacts at Late Neolithic site Zbradila in the analysis of provenance of this kind of chert raises some questions:

– is it possible that common raw material as chert that is widely distributed could have been the object of trade or barter operating at distances greater than 700 km what was recorded only in the trade and exchange of obsidian, which from geographical point of view has rather restricted area of deposits and which due to its quality attracts special attention of users?

– is it probable that from the areas of primary deposits instead of high quality large pieces of chert small river pebbles have being brought as subject of exchange or trade?

– whether the find of artifact with river pebble cortex suggests collecting of this raw material washed out from primary deposit in the immediate vicinity of Velesnica and Blagotin?

As we already emphasised the conditions of chert formation are such that in different areas could be created stone of identical petrographic characteristics so this should be taken into account when trying to locate primary deposits of »Balkan flint«. So even if we accept the thesis about existence of primary deposits of that kind of raw material in the region imprecisely determined as »Pre-Balkan Plateau« in the works of above mentioned authors it in any case does not mean that only in that region could be found stone of cited macroscopic characteristics known as »Balkan flint«.

Quartzite is metamorphic rock very widespread in nature and when it concerns the variety convenient for production of chipped stone artifacts it was most frequently collected from river deposits. The fact is that quartzite is greatly used for production of tools and reason for unawareness of this industry is in the fact that such tools are often unrecognised and hence not gathered during excavations. Therefore, we think that great discrepancy in proportional presence of quartzite at certain sites is not the result of more or less distinct heritage of earlier periods but to the great extent consequence of the incomplete collections. If it concerns the sites with undoubtedly complete inventory of chipped stone tools difference in the proportional occurrence of quartzite could primarily be the result of greater or smaller availability of raw material in the environment. Best indicator of this is the fact that almost all specimens with preserved cortex have in fact the river pebble cortex as the evidence that mostly pebbles from river deposits were used. The only exception is Blagotin with exceptionally developed quartzite industry where most of the specimens have cortex that indicates exploitation from primary deposits. Having in mind that at Blagotin were not ascertained traces of settlement dating prior to Proto–Starčevo culture the use of quartzite surely was not the consequence of eventual Mesolithic tradition but of the fact that in immediate surrounding, in the rocky massifs, were easily accessible quartzite veins.

Quartz – regular crystals of quartz are often found in rock cavities – geodes and best known varieties are: citrine– of yellow color, amethyst – violet, morion – black and cairngorm – dark brown. Besides as separate quartz crystals also appears like druse and more often in grainy aggregates. Its hardness is 7 according to Mohs’ scale, it has rather distinctive conchoidal fracture with exceptionally sharp edges on the flakes and except by color it is very difficult to distinguish visually quartz flakes from those of volcanic glass especially when thin and very transparent artifacts are concerned.

Rock crystal is colorless variety of low-temperature quartz that makes rhombohedral prisms with pyramidal planes on both or only one end. Larger specimens of crystalline quartz suitable for flaking seem to be found rather infrequently so the artifacts of this raw material are exceptionally rare at our Early Neolithic sites. In the material examined in this work artifacts of quartz and in a small amount were discovered only at the sites Popovića Brdo and Blagotin.

Considerably less represented in nature than cherts and quartzites is the main reason why quartz as raw material was not used more often and small number of artifacts at the sites where it was used is the result of scarcity of large enough crystals suitable for working. However, quartz remains as one of top-quality raw materials that is confirmed by the quality of quartz blades from Blagotin. Presence of quartz at Blagotin (29 specimens) could be related to the position of this settlement located in the Zapadna Morava valley and surrounded by mountains Kotlenik, Jelica, Čemerno, Kopanik, Požar, Jastrebarski, Ozren, Rtanj, Kučaj, Juho and Gledić. Somewhat to the north is mountain Rudnik where in the region Pršuš–Mali Šturac were discovered traces of exploitation of copper and quartz from the

Metal Ages. In the pit-dwelling 07 were discovered specimens of amphibolite with characteristic paragenesis. They were probably used as raw material for decorative objects because of its impressive weight and attractive surface after polishing. In the natural environment these amphibolites could be found together with quartz crystals and they are the evidence of interest for different types of raw material as well as of exploratory campaigns organized to look for them. Thanks to such campaigns the quartz was found at Blagotin.

**White stone of different origin** – this unfortunately inadequate term stands for artifacts made of siliceous limestones, magnesite, porcelain, tufts and diatomaceous earth, at least when polished tools are in question. Antonović states that investigation of so-called *light white stone* revealed that it was mostly silicified magnesite, which because of its density of 3 g/cm³ could not at all be called *light white stone* but that this term should be retained for the time being because it is largely accepted in literature. “Bogosavljević–Petrović suggests the use of term *soft white stone*.”

Adopting such formulations for the group of stone of different origin and physical properties among which predominates silicified magnesite that is neither light nor soft stone marks the beginning of the whole series of, later hardly eradicable, misconceptions that have most striking examples in inadequate use of terms silex, chert, flint, quartz and quartzite in our or foreign literature as the problem we have already discussed. Neither the term *white stone of different origin* could solve this problem and in this work we used it to diminish inconsistencies noticed also by the authors that suggested those two cited terms.

Raw material studied in this work that relates to the term *white stone of different origin* occurs in very small proportion at the sites Livade (Kalenic), Simića strana (Čučege), Toplik (Malu Crnici), Šalitrena pećina (Brežde), Popovića brdo (Zablace) and Blagotin (Poljana). As it was possible to perform only macroscopic analysis on the basis of noticed characteristic it could be concluded, with certain reserve, that material used was in most instances silicified tuff but there were artifacts of silicified marl and silicified wood (at Blagotin). Having in mind the activities that chipped stone artifacts were intended for and the fact that silicified tuff is less hard than chert and that it is much more liable to damage even when working less hard materials it is surprising that this raw material was used for chipped stone artifacts. It could not be ruled out that these artifacts were possibly by-products in the process of making polished artifacts – axes as it was the case at Divostin.

White stone of different origin as well as quartz represent secondary raw material for production of chipped stone artifacts. Artifacts of this raw material are represented in small number and these are mostly unretouched and low-quality flakes and blades. It is interesting that four sites (Popovića brdo, Simića strana, Šalitrena pećina and Livade) are situated within restricted geographical area between rivers Sava to the north, Drina to the west, Kolubara to the east and Ribnica to the south where Blagotin is in central Serbia on the river Zapadna Morava and Toplik more to the east on the Mlava river. For Toplik suggested dating is in Proto–Starčev phase, for Livade (without more precise determination) in Starčev, for Popovića brdo, Simića strana and Šalitrena pećina in Starčev II and for Blagotin in Proto–Starčev II phase. Geographical position of the sites and period from which the last four sites date could be indicators for the space and time when white stone of different origin emerged in use reaching maximum during Late Neolithic and Vinča culture.

Core made of fragmented axe from the site Popovića brdo supports the assumption that chipped stone artifacts made of white stone of different origin are in fact by-products in the process of making polished stone artifacts as it is the case at Divostin.

**Obsidian** belongs to the group of volcanic glass, which represents amorphous mass produced by sudden
cooling of molten lava during volcanic eruptions. It is often found as interstices in volcanic rocks.\textsuperscript{40}

Volcanic glasses differ according to chemical composition (water contents is very important) and structural and texture characteristics. On the basis of these parameters it is possible to distinguish following varieties: obsidian, pitchstone, perlite and pumice.\textsuperscript{41}

Obsidian and pitchstone do not differ macroscopically while perlite with its perlite fissures and porous pumice is clearly distinguishable.

Obsidian is volcanic glass having structure from rhyolite to andesite with 1% of water.\textsuperscript{42} It has smooth, glossy surface with conchoidal fracture and is mostly of grey, grey-black and black color\textsuperscript{43} although dispersed hematite could provide dark red or brown color.\textsuperscript{44} Hardness of this rock according to Mohs’ scale is about 6.5 so traces of wear on the surface are more easily and quickly established then on chert.

When we consider obsidian as specific raw material whose primary deposits are rather restricted regionally it is interesting to examine distribution of this material.

For central and southeast Europe important is obsidian deposit in Tokay–Preshov district and on mountain Hedaly in Hungary. This obsidian is mostly of green and light green color but could be also grey, black, brown and very rarely red.\textsuperscript{45} Obsidian was recorded in Romania as well but it was established that this obsidian is unsuitable for producing artifacts by chipping\textsuperscript{46} while Williams and Nandris\textsuperscript{47} present data about primary deposits of obsidian in north-eastern Hungary in the area of mountain Zemplén (Tokay–Preshov region) and in south-eastern Slovakia.\textsuperscript{48} In the central Mediterranean predominate deposits on Sardinia, Patmara, Lipari and Pantelleria\textsuperscript{49} in eastern Mediterranean deposits on Gialio, Melos and Antiparos\textsuperscript{50} and in the region of Asia Minor and the Near East deposits in central Anatolia and in Armenia to the west of lakes Van and Sevan.\textsuperscript{51}

At Middle Neolithic site Gaione near Parma obsidian from island Palmarola is present, in Early Neolithic horizons of the site Arene Candide was discovered obsidian from Sardinia (52%) and Palmarola (42%) while in Late Neolithic horizons of Arene Candide prevails obsidian from Lipari (88%). It is significant that at Grotta dell’ Uzzo in the Neolithic period predominates obsidian from Pantelleria contrary to the previous assumption that in Sicily and south Italy predominates obsidian from Lipari.\textsuperscript{52} Distance between the southernmost source of raw material and northernmost find of obsidian artifacts from this deposit is about 540 km and relates to Palmarola Island and site of Arene Candide.

In the Early Aegean Neolithic the northernmost find of obsidian from Melos is at Nea Nikomedia about 480 km far,\textsuperscript{53} while in Asia Minor and the Near East obsidian was transported at the distance of almost 850 km, for Anatolian obsidian found in Beidha and somewhat more than 1000 km for Armenian obsidian found in Ali Kosh.\textsuperscript{54}

As Renfrew concludes\textsuperscript{55} on the basis of ethnoarchaeological studies of contemporary primitive societies commodity as obsidian was probably treated as gift between friends and merchants based on reciprocity thus excluding existence of free market. Further implications of such conclusion were that Melos obsidian was exploited by members of one community and as highly prized commodity exchanged unworked pieces for food and other goods with communities in their closest vicinity. From there obsidian as part of similar barter trade shifts further without involvement of specialized merchants. This means that subject of exchange was obsidian in cores while production of necessary flakes and blades was carried out by later users, that is specialists at certain settlements or individuals skilled in working this kind of raw material.

\textsuperscript{40} Tomkeieff S.I., Dictionary of Petrology, Chichester, New York, Brisbane, Toronto, Singapore 1983.
\textsuperscript{41} Đorđević V., Đorđević P., Mirovanić D., Osnovi petrologije, Beograd 1991.
\textsuperscript{42} Huang, op. cit. 148. Protić M., (urednik), Geoška terminologija i nomenklatura IV, Petrologija, Beograd 1975, 108.
\textsuperscript{43} Protić M., op. cit. 108.
\textsuperscript{44} Huang, op. cit. 147.
\textsuperscript{45} Титов В., Ранний и средний неолит восточной Бенгрии, Культура Бьюк, у Археологи Бенгрии, Москва 1980, 220.
\textsuperscript{46} Nandris J., A reconsideration of the south-east European sources of archaeological obsidian, Bulletin London University Institute of Archaeology 12, London 1975, 71–94.
\textsuperscript{48} This obsidian is also of no use for making chipped artifacts but it is important as an example for primary occurrence even today noticeable in the nature.
\textsuperscript{52} Tykot H.R., Ammerman J.A., op. cit. 1004.
\textsuperscript{53} Renfrew C., op. cit.
\textsuperscript{54} Renfrew C., Bahn P., op. cit. 325–326.
\textsuperscript{55} Renfrew C., op. cit.
Same conclusion is stated by Renfrew and Bahn for routes of distribution of Anatolian and Armenian obsidian identifying the zone of procurement covering primary deposits within an area of 320 km in diameter and contact zone outside the mentioned area. In the procurement zone inhabitants of certain settlements acquire raw material themselves while in the contact zone barter trade was organized for convenient goods without participation of specialized merchants. In the contact zone as the settlement is further from zone of procurement so the amount of obsidian artifacts is smaller.

Accepting this model of obsidian distribution we can use term zone of procurement for Tokay–Preshov area while archaeological sites in Serbia where obsidian was found are within the contact zone. Unfortunately, incomplete information about discovered material so far does not make possible establishing of completely clear picture about decreasing of number of obsidian artifacts in relation to the distance of archaeological site from the zone of procurement. Obsidian from the area of mountain Zemplén occurs like small and often secondary deposits where fragments of various sizes are found but without large and massive outcrops. These fragments most probably represent remains of disintegration of certain outcrops of ryolitic glass. Wooded and tilled areas hinder discovering of these outcrops and in that area also have not been registered traces of prehistoric settlements. Zone covering approximately 6 sq. km is also identified in the territory of Ukraine in the Gerovske–Fedelshovtsye region between the zone with obsidian in eastern Slovakia and zone with pearlite in Oaș–Negrești region in northwestern Romania. This so called Trans–Carpathian zone supplied predominantly obsidian of purple color and black obsidian with spherulites and black obsidian with «liquid» structure that are of less significance and are scattered in this area. Williams and Nandris emphasize that during investigations in 1975 in the area of Zemplén mountain among large amount of geological and archaeological material were not encountered specimens of obsidian of green, red and red-yellow color that are mentioned by Roska and Janšak. New investigations revealed, however, that obsidian from Tokay–Preshov district and mountain Hedal is mostly green and light green and to a smaller scale grey, black, brown and red. If all obsidian from our sites originates from this zone of procurement and all discovered examples are black or grey question could be asked why not a single specimen of green color was found when it is best represented in the area of primary deposits nor any piece of brown or red color.

Williams and Nandris cite in their report largest finds of black obsidian, up to 3.3 cm in Hungary (Tolcsva) and 7.5 cm in Slovakia (Malá Torona) while Titov mentions finds of obsidian cores up to 15 cm long from the sites of Bükk culture in Hungary.

Difference in these data points clearly to insufficient geological investigations of regions with primary deposits of obsidian and that leads to further negative implications in archaeological investigations. Only detailed comprehension of primary deposits and analyses of samples from them will enable establishing of control series that will help in interpretation of origin of obsidian artifacts from the Neolithic sites in southeast Europe, that is from Proto–Starčevo and Starčevo sites in Serbia. Until then the possibility should be open for the existence of primary deposits of obsidian also in the territory of Serbia. That means that all obsidian need not be explained as import from archaeological point of view. In the territory of Serbia are known numerous examples of Tertiary volcanism of acid or intermediary character and as a consequence of volcanoc activities and ejection of magma could be expected finds of volcanic glass. Local outcrops of volcanic glass whose exploitation was possible in the Neolithic could have been of small size and exhausted already in that time or could have been covered with sediments in the earlier millennia and nowadays inaccessible or unknown. Proof for stated assumption is the find of black obsidian pebbles in the valley of Onjega brook on the northern slopes of the Rudnik mountain.

Pitchstone is also volcanic rock, similar to obsidian, and according to some authors it is of rhotitic structure while according to others its structure is rather various.

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56 Renfrew C., Bahn P., op. cit. 325–326.
57 Williams O., Nandris J., op. cit.
58 Ibid.
59 Ibid.
60 Roska S., Ceva despre obsidiana, Archivale Olteniei IV, No. 17, Câmpia 1925, 168–170.
61 Janšak S., Praweštništvo s obsidjanovno industrijo na vzhodnom slovensku, Bratislava 1935.
62 Titov B., op. cit. 220.
63 Williams O., Nandris J., op. cit.
64 Titov B., op. cit. 220.
66 Žež, Ј., Najstariji tragovi sedelackog живота на подруча Кубуре, прилог возникавању развоја староречке културе, Кубуба 3, Beograd 1998. 27–37. Even though there is no mention of obsidian pebbles in the published text in personal communication Žež told me about the find of obsidian pebbles in the brook Onjeg, and that he got the information from geology engineer S. Čišaković.
It is produced as a result of sudden cooling of lava, it is of resinous gloss and could be black, brown, green and red. It contains up to 10% of water and it is one of essential criteria for distinction among the types of volcanic glass since there are great difficulties in establishing mineralogical composition and inconsistencies of criteria for identification. Hence there are no analyses performed on the artifacts of volcanic glass from the sites in Serbia the question is still open whether it was always obsidian or the picchstone was also used. Obsidian is raw material of almost no importance for production of chipped stone artifacts in the Early and Middle Neolithic of Serbia. Only quartz was used less than obsidian. It is interesting coincidence, which might be also accidental that of six sites where white stones of different origin were used at five of them obsidian was also used and these are Toplik, Blagotin, Popovica brdo, Simica strana and Livade. Besides these mentioned sites obsidian was found at Lepenski Vir, Donja Branjevina, Golokut and Stari vinogradi (Banatska Dubica). The earliest use is related to Lepenski Vir and Toplik dated into Proto-Starcevo and Blagotin dated into Proto-Starcevo II. All other finds relate to phases Starcevo II and III. While for the finds from Donja Branjevina, Golokut and Stari vinogradi it could be assumed with considerable probability that this material was imported for other sites there is still an open question of the provenance of obsidian. High proportion of obsidian artifacts from Golokut (18.51%) is surprising disregarding the fact that whole series is in fact small for proportional analyses.

Following the data offered by interpreters of main geological map as possible primary deposits of volcanic glass could be distinguished Timok eruptive region 68 volcanics of Turonian–Sennonian series in the Bor region 69; tuffs of Tertiary magmatism in the Ibar valley 70; as well as Cačak–Kraljevo basin 71; and volcanic area Barajevo–Ripanj. It is necessary to mention again information about obsidian pebbles in the Onjega brook on the northern slopes of the Rudnik mountain as well as about hyaloclastite in the Borač eruptive complex. 73

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Taking into account present level of our knowledge many conclusions remain hypothetical and depending to the great extent on the number of investigated archaeological sites, amount of discovered chipped stone artifacts, the scope of technical documentation from excavations, number and character of petrologic analyses, uncoordinated academic terms as well as on insufficiently approved hypotheses cited in literature by different authors.

Location of possible primary deposits of certain raw materials used for chipped stone artifacts could and should be the starting point for detailed site survey but in co-operation with competent geological experts. Having in mind the genuine assumptions about local origin of at least one segment of the used «Balkan flint» and possibly obsidian results could be very interesting and indicative for partial correction of current opinions about processes and routes of communication between the bearers of Neolithic cultures in Serbia.

Translated by: Mirjana Vukmanović

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67 Huang T.W., op. cit. 148.; Protic M., op. cit. 122.
68 Bogdanovic P., Rakić M., op. cit.
69 Kalenić M. i dr., op. cit.
70 Urosevic M. i dr., op. cit.
71 Markovic B. i dr., op. cit.
72 Filipovic I., Rodin V., op. cit.
73 Cvetkovic V., op. cit.
Резиме: "ЈОСИП ШАРИЋ, Археолошки институт, Београд СТЕНЕ КАО МАТЕРИЈАЛ ЗА ИЗРАДУ ОКРЕСАНИХ АРТЕФАКАТА У РАНОМ И СРЕДЊЕМ НЕОЛИТУ СРБИЈЕ

"Велики и веома битан део необраћених археолошких налаза чине артефакти ел окренутог камена који, као део инвентара свакодневно коришћеног у различитим производним процесима и на различитим материјалима, могу да пруже бројне податке везане за целоугласту реконструкцију живота у самој једном објекту, у једном насељу или на широм простору настањености припадници једне веће етничке агломерације који ми данас називајемо простором одређених културних група.

Овај рад је покушај да се, поред детерминијације стена коришћених за израду окренутих артефаката, да потпунији одговор на питања да ли су си окренуте артефакте израђене из од писаних тзв. "балканског крмена" преношења на нешто од рано- и средњеенолитских локалитета у Србији импорт као резултат контаката међу удаљеним заједницама или су могли да буду и аутохтоног порекла.

Артефакти од окренутог камена на основу којих је извршена анализи сировина и њеног порекла потичу са 20 налазишта (слика 1). Услови налаза нису били идентички, али већи део материјала је за локалитета на којима су вршене систематска исековања, а то су Падина, Лепенски Вир, упиће Камечковог потока, Књешице, Доња страна-Велесница, Блатогин, Виногради-Грабовац, Лавале, Шалгрен, пећина Доња Брањевина, Голокут и Војловица.

Осим локалитета Лепенски Вир, за који се наводи да се за израду окренутих артефаката користе балт и магматске стене, на свим осталим налазиштима могуће је сировински материјал раздржати на: роман, квартар, кварц, "беле сече различитих боја" (слика 1 и 2).

Поменути такозвани "балкански крмен" је рогоза чија боја може бити од боје мела до млесносе, односно млечнасто, са светлозеленим кружним петама сиваке боје, за који Козловски и Козловски као и Војтек дају податке о локацијама примарних појава и лежишта највише у области "Пребалканског плафформа". У својој дисертацији Војтек даје приказ зона рогоза у Бугарској (слика 2). Јасно се уочава зона која се у правцу исток-запад пружа од обала Црног мора до источних области Србије. Када се тај приказ упореди са геолошком картом на слици 3, приметна је асоцијална подухваљност са зоном обележеном као Пребалкан. Употребљени термин "Пребалкан плалеформ" је са геолошке тачке гледиша (у овом контексту) веома проблематичан. Та зона на коју се привлаче Козловски и Козловски и Војтек, највише је "Пребалкан плалеформ", према геолошким литературним позицијама припада посебној посемио некој јединици која одговара термину "не шерен") по назвом Пребалкан као који је изложен на подручју Бугарске, а даље ка западу настајао се на вреш Вршка Чука-Мирот (источна Србија). Реч је о посебним геолошким појмовима, на њихово постојање и развој до забуну, како приликом коришћења литературе, тако и веома конспекцију са којима геолошке струкре.

Анализи проценатаб увешта тзв. "балканског крмена" у материјалу обрађеним у овом раду показује да идуив изложност Дунавом, од Лепенског Вира ка Кнечику. Број артефаката од те сировине опада, што би било неолошко ако се прихваћа претпоставка о положају примарних појава/лежишта оно ко како то би симетрично Козловски и Козловски и Војтек (слика 4). Ако се прихваћа тумачење Војтек о пријек употребе тзв. "балканског крмена" тек од стране једрена јела иза удаљених појава алтернативне локације у односу на древни атрактор, као што су Топли (Мао Цини), Орание (Дубрачко) и Блатогин (Полна) који су датовани у старој фази старије културе у.

"Најаз тренутних сировина на територијал прогласи у Бугарску и у Блатогину, као и веома број таквих артефаката са алтернативом локалитета бифрени, у анализи о пореклу о врстама рогоза постоји следећа питања:

- да ли је вероватно да би било сировина, као што је рогоза који је веома распрострањен, могао да би био предмет размене или трговине обављане и на удаљеностима већим од 700 km, што је објаснено само у размене и трговине опсегом који има, у географском смислу, уског лежишта и који се формирају уважавајући коришћење географског караграђевине и Блатогину.

- да ли је вероватно да би се и на простору примарних лежишта, као предмет размене или трговине, уместо караграђевина који се формирају уважавајући коришћење географског караграђевине и Блатогину.

Услови под којима се формирају рогоза таквих су да на различитим просторима могу да настани стена идентичних петрограђевских карактеристика. Та су чинилице треба увести у обзор и приликом покушаја да се локацију примарне појаве/лежишта тзв. "балканског крмена" Дакле, чак и ако прихватимо тежу о положају примарних лежишта те врсте сировинског материјала на простору непреривно дефинисање "Пребалкан плалеформ" у радовима већ поменутих аутора, то ни у ком случају не значи да би само на том простору могао да се јаве стена наведених макроскопских карактеристика позната под називом "балкански крмен". Описани припада групи вукансках стакла које представља аморфне масе насталих наглим очуваним оном вукансках ерупцијама. Често се појављује као интерпретације у вуканским стенама. Вуканска стакла се межу
Собно разликују према хемијском саставу (веома је значајан садрај раже у њима) и структурно-текстурним карактеристикама. На основу ових параметара могуће је извожити следеће врсте разлика: опсидеија, чехијати, перлит и пловућан.

Описија је вулканско стакло састав глибог глине до анделита са сањарем воће у 1%. Изражена је глатка, сајуна са просечним разменим, а јаља са углавном у свици, свици и црној боји, из које липсери чемат мого да му дат тамилорскому или муру боју. Тврдина ове стена по мосу је око 6,5, па се и употребе творове камице и бреху обраснула на површини, него код рохана.

За целокупну и југоисточну Европу значајно је лепише опсидеја у Токаској - преновској области и на планини Кедаља, у Мађарској. На том простору опсидеја се јавља углавном у зеленој и светлозеленој боји, а наступају и суви, црни, мрк и још ређе црвени. Евиденциране су и појаве у омунуци за које се установило да се на њима налази опсидеј из најновијег археолошког периода. Док Вилице и Нацрдис износе податке о примарним лепишима опсидеја у североисточној Мађарској, у области планине Зеелен (Токаско-преновска област) и југоисточној Војводини. У централном Средеземном делу дионишта лепиши на Средици, Осинови, Липарима и Панагелије, у источном Средеземном делу налази на Галатију, Мелосу и Антипирсу, а у области Мале Азије и Бисхосписте, лепишта у северној Анатолији и у Јерменији, на простору западно од језера Ван и Цеван.

Као што закључује Ренфру на основу статистичких процени срвених примитивних заједница, роба као што је опсидеј изузетно је била предмет поклона између пријатеља и трговаца и то на бази реципипности, што би исказивало постојање трговинског тржишта. Даље импиликације таквог закључка биле би, релативно, да мелоски опсидеј претходну припадници једне заједнице, као и високољену робу, необаврсени машине и инструменте који су били на јерменијском простору. Одакле роба у сличној размени оддале се без присуства специјализованих трговаца. То подразумева и да је предмет размене опсидеј у језгрума, док израду потребних одбирака и сечива врши који се кретао, односно специјализовани мајстори није била употреба опсидеја је значајан.
вани у протостарчево и Благотин који је датован у протостарчево II. Сви остали налази везани су за фазе старчево II и III и док за налазе са Доње Брањевине, Горакта и Старог винограда са знатном вероватноћом може да се претпостави да је реч о импортованом материјалу, за остале локалитете остаје отворено питање порекла пронађеног опсидања. Изменајуће висок проценат опсидијалних артефаката са локалитете Горак (18,51%), без обзира што је цела серија у основи мала за проценатне анализе.

Праћени поплут које дају тумачи означне геолошке карте, као потенцијалне примарне појаве/лежишта вулканског стакла издавају се тимочка срупиони област; вулканин турон-сенонске серије на простору Бора; туфови терцијарног магматизма у долини Ибра; као и чачанско-краљевачки басен; и вулканогене подручје Барајево – Рипањ. Неопходно је поновити и податак о налазу опсидијалских облутака у кориту потока Оњега, на северним падинама Рудника, као и о појавама хијалокластита у борачком срупионом комплексу.

На садашњем степену истражености многи заслужни остале у сферу хипотетичног, диктори у великој мери бројем истражених археолошких локалитета, количином пронађених окресанних артефаката, обимом техничке документације и изложености, бројем и врстом обављених петролошких анализе, неуспашаношћу стручних термина као и неусловно аргументованим поставкама које се у литератури цитирају од аутора до аутора.

Лоцирање потенцијалних примарних појава/лежишта за поједине сировине коришћене у изради окресаних артефаката може и требало би да буду полазна основа за детаљну теренску проспекцију, али у оквиру сарадње са компетентним стручњацима геолошке структе. С обзиром на реалне претпоставке о локалном пореклу бар јелог дела коришћеног твр��о „балканског кремена“ и, могуће опсидања, резултати би могли да буду веома интересантни и индицирани за делимичну корекцију тренутних важних имплекирања о процесима и правцима комуникације међу носиоцима неолитских култура на ту Србије.