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REVIEW ARTICLE

Lithic Research Roundtable 12, 2022

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Abstract The twelfth annual meeting of Hungarian lithic specialists was held on December 9, 2022, from 9:00 a.m. to 5:00 p.m. at the Central Library of the Hungarian National Museum, Budapest, organized by Katalin T. Biró and András Markó. The abstracts of the presentations and posters are as follows.

Keywords *Lithic Research Roundtable, Litikum, Hungarian National Museum*

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Mogyorósbánya, final report for 2022

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In the presentation, we will outline the results of the analysis of the material from the three settlement patches of the most important Upper Paleolithic site in Hungary, Mogyorósbánya - Újfalusi dombok. We will discuss the poorly preserved large mammal fauna, the exotic Northern flints, local quartzite and the poor quality nummulitic chert, phyllite artefacts of non-practical use, as well as the distribution of finds belonging to several technological and typological categories.

Field investigation at Acsa-Rovnya in 2021–2022

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The Acsa-Rovnya site is located in the southwestern part of the Ecskend hills, in the territory of Acsa village, where the MNM database registers 53 archaeological sites. The vast majority of these are found in the Galga Valley, consisting of mixed surface pottery material from the Bronze Age, Iron Age and Middle Ages. The Paleolithic site has been known since 1999. Viola T Dobosi conducted verification excavations here in 2002 and 2004, and independent researchers Sándor Béres

and Attila Pének collected knapped lithics on several occasions. In our presentation, we present the most recent field research conducted here. This time, the fieldwork was carried out with the help of the Ferenczy Museum Center, with the members and volunteers of the Community Archaeological Association, which might be of interest from a methodological point of view. On two occasions we examined an area of approximately 60,000 square meters and recorded 641 finds, almost exclusively knapped lithics from Early Upper Palaeolithic times. Together, the two visits enable more accurate archaeological mapping of the area and the preparation of a control excavation.

Recent results of research on the Aurignacian in Hungary

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The Istállós-kői Cave is the best-known Aurignacian site in Hungary. Its research dates back more than 100 years. It became famous with the excavations of László Vértes in 1947-1951. Based on his work, the Aurignacian culture in Hungary was divided into two phases. Several attempts were made to clarify the chronological position of the finds with the help of artefacts or stratigraphic samples. In 2020, we re-sampled the entire layer sequence of László Vértes, which allowed us to obtain chronological and archaeological data.

We excavated a new Aurignacian site, Alsódobsza-Kerekdomb in the Hernád valley, in 2021. We uncovered numerous animal remains and knapped lithics, making this the first open-air Aurignacian site in Hungary where animal bones have survived. Their study significantly contributes to the absolute and relative chronology and paleo-ecology of the Aurignacian open-air sites. Bodrogkeresztúr-Henye is primarily known for the settlement of the Late Gravettian culture. Based on the results of the 2019 excavation, the remains of an Aurignacian occupation are assumed based on relative and absolute chronological data. We present the results of the fieldwork mentioned above.

The role of mollusc fossils in the Hungarian Upper Paleolithic

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Tertiary molluscs, called jewels, in the Hungarian Upper Paleolithic record, raise many questions. In the case of sites with a large number of molluscs, a preference for certain species is evident, which suggests conscious selection. The concentration of such sites around the Danube Bend can be linked to the proximity of the primary sources of fossil mollusc skeletons. However, there may be other factors behind their frequent occurrence there, such as the presence of groups with distinct identities based on the classical interpretation of the objects as jewellery. The presentation focuses on these problems, as well as whether the classical interpretation of the objects as personal adornment is valid.

Traces of the Middle Paleolithic in the Mátraalja region

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A large number of Middle Paleolithic surface finds, rich in quartz porphyry raw material, are known from the Cserhát Mountains area, and in the case of three sites, excavation results, including OSL dating, have also confirmed their Middle Paleolithic age. The occurrence of leaf points in itself cannot be considered a watershed between the Middle Paleolithic and Upper Paleolithic, therefore the evaluation of the mixed collections in the vicinity of Eger, close to

the geological source of the quartz porphyry, is problematic. Middle Paleolithic hunting groups came to the Cserhát Mountains through the Mátra foothills, the Mátraalja area. However, until Mónika Gutay's thesis was written in 2007, we had virtually no data on the Middle Paleolithic of the Mátraalja. One of the motivations for the fieldwork carried out by the speaker in the area was the systematic research of the Mátraalja sites, where Middle Paleolithic finds and/or quartz porphyry raw material were known to occur, following Gutay's thesis.

We present some partial results of the fieldwork and site documentation carried out in the Mátraalja area between 2017-2021, including middle palaeolithic finds of two site complexes (Gyöngyöspata-Gereg and Ecséd-Gárdony/Mogyorós-hegy).

Hont-Csitár: a leaf-tool site in the Ipoly Valley

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The Ipoly Valley is one of the best-researched areas of Hungary from a prehistoric point of view. The paleontological research of Ferenc Kubinyi dates back to the 19th century. The first prehistoric finds were found in Ipolyság by István Majer in 1920. In the 1950s and 1960s, Pál Patay conducted field walkings, and Miklós Gábori and Vera Gáboriné Csánk conducted test excavations. In the mid-1990s, Viola T. Dobosi and Katalin Simán authenticated the previously known deposits with surveys and test excavations. From 2011 until today, we have been conducting systematic field walks and stratigraphic test excavations in the area.

The Hont-Csitár site is located on a ridge above a small stream joining the Ipoly Valley at the junction of the Ipoly terraces and the foothills of the Börzsöny, in an ideal topographical location for a Middle Paleolithic hunting strategy. From Miklós Gábori's excavations at the end of the 1960s, 1,550 finds, some photos and brief descriptions have survived. The site was identified by the presenters in 2002, the material was published in 2010, and systematic collections have been taking place in the area since 2011. The stratigraphic sounding that began in 2021 could not be continued this year. Both the previous excavation material and the finds from surface collections show a double picture. The finds of a late Middle Paleolithic leaf-tool industry, as well as characteristic types of an Upper Paleolithic blade industry are both found. The raw material use is characterised by local Börzsöny, and regional Cserhát and Slovakian limnosilicites, radiolarite and quartzite pebbles. In the Middle Paleolithic material, distant metarhyolite (quartz porphyry) appears, while in the material of the Upper Paleolithic industry, also distant obsidian and northern flint appear. Similar mixed collections are known from the surface immediately north (Hont-Babat) and south (Hont-Csitár 2) of the site. The finds from Moravany nad Váhom-Dlhá and the Jankovich cave can be mentioned as parallels to the leaf-tool industry, while the Upper Palaeolithic types can be linked to a large number of Epigravettian materials known from the area.

Bátor (Csipkéstető) radiolarite: a possible prehistoric lithic raw material source

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In the summer of 2021, in the vicinity of Bátor, the source of a rare prehistoric lithic raw material, the blue version of Csipkéstető radiolarite, has been found. According to our current knowledge, this siliceous rock is so rare that until now it has only been found in large numbers among the Middle Paleolithic finds of the Suba-lyuk cave: the 108 Palaeolithic artefacts make up only a few per cent of all the finds we know of this raw material.

Both in terms of size and workability, the Bátor raw material stands out among the Csipkéstető formation radiolarites, which covers a relatively large area of the western edge of the Bükk. In the laboratory of the Institute of Mineralogy and Geology at the Miskolc University, the Bátor radiolarite was compared by X-ray diffraction (XRD) and destructive analysis with a blue radiolarite from the Suba-lyuk, provided by the Hungarian National Museum, and samples collected from a secondary deposit in the Bánya-hegy, at the western side of Noszvaj, Zsidó-szél-dűlő, and Felsőtárkány, as well as with a Bakony radiolarite sample collected from Szentgál. The measurement results of the samples from Suba-Lyuk and Bátor show a high degree of agreement, so it is assumed that a new location of Middle Paleolithic lithic extraction in the Bükk Mountains has been identified.

The so-called macro-laminar industry in the Bükkalja region

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In the framework of the collaboration between the Eötvös Loránd University in Budapest and the Jagiellonian University in Krakow, Janusz Kozłowski participated in three excavations in the Bükkalja region. His most important contribution is the discovery of a new culture based on the sites of Egerszalók-Kővágó-dűlő, Eger-Kőporos-tető and Andornaktálya-Gyilkos.

The newly identified industry is significantly different from the material of the previously known Aurignacian sites, and its roots are probably connected to the Bachokirian. Its main characteristics are the significantly high proportion of tools made on blade supports, the almost complete absence of carenoid pieces, and the extensive use of local raw materials. The three sites mentioned above have highly mixed collections, but at the Demjén-Szőlő-hegy site, Krisztián Zandler managed to identify a homogeneous assemblage that exactly meets the criteria established by J. K. Kozłowski. This latter material provides a good overview of the characteristics of the large blade industry from both a technological and a typological point of view, so it is suitable for a more comprehensive presentation of the industry.

Hont–Templomdomb and the Epipalaeolithic in Hungary

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Hont–Templomdomb is considered by Hungarian Palaeolithic research to be a Late Pleistocene, Epipaleolithic site. Since the first publication of its knapped lithic material in 1956, it has not been subjected to a more detailed examination, although the Epipaleolithic remains a white spot in Hungary. We present the results of the 2022 reassessment of the find material.

Diagnostic chronological phenomena from the research area of Neolithic stone tools in Hungary

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The research of the Hungarian Neolithic (6000 – 4600/4500 BC) began at the very beginning of the last century, and the framework of our cultural concepts, which we still use today, was formed relatively early. It is not surprising that the relevant units, such as the Körös culture, the Bükk culture or even the Tisza culture, were distinguished based on their ceramic styles and forms. In the last hundred years, Hungarian prehistoric research has done a lot to define the spatial and temporal boundaries of these cultures. By the 1980s, a chronological system that is still valid today crystallized, and the ceramics-centred approach has remained dominant to this day. Although the systematic research of Neolithic chipped stone tools does not have such a long history, its development in the last thirty years is sufficient to compare this artefact class with other elements of material culture and draw further conclusions by integrating them at a higher level.

It is generally accepted that the opportunistic Neolithic chipped stone tools do not allow for the development of sophisticated typologies characterizing the Paleolithic or Mesolithic. However, there are phenomena by which one region, period or archaeological culture can be distinguished from another. These phenomena can be lithic raw material selectivity, typological differences and technological change. For example, the abundance of scrapers and the presence of raw materials brought from regions far beyond the Carpathians can be linked to the Late Neolithic in the Great Hungarian Plain. However, almost all such characteristics have a common feature, namely that they are not exclusive, but rather can be considered a rule of thumb. In the presentation, I discuss these observations from the Carpathian Basin and interpret them in the context of our classic cultural units.

Kup – a Tevel flint processing workshop

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We noticed the Kup-Egyes site in the mid-1980s, during research related to the Sümeg-Mogyorósdomb flint mine. Together with Erzsébet Bácskay, we tried to find and map the distribution of the raw material of chipped stone tools from the Sümeg flint mine. The lithic material of the site excavated by Sándor Mithay in 1974 was outstanding among the prehistoric sites known at that time, both in terms of quality and quantity. Mithay found the material of the Transdanubian Linear Pottery and the Lengyel cultures at the site, published in 1989. Despite the relatively small distance and the dominance of "grey flint", the lithic material did not show significant connections with the Sümeg mine, but it was possible to identify it as the only processing site of Tevel flint in Hungary so far.

On a local initiative, and with the support of the village of Kup throughout, we carried out excavations at the site between 2000 and 2003 in cooperation with the Hungarian National Museum and the Laczkó Dezső Museum in Veszprém, largely using traditional ("manual") techniques, thanks to which we collected practically all lithic from the excavation area. As a result, we collected a significant number of stone tools, the largest set among the prehistoric sites known to me so far. The lithic raw materials are Cretaceous grey flints of Nagytevel, which is barely 10 km from the site as the crow flies, and colour variants of the Bakony radiolarites.

In the course of the new excavations, we discovered primarily the finds of the Lengyel culture, with a smaller number of finds of the Transdanubian Linear Pottery and the Copper-Age Protoboleráz cultures. Unfortunately, the intensive agricultural work significantly mixed the ceramic finds, so the dating of the stone tools is uncertain. According to the distribution of the ceramics, the Lengyel component is dominant, which is why the entire lithic material is treated uniformly. During the processing, we examined the characteristic stone tool types and „technological" pieces, and their size distribution regarding the two types of raw materials, as well as the relationship system designated by the lithic raw materials of the site.

Possible raw material sources of dolerite-metadolerite polished stone tools in Hungary

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Metadolerite is a rock type with basic composition, mostly of ophiolite origin, which, due to its dark grey-black, hard, dense, intergranular-subphytic-ophitic fabric, its fine- to medium-grained lithology, is suited well for the production of polished stone axes. The texture of closely connected new minerals formed as a result of the low-to-very low-grade metamorphic transformation further enhances the rock's physical toughness. The domestic and international archaeometry literature on polished stone tools describes metadolerite stone tools from many archaeological sites from the Neolithic to the Copper Age. Chunky chisels, chisel axes and shaft-hole axes, tools resistant to high mechanical impact, were mainly made from this rock type.

Metadolerite is a common and characteristic raw material in the Hungarian prehistoric polished stone tool record in the areas east of the Danube (e.g. Hódmezővásárhely-Gorzsa, Szakmány et al. 2009, 2011a, 2011b; Öcsöd-Kováshalom; Polgár-Csőszhalom, Szakmány et al. 2019; Aszód-Papi-földek, Judik et al. 2001). Without knowing the complete polished stone tool find material, we identified 1–6 specimens from the Middle Neolithic (Aggtelek-Baradla, Edelény-Borsod-Derékegyháza, Dévaványa-Sártó, Dévaványa-Simasziget, Dévaványa-Réhelyi dűlő), Late Neolithic (Kisköre-Gát, Tápé-Lebő Alsóhalom), in Early Copper Age (Szegvár-Tűzköves), Middle Copper Age (Tiszalúc-Sarkad) and Late Copper Age sites (Tarnabod). This raw material also occurs sporadically in North Transdanubia (see e.g. the Ebenhöch collection, Szakmány et al. 2011b), and among the finds of Neolithic sites in South Transdanubia (e.g. Alsónyék-Bátaszék, Szakmány et al. 2021; Lengyel).

Based on the results of the investigations so far, it can be assumed that the raw materials of Hungarian, mainly Neolithic metadolerite polished stone tools, do not form a uniform group. They can be divided into several types based on their state of preservation, their magnetic susceptibility values (MS), and their complete rock chemical and mineral chemical composition. A more precise definition of the types has not yet been made. Based on preliminary research, it can be assumed that the metadolerite stone axes found in northern Hungary can be linked to the Szarvaskő metadolerite raw material source, while the southern ones originate from the ophiolite belt along

the Maros River (a Száva-Vardar zone origin is also not excluded).

In the framework of our research project, we examined 55 metadolerite stone tools to characterize the metadolerite raw material types appearing in the archaeological record. The dominant grain size ranges of the metadolerite types were characterized with the help of the macroscopic petrological examination. Magnetic susceptibility measurements were used to determine the magnetizable mineral content. Complete rock chemical data were obtained by non-destructive prompt gamma activation analysis (PGAA). We characterized the rock fabric by primarily non-destructive SEM-EDS of the original surface and, secondarily, by conventional destructive thin-ground petrographic description as well as SEM-EDS measurements. Based on these, we identified the rock-forming minerals, as well as determined their chemical composition. Our studies identified two main types of metadolerite among the polished stone tools.

By comparing the results with the lithological-geochemical properties of the metadolerite rock types of the potential raw material deposits (Szarvaskő, Maros Valley), we found that the metadolerites show a high degree of similarity in several respects (main element chemistry, modal composition). This is mainly due to the same rock development. The difference in the composition of the minerals (amphiboles) formed during late igneous or metamorphic processes and the secondary components (magnetizable opaque minerals) makes it possible to separate them. According to this, the use of the Szarvaskő raw material in the production of metadolerite polished stone tools can be justified, and the use of the Maros material is highly probable. The presence of metadolerite as a raw material in the areas east of the Danube thus simultaneously proves northern and eastern connections in the supply system of polished stone tools.

The tests were carried out with the support of the NKFIH, funded by the K 131814 tender program.

Complex petrographic examination of grey sandstones on the example of the Hódmezővásárhely-Gorzsa tell settlement

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From the Hódmezővásárhely-Gorzsa tell settlement, nearly four hundred sandstone toolstones are known, one quarter of which is red, while three quarters are yellow, gray and white sandstones. The previous studies focused primarily on red sandstones, therefore this work aims to present the complex lithological examination of "grey" sandstone tools.

Within the sandstones that appear grey to the naked eye, we have distinguished three groups, of which the largest number (about 40%) is the medium-dark grey, mica sandstones. In terms of their appearance, they are very diverse and in many cases, it is difficult to separate them macroscopically from sandstones with a medium grey, light grey, sometimes yellowish or slightly whitish grey colour. The grey sandstones may contain mica and show a strong reaction to dilute hydrochloric acid, which indicates a significant carbonate content. These are collectively called "young" carbonate sandstones, and within the non-red sandstones, they make up approximately 20%. The third type, the so-called white metasandstones represent nearly 30%, this group includes apparently white, greyish-white, sometimes purplish-grey, shiny rocks, often with a directed, deformed and even wrinkled texture.

In a polarizing microscope, the three groups can be separated from each other as well, and we were also able to distinguish subtypes. Among the three sandstone versions, the grey versions were the most varied. Based on experience so far, it is necessary to produce thin sections of these finds, even though this process involves a small degree of destruction, because this is the only way we can separate the different rock types from each other, and it also helps to classify the questionable types. In addition to the thin-section examination, we also performed heavy mineral tests using a larger amount of material. The essence of the process is that high-density microminerals, which are usually less than 1% in sandstones, are enriched with the help of a heavy liquid. These minerals are indicators of the rock exposure area, so by examining them we can get information about the raw material source of these artefacts. Our heavy mineral tests show that the three types of sandstone showed significant differences. Grey sandstones (grey-1) have significant heavy mineral content: garnet, brown-greenish-brown tourmaline, zoisite and rutile, less often zircon, green amphibole, apatite, epidote, titanite

and chrome spinel. The other, rarer version (grey-2) contains a few heavy minerals: red-brown, almost black, and also greenish-brown tourmaline, zircon, rutile, and garnet. The white metasandstones are extremely poor in heavy minerals: brown or greenish-brown tourmaline, zircon, rutile, less often garnet, ortho- and clinopyroxene, epidote and zoisite. The carbonate sandstones contain a significant amount of heavy minerals with a characteristic composition: garnet, brown and green amphibole, oxyamphibole, orthopyroxene, epidote, zoisite, brown tourmaline, zircon, rutile, staurolite, kyanite, rarely tremolite-actinolite, chloritoid and andalusite. In the future, we plan to perform mineral chemistry tests on some types of heavy minerals (e.g. opaque minerals, garnet, amphiboles and pyroxenes, tourmaline, chrome spinel) with a scanning electron microscope (SEM-EDS). In doing so, we can separate the heavy minerals of different origins from different rocks based on the element content of each heavy mineral type, and this can help in determining the raw material deposits more precisely.

Together, the tests listed here can be suitable for distinguishing raw material types, and if we combine them with whole rock analyses (NAA and PGAA methods), our results can be further refined.

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Polished stone tools from the Late Neolithic Bátaszék-Alsónyék settlement with raw materials from the Mecsek mountains

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On the border of Bátaszék and Alsónyék, a part of a Neolithic settlement (ca. 5800–4500 cal BC) was excavated in connection with the construction of the M6 highway, which is one of the most important such sites in Hungary. From the settlement and its burials, 668 polished stone tools (shaft-hole axes, celts, adzes or flat chisels, shoe-last adzes and maces) were found. The finds are currently in the ELKH BTK Institute of Archeology and the Wosinsky Mór County Museum (Szekszárd). So far, a detailed description, definition and provenance studies of the high-pressure metaophiolites (eclogite, Na-pyroxenite) have been prepared (Bendő et al. 2014, 2019).

The detailed macroscopic geological processing of the artefacts was carried out in 2021–2022. In addition to the lithological determination of the material of the stone tools and their classification into rock groups, the archaeological typochronological features were also determined. Based on their lithological properties that can be examined macroscopically (texture, mineral composition, magnetic susceptibility), the assemblage contains a large number of deep igneous, volcanic, metamorphic and sedimentary rocks of extremely diverse material. Their presumed place of origin is mostly local: the Mecsek mountain and its vicinity. Most of the local raw materials are presumably the product of Cretaceous alkaline-base magmatism (alkaline basalt, alkaline gabbro, alkaline dolerite, phonolite), in addition, small amounts of mottled marl, bituminous limestone, and spiculite also occur. Based on preliminary tests, the long-distance raw materials came from the Carpathian-Pannonian region and its surroundings: e.g. the Balaton Highlands (basalt), the North Hungarian Range (andesite), Transylvania (hornfels), the Bohemian Massif, the Lesser Carpathians (contact metabasite – mainly the so-called Železný Brod type, and amphibolite), the Alps (Na-pyroxenite, eclogite), southern Poland (nephrite), and Serbia (serpentinite, whitestone).

In the present work, we focus on stone tools presumably made from igneous rocks. During the macroscopic rock determination, the following igneous groups were separated. 1) Mecsek-type alkaline basalt (dolerite): 1A) porphyry, vesicular/tonsular; 1B) rare porphyry, with trachytic fabric; 1C) porphyry-free, trachytic fabric; 1D) porphyry-free, vesicular; 2) microgabbro; 3) alkaline gabbro: 3A) inequigranular (porphyry); 3B) equigranular (porphyry-free); 4) phonolite; 5) andesite; 6) non-Mecsek alkaline basalt. A total of 43 stone axes were selected from these groups, from which we prepared lithological thin sections for precise petrographic description. After the polarization microscopic description, 14 samples were selected for scanning electron microscopic (SEM) petrographic and geochemical examination. Based on the polarization microscopy and SEM examinations, the source area of the stone tools belonging to group 4 (phonolite) can be identified with the greatest certainty (Mecsek: Szamár

and Somlyó hills). Most of the gabbroid rocks (group 3) are related to the alkaline gabbro blocks found in the clastic sedimentary formations in the Mecsek. Alkaline vulcanites (group 1), based on literature data, are also related to basaltic rocks from the Mecsek (in the vicinity of Komló-Mecsekjánosi). Further tests are required to identify rocks belonging to groups 3, 5 and 6.

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A Buda hornstone lithic workshop in Solymár (poster presentation)

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Geologist István Szenthe collected knapped lithic artefacts on the ploughed surface during geological surveying in the outskirts of Solymár, on the hilltop south-southeast of the castle. The findings were transferred to the Hungarian National Museum. During the on-site inspection held in the spring of 2021, we collected additional finds, a trapeze, scrapers, unretouched blades and flakes among others, as well as cores and pieces of raw material, and recorded their location with a hand-held GPS. The ceramic material is represented by three tiny, weathered fragments. The common feature of the lithic finds is their raw material, the Buda hornstone, the nearest primary occurrences of which are known from a few kilometres away, on the steep northeastern slopes of Hármashatár-hegy and Viharhegy. According to our current interpretation, at the Solymár site, we managed to locate a special stone tool-making workshop from the Late Copper Age, less likely from the Bronze Age.

Lithic landscapes: The system of relationships of Neolithic and Copper Age communities in the Carpathian Basin based on stone tools (poster presentation)

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The wide range of workable lithic raw materials of the Carpathian Basin is well-known and well-researched at the European level. Of these, obsidian, Bakony radiolarite (Szentgál) and flint (Tevel) in particular, are distributed outside the Carpathian Basin and thus have international interest. The distribution of these rocks plays an important role in the long-distance exchange networks of Central-Southeastern Europe. The poster turns the attention from some prominent raw materials to the entire lithic raw material spectrum of the prehistoric communities and places them in the context of the geological potential of the local environment. Instead of an economy-oriented research perspective, it examines the presumed social and ritual values of the used rocks at the local and regional levels. The lithostratigraphic characteristics of the available rocks and the various cultural-technological traditions show significant diversity in the Carpathian Basin. I compare regions rich and poor in stones to take into account the parameters that could actively shape the relative value of each raw material in the life of a community. A more thorough knowledge of the different layers of economic, social and ritual values can help to better understand the role and values of rocks in Neolithic and Copper Age communities.

Archaeometric examination possibilities of sandstone archaeological finds in the case of young carbonate sandstones (poster)

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Since prehistoric times, mankind has used various rock types found in its environment, including sandstone. They were primarily used as tools for grinding, abrading, polishing and sharpening, as

single-use moulds, and as building material. These rock types are very widespread in the Carpathian-Pannonian region, we know many different versions of them, so they play a prominent role in Hungarian archaeometry. In archaeology and its archaeometric aspect, the study of tool stones and sandstones is still less common. Our present work aims to show how and with what methods it is worth examining the finds made from this rock type using the example of a very characteristic "grey" type of carbonate sandstone.

The material examination of sandstone tools always begins with macroscopic, i.e. naked eye, observations, the purpose of which is the general characterization, as well as the separation of possible types. After that, we prepare a thin section of some representative samples, which is analyzed with a polarizing microscope. Using a microscope, we observe the main tissue marks characteristic of sandstones and also determine the composition and ratio of the four main components that make them up (grain, matrix, cement and pore). Within these, we pay particular attention to the grains, because we can specify the raw material source with them. The types separated during the macroscopic examination can be further refined if, during the thin-section examinations, quantitative determination is carried out by volume measurement, and heavy minerals that rarely appear between the grains are also observed, because these characterize the rocks that contain them, and are therefore vital in the clarification of raw material source areas. We can also perform mineral chemical analyses (SEM-EDS) on heavy minerals, and geochemical tests (NAA and PGAA methods) on the whole rock.

As a case study, we chose a "grey" type of sandstone with a characteristic heavy mineral content and a carbonate matrix of which we currently know 20 finds from four different sites:

Balatonszentgyörgy-Faluvégi-dűlő Site 2, from which 10 tool stones of the Late Copper Age (Baden culture), mostly grinding stones, were found. All of these are grave finds. Based on both macroscopic and microscopic examinations, they are of the same type, and based on measurements, they proved to be feldspathic greywacke. In this sandstone, minerals that are excellent for identifying the rock source, e.g. actinolite, orthopyroxene and sillimanite, were detected.

Sármellék-Száraz-eleje is a settlement, where four Late Bronze Age moulds (the beginning of the Urnfield culture) were found. These have a similar composition to the previous sandstones, and their heavy mineral content is also the same. In addition, they contained many skeletal remains of calcareous single-celled foraminifera of marine origin. With their micropaleontological examination, it would be possible to further narrow down their source area in the future.

At the Balatonendréd-Vaklápa Öreg-hegy Site 7, Neolithic (Lengyel culture) and Late Bronze Age (Urnfield culture) artefacts are known along with 88 graves. We examined 5 pieces of Late Bronze Age tool stones (grindstones, grinding slabs and their fragments), which were made of a similar rock type as the sandstones found at the previous two sites. Detailed chemical and heavy mineral tests are still in progress.

We know of one sandstone piece similar to the above from Perkáta-Homokkőbánya. Artefacts and features of several archaeological periods are known from the site (Middle Neolithic Želiezovce group, Late Bronze Age Tumulus and Urnfield cultures, native settlements from the Roman period, Avar and medieval settlements). From there, we examined a Late Bronze Age carbonate sandstone tool. Detailed investigations are underway.

Based on our investigations and observations so far, we have established that the examined tools representing several archaeological sites and ages were made of a uniform type of sandstone. Based on the petrographic thin-section methods, it seems that these sandstones are young, probably Upper Miocene, Pannonian in age. Their possible source is in the vicinity of Lake Balaton. In the future, we will try to delineate this raw material deposit more precisely with the help of heavy mineral, micropaleontological and geochemical tests.

We are grateful for the support of the NKFI projects K-128413 and K-131814. The test results of the Balatonszentgyörgy sandstones will be published in 2022 in the volume dealing with the cemetery.

Contact metabasite stone tools from two high-altitude sites near Vienna (preliminary results) (poster presentation)

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In the vicinity of Mödling, 16 km south of Vienna, two high-altitude sites are known from the Late Neolithic period: Jennyberg, where the Boleráz culture settled, and Hirschkogel, now located on the border of the neighbouring settlement of Maria Enzersdorf, which is the high-altitude site of the Jevišovice culture. The two sites lie at a distance of approximately 2 km and have settlement layers dating from 3400/3300 BC to 2900/2800 BC. This situation is considered unique even in Austria, which is characterized by a large number of high-altitude settlements belonging to the Jevišovice, Cham and Mondsee cultures. The high number of settlements is characteristic of the period because here two different cultures lived close to each other. However, the Boleráz culture has only two known settlements in Austria and one of them is one of these high-altitude settlements. Both sites have been researched for a long time, excavations took place at Jennyberg in 1970–1971, and at Hirschkogel in 1926. The examined material from both sites is mostly undocumented scattered excavation material from amateur excavation activities and less from the mentioned systematic excavations.

Among the stone tools at the Maria Enzersdorf-Hirschkogel site, we find the largest number of tools made of contact metabasite (29 of the 67 artefacts we examined), but they also occur among the stone tools at the Mödling-Jennyberg site (3 of the 59 artefacts we examined).

The raw material of the stone tools belonging to this group has a varied appearance, but all specimens are characterized by a fine or very fine grain size. Their colour is usually dark: black, and dark grey, but there are also light and light grey specimens, especially on their surfaces. Several of them are characterized by a directional fabric visible to the naked eye, foliation, which usually appears as an alternation of light grey and black bands. However, this can also be masked by the surface wear that occurs during the polishing of the surface or burial after use. The "spotted" appearance is also common: usually dark grey, greenish, bluish-green and/or light (light grey, pale pink, etc.) spots are visible on a black background. During ageing, the surface of some specimens became brownish. Due to the very fine grain size and surface changes, the classification into the macroscopic group is uncertain for some specimens.

To preserve the integrity of the artefacts, non-destructive OS-SEM-EDX examinations were performed on some selected specimens („original surface method", Bendő et al. 2013).

The specimens with contact metabasite raw material were classified into four versions. The raw material of version 1, which contains the most finds (12 finds), has a banded fabric, formed by bands rich in amphibole and plagioclase, and bands rich in quartz and ilmenite. The composition of the plagioclase is basic (labradorite-bytownite), among the amphiboles here are actinolite, ferroactinolite, magneziohornblende, ferrohornblende and in the core of some amphibole crystals, cummingtonite is present.

The main mass of the raw material of version 2 (5 finds) is composed of magneziohornblende-composed amphibole crystals (cummingtonite is also present in minor amounts). The rock contains muscovite and ilmenite in even greater quantities, but not quartz and feldspars.

The raw material of version 3 (2 finds) has a slightly directed texture (banded), and its main mass is composed of magneziohornblende and edenite-composed amphibole and muscovite. In addition to a larger amount of ilmenite, a small amount of basic feldspar (bytownite) and quartz can also be found in the rock.

Amphibole and plagioclase are also the main constituents of the raw material of version 4 (4 finds). The banding visible to the naked eye is caused by the alternation of bands rich and poor in ilmenite. The original rock before the metamorphosis was probably a gabbro which was coarser-grained than the other versions, which is why these specimens are also less fine-grained than the other 3 versions. The composition of amphiboles and feldspars is also varied: in addition to magneziohornblende, actinolite, edenite and cummongtonite, basic-neutral plagioclase (andesine, labradorite, bytownite) and alkali-feldspar (anorthoclase) also occur.

9 findings were not classified in any variant due to the uncertain macroscopic determination caused by surface changes.

Among the contact metabase variants we examined, variants 1 and 4, based on their texture and mineral composition (taking into account the limitations of the measurement method and the electron microscope used for measurement), can be identified with the contact metabasites occurring in the Krkonoše-Jizera Crystalline Massif in the NW part of the Czech Massif (Šída & Kachlík 2009).

The reason for the diverse composition of amphiboles and plagioclase can be traced back primarily to the original diversity of the rocks that underwent contact metamorphosis and the distance of the specific raw material source from the contact.

Based on the high muscovite content and the texture of the muscovite (it fills the space between the amphibole crystals), the 2nd and 3rd contact metabasite variants are similar to the raw material of some stone tools from NE Hungary (Kereskényi 2021), but in these latter, clinozoisite is also a characteristic component, which it is absent from the rocks we examined.

The delimitation of the source area of the above two metabasite variants requires further investigation.

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