Carpathian Obsidians: State of Art

Archeometriai Műhely / Archaeometry Workshop
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Varnyúkova program / Preparatory meeting for IOC 2019

Lectures

13:00-13:20	T. Biró, Katalin:	Introduction: Obsidian – the term, the concept, the phenomenon
13:20-13:40	Bačo, Pavel – Bačova, Zuzana:	Geology of the Carpathian Volcanic Glasses, mainly Obsidians in Slovakia
13:40-14:00	Kasztovszky, Zsolt – Přichystal, Antonín:	An overview of the analytical methods applied to study the Carpathian obsidians
14:00-14:30	Coffee break / Posters	
14:30-14:50	Sobkowiak, Iwona:	The distribution of Carpathian obsidian during the Stone Age in Poland
14:50-15:10	Kaminská, L'ubomíra:	Verwendung von Obsidian in Paläolithikum und Neolithikum der Slowakei
15:10-15:30	Přichystal, Antonín:	State of arts: The Carpathian obsidians in the Czech Republic
15:30-15:50	Markó, András:	Use of obsidian in the Epigravettian period
15:50-16:10	T. Biró, Katalin:	The regular and the special: mass supply vs. exotics
16:10-16:30	Discussion	

Posters:

Szepesi, János:	Volcanology of the Obsidians in the Tokaj Mts.
Antoni, Judit:	Extra-European obsidian tool assemblages in Hungarian museums
Priskin, Anna – Wieszner, Balázs:	Obsidian finds from Hajdú-Bihar county
Rácz, Béla:	The Carpathian 3 obsidian
Sztáncsuj, Sándor József:	Prehistoric obsidian finds in the territory of Romania. The current state of research
Rhyzov, Sergey:	Archaeological and geological studies of obsidians in Ukrainian Transcarpathia

Introduction: Obsidian – the term, the concept, the phenomenon

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Obsidian is a „magical" material. Its outstanding aesthetic and physical qualities made it appealing both in prehistory and (partly consequently) in modern research of the prehistoric period. Due to its specific conditions of formation it can be easily characterised and attributed to source region; moreover, the source areas are confined to specific parts of the World while its antropogenous „spreading" is a World phenomenon. All these factors render obsidian a truly „international", World-wide subject of research. A scientific body, „International Association for Obsidian Studies" (IAOS) has been established to convey obsidian research data for the scientific community. One of the specific reasons for our current meeting is to complete and correct their data on the occasion of the forthcoming IOC 2019 – International Obsidian Conference in Sárospatak, Hungary 2019 (http://ioc-2019.ace.hu/).

Geological background of the occurrences of Carpathian volcanic glass, mainly obsidians, in Eastern Slovakia

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Primary natural occurrences of volcanic glass in the region of Eastern Slovakia are associated with other products of silicic (rhyolite, rhyodacite) volcanism. This Upper Badenian to Lower Pannonian volcanism was a part of the bimodal andesite/rhyolite volcanic activity. Products of the silicic volcanism occur as tuffs and pumice tuffs, reworked epiclastic volcanic rocks, rare intrusions and dominantly as extrusive domes that sometimes pass into short and thick lava flows. The volcanic glass associates with intrusive and extrusive forms of silicic volcanism and occurs in massive as well as brecciated forms (e.g. in the type locality of Merník), or as perlite (Brezina, Byšta) and perlite with obsidian (Malá Bara, Viničky). Rarely the volcanic glass can occur in explosive forms of silicic volcanism (obsidian – Hermanovce, Veľká Bara).
Fragments of perlite with obsidian and rare obsidian, occurring alone, are a part of reworked rhyolite/rhyodacite tuffs, epiclastic volcanic sandstones and gravels, as well as epiclastic volcanic breccias, all occurring near the municipality of Streda nad Bodrogom.
In Quaternary deposits, obsidian occurs around the Cejkov and Brehov villages.

An overview of the analytical methods applied to study the Carpathian obsidians

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We give a brief overview of the analytical techniques applied on Carpathian obsidians, from the mid-sixties (Cann & Renfrew, 1964) until present. The presented methods are discussed according to their physical features, i.e. how the information obtained, elemental-, isotopic- or structural analysis, bulk or surface methods, what elements can be measured, are they sensitive enough for trace element analysis, what are the advantages and limitations. Question of the non-destructivity, as well as economic aspects, i.e. the speed and costs of the analysis are also considered. Some examples of the provenance research of Carpathian obsidians are shown.

Besides modern analytical techniques that are focussed especially on the determination of obsidian artefact provenance, petrographic methods are also applied: investigation in thin section under polarising microscope (flow fabric, inclusions, phenocrysts), characterization of individual microlites and trichites embedded in a glassy groundmass using microprobe, measurement of glass refractive index. Already in 1886, Gyula Szádeczky used the determination of specific gravity on Hungarian obsidians to describe black, translucent, green and red varieties. Magnetic susceptibility was used to distinguish obsidian tools from pieces of artificial glassy slag resembling to artefacts and found during field prospection.

The distribution of Carpathian obsidian during the Stone Age in Poland

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Obsidian, as a natural volcanic glass, was one of the best siliceous rock available for prehistoric societies for manufacturing various tools. Due to distinctive trace and rare earth element composition both its geological sources and chemical types can be precisely determined. This feature made obsidian an excellent record for reconstructing its distributions routes, exchange, mobility, communication network and contacts between human groups. In recent years studies devoted to recognize obsidian provenance and variant by means of instrumental, non-destructive methods (i.e., prompt gamma activation analysis – PGGA, energy dispersive x-ray fluorescence -EDXRF) have been distinctively developed. The strong increase of application this kind of analyses has been observed also in refer to obsidian archaeological collections from present-day Poland.

The paper aims primarily to give a comprehensive overview of Carpathian obsidian distribution within assemblage from almost the entire Stone Age (Middle, Upper and Palaeolithic, Mesolithic and Neolithic), registered in Poland. Furthermore, we will focus on the changeable obsidian flow intensiveness – rather small in the Palaeolithic and Mesolithic to significant increase in the Neolithic, especially over the time of Lengyel and Malice Culture development.

Use of obsidian in the Paleolithic and Neolithic of Slovakia

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Paleolithic

The oldest use of obsidian in Slovakia is documented in the Upper Paleolithic Aurignacian culture. In small numbers, it occurred at Aurignacian sites in the Košická kotlina basin (Košice-Barca I, II, Kechnec I, Čečejovce). In Tibava in the Východoslovenská nížina lowland, 19% of finds were obsidian. It is probably of Hungarian origin (Carpathian group 2). More frequent use of obsidians started in the Gravettian at the sites situated near its sources (Carpathian group 1) in the Zemplínske vrchy hills (Cejkov I-IV, Kašov I, lower layer – 33.26%) and in the Košická kotlina basin (Košic-Barca-Svetlá III). Small numbers of obsidian are known also from the Gravettian sites in Western Slovakia (Trenčianske Bohuslavice, Nitra I-Čermáň).

Obsidian became the prevalent raw material in the Epigravettian of Eastern Slovakia (Kašov, upper layer – 81.73%, Hrčeľ-Nad baňou – 47.29%, Hrčeľ-Pivničky – 69.95%, Veľaty I – 66.45%). In Western Slovakia, it has been documented at the Epigravettian site of Nitra III.

Use of obsidian in the Paleolithic is known from the sites with the Świderian culture in Spiš (Veľký Slavkov-Burich, Lučivná/Svit) and other Epipaleolithic to Mesolithic sites in Spiš (Smižany-Hradisko I), in Orava (Bobrov) and in the south of Slovakia (Veľká Ves nad Ipľom, Silická Jablonica).

Mesolithic

Obsidian was an important raw material also for the Mesolithic population of Eastern Slovakia. All chipped industry in Košice-Barca I was made of obsidian. Obsidian prevailed in Čičarovce and is rarely represented among finds from Medvedia jaskyňa cave near Ružín.

Neolithic

Obsidian prevailed since the oldest stages of the Eastern Linear Pottery culture at sites in the Východoslovenská nížina lowland (Moravany – 89%, Zbudza – 90.7%, Slavkovce – 96.2%, Zalužice – 67% to 91%, Zemplínske Kopčany – 97.6%). In the Košická kotlina basin, it was less frequent (Košice-Červený rak – 29.3%, Košice-Barca III – 36.5%, Čečejovce – 32.7%).

In the Bükk culture of Eastern Slovakia, obsidian prevails at sites situated near its sources (Zemplínske Kopčany – 96%, Kašov-Čepegov – 100%) or it has high percentages (Šarišské Michaľany – 25.5%). In Western Slovakia obsidian occurs as early as the late stage of the Linear Pottery culture. Obsidian cores, nodules and tools become objects of exchange/trade and spread to the environment of the Želiezovce group as well as the starting Lengyel culture.

Eneolithic – Early Bronze Age

In the Eneolithic, interest in obsidian slowly decreased, although in some cultures obsidian was even more frequent (Tiszapolgár culture). Some types of tools (arrowheads with surface retouch) occur also in cultures of the Early Bronze Age (Valaliky-Košťany, Nižná Myšľa).

Use of obsidian in the Epigravettian period

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The archaeological assemblages of the Epigravettian period i.e. dated to the Last Glacial Maximum and the Late Galcial are very diverse in Central Europe.

In the presentation we shortly review some published details of the use of obsidian raw materials with a special focus on the quasi contemporaneous Upper Palaeolithic

sites in the northern part of the Great Hungarian Plain and in the Danube bend. Another important point is the presence of this raw material in the assemblages lying at a greater distance from the source areas: in Lower Austria, in Moravia, and on the sites lying along the Dniestr river.

The regular and the special: mass supply vs. exotics

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When investigating the archaeological distribution of a specific raw material, researchers of the problem are essentially helped by actual geographical and settlement historical endowments of the study area. Raw material supply is a logical enterprise and it has been (even more...) logical in all periods of prehistory. Outstanding quality raw materials of a given area were always found, known and traded – at least distributed – wide. The proximity of the *Source* is typically marked by surrounding *Supply Areas*. Exceptional quality and prestige commodities, however, found their way far beyond the regular supply zones. Their investigation requires special care and consideration on behalf of the analyst and the interpreter.

Volcanology of the obsidian in the Tokaj Mountains

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The Tokaj Mountains evolved in the back-arc system of the Carpathian volcanic arc during Middle-Late Miocene (14-10Ma). The geochemically rhyolitic glassy obsidian identified from a complex succession of effusive and explosive volcanism. The localities described as 1) in-situ mainly perlite related and 2) reworked occurrences. Complex laboratory investigations (SEM imaging, Scanning calorimetry, Fourier transformed infrared spectroscopy, thermogravimetry) performed to develop a complex volcanological model for the obsidian formation and the subsequent hydration process. The field investigations verified the different volcanic origin of the perlite related and reworked occurences. The perlite related obsidians emplaced by effusive silicic volcanism which produce rhyolite flows and domes developing an inner rhyolitic core and a glassy autoclastic carapace. The obsidian formed in the medial coherent glass and the carapace zone with fast cooling and hydratation. The 2nd type occurences with larger obsidian pieces is usually surrounded by rhyolite lapilli tuffs. Their volcanic origin could be explained by explosive volcanic eruptions. In this case the obsidians deposited as lithic clasts and derived from volcaniclastic material. The laboratory dataset support the published cooling and hydration/perlitization models. The textural heterogeneity of the silicic lava domes reflects variations in cooling rate related to Tg, The distal part of the subaerial rhyolite lava domes quenched below the Tg (~700 °C) to form glass while the proximal vent related zones remained at elevated temperature (above Tg) and devitrified to rhyolite ($H_2O<1\%$). The perlitic cracking happens at $T<Tg$ allowing a permeable textural network for hydration. The measured H_2O varied between 2-5% but the extent of primary (cooling to ambient T) and secondary, low temperature (post emplacement) hydration is debated in the literature and needs further investigations.

Extra-European obsidian tool assemblages in Hungarian museums

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There are over 1500 obsidian objects registered in four Hungarian museums, acquired mainly by donations, purchase and exchange, from Africa, North and Middle America and Oceania (Melanesia and Polynesia). The assemblages serve first of all to demonstrate the technological skill of different cultures. Some of them were the subject of scientific studies, some others are currently prepared for working up.

Obsidian finds from Hajdú-Bihar County, Hungary

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In 2017, a significant assemblage was found during a large-scale preventive excavation preceding the construction of the M4 motorway in the vicinity of Váncsod. This deposition of 14 large obsidian nodules provided the inspiration to create a database containing all the obsidian finds that had come to light in Hajdú-Bihar County. Although in the 1990s the material of a few sites was analysed, since then the number of sites that yielded larger amounts of obsidian finds has increased considerably due to new excavations. While the context of the finds is not always clear in the case of the earlier excavations, it is clearly identifiable in the case of new materials. Our work contains so far the analysis of the material of the Déri Múzeum in Debrecen, but in the future we plan to include materials from other collections in the county as well.

The aim of our poster is to present the obsidian raw material finds of the county and, if possible, their archaeological context with the help of the data from our database.

The Carpathian 3 Obsidian

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The territory of the westernmost part of present-day Ukraine (Transcarpathia) has been a densely inhabited area in almost all periods of human history. In the region of Transcarpathia, currently more than 100 Palaeolithic sites are known, most of them known from surface collections. Early petroarchaeological studies commenced in Transcarpathia with the activity of V. Petrun' and by the discovery of Middle Palaeolithic settlements and workshops around Rokosovo and Maliy Rakovets and the description of the local obsidian sources. Obsidian was one of the most important raw material for prehistoric stone tools. In the Carpathian Basin we know three separete sources of Carpathian obsidian (C1 – from Slovakia, C2 - from Hungary and C3 – from Ukraine), the aim of the present work is to introduce the Carpathian 3 obsidian from Transcarpathia.

Palaeolithic communities in the recent territory of Transcarpathia were primarily using local raw materials for the production of their tools. In the volcanic raw material regions of the Transcarpathian Palaeolithic two raw material types of volcanic origin played a dominant part

in the production of stone artefacts: glassy dacite from Korolevo and Carpathian 3 type obsidian from Rokosovo.

Prehistoric obsidian in Romania. The current state of research

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Due of its outstanding physical properties, obsidian was one of the most popular raw material of the prehistoric man. At the same time, because of its rarity, it was also extremely valuable. Obsidian finds from a diverse archaeological context later attracted attention to archaeological research as well. Thanks to its role in archaeological interpretation (e.q. cultural, economic relations; trade routes; symbolic and/or ritual behaviour; technologiacal aspects etc.) it is still one of the most exciting research themes today. The purpose of this presentation is to briefly review the current state of research of the Neolithic and Copper Age obsidian finds on the territory of present Romania. We will present the most important moments and figures of the history of research and the historical/archaeological background of the obsidian finds.
The earliest obsidian objects appear on the territory of Romania in the Paleolithic. However, the peak in the use of this raw material was reached in the Neolithic and Copper Age, showing a significant decline in more recent periods of prehistory. Based on the information published in the Romanian literature, we know up to now about 150 settlements or locations with obsidian discoveries. However, the exact number of objects is still unknown. The territorial distribution of objects shows that the richest areas were in the western and northwestern parts of Transylvania which are relatively close to the source of the raw material. Modern analytical procedures can determine by now the origin of the raw material with great precision. According to the comparative raw material studies conducted so far, the majority of Romanian obsidian findings can be classified into the ”Carpathian 1.” (Cejkov, Kasov, Viničky) type. ”Carpathian” 2. (Tolcsva-Erdőbénye and Mád) type occurs in much smaller quantity, mainly in the Early and Middle Neolithic period, while the presence and use of ”Carpathian” 3. (Racșa-Rokosovo) is documented quite narrowly, only near the local sources in the Oaș Mts. in Northern Romania.