

## **Description of the main research directions investigated by the institute**

The research strategy of the Institute is based on a conception of archaeology as a historical field of the humanities with an irreplaceable position in modern cultural society. Archaeology allows learning about the earliest human prehistory in its broad contexts and transformations. It forms the social awareness of development continuity and discontinuity while emphasising in the necessary extent humankind's historical, inter-ethnic, cultural, economic and environmental links and interactions that were active during the historical development and, in their consequences, remain active also at present. Likewise, it fulfils people and society's permanent interest in learning about their own past and forming national identities, i.e. ideological, social and economic foundations of both society and statehood. At the same time, its activities contribute to the salvage and protection of archaeological finds and monuments as part of the national and global cultural heritage and wealth. The findings of archaeology as a modern and complex discipline have potentially broad social and economic impacts. As examples, we can name the general level of education, the effort to increase the cultural awareness of the population, the modelling of procedures in the social, economic and environmental spheres, the development of leisure time activities, tourism and the related infrastructures, etc.

The direct predecessor of the present-day Institute was established in the 1940s due to the need to form a scientific workplace that would deal with the basic research and protection of archaeological monuments in the Moravia and Czech Silesia. Within the framework of Central Europe, Moravia and present-day Czech Silesia form a geographically, culturally and historically distinctive territory with its own specific development. The region has traditionally been a place where the west and the east, the south and the north of Europe meet. The geographic predisposition of the territory, its position at a "crossroad" of long-distance routes and the strong influence of the neighbouring lands created a specific historical and cultural milieu. This phenomenon is one of the cornerstones of the activity of the Brno-based institute, in contrast to the scientific conception of the Czech Academy of Sciences' Institute of Archaeology in Prague. In this context, we need to emphasise the importance of Moravian Upper Palaeolithic sites (Dolní Věstonice, Pavlov) for the beginnings of modern humans and the European civilisation or the important role the Moravian area played in the power, cultural and ethnic conflicts of the Roman and Migration Periods (Mušov and other important sites of the Roman legions in the Barbaricum; the south Moravian burial sites of the Lombards). The Institute's research has also revealed Moravia's crucial position in the formation of West Slav cultures and statehood and of early medieval sites in Central Europe (Mikulčice and others).

The present-day Institute focuses on the prehistoric, protohistoric and early medieval history of Moravia and Czech Silesia and of the broader Middle Danube region. A special place belongs to the study of the Palaeolithic and the questions of the earliest human past in the broadest geographical scope. The present form of the Institute arose from a substantial reduction and transformation it underwent in 1990–1994, whose consequences allowed it to fully concentrate on basic research in accordance with the overall scientific conception of the Czech Academy of Sciences. In its research activity, the Institute strives to specialise in fundamental spheres of archaeological issues that are of (Central) European and partly also broader global importance in the given historical context and that can be successfully investigated precisely in the studied territory. At the same time, these are the topics that, considering the adequate experts, the level of knowledge base and the required technical equipment, cannot be studied in a comparable extent in other scientific workplaces in the Czech Republic. An excellent study basis and its further research direction is partially formed by high-quality and extensive archaeological collections originating from long-time excavations carried out by the Institute at most important archaeological sites in Moravia.

A basic research strategy concentrated primarily on selected topics of the historical development of Central Europe has turned out to be efficient and sufficiently productive over

the past twenty-five years from the perspectives of both the importance of the investigated problems and the utilisation of the Institute's professional and technical capacities. The workplace, therefore, remains characterised by three principal research priorities:

- 1) The research of the **genesis and evolution of modern human population** (*Homo sapiens*), especially the formation of its cultural, economic and social structures in contact with earlier populations and with similar cultural groups in geographically more or less distant territories;
- 2) The clarification of the historical development of Central Europe and particularly of the Northern Danube region in the crucial phases of the **Roman Empire's power and cultural expansion** beyond its borders and during the migrations and cultural-ethnic transformations in Late Antiquity and the Early Middle Ages;
- 3) The general study of the **period between the arrival of the Slavs in Central Europe in the 6th century and the High Middle Ages** (the 13th–15th centuries) with an emphasis on the knowledge of early power units in the 8th to 10th centuries, their elites, and the issues of continuity, discontinuity and transitional phases.

The research of the three principal themes attempts to intensively, innovatively and efficiently apply the methods and analytical procedures of progressive natural science and technical disciplines. Their broad utilisation offers itself above all in the study of the physical habitus of prehistoric and early historical populations depending on the social stratification and the living conditions, in the investigation of migration, of prospective autochthony issues, in the knowledge of the natural environment and its fauna and flora, influenced by human activity (archaeogenetics, isotope geochemistry, multi-element analytics, seasonality, geoarchaeology, palaeobotany, etc.). A number of possibilities for deepening the knowledge opens in this respect, for instance the transformations of settlement patterns (the application of spatial tools of geographic information systems – GIS) or population development (e.g. computer agent modelling and simulations). Modern laboratory material and technology analytics has considerably advanced the knowledge of selected categories of material culture, such as finds from precious and non-ferrous metals (jewellery, coins) or weapons, examined by XRF analyses, spectrometry or chemical analyses. Modern research methods have become a necessary and natural part of systematic archaeological surveys, documentation and of the individual stages of the excavation processes (geophysics, georadar, ground and aerial scanning, documentation micro-scanning, aerial photography and prospection, metal detector prospections, etc.).

In accordance with the principal thematic areas of research currently investigated by the research teams, the Institute is structured in three centres for basic research. All three centres, within the frame of their scientific activity, depend on fully functional and adequately technically equipped research bases situated directly in the area of their fieldwork interest (research centre for Palaeolithics is based in Dolní Věstonice; centre for the Roman and Migration Periods in Dolní Dunajovice, and centre for the Early Middle Ages in Mikulčice). These archaeological bases allow efficient and practical deployment of personal and technical capacities depending on the specific investigated topics, while providing a sufficient basis for modern fieldwork and for the treatment, analytical study and deposition of archaeological material. They are suitably complemented by the research infrastructure of the central workplace in Brno with its modern equipment.

The main research directions of the Institute are thus concentrated around three research teams:

**The team of the Research Centre for Palaeolithics and Palaeoanthropology** systematically deals with interdisciplinary study of the earliest anatomically modern human populations (*Homo sapiens*) in Eurasia, with an emphasis on the knowledge of their physical habitus depending on the transformations of the natural environment and climate as well as

on the formation of their cultural, economic and social structures, material culture, art and spiritual manifestations. An important place belongs to the study of their possible contacts with earlier human groups and with contemporary populations in the broader Eurasian space.

Within beneficial international cooperation, the team focuses on four important development periods in which the research potential of the Moravian Palaeolithic is the widest. The first of them is the Early Upper Palaeolithic (45–35 kyr BP), a fundamental and revolutionary epoch during which anatomically modern people replaced Neanderthals. This process was linked to significant cultural and social changes traceable in the material culture and in the way of life of the hunting communities. The attention is naturally focused also on the Gravettian (30–22 kyr BP), the peak epoch of the Mid-Upper Palaeolithic, which represents one of the most advanced adaptations of the hunters and gatherers considering the Ice Age. The traditional Moravian sites offer enormous opportunities to study a rich material culture of the Gravettian as well as cultural relations within the whole Eurasian space. New surprising findings, made within the period in question, allowed to develop the research into the third thematic area, the Early Late Upper Palaeolithic period (22–18 kyr BP), with newly investigated sites in Moravia and some other territories testifying to the cultural response of local populations to the worsening climate during the Last Glacial Maximum. The fourth studied segment is the Mesolithic period (10–5.5 kyr BC) and its communities of the last hunters and gatherers, gradually replaced by farmers. The specific topics of the Mesolithic settlement patterns are studied in certain “model” regions (especially the North Bohemian sandstones).

In the study of the individual thematic areas, the team has focused on the application of innovative methods and analytical processes including exact dating, microstratigraphy, spatial and settlement strategy analyses (GIS) or technology, typology and trace evidence analysis methods in material culture. The team thoroughly studies also other selected significant aspects: the symbolism of Palaeolithic societies, the ritual behaviour and the arts. Palaeoanthropological research focused on the detection of new human fossil finds, virtual anthropology, genetics and hard tissue histology along with isotope analyses of the food chains, seasonality and migration of prehistoric human populations. Archaeozoological and palaeoenvironmental studies are aimed on the reconstruction of the Palaeolithic landscape and biotic and abiotic deposition and post-deposition processes that influence the archaeological contexts. Ethnological and experimental comparative studies extend the possibilities of interpretation concerning the evolution of humans from the perspectives of palaeoanthropology, the early arts, the seasonality of prehistoric hunters, etc.

The team's research activity concentrates in the Middle Danube region with the unique Moravian sites in the territory of Dolní Věstonice-Pavlov-Milovice area, a traditional subject of the Institute research. Other selected territories in Moravia with traces of Palaeolithic occupation whose character and abundance enable the development of modern research are also studied in detail: the Brno Basin, the eastern parts of the Bohemian-Moravian Highlands, the Předmostí micro-region, the Moravian Karst or North Bohemian sandstone areas occupied in the Mesolithic. Ethnological and experimental comparisons utilise above all the knowledge from north-western Siberia.

**The team of the Research Centre for the Roman Period and the Migration Period** focuses on broadly defined basic scientific research into the period of Germanic occupation of the Middle Danube region in the 1st to 3rd centuries CE connected with an intensive power and cultural intervention of ancient Roman Empire in the domestic milieu. It also examines the manifestations of the dynamic cultural, ethnic and political processes in the Middle Danube region in Late Antiquity and the Early Middle Ages (the 4th to 6th centuries CE). The interdisciplinary, internationally interconnected study is intensively devoted to selected cultural, historical, chronological or technological issues of the two periods of interest. The priority belongs to the examination of the wide range of interactions between the Germanic and the ancient Roman worlds in the cultural, settlement and especially military spheres.

In accordance with the basic delimitation of professional activities, the team's work is thematically divided into two autonomous parts: research into the Roman Period and into the Migration Period, with separately defined research objectives.

The basic research focus of the team is the study of Roman-German military confrontations. The research is based on the specific and unique material base and archaeological record, which the area of southern Moravia and the neighbouring regions offers for the investigation of archaeological and historical questions connected with Roman military interventions with an exceptional far-reaching impact within the entire archaeology of the Roman Period. Moreover, this topic is one of the few spheres, in which the Czech archaeology can establish itself and realise its potential today in a broader framework of Roman-provincial archaeology and archaeology of Roman limes (*Limes Romanus*) as a pan-European phenomenon. In this way oriented thematic focus also creates a wide network of national and international contacts and collaborations, which benefit the research team. Within the study of the Roman Period, the team systematically investigates also the development of the Germanic population and its settlement structures by examining the individual categories of material sources and by analysing large datasets by means of computer agent modelling.

Within the thematic sphere of the Migration Period, the principal attention is paid to the later, Lombard phase of the epoch. The large archaeological material collection from the territory of Moravia represents an extraordinarily important link in a chain of archaeological evidence left behind by the Lombards during their migration from the north of Europe to Italy. The extensive burial sites long researched by the team offer fundamental anthropological material and finds of material culture that enable besides traditional archaeological analyses also new complex bioarchaeological research. In addition, the studied thematic areas allow a very broad involvement of the team in international cooperation.

Rescue excavations represent a considerable part of the team's activity as well. They are systematically concentrated in the geographic areas and periods represented in the team's scientific focus, providing additional information to the known archaeological record. The team also intensively utilises its traditional position as one of the main centres of research into protohistory in the Czech Republic and Central Europe, continually interconnecting research workplaces, including the organisation of international workshops and conferences. Moreover, the centre actively focuses on current social challenges in archaeology, in particular on the topic of metal detector prospections and the so-called "citizen science".

**The team of the Research Centre for Slavonic and Medieval Archaeology** has fully focused its attention on complex research into key issues of the medieval history of Central and Eastern Europe, basically covering a period of time from the first evidence of Slavic presence in Central Europe (6th century CE) to the High Middle Ages (13th to 15th centuries). Within the framework of Central and Eastern Europe, the focus of the study has been concentrated especially on the territory of Moravia including its marginal or periphery areas and with important geographic overlaps within the individual topics (for instance, adjacent parts of the present-day Slovak Republic in the study of the wider hinterland of the Mikulčice centre; the northern Danube region and the Carpathian Basin in the complex study of the Mojmirid domain and the neighbouring power units; or wide territories of Central and Western Europe and the Balkans when investigating cultural influences affecting the domestic milieu). The natural basis for the study was formed by the rich and unique archaeological collections yielded by the Institute's own excavations at the most important medieval sites (Mikulčice, Dolní Věstonice, Chotěbuz-Podobora, Opava-Kylešovice, Přerov, Brno and others). The needed complementary or new information has been gathered through systematic and modern fieldwork methods.

The team has systematically and intensively investigated the phenomenon of power-political units in the 9th to early 11th centuries, with an emphasis on their social-economic and cultural relations, based on the study of Moravia's central sites and their interaction with their adjacent hinterland and distant peripheries. A wide range of questions has been studied: the form, development, internal structure, networking and natural framework of power-administrative centres, their cultural transformations and contacts, the manifestations of Christianisation, the reflection of the political processes and conflicts in archaeological record, the integration of foreign influences, the power and cultural expansion to the neighbouring regions, the downfall of Mojmirid Moravia, the fading of its influences and the transfer of some elements into later periods. Thanks to spatial GIS analyses, statistical analyses and mathematical modelling, it has been possible to create new theoretical models of the functioning of social and economic relationships between the centres and their hinterland and contribute to the understanding of the economic foundations of Great Moravia.

In the context of the research into the Great Moravian elites, their material culture and social status, the team has intensively studied the issues of early medieval material culture in Europe including the questions of the transfer of ideas and technologies. The matters of the production technologies used by the craftsmen producing jewellery and war gear have been getting ever more into the forefront.

Cooperation with natural and technical sciences has been used in the maximum possible extent. Examples include bioarchaeological studies of the physical habitus of early historical populations, their nutrition, residential mobility and social structure or the study of the historical natural environment and its alterations caused by human activity.

Apart from the dominant early medieval research topics, the team has systematically studied selected issues of high and late medieval history, especially urbanisation, specific categories of material culture (war gear) and the exploitation of precious metals. The list of five thematic areas of the centre:

1. Central agglomerations of the Early Middle Ages and socioeconomic interactions between centres and rural areas.
2. Early medieval burial sites and population: the social structure, identity, mobility, health and sustenance.
3. The traditions and innovations in Great Moravian arts and crafts.
4. The attributes of power and self-presentation in medieval society: fortifications, weapons, symbolism.
5. Urbanisation and precious metal mining in the medieval history and economy of the Czech lands.

## Research activity and characterisation of the main scientific results

As a follow-up to the previous evaluation period, the team primarily studied the power-political units of the 9th to the early 11th centuries, particularly their socioeconomic and cultural relations. It continued to focus its main attention on the topic of Great Moravia as part of the eastern periphery of the Frankish Empire in the 9th century. The basis for the international interdisciplinary study of this phenomenon was research of the central sites and how they interacted with their immediate surroundings. Mikulčice represents a model site, and research is continuously being carried out there. In connection with the study of these centres, the team also carried out intensive research of the selected areas on the border of the Great Moravian power and cultural oikumene. One important aspect of this was the demise of Mojmir's Moravia in the context of the settlement and ethnic changes that occurred in Central and Eastern Europe in the 10th century. These questions were closely linked to studies devoted to the decline in the influence of Great Moravia during the 10th century and the further development of this region within the framework of the Přemyslid state in the 11th–12th centuries.

In addition to the research of the Early Middle Ages, the team members systematically studied selected key phenomena of high and late medieval history. In accordance with the Institute's long-term concept, the priority topics were urbanisation and the mining of precious metals.

During the period in question, the team's research focus was centred around five main thematic areas (for their list, please see the section above):

### 1. Central agglomerations of the Early Middle Ages and socioeconomic interactions between the centres and rural areas

The main subject of this research comprised the social and economic relations of the communities living in the central agglomerations of Mojmir's Moravia in the 9th century. The team's ambition was to join in the broad interdisciplinary and international discussion concerning the form and interpretation of the social and economic relations in Central Europe. The model site for such research is still **Mikulčice** and the Institute's research base there. The methodology of research in Mikulčice is based on the principles of relational archaeology and draws on the concept of K. Kristiansen's archaeology of restored modernity (see *Hladík, M.: On theoretical pragmatism in archaeology. *Musaica archaeologica* 4(2), 2019, 195–213*). In accordance with the given theoretical concepts, this involves the study of more global topics using the most comprehensive analyses of data from the lowest local level, in our case from Mikulčice and its hinterland. In terms of methodology, the comprehensive research was conducted in the form of archaeological surveys, post-excavation analyses and theoretical research.

**Archaeological surveys** of the Great Moravian central agglomeration of Mikulčice-Valy are based on three pillars. The first of these comprises non-destructive surveys, as in spatial and landscape archaeology (archaeological surface surveys, aerial photography, LIDAR, GIS, geophysical prospecting, palaeoecological reconstruction). The second pillar is represented by standard archaeological excavations (partly revision, partly systematic, focused on resolving specific research questions). The third pillar consists of an interdisciplinary approach, particularly involving bioarchaeology and geoarchaeology. Emphasis was placed on connecting all three pillars and involving them in the comprehensive surveying of the main components of the Mikulčice settlement agglomeration, i.e. the fortified core, the suburbium and the hinterland.

**Post-excavation analysis** was conducted on the areas explored during the large-scale excavations of the stronghold in the second half of the last century, and also in particular during the "new" rescue, revision and systematic excavation. The fieldwork documentation has been

processed in the form of excavation reports during the entire period in question. This work included the gradual processing of the newly excavated masonry buildings (revision excavation of palace and churches in 2008–2013), the fortifications and the silted-up river branches (rescue excavations in 2012 and 2018), and the settlement or burial complexes in the suburbium and the hinterland (particularly the extensive rescue excavation conducted at the Mikulčice-Trapíkov settlement area in 2010–2015).

The priority focus for **theoretical research** was on topics supported by grants. These projects essentially touched upon all three components of the Mikulčice agglomeration, i.e. the fortified core, the suburbium and the hinterland. The topic of the fortified core as the assumed residence of the ruling Mojmirid dynasty, and the seat of the central administrative and ecclesiastical bodies of Great Moravia, was particularly represented by a project devoted to the **Mikulčice elites: Lifestyle and identity of the Great Moravian nobility: archaeological and bioarchaeological analysis of the evidence of Mikulčice's uppermost elites** (2017–2020, Czech Science Foundation, Contract ID 17-01878S). A database of approximately 450 elite graves from the stronghold and its hinterland (1), conventional archaeological analyses of selected grave goods (2) and wide-ranging anthropological research using C, N stable isotopes (3) were used to obtain and analyse bioarchaeological data relating to the highest-ranking social elites of Mikulčice and Great Moravia. The result is a new picture of the 9th-century Moravian elites, portraying a holistic view of their identity and lifestyle, including diet and nutrition. The multidisciplinary approach realised through the combined efforts of a large team of specialists from the fields of archaeology, history, anthropology, biology, archaeobotany and archaeozoology was featured in the representative collective monograph entitled *Great Moravian Elites from Mikulčice* (Poláček, L. et al., in print).

This comprehensive approach was made possible, amongst other things, by many years of heuristic work carried out at one of the most important and “richest” burial sites in Great Moravia – the **necropolis by the basilica in Mikulčice** (over 550 graves), culminating in the publication with a complete critical catalogue of the cemetery (*Klanica, Z./Kavánová, B./Kouřil, P./Ungerma, Š.: Mikulčice – Die Nekropole an der dreischiffigen Basilika, Brno 2019, 415 pp.*). This absolutely crucial publication is essential for the further analysis of the individual aspects of the material culture of the highest ranks of Great Moravian society.

The **suburbium** as a group of settlements in the immediate vicinity of the fortified centre in Mikulčice was the first of the main components of the Mikulčice agglomeration to be a subject of the critical assessment in the publication by *Poláček, L./Bartošková, A./Mazuch, M./Hladík, M./Látková, M./Hajnalová, M.: Das Suburbium des Burgwalls von Mikulčice. Studien zum Burgwall von Mikulčice IX, Brno 2019, 488 pp.* Comparison of the seven settlement complexes of the suburbium has enabled us to evaluate the socioeconomic structure of this centre's closest operational hinterland in the context of the agglomeration as a whole. Although this was a “secondary” settlement complex, in many respects (e.g. in terms of construction and normal material culture) it was no different from the fortified core. Another important finding showed that the suburbium offered a place to live for those inhabitants of the acropolis forced out of the fortified complex by the foundation of the churches there, together with their large cemeteries. Although it was not fortified, the suburbium became part of the elite environment of the power centre.

**The economic hinterland** as the third main – and least understood – component of the Mikulčice agglomeration was the subject of close attention, with the aim of enhancing our picture of the settlement with the addition of newly discovered settlements and burial sites, gaining a detailed understanding of their mutual relations and their relations with the centre and the natural environment. For the first time in Mikulčice, a comprehensive geoinformation database of all known early medieval components of the settlement network was processed in the GIS framework and made available online using the ArcGIS web application, see *Hladík,*

M.: Socio-economic Relations of Mikulčice with Hinterland (2015); (<https://www.arcgis.com/apps/MapTools/index.html?appid=95f4ba3021f24e4d96859159fd3c5fde>).

GIS spatial analyses, statistical analyses and mathematical modelling enabled us to create a new theoretical model of the socioeconomic relations between the centre and its hinterlands, see Hladík, M.: Mikulčice and its Hinterland. An Archaeological Model for Medieval Settlement Patterns on the Middle Course of the Morava River (7th to Mid-13th Centuries). Boston 2020, 361 pp. The model site chosen for resolving questions of relations between the centre and the hinterland in Mikulčice, or Great Moravia as a whole, was the newly processed settlement site of Mikulčice-Trapíkov. A comprehensive assessment of these extensive rescue excavations is being prepared for print (Hladík, M./Mazuch, M./Látková, M.: The Great Moravian Settlement in Mikulčice-Trapíkov and the economic Hinterland of the power centre, Brno, 250 pp.).

A different theoretical approach for resolving issues concerning the economic relations between the centres and their periphery regions, specifically analysis of the **spatial distribution of goods and commodities** and the subsequent characterisation of the system by which they were circulated in Great Moravia, was adopted by M. Hlavica (*Značky na dnech velkomoravských keramických nádob jako nástroj poznání ekonomicko-politické komplexity Velké Moravy [Imprints on bottoms of Great Moravian ceramics vessels as a tool to understand the economic and political complexity of the Great Moravia]*, dissertation, Masaryk University, Brno 2020, 218 pp.). For understanding the principles of the given economic system then enabled us to deduce the form of the organisational structures within 9th-century Moravian society, see the chapter by Hlavica, M./Procházka, R.: Basic Principles of the Great Moravian Economy in the aforementioned book *Great Moravian Elites from Mikulčice* (Poláček, L. et al., in print).

A probe into the economic mechanisms of Great Moravia and how they operated, based on detailed analysis of material from the local, i.e. Mikulčice level, was the comprehensive study of plant macro-remains from the agglomeration as a whole, by Látková, M.: *The archaeobotany of Mikulčice. Food supply to the Early Medieval Stronghold. Studien zum Burgwall von Mikulčice 12, Brno 2017, 247 pp.* Its newly defined **model of the agglomeration's diet** based on the taphonomic analysis of purposefully obtained material (particularly crops) and theoretical subsistence models assumes that the centre's inhabitants were closely involved with processing foodstuffs, at least during harvest time and the tasks that followed. Also related to this is the assumption that the fields were situated as close as possible to the fortified core, i.e. in the valley floodplain.

The phenomenon of the Mikulčice site as an island stronghold is within the Czech Republic undoubtedly **river archaeology**. During the given period, archaeologists continued to work on processing the large-scale excavations of silted-up river branches, see Poláček, L.: River archaeology and the search for a harbour in Mikulčice. In: Foucher, M. et al. (eds.): Inland harbours in Central Europe: Nodes between Northern Europe and the Mediterranean Sea, Mainz 2019, 179–189.

In connection with the study of the central sites of 9th-century Mojmir's Moravia, an intensive research was carried out into selected territories on the **border of the Great Moravian power and cultural oikumene**. One region traditionally studied by the Institute is Czech Silesia and the exemplary region of the upper Poodří with the fieldwork conducted at the Chotěbuz-Podobora Stronghold (Kouřil, P./Gryc, J.: Czech Silesia in the Early Middle Ages. Přehled výzkumů 60(2), 2019, 93–143). Fieldwork at the stronghold continued with rescue excavations carried out in 2018–2019 and was accompanied by the preparation of excavation reports from the latest years of research.



**The demise of Mojmir's Moravia** in the context of the settlement and ethnic changes that occurred in Central and Eastern Europe in the 10th century was also an important topic. An innovated view of the causes that led to the collapse of Great Moravia was presented by Kouřil, P.: *The Magyars and their Contribution to the Collapse and Fall of Great Moravia: Allies, Neighbours, Enemies*. In: Macháček, J./Wihoda, M., eds. *The Fall of Great Moravia. Who Was Buried in Grave H153 at Pohansko near Břeclav?* Leiden 2019, 62–93. The author seeks deeper causes of the collapse of the political entity in, for example, the antagonism of the Moravian and Nitran elites and the consequent weakening of central power. L. Poláček offers a specific reflection of these events evidenced in the archaeological record from Mikulčice in his paper entitled *The Faded Glory of Great Moravia: Post-Great Moravian Finds and the Question of Settlement Continuity in Ninth-Eleventh Century Mikulčice* (pp. 73–97) in the collective monograph by Kouřil, P./Procházka, R. et al.: *Moravian and Silesian strongholds of the tenth and eleventh centuries in the context of Central Europe*, Brno 2018, 432 pp. This book, co-written by another four team members, links the fall of Great Moravia with the waning of its influence during the 10th century and further developments towards **anchoring Moravia in the power-political structures of the Přemyslid state in the 11th–12th century**. The book offers a new, comprehensive insight into the fortified settlements in Moravia and Silesia during the 10th and 11th centuries, in the broader Central European context. It specifies the general development tendencies and findings regarding the individual sites, and now also outlines the differences between Moravia itself and the neighbouring regions. A detailed look at the topic of the “new” fortified centres can be found at **Přerov** in northern part of Moravia. The collective monograph by Procházka, R. et al.: *Hrad Přerov v raném středověku (9. – 11. století) a počátky mladohradištní hmotné kultury [Přerov Castle in the Early Middle Ages (9th – 11th century) and the Origins of Material Culture in the Late Hillfort Period]*, Brno 2017, 548 pp., sheds light on the importance of the site in the context of the Piast domination over Moravia at the end of the 10th century; finds from there show numerous links to the early Polish state. Unique excavation with exceptionally well-preserved wooden structures and “Polish” structural elements of the fortifications has enabled us, amongst other things, to analyse the origins of the “Late Hillfort period” material culture in Moravia in the broader context. Also from the same site is the comparative study by Procházka, R.: *Socio-economic aspects of the 11th and 12th century material culture of Přerov Castle in a contemporary context*, In: Fusek, G., ed. *Archäologische Studien zum frühen Mittelalter*, Nitra 2017, 115–146.

## **2. Burial sites and the population of the Early Middle Ages: social structure, identity, mobility, health and diet**

Recently the team has been taking a growing interest in the **study of the social structures** of historical populations, with the excavations of Great Moravian burial sites providing an extensive material base (e.g. Mikulčice: approximately 2500 graves situated within the stronghold and an additional 1000 graves in the hinterland). The application of new methods, particularly molecular genetic and isotope analyses, gives this aspect of research a whole new perspective. The comprehensive bioarchaeological study of the population of Mojmir's Moravia during the 9th century is the subject of close interdepartmental collaboration between two leading anthropological workplaces: the Anthropological Department of the National Museum in Prague and the Department of Anthropology and Human Genetics of the Faculty of Science at Charles University.

Mojmir's 9th-century empire was a “**complex**” **society** with marked social differences, developing in the specific conditions of the ongoing process of Christianisation, cf. the work by team member Kalhous, D.: *Graves, Churches, Culture and Texts: The Processes of Christianisation in the Early Middle Ages and Their Social and Cultural Context*. In: Macháček, J./Wihoda, M., (eds.), *The Fall of Great Moravia. Who Was Buried in Grave H153 at Pohansko near Břeclav?* Leiden 2019, 110–129. Unlike the Frankish Empire, however, in Moravia there was no significant limitation on the grave goods placed with the deceased during the 9th

century. This means that we possess a “wealth” of finds that, despite the complexity of their testimony, represents a unique source for understanding the social structure of society. In this sense, the key source and basis for further study is the aforementioned catalogue of burial sites by the Mikulčice basilica.

Part of the team focused on **grave archaeology** during the period in question. Their attention centred around modifications of the grave pits, particularly their wooden structures that are typical of rural burial sites in the hinterland of the central agglomerations. This specific subject of Great Moravian burial rite and its social interpretation is covered in the book by Mazuch, M./Hladík, M./Skopal, R.: *Úpravy hrobových jam a dřevěné konstrukce v hrobech na pohřebištích Velké Moravy. (Sociální, duchovní a chronologický fenomén)* [Modifications to Grave Pits and Wooden Structures in Graves at the Burial Sites of Great Moravia. (A Social, Spiritual and Chronological Phenomenon)]. Brno 2017, 338 pp. The team members also dealt with the so-called masonry tombs inside churches and in their cemeteries. They proved that most of these structures actually originated as the result of stone rubble from destroyed churches later falling down into what were originally the timber-lined hollow grave chambers, see Mazuch, M./Hladík, M./Poláček, L.: *Úpravy hrobových jam, konstrukce v hrobech a fenomén tzv. hrobek v Mikulčicích* [Modifications to Grave Pits, Structures in Graves and the Phenomenon of the So-called Tombs in Mikulčice]. *Přehled výzkumů* 59(2), 2018, 87–117.

In the case of **bioarchaeological research**, the interdisciplinary team continued its comprehensive study of the 9th-century Moravian population, its physical condition and diet in the context of the social structure of society. This approach was applied during the realisation of the aforementioned bioarchaeological project “*Lifestyle and identity of the Great Moravian nobility.*” The main output of this project is a collective monograph by Poláček, L. et al.: *Great Moravian Elites from Mikulčice (Brno, in print)*. Selected biological indicators of the population, including stable isotopes, were analysed in the context of the study of social structure of the Great Moravian burial sites; L. Poláček is the co-author of several archaeological and anthropological studies published in high-impact natural science journals (e.g. Ibrová, A. et al.: *Facial skeleton asymmetry and its relationship to mastication in the Early Medieval period (Great Moravian Empire, Mikulčice, 9th–10th century)*. *Archives of Oral Biology* 84, 2017, 64–73; Jílková, M. et al.: *Early medieval diet in childhood and adulthood and its reflection in the dental health of a Central European population (Mikulčice, 9th–10th centuries, Czech Republic)*. *Archives of Oral Biology* 107, 2019; Stránská, P. et al.: *The prevalence and distribution of dental caries in four early medieval non-adult populations of different socioeconomic status from Central Europe*. *Archives of Oral Biology* 60(1), 2015, 62–76; S. Kaupová et al.: *Diet in transitory society: isotopic analysis of medieval population of Central Europe (ninth–eleventh century AD, Czech Republic)*. *Archaeological and Anthropological Sciences* 10(4), 2018, 923–942). The latter article was the first to evaluate the dietary habits of the population of the core of the historical territory of Great Moravia during the 9th century with regard to the socioeconomic structure and the further development of settlement in the 10th and 11th centuries. Analyses of stable isotopes demonstrate that this was a highly socially stratified society with significant status and gender differences in terms of access to quality foodstuffs.

Bioarchaeological research also focused on economic issues relating to the level of agriculture at the time, the range of luxury cultural crops cultivated and the **subsistence of the centre's inhabitants**, see the aforementioned archaeobotanical work by team member Látková M.: *The archaeobotany of Mikulčice. Food supply to the Early Medieval stronghold. Studien zum Burgwall von Mikulčice*, Brno 2017, 247 pp. In the European context, evidence from Mikulčice is used to resolve the question of how grape vines were grown in Great Moravia, see Látková, M./Hajnalová, M./Havlík, M.: *Grape vine and viticulture tradition in Mikulčice*. *Přehled výzkumů* 60(2), 2019, 79–91.

### 3. The tradition and innovation of Great Moravian arts and crafts.

In the context of study of the Great Moravian elites, their material culture and social status, the team members paid close attention to questions related to early medieval arts and crafts. They focused on the broad geographic region of Central and South-Eastern Europe, regional and chronological groups of jewellery and relations between them. Questions concerning the technologies used by craftsmen to make jewellery and parts of male warrior equipment became ever more prominent. The numerous find collections from the large Great Moravian burial sites and parallel ongoing bioarchaeological and archaeometric research are giving this study a new perspective.

Detailed study was done both on lavish and folk jewellery in the Mediterranean during the 7th–12th centuries and its influence on jewel-crafting in more northerly regions, including Great Moravia. Another category studied comprised the so-called Carantanian jewellery in the eastern Alps and its influence on the surrounding parts of Central Europe. One specific topic is the comprehensive research into a significant element of the material culture of the highest-ranking elites of Great Moravia – the so-called *gombík* – a spherical hollow button in the context of period clothing.

In contrast to the former view of Great Moravian jewellery as a syncretic, yet original and unique phenomenon linked to this power-political agglomeration, it is becoming ever more apparent that this question needs to be evaluated in the broader context of the transfer of ideas and technologies within Europe at that time. A key role here is played partly by the reflection of the living culture of the Early Middle Ages in the archaeological sources (the presence of lavish grave goods to a varying extent), and partly by knowledge itself (particularly the unsatisfactory state of research in the Balkan countries, which formerly prevented us from gaining an adequate understanding of the intense and long-lasting influence of the Byzantine Empire). E.g.: Ungerman, Š.: "Karantánsko-köttlašský" šperk na jihozápadním Slovensku a v dalších částech Karpatské kotliny [*"Carantanian-Köttlach" Jewellery in Southwest Slovakia and in Other Parts of the Carpathian Basin*]. *Přehled výzkumů* 57(2), 2016, 11–48; Ungerman, Š.: *Prachtfingerringe im frühmittelalterlichen Mähren (9.–10. Jahrhundert). Bemerkungen zur Chronologie und Provenienz des großmährischen Luxusschmucks*. *Přehled výzkumů* 58(2), 2017, 19–95; Ungerman, Š.: *Frühmittelalterliche Schlaufenohrringe mit Drahtanhängern oder Kettchen*. In: Daim, F./Heher, D./Rapp, C. (eds.) *Menschen, Bilder, Sprache, Dinge. Wege der Kommunikation zwischen Byzanz und dem Westen 1: Bilder und Dinge. Studien zur Ausstellung »Byzanz & der Westen. 1000 vergessene Jahre«*. Mainz 2018, 9–43; Ungerman, Š.: *Frühmittelalterliche Ohrringe mit drei Blechbommeln*. In: Nowotny, E./Obenaus, M./Uzunoglu-Obenaus, S. (eds.): *50 Jahre Archäologie in Thunau am Kamp. Festschrift für Herwig Friesinger*. Krems 2018, 107–124; Krupičková, Š./Ottenwelter, E./Březinová, H.: *Exact evidences of the use of spherical buttons (gombíky): two case studies from Moravian finds*. *Přehled výzkumů* 60(2), 2019, 57–77. Ungerman, Š.: *Die Wadenriemengarnituren im frühmittelalterlichen Mähren*. In: Poláček, L./Kouřil, P. (eds.): *Bewaffnung und Reiterausrüstung des 8. bis 10. Jahrhunderts in Mitteleuropa. Waffenform und Waffenbeigaben bei den mährischen Slawen und in den Nachbarländern. Internationale Tagungen in Mikulčice IX, Brno 2019*, 307–336; Poláček, L.: *Die Suche nach kultureller Identität. Architektur und Kunsthandwerk im Großmährischen Reich*. In: Lübke, Ch./Hardt, M. (eds.): *400-1000. Vom spätantiken Erbe zu den Anfängen der Romanik. Handbuch zur Geschichte der Kunst in Ostmitteleuropa*, Berlin 2017, 202–213. The range of specific categories of jewellery and male warrior equipment are covered in separate chapters in the collective monograph by Poláček, L. et al.: *Great Moravian Elites from Mikulčice (Brno, in print)*.

#### 4. Power attributes and the representation of medieval society: fortifications, weapons, symbolism

In connection with the study of the medieval elites and central agglomerations, attention has long been focused on gaining a deeper understanding of fortified settlements. As the centres of political and military life, they were always the primary target of armed raids and their settlement complexes were transformed into battlefields. During the period in question, attention was devoted to these upheavals particularly in connection with the role played by the Old Hungarians in the **collapse and fall of Great Moravia** and the closely related crisis at the end of the 9th and beginning of 10th centuries (e.g. *Kouřil, P.: The Magyars and their contribution to the collapse and fall of Great Moravia: allies, neighbours, enemies*, in: J. Macháček, M. Wihoda, M. (ed.), *The Fall of Great Moravia. Who Was Buried in Grave H153 at Pohansko near Břeclav?* Leiden 2019, 62–93; *Dresler, P./Mazuch, M.: Mikulčice a Pohansko – Zánik velkomoravských center na dva způsoby [Mikulčice and Pohansko – the Demise of the Great Moravian Centres in Two Ways]*. In: Kovár, B./Ruttkay, M. (eds.): *Kolaps očami archaeologie*, Nitra 2019, 165–177.

Another large set of questions was resolved in connection with the attempt to create a **comprehensive picture of the fortified settlements of Moravia and Silesia in the 10th–11th centuries**, i.e. immediately after the collapse of the Great Moravian centres and the rise of the Přemyslid estate. It is castles, which are usually the most well researched sites, that provide the most relevant information enabling the formulation of broader historical and archaeological conclusions concerning the possible continuity, restoration or emergence of new political and settlement formations and structures. It has been proven that Moravia was far from a dead zone. It was actually a region of slow restoration after the collapse of Great Moravia and that its attachment to Přemyslid Bohemia was a gradual process, in terms of both time and territory (e.g. *Kouřil, P./Procházka, R. et al.: Moravian and Silesian Strongholds of the Tenth and Eleventh Centuries in the Context of Central Europe*. Brno 2018, pp. 432).

The team also explored particular questions related to **fortifications as a construction phenomenon**, whose modernisation was always closely linked to the development of military dynamics and mechanics in general (e.g. *Mazuch, M.: Findings About the Early Medieval Fortification of the Mikulčice-Valy Acropolis*. *Slavia Antiqua* 55, 2015, 7–65). Special attention was also devoted to gaining a detailed understanding of individual sites of the Early and High Middle Ages, as well as the relics of the **material culture of these settlements** (e.g. *Procházka, R.: Hrad Přerov v raném středověku (9.–11. století) a počátky mladohradištní hmotné kultury (archeologický výzkum na Horním náměstí č. p. 8, 9 a 21) [Přerov Castle in the Early Middle Ages (9th–11th Centuries) and the Origins of the Material Culture of the Late Hillfort Period (Archaeological Excavations at nos. 8, 9 and 21 Horní náměstí)]*, Brno 2017, 548 pp.; *Procházka, R./Žákovský, P.: K současnému stavu poznání gotické fáze hradu Pustiměř (Zelená Hora u Radslavic) – výpověď archeologie [The Current State of Knowledge Concerning the Gothic Phase of Pustiměř Castle (Zelená Hora near Radslavice) – Archaeological Testimony]*. In: *Dejmal, M./Jan, L./Procházka, R. (eds.), Na hradech a tvrzích. Miroslavu Plačkovi k 75. narozeninám jeho přátel a žáci*, Praha 2019, 203–231).

Another segment of the team's research activities, closely related to the military aspect of fortified settlements, is focused on the detailed **study of medieval and early modern war gear and evidence of the military in material culture** in general. Archaeological, military and historical analysis of selected types of material sources (militaria, battlefields, fortified settlements) furthers our understanding of the medieval military and war from the 9th to the mid-17th centuries. Emphasis is placed partly on the period of Great Moravia and its demise in the 9th and 10th centuries, and partly on the 14th and 15th centuries, an era of frequent conflicts. Militaria often tends to be the only evidence of such wars. Detailed study enables us to resolve questions such as the level of contacts, as well as the sources of cultural influences

and stimuli on the domestic milieu (e.g. the influence of equipment and armaments of Western and Eastern production traditions, technological innovations). The aforementioned concept is fulfilled through partial steps, which particularly include:

- An ongoing inventory of selected medieval and early modern war gear from archaeological contexts and collections. The outcome of this **general corpus of militaria from the Czech Republic** includes publications in the form of catalogues (e.g. Žákovský, P./Schenk, Z.: *Středověké a raně novověké zbraně Přerovska. Zbraně a zbroj od kolapsu Velké Moravy do konce třicetileté války* [Medieval and Early Modern Weapons of the Přerov Region. Weapons and Armour from the Collapse of Great Moravia to the End of the Thirty Years' War]. Přerov-Brno 2017, 175 pp.), as well as in the form of a comprehensive analysis of a selected type of weapon (e.g. Hošek, J./Košta, J./Žákovský, P.: *Ninth to mid-sixteenth century swords from the Czech Republic in their European context. Part I. The finds*. Prague-Brno 2019, 424 pp.; Kouřil, P.: *Frühmittelalterliche bronzene Hakensporen mit nach innen umgeschlagenen Enden aus Mähren*, in: Poláček, L./Kouřil, P. (Hrsg.), *Bewaffung und Reiterausrüstung des 8. bis 10. Jahrhunderts in Mitteleuropa. Internationale Tagungen in Mikulčice IX*, Brno 2019, 181–200).
- Selected artefacts are subject to **material and technological analysis** with the aim of accurate determining of their materials and how they were worked and constructed. The results obtained enable us to answer a series of partial questions relating to the innovation of production and the distribution of weapons. The assumed technological processes are verified by experimental production.
- Targeted assessments are carried out on collections of metallic artefacts from selected medieval fortified settlements whose origin and demise are known with some degree of certainty.
- Set objectives should be used to gradually present the topic of militaria and fortified sites as an important archaeological source for the **study of medieval warfare and conflicts** in this country, including how they are set in the period context and the historical landscape. Also developed within the framework of this activity in the Czech Republic is battlefield archaeology, a discipline previously somewhat overlooked, with the main focus on medieval battlefields and the demise of human settlements as a result of war.

## 5. Urbanisation and the exploitation of minerals

Two topics associated with the transformation and rise of civilisation in the Czech lands in the 13th century form an integral part of the team's long-term research concept. The process of urbanisation and the emergence of a systemic complex of urban communities had a major influence on the settlement, social and economic structure of Central Europe as a whole. The boom in the mining of precious metals thus provided important resources for the all-round development of society and also for the political expansion of the last Přemyslids.

The systematic archaeological **study of the origins and initial development of towns** in Moravia commenced at the beginning of the 1980s at the Institute. Although the centre of fieldwork was later relocated to another specialised workplace, the Institute continues to be particularly involved in the processing and publication of the long-time excavations carried out at the Brno medieval settlement agglomeration, which – after Prague – represents archaeologically well-researched and closely studied medieval town in the Czech Republic.

During the period in question, Brno was used as an example for the study of certain important aspects of the life and culture of medieval towns as segments of a possible future synthetic summary. These are the development and typology of pottery kilns, predominantly from towns during the 13th and 14th centuries, as well as how waste was treated in the high medieval

town, butchery as a trade in Central Europe on the basis of the archaeozoological analysis of animal bones and the link between fortifications and the shaping of the town's ground plan with an emphasis on the 13th and 14th centuries (e.g. *Procházka, R.: Mittelalterliche Töpferöfen in Mähren. Die Konstruktion der Töpferöfen im Verlauf der Jahrhunderte. In: Grunwald, L. (Hrsg.), Den Töpfern auf der Spur. Orte der Keramikherstellung im Licht der neuesten Forschung. Mainz 2015, 215–224; Procházka, R./Holub, P./Sedláčková, L.: Der Umgang mit Abfällen im mittelalterlichen Brno, Beiträge zur Mittelalterarchäologie in Österreich 31, 2015, 111–122; Kolařík, V./Procházka, R.: Die mittelalterliche Befestigung von Brno und die Gestaltung des Stadtgrundrisses. In: Towns as living spaces. Static and Dynamic Aspects of Medieval and Early Modern Urban Communities: A Comparative Topographical Approach. 2020, in print).*

One discipline that is currently highly promising for understanding the key economic and social tendencies of the European Middle Ages is **mining archaeology**. Around the turn of the millennium, the Institute was behind the fundamental qualitative transformation of this dynamically developing discipline in the Czech Republic, and during the period in question, it was involved in the implementation of several projects. One crucial outcome of part of the team's work on the project "Historical Use of the Landscape of the Bohemian-Moravian Highlands in Prehistoric and Medieval Times" (NAKI – Ministry of Culture of the Czech Republic, 2013–2016) was a paper on the history of silver ore mining in the Vrbické Hory mining area in the Čáslav region at the turn of the Middle Ages and the Early Modern Period (*Doležel, J.: K těžbě stříbra na Horách Vrbických v 16. Století [Silver Mining at Vrbické Hory in the 16th Century]. Přehled výzkumů 57(2), 2016, 197–249.*

In 2017–2019, a project aimed at the detailed documentation of one of the most well preserved medieval mining complexes in Central Europe, Havírna in the Bohemian-Moravian Highlands ("The 13th-century Silver Mining Complex at Havírna near Štěpánov nad Svratkou – Survey, Documentation, Presentation and Protection"; regional cooperation programme implemented by the Czech Academy of Sciences and the Vysočina Region). Within the framework of this project, the team carried out detailed surveys using laser scanning and non-destructive surveying of the entire complex, covering an area of 21 ha. The partial publication (*Doležel, J.: Středověký areál těžby stříbra Havírna u Štěpánova nad Svratkou: dokumentace v letech 2017–2019 a problém její interpretace [Medieval Silver Mining Complex at Havírna near Štěpánov nad Svratkou: Documentation in 2017–2019 and the Problem of Its Interpretation]. Přehled výzkumů 62(2), in print*) forms the starting point for further research and the basis for a planned monograph on this model site.

## Research activity and characterisation of the main scientific results

### Late Middle & Early Upper Palaeolithic

The Middle to Upper Palaeolithic transition and the replacement of Neanderthals by anatomically modern humans (AMH) is one of crucial issues in current Palaeolithic archaeology and palaeoanthropology; therefore, our team paid high attention to this issue during the evaluated period.

A broader topical study, devoted to migration of AMH to Europe, was published by **J. Svoboda**:

- **Svoboda, J.:** *Early modern human dispersal in central and eastern Europe. In Kaifu, Y., Izuhu, M., Goebel, T., Sato, H., Ono, A., Emergence and diversity of modern human behavior in paleolithic Asia. Texas A&M University Press, 2015, 23-33.*

He argues that the desertification of Sahara before and during MIS 3 stimulated demographic pressures in the Mediterranean and consequential expansion of modern humans into the Neanderthal territories in Europe. However, Europe played not only a passive role of a new home for the immigrants, but the typical periglacial environment and richness in animal herds stimulated new behavioural patterns, complex hunting strategies, technologies, and symbolism.

Focusing on Moravia, the research was concerned on the Bohunician and other Early Upper Palaeolithic (EUP) technocomplexes as the Szeletian and the Aurignacian. Their spreading in the territory of Moravia created a possible “zone of contact” between the local Neanderthals and incoming AMH, although it is not known precisely which hominins made individual technocomplexes.

Most of the activities the team develop in this issue were mainly carried out under leadership of **P. Škrdla** within the grant project no. #15-19170S – “Earliest Modern Human Behaviour in Eastern Central Europe”, funded by Czech Science Foundation in 2015-2017. The project generated number of results, including a total of 14 publication outputs (case studies reporting site excavations and methodology, evaluating/synthesis papers, and summarising monograph), supplemented by oral presentations on several international conferences.

A lack of stratified EUP sites in Moravia lead to the development of a new methodology for their location; the following contribution was presented in the impacted journal paper:

- **Škrdla, P., Nejman, L., Rychtaříková, T.:** *A method for finding stratified sites: Early Upper Paleolithic sites in southern Moravia. Journal of Field Archaeology 41:1, 2016, 57-67.*

The method described here is based on distribution of surface scatters and involves pedestrian surveys guided by precise background research. All Palaeolithic artefacts are GPS recorded with particular attention to calcium carbonate crust on artefact surfaces, which can be indicators of nearby stratified deposits. Exploratory test pits are then excavated, followed by systematic excavations if the potential for stratified cultural deposits was deemed high.

Employing this new methodology, several new sites were discovered and subsequently excavated, e.g. Tvarožná X (2015), Líšeň/Podolí I (2015-2016) – the closely undefined EUP site with personal ornaments (pierced mollusc shells with traces of red ochre), and Ořechov IV (2016-2017) – the Bohunician site with several phases of occupation (classical Bohunician dated to GIS-12 and Late Bohunician with bladelet technology dated min. to GIS-9), published in two case studies:

- **Škrdla, P., Rychtaříková, T., Nejman, L., Bartík, J., Hrušková, A., Krása, J.:** *Ořechov IV: Nová lokalita bohunicienu nad údolím Bobravy [Ořechov IV: A new Bohunician site above in the Bobrava River valley]. Přehled výzkumů 57:1, 2016, 11-31.*
- **Škrdla, P., Rychtaříková, T., Bartík, J., Nejman, L., Novák, J.:** *Ořechov IV: nová stratifikovaná lokalita bohunicienu mimo brněnskou kotlinu [Ořechov IV: A new*

*stratified Bohunician site outside of Brno Basin]. Archeologické rozhledy 69:3, 2017, 361-384.*

Moreover, other EUP collections were re-examined and re-evaluated with new methodology and new techno-typological approach, published in two topical studies:

- **Škrdla, P.:** *Bifacial technology at the beginning of the Upper Paleolithic in Moravia. Litikum 4, 2016, 5-8.*
- **Mlejnek, O., Škrdla, P., Tostevin, G. B., Lisá, L., Novák, J.:** *Želeč I (okr. Prostějov/CZ) - the Early Upper Palaeolithic Stratified Site: the Question of the Integrity of the Ondratice I/Želeč Surface Collection. Archäologisches Korrespondenzblatt 46:1, 2016, 1-14.*

The research was generally evaluated in two summarising papers:

- **Škrdla, P.:** *Middle to Upper Paleolithic transition in Moravia: New sites, new dates, new ideas. Quaternary International 450, 2017, 116-125.*
- **Demidenko, Y. E., Škrdla, P., Nejman, L.:** *Aurignacian in Moravia. New geochronological, lithic and settlement data. Památky archeologické 108, 2017, 5-38.*

Concerning new data, chronological position as well as technological and typological homogeneity of these (Bohunician, Szeletian, and Aurignacian) technocomplexes, the papers argue that the Bohunician was made by the first anatomically modern humans that migrated to this area while the Szeletian was produced by the local Neanderthals. Both, Bohunician characterised by the evolved Levallois technology and Szeletian characterised by bifacial knapping and intensive flat retouch, are chronologically contemporaneous, while an Aurignacian occupation, including also new discovered sites Líšeň-Čtvrtě, Líšeň-Nad výhonem and Napajedla-Zámoraví, is chronologically younger. Early Aurignacian sites have never been found in Moravia.

The project was closed with the monograph:

- **Škrdla, P.:** *Moravia at the onset of the Upper Paleolithic. The Dolní Věstonice Studies 23, Brno, 2017. 159 p.*

It summarises an actual knowledge regarding the EUP period in Moravia. Considering the results of a long-term research history, an examined EUP sites and their archaeological records are presented in the context of the surrounding regions and global climatic trends. Based on that, a hypothetical cultural evolutionary model for this period is suggested.

Within international cooperation, **P. Škrdla** also re-examined a lithic assemblage from the Hlinsko-Kouty I site, which was published as:

- **Demidenko, Y. E., Škrdla, P., Ríos-Garaizar, J.:** *The Hlinsko-Kouty I site and the only stratified Aurignacian-like assemblage with a bifacial triangular point in Moravia. Přehled výzkumů 59:1, 2018, 17-34.*

The article presents additional refitting and use-wear study, which confirmed the homogeneity of Aurignacian-like and Szeletian-like features in the examined assemblage. This classifies the site, in Moravia, as a unique stratified collection of the Morava-type Aurignacian (or Míšovce-type Upper Palaeolithic), furthermore analogous with some similar assemblages known from Eastern Europe.

In a frame of institutions-wide international collaboration, the team was involved in multidisciplinary excavation of the Pod Hradem Cave site, carried out between 2011 and 2016. The team members (**Škrdla, Nývltová Fišáková, Sázelová, Svoboda**) contributed in fieldworks, processing and analyses of the archaeological and archaeozoological finds and participated in contextual site interpretation. The excavation of the site, located in the Moravian Karst, offered an excellent opportunity for environmental reconstructions of MIS 3 period in Central Europe due to its detailed sedimentary record dated from 50 to 28 kyr BP. A comprehensive AMS dating program and detailed analysis of large palaeoenvironmental dataset reflect that the Pod Hradem Cave environment may have acted as a buffer zone,



ameliorating extreme climate fluctuations during MIS 3, and providing a suitable refuge for both bears seeking winter hibernation dens and occasionally visiting humans during the Middle-Upper Palaeolithic transition. The results were evaluated in several impacted journal articles, such as:

- **Nejman, L., Wood, R., Wright, D., Lisá, L., Nerudová, Z., Neruda, P., Přichystal, A., Svoboda, J.:** *Hominid visitation of the Moravian Karst during the Middle-Upper Paleolithic transition: New results from Pod Hradem Cave (Czech Republic). Journal of Human Evolution* 108, 2017, 131-146.
- **Nejman, L., Lisá, L., Doláková, N., Horáček, I., Bajer, A., Novák, J., Wright, D., Sullivan, M., Wood, R., Gargett, R. H., Pacher, M., Sázelová, S., Nývltová Fišáková, M., Rohovec, J., Králík, M.:** *Cave deposits as a sedimentary trap for the Marine Isotope Stage 3 environmental record: The case study of Pod Hradem, Czech Republic. Palaeogeography, Palaeoclimatology, Palaeoecology* 497, 2018, 201-217.

Team member **P. Škrdla** also participated in several research projects abroad. Joint Ukrainian-Czech expedition in 2015, focusing on a new research of Kulychivka site, resulted in paper:

- **Škrdla, P., Sytnyk, O., Koropets'kyi, R.:** *New observations concerning Kulychivka site, Layer IV. Materialy i doslidžennja z archeologiji Prykarpattja i Volyni* 20:1, 2016, 15-25.

Output presents that techno-typological analysis and chronostratigraphic position of examined cultural horizon IV confirm the hypothesis that it belongs to the wide Emiro-Bohunician techno-complex, where also the Moravian site of Stránská Skála is included. Further research of the site as a reliable source for studying the transition between Middle and Late Palaeolithic in Eastern Central Europe is recommended.

Additional output – the result of the broad international cooperation between academic archaeological institutions in Moravia, Slovakia and Poland (#PAU-16-01) – is represented by the paper devoted to the specific type of artefact – the Moravany-Dlhá-type points:

- **Kaminská, L., Kozłowski, J. K., Moskal-del Hoyo, M., Nemergut, A., Škrdla, P.:** *Moravany-Dlhá: a phenomenon of the Poplar-leaf shape points. Eurasian Prehistory* 14:1/2, 2017, 41-54.

The paper is dealing with the raw material and morphometrical features of these typologically significant artefacts, spatial distribution, homogeneity of the findings collections and the recent C14 dating. It presents strong evidence to claim these points as a diagnostic feature for specific technocomplex of the Early Upper Palaeolithic in Central Europe.

### Gravettian

A research in the topic related to the Gravettian represents a key issue of centre's activities. Within this, the centre follows the long-term research plan concerning the formation of large and complex hunter sites dated to the Danubian Gravettian (Pavlovian), which represents one of the attributes within modern human adaptations in Central Europe. Naturally, our activities focus on a chain of Upper Palaeolithic sites in the Dolní Věstonice – Pavlov – Milovice (DV-P-M) area, as one of the most significant settlement area oriented on mammoth hunting in the Moravian territory.

During the evaluated period, the team continued in the systematic settlement and environmental studies, based on new excavations, investigation of unearthed archaeological material or laboratory analyses, concerning the sites of Dolní Věstonice I and II, and Pavlov I. Focusing on the site of DV I, one of the largest and most complex Gravettian settlement agglomerations in Moravia, the team published an article reporting the last excavation of the site conducted by the team in 1990–1993:

- **Svoboda, J., Novák, M., Sázelová, S., Hladilová, Š., Škrdla, P.:** *Dolní Věstonice I. Excavations 1990-1993. Přehled výzkumů* 59:1, 2018, 35-67.

The article evaluates obtained chronostratigraphic and archaeological evidence from a series of trenches along the site boundaries, concerning the overall situation of the site. With the

newly acquired data, the paper addresses the questions of general stratigraphy and local microstratigraphies, radiometric chronology, centre-periphery relationships (on levels of the whole site and of the individual residential units), and structure of relevant faunal and lithic assemblages.

Field activities of the team were concentrated at the site of Pavlov I, the second complex hunter's site in the DV-P-M settlement area. Due to the construction of a modern museum building with an in-situ exhibition (Archeopark Pavlov), a new large-scale rescue excavation was carried out in years 2013–2015 (with additional small fieldwork in 2017 and 2019), which resulted in an extensive surface reopening and revisions in spatial and stratigraphic context. Preliminary results from this new excavation were published in the article:

- **Svoboda, J., Novák, M., Sázelová, S.:** *Pavlov I. Předběžné výsledky výzkumu v letech 2013–2015 [Pavlov I. Preliminary results of the 2013–2015 excavation]. Přehled výzkumů 57:1, 2016, 33-57.*

Although some parts of this area were previously and partially excavated by B. Klíma in 1952–1972, it needs to be pointed out that large parts of the site were still left unexplored, and thus our excavations could concern here the spatial organisation, microstratigraphy, and effects of natural (cryogenic) processes in site formation. In the follow-up article published in the impacted journal, we again discuss the above-mentioned attractive research issues (spatial organisation, microstratigraphies, and effects of cryogenic processes), the understanding of which is a basic presumption for further analysis of the archaeological material:

- **Svoboda, J., Novák, M., Sázelová, S., Demek, J.:** *Pavlov I: A large Gravettian site in space and time. Quaternary International 406, 2016, 95-105.*

The article also reviews the interpretative potential of the Pavlov I site within the phenomenon of site formation and prepares the adequate background in solving the question of Gravettian origin. The sequence of acquired C14 data demonstrates a gradual formation of cultural deposits within the time-span of 32–25 kyr uncal. BP, when the sequence do not cover just the Evolved Gravettian, but also earlier bellow occupations dated to unknown Upper Palaeolithic. The excavation yielded a large number of archaeological data and material, including lithic and bone artefacts, archaeozoological, malacozoological and palaeobotanical remains. We have compiled an inventory with 17,000 3D localised items, complemented by other unnumbered material (sorted by square grid) coming from wet-sieving of excavated sediment (about 25 tons). In 2015–2019, during the annual summer student workshops oriented to post-excavation processes, the whole finding assemblage was cleaned, sorted and currently is being prepared for the next phase – basic description and analysis.

For this purpose, within the frame of the Czech Academy of Sciences research programme “Strategy AV21 – Memory in the Digital Age” and the project “The Palaeolithic site of Pavlov: GIS application as a comprehensive tool in archaeological data management and analysis”, we establish a comprehensive management system (PaleoGIS), as the basic processing tool for managing and analysing a wide variety of archaeological data interconnected in GIS.

During the period in question, the most intensive work within the Gravettian topic was related to the research of Dolní Věstonice II site. The attention was first paid on the upper most part of the site – a sub-site DV IIa, last excavated in 2012. An interdisciplinary cooperation, including natural science researchers from Masaryk and Charles University, resulted in the impacted journal paper:

- **Svoboda, J., Hladilová, Š., Horáček, I., Kaiser, J., Králík, M., Novák, J., Novák, M., Pokorný, P., Sázelová, S., Smolíková, L., Zikmund, T.:** *Dolní Věstonice IIa: Gravettian microstratigraphy, environment, and the origin of baked clay production in Moravia. Quaternary International 359-360, 2015, 195-210.*

The paper addresses the formation of microstratigraphies at large open-air sites, evidence of the earliest Gravettian occupation in the DV-P-M area, and occurrence of early ceramics from

this context. The associated environmental evidence of charcoal, pollen and molluscs completes the picture of MIS 3 landscape and climatic development.

A broad multidisciplinary collaboration culminated in the follow-up collective monograph, summarising results of the research of the whole Dolní Věstonice II site:

- **Svoboda, J. ed.:** *Dolní Věstonice II. Chronostratigraphy, Paleoethnology, Paleoanthropology. The Dolní Věstonice Studies 21, Brno, 2016, 420 p.*

A comprehensive publication of this extensive and important Gravettian site presents the course of earlier (1985–1990) and new (1999–2012) excavations. Processing of the accumulated material was realised by a team of specialists from the Czech Republic, France, Germany, UK, USA, Poland, Slovakia, and Spain, where also most of the team members (**Svoboda, Sázelová, Novák, Polanská and Šída**) participate as co-authors. The individual chapters start with the site-structure, geology, stratigraphy, palaeobotany, archaeozoology and continue to presenting various types of archaeological materials. One of the unique features represents the burials and skeletons of *Homo sapiens*, submitted here to new anthropological, dental-anthropological and palaeogenetical analyses.

Regarding the DV-P-M settlement area, **J. Svoboda** published four general and broader syntheses:

- 1) The following paper presents three complex engravings on mammoth tusks from the sites of Pavlov and Předmostí, and suggests their possible interpretations as "maps" and/or "hunting plans":
  - **Svoboda, J.:** *On landscapes, maps and Upper Paleolithic lifestyles in the Central European corridor: The images of Pavlov and Předmostí. Veleia 34, 2017, 67-74.*
- 2) A short contribution in a form of encyclopaedia entry presents a basic knowledge about the area in terms of stratigraphy, dating, archaeology and anthropology:
  - **Svoboda, J.:** *Dolní Věstonice, Pavlov, Milovice. In: Gilbert, A., Encyclopedia of Geoarchaeology. Springer, Dordrecht, 2017, 198-199.*
- 3) A more comprehensive paper, underlining world-wide prehistoric significance of the area, was presented within the effort activities to register the National Cultural Monument "Archaeological sites of Dolní Věstonice-Pavlov" on the UNESCO World Heritage List:
  - **Svoboda, J.:** *Perspectives on the Upper Palaeolithic in Eurasia: the Case of the Dolní Věstonice-Pavlov sites. In: Sanz, N., Human Origin Sites and the World Heritage Convention in Eurasia. World heritage series, Papers, 41, UNESCO, Paris, 2015, 190-204.*  
The paper synthetically reports actual knowledge about the Gravettian sites in the DV-P-M area, and propose a future strategies for their conservation and presentation to the public in exhibits, in a way corresponding to their scientific value.
- 4) Long-term interest in the Gravettian issue and research of the DV-P-M settlement area culminated in the large, comprehensive monograph for broader public:
  - **Svoboda, J.:** *Dolní Věstonice - Pavlov. Academia, Praha, 2016, 399 p.*

This publication is a popular science synthesis of the complex of Upper Palaeolithic sites in the view of archaeology, geology, palaeontology and palaeoanthropology. Well-structured and visually rich book summarises the history of research and current knowledge about the unique settlements of mammoth hunters under Pavlov Hills in Southern Moravia. The book introduces readers to their advanced culture, settlement system and unique way of life, considering also the Pleistocene natural environment and ethnoarchaeological observations of current archaic cultures.

The team members also participate in other topical studies, which were focused on palaeontological, archaeozoological or geoarchaeological studies:

- **Wilczyński, J., Wojtal, P., Svoboda, J.:** *Pavlovian hunters on the margin - archaeozoological analysis of the animal remains discovered at the Pavlov II site (1966-67 excavations). Fossil Imprint 73:3-4, 2017, 322-331.*

An archaeozoological study confirming a wide diversity of animals species in the everyday life of Gravettian hunters – not only herbivores as mammoth, horse, and reindeer, but also carnivores, such as wolves, wolverines, bears and cave lions.

- **Wojtal, P., Wilczyński, J., Wertz, K., Svoboda, J.:** *The scene of a spectacular feast (part II): Animal remains from Dolní Věstonice II, the Czech Republic. Quaternary International 466, 2018, 194-211.*

The study provides insight into the lives of Pavlovians through the wide spectrum of hunted prey, where small and medium animals (birds, hares, foxes, wolves, reindeers, wolverines) dominate at the site, accumulated here during a relatively long occupation, perhaps lasting months or even years.

- **Svoboda, J., Krejčí, O., Krejčí, V., Dohnalová, A., Sázelová, S., Wilczyński, J., Wojtal, P.:** *Pleistocene landslides and mammoth bone deposits: The case of Dolní Věstonice II, Czech Republic. Geoarchaeology: an international journal 34:6, 2019, 745-758.*

The paper evaluates a formation of the extensive mammoth bone deposits as a characteristic feature of the large Upper Palaeolithic settlements. Some of these were deposited in moist locations, possibly for reasons of hygiene and conservation, as in a case of the DV II site, where an earlier Pleistocene landslide temporarily created a shallow water basin. The osteological assemblage suggests the use of this location as a place for storage and garbage disposal, where the mammoth remains were transported either directly from kill sites, or, after first selection, from the nearby settlement.

### Early Late Upper Palaeolithic

The issue of the Early Late Upper Palaeolithic is mainly focused on the still-ongoing excavation project at the site of Mohelno-Plevovce. The site represents rare insight into the human settlement of sparsely populated Central Europe during the Last Glacial Maximum, characterised by decreasing temperatures and increasing aridity. It is located in deeply incised river valley in the Bohemian-Moravian Highland, directly on eroding banks of the water reservoir, where archaeological layers are continually eroding due to constantly fluctuating water levels. The excavation resulted in the discovery of two notable unique settlement stone structures, interpreted as floor pavements of the possible dwellings. Both structures also yielded unique lithic industries (with characteristic microlithic implements), analogous with the assemblages known from the North Black Sea region. The use wear analysis of lithics identified various activities including cutting, scraping, boring or mainly rearming with microlithic armatures. Recovered faunal remains and charcoals indicate a cold, dry climate in an almost treeless landscape.

The results of the excavation were presented on international conferences and published in several studies, where team members (**Škrdla, Nývltová Fišáková, Polanská**) contributed in the fieldwork evaluation, processing and analyses of finds and data, and a general contextual interpretation of the site. In some specific analysis, the team developed the research in collaboration with specialists abroad – from Australia (L. Nejman – spatial analysis), Ukraine (Y. E. Demidenko – analysis of microlithic tools) and Spain (J. Rios Garaizar – use-wear analysis). Some of the most important outputs are:

- **Škrdla, P., Nejman, L., Bartík, J., Rychtaříková, T.:** *Human occupation of Central Europe during the Last Glacial Maximum: new evidence from Moravia, Czech Republic. Antiquity 89:347, 2015.*
- **Škrdla, P., Bartík, J., Rychtaříková, T.:** *Dvě koncentrace epigravettských artefaktů v Mohelně-Plevovcích [Two Epigravettian artefact clusters in Mohelno-Plevovce]. Přehled výzkumů 56:1, 2015, 9-29.*
- **Škrdla, P., Nejman, L., Bartík, J., Rychtaříková, T., Nikolajev, P., Eigner, J., Nývltová Fišáková, M., Novák, J., Polanská, M.:** *Mohelno – A terminal Last Glacial Maximum*

*industry with microlithic tools made on carenoidal blanks. Quaternary International 406, 2016, 184-194.*

- **Škrdla, P.**, Rychtaříková, T., Bartík, J., Nejman, L., Demidenko, Y. E.: *Last Glacial Maximum paved stone structures from Mohelno-Plevovce, Moravia. Quartär 65, 2018, 51-61.*
- Ríos-Garaizar, J., **Škrdla, P.**, Demidenko, Y. E.: *Use-wear analysis of the lithic assemblage from LGM Mohelno-Plevovce site (southern Moravia, Czech Republic). Academie des Sciences. Comptes Rendus. Palevol 18:3, 2019, 353-366.*

The site has also been evaluated in a frame of broader comparative synthesis:

- Demidenko, Y. E., **Škrdla, P.**, Ríos-Garaizar, J.: *In between Gravettian and Epigravettian in Central and Eastern Europe: a peculiar LGM Early Late Upper Paleolithic industry. Přehled výzkumů 60:1, 2019, 11-42.*

The article presents data on the Early Late Upper Palaeolithic assemblages from 9 sites in Eastern and Central Europe that compose the same specific Epi-Aurignacian technocomplex with Sagaidak-Muralovka-type microliths. From a pan-European perspective, the article provides an insight into the human subsistence strategies, including technological adaptations, practiced by the groups inhabiting the cold steppe environment during the harsh climatic conditions of the LGM and discuss possible scenarios of migration, cultural contact, etc.

### Mesolithic

A research realised within the frame of the Mesolithic topic represents important part of our activities, primarily as a part of comparative research of hunter-fisher's settlement areas in the forested Holocene environments. The team is systematically focusing on the selected areas in Bohemia, especially in the North Bohemian sandstones (rockshelter sites of Bohemian Switzerland, Česká Lípa District and Bohemian Paradise) and lake areas of South Bohemia (with a key site of Švarcenberk).

From the previous evaluation period, team continued its research activities with a financial support of the Czech Science Foundation, grant no. P504/13/08169S "Prior to the Neolithic: Contextual Analysis of Environmental Dynamics during Early Postglacial Transformation of Central Europe", duration 2013–2017. The project, with wide institutional collaboration of Institute of Archaeology of the Czech Academy of Sciences, Brno; Charles University, University of West Bohemia and University of South Bohemia, aimed to understanding of the historical causes for present biodiversity in Central Europe and increasing our knowledge of the oldest roots of human impact on natural environment in the same region. Within the frame of this project, the team realised several surveys and small-scale systematic excavations on more than a dozen rockshelter sites (e.g. Kostelní rokle, Smolný kámen, Dvě věže, Táborový kotel, Vlčí hlídka).

The results were summarily published in a collective monograph and several impacted journal articles, where team members (**Svoboda, Sázelová, Novák, Šída**) contributed on processing of fieldwork documentation, analyses of archaeological and archaeozoological finds and data, and a contextual interpretation of the examined sites.

A collective monograph complexly evaluated a detailed survey and excavations of rockshelters in the Česká Lípa and Děčín areas (Northern Bohemia) during 2003–2015 period (18 sites in total), combining analysis of environmental records (vegetation, fauna) of the Late Glacial and Holocene in the context of archaeological sites with Mesolithic occupation:

- Abraham, V., Divišová, M., Horáček, I., Ivanov, M., Jurkovičová, L., Juříčková, L., Kozáková, R., Lőugas, L., Novák, J., **Novák, M.**, Pokorný, P., Prachařová, M., **Sázelová, S.**, **Svoboda, J.**, **Šída, P.**, Trinkaus, E., Willman, J. C.: *Mezolit severních Čech II. Komplexní výzkum skalních přepisů na Českolipsku a Děčínsku, 2003-2015*

*[Mesolithic of Northern Bohemia. Complex excavation of rockshelters in the Česká Lípa and Děčín areas, 2003-2015]. The Dolní Věstonice Studies 22, Brno, 2017, 247 p.*

This paper studies colonisation of the Late Palaeolithic and Mesolithic foragers into the versatile sandstone landscape of Northern Bohemia, as an optimal behavioural adaptation throughout the climatic change after the LGM, with the aim to best exploit changing natural resources:

- **Svoboda, J., Pokorný, P., Horáček, I., Sázelová, S., Abraham, V., Divišová, M., Ivanov, M., Kozáková, R., Novák, J., Novák, M., Šída, P., Perri, A.:** Late Glacial and Holocene sequences in rockshelters and adjacent wetlands of Northern Bohemia, Czech Republic: Correlation of environmental and archaeological records. *Quaternary International* 465, 2018, 234-250.

The following paper investigates the history of Holocene woodlands based on charcoal assemblages from eight archaeological profiles:

- **Novák, J., Svoboda, J., Šída, P., Prostředník, J., Pokorný, P.:** A charcoal record of Holocene woodland succession from sandstone rock shelters of North Bohemia (Czech Republic). *Quaternary International* 366, 2015, 25-36.

Long-term excavation of Mesolithic sites around the extinct lake Švarcenberk in South Bohemia was evaluated (oriented on lithic industry analysis) in study:

- **Šída, P.:** Archeologický výzkum na mezolitické lokalitě Švarcenberk 7, sonda 2/05 [Archaeological Excavations on Mesolithic Site Švarcenberk 7, trench 2/05.]. *Archeologické výzkumy v jižních Čechách* 30, 2017, 61-95.

The team (**Svoboda, Novák, Sázelová**) also presented and discussed the results on several international conferences: “MESO15 – Mesolithic in Europe” in Beograd, Serbia, 14–18 September 2015, and “25th Annual Meeting of the German Mesolithic Workgroup”, held in Krásná Lípa, 17–19 March 2016, where the team also directly participated on its organisation, together with Masaryk University and the Bohemian Switzerland National Park.

Mesolithic research has continued also after the end of the grant project and was primarily oriented on fieldwork (small-scale excavations with test trenches) in subjected areas of Bohemia. The results were published as reports in local scientific journals, e.g.:

- **Šída, P., Menšík, P., Prokop, V.:** Několik nových předneolitických lokalit z Jindřichohradecka [Several new pre-Neolithic sites from the Jindřichův Hradec region]. *Archeologické výzkumy v jižních Čechách* 31, 2018, 5-23.
- **Hošek, J., Pokorný, P., Prach, J., Šída, P., Křížek, M.:** Fossilní termokras v jižních Čechách [Fossil thermokarst in South Bohemia (Czech Republic)]. *Zprávy o geologických výzkumech* 51:2, 2018, 131-139.

### Palaeoanthropological studies

The team was involved in achieving important and worldwide significant scientific results within the frame of palaeoanthropological research. The centre systematically followed up on activities from the previous evaluation period and focused above all on the ongoing study of unique human remains from the Gravettian sites of Dolní Věstonice II and Pavlov I.

Great attention was paid to palaeogenetic research realised in cooperation with worldwide leading teams. **J. Svoboda** participated on two multi-author papers published in prestigious, highly impacted journals, where he provided the examined palaeoanthropological material, archaeological documentation and performed a contextual interpretation:

- **Posth, C. et al. (35 authors in total):** Pleistocene mitochondrial genomes suggest a single major dispersal of non-Africans and a Late Glacial population turnover in Europe. *Current Biology* 26, 2016, 827-833.
- **Fu, Q. et al. (64 authors in total):** The genetic history of Ice Age Europe. *Nature* 534:7606, 2016, 200-205.

Both broader syntheses consider the genetic diversity and demography of Europeans, based on analysis of mitochondrial genomes from prehistoric Europe population, and document how population turnover and migration have been recurring themes of European prehistory.

More detailed palaeogenetic study was directly devoted to the Dolní Věstonice triple burial:

- *Mittnik, A., Wang, Ch.-Ch., Svoboda, J., Krause, J.: A molecular approach to the sexing of the triple burial at the Upper Paleolithic site of Dolní Věstonice. PLoS ONE 11:10 - e0163019, 2016.*

The paper presents a novel approach in ancient DNA research focused on the determination of sex in human skeletal remains, and reveals that all three skeletons, including the individual DV 15, whose sex has long been debated due to a pathological condition, were males.

Small amount of bone material, left from the aDNA sampling in 2013, provides also the first opportunity to directly date the DV-P human individuals. The direct dates confirm the Pavlovian origin of the human remains and add these individuals to the small collection of reliably dated Upper Palaeolithic humans in Europe. This was published in:

- *Fewlass, H., Talamo, S., Kromer, B., Bard, E., Tuna, T., Fagault, Y., Sponheimer, M., Ryder, C., Hublin, J.-J., Perri, A., Sázelová, S., Svoboda, J.: Direct radiocarbon dates of mid Upper Palaeolithic human remains from Dolní Věstonice II and Pavlov I, Czech Republic. Journal of Archaeological Science: Reports 27, 2019.*

In collaboration with the University of Tübingen, Max-Planck Society's Institute for Evolutionary Anthropology in Leipzig and Institute for the Science of Human History in Jena, we developed research in the field of aDNA analysis and CT scanning of human remains. In 2017, based on the previous successful genetic analysis of the triple burial from the DV II site, additional samples were collected to obtain the complete genome of buried individuals (currently still under analysis, without outputs).

The extensive CT scanning of the complete palaeoanthropological collection from the Dolní Věstonice and Pavlov sites was carried out in 2016, using DIONDO D3 high resolution industrial CT system, which was for this purpose transported from Leipzig to Dolní Věstonice. Our centre currently possess around 40 TB of data – highly detailed micro-CT images (with resolution around 100 microns, some in detail up to 7 microns) prepared for further palaeoanthropological research, using methods of virtual anthropology. This enables performing more advanced analyses in terms of solving specific topics (e.g. osteometric studies) without direct access to the originals, which contributes significantly to the protection of these unique findings.

Based on a long-term international collaboration with Washington University and Polish Academy of Science, series of studies were devoted to findings of new human fossils at Pavlov I site, identified from the faunal collection:

- *Trinkaus, E., Wojtal, P., Wilczyński, J., Sázelová, S., Svoboda, J.: Palmar, Patellar, and Pedal Human Remains from Pavlov. PaleoAnthropology 2017, 2017, 73-101.*
- *Sázelová, S., Wilczyński, J., Wojtal, P., Svoboda, J., Trinkaus, E.: Puzzling Pairs from Pavlov and Mortuary Diversity in the Mid Upper Paleolithic. Přehled výzkumů 59:1, 2018, 69-88.*
- *Trinkaus, E., Sázelová, S., Svoboda, J.: Pieces of people in the Pavlovian: Burials, body parts and bones in the earlier Upper Palaeolithic. Human Remains and Violence 5:1, 2019, 70-87.*

Besides detailed morphometric description, the papers review taphonomy, palaeopathology and archaeological context and raise questions about the differential mortuary behaviours in Upper Palaeolithic.

A summary of actual knowledge on human evolution in Africa was published as a monograph chapter:

- **Svoboda, J.:** Evoluce předků moderního člověka. Bipédie, technologie, migrace [Evolution of modern human ancestors: Bipedity, technology, migration]. In Pokorný, P., Afrika zevnitř. Kontinentem sucha a věčných proměn. Academia, Praha, 2016, 197-243.

The text demonstrates that bipedity and technology are interrelated as components of the same evolutionary system, whose success and demographic growth induce repeated migrations out of Africa.

### Others

Besides the main research topics, the team was also interested in research of other issues. Two significant studies were devoted to the research of Lower Palaeolithic occupation and Central Europe, where certain archaeological sites are actually rejected and some deserve a revision:

- **Svoboda, J.:** At the edge: Acheulean in the middle of Europe. *Anthropologie* 56:3, 2018, 163-172.

In this paper, the author deals with eastern-exposed Acheulean with different settlement patterns for Early and Evolved Acheulean and mentions the discrepancy between Acheulean palaeogeography and the fossil human record.

- **Svoboda, J., Horáček, I.:** *Between Bilzingsleben and Vértesszölös: Small-sized industries in the Middle of Europe (Czech Republic).* *Anthropologie* 57:3, 2019, 363-371.

This paper discusses two promising Bohemian sites (Račíněves and Karlštejn) of Middle Pleistocene age associated to the small-sized lithic industries.

Specific ecological study from Antarctic Peninsula examines, using a multidisciplinary analysis, the origin and nature of seal carcasses in this environment (in collaboration with Masaryk University):

- **Nývlt, D., Nývltová Fišáková, M., Barták, M., Stachoň, Z., Pavel, V., Mlčoch, B., Láska, K.:** *Death age, seasonality, taphonomy and colonization of seal carcasses from Ulu Peninsula, James Ross Island, Antarctic Peninsula.* *Antarctic Science* 28:1, 2016, 3-16.

Team member **M. Nývltová Fišáková** also participated in several other studies concerning archaeozoological and palaeontological evaluation of faunal remains from the sites in Moravia and Poland, to provide an analysis of dental cement microstructures and stable isotope analysis for determination of seasonality and age at death of subjected animals (in cooperation with Moravian museum and Maria Curie-Skłodowska University in Lublin):

- **Roblíčková, M., Káňa, V., Nývltová Fišáková, M.:** *The mammalian fauna of Barová Cave (Moravian Karst, the Czech Republic).* *Fossil Imprint* 73:3-4, 2017, 515-532.
- **Roblíčková, M., Nerudová, Z., Nývltová Fišáková, M.:** *Analýza zvířecích kostí z epigravettienské lokality Brno-Štýřice III, výzkumné sezóny 2012–2014 [Analysis of animal bones from the Epigravettian open-air site Brno-Štýřice III (2012–2014)].* *Archeologické rozhledy* 67:4, 2015, 627-653.
- **Nývltová Fišáková, M.:** *The seasonality of the open-air Magdalenian site in Klementowice.* In Wiśniewski, T. ed., *Klementowice. A Magdalenian site in eastern Poland.* Lublin, 2015, 305-307.

It is also important to mention the editorial work carried out by the team, which resulted in two publications, reflecting archaeological, archaeozoological, palaeoanthropological and ethnological study of Palaeolithic and Mesolithic:



- **Sázelová, S., Novák, M., Mizerová, A., eds.:** *Forgotten times and spaces. New perspectives in paleoanthropological, paleoetnological and archeological studies. Brno, 2015, 617 p.*

Comprehensive edited monograph, published in cooperation with Masaryk University, reflects human lives and their evolution spanned throughout different times and various spaces and from the perspectives of the scope of Jiří Svoboda's work.

- **Boriová, S., Novák, M., Sázelová, S., eds.:** *Mikulov Anthropology Meeting II. 11th-12th October 2018, Mikulov - Pavlov. Book of Abstracts. Brno, 2018, 42 p.*

Proceedings of the international conference present abstracts of the lectures from the field of anthropology, Palaeolithic archaeology, Quaternary geology, palaeontology, ecology, and other related disciplines concerning the study of Pleistocene and Holocene.

### **Comparative ethnoarchaeological research**

With respect to the long-term research tradition of the centre, the team has continued in comparative ethnoarchaeology research, to map the variability in the behaviour and adaptation in recent hunting populations in various ecological environments.

In 2015, the team finished evaluation of a previous ecological-ethnological expedition in 2009–2010 among Nenets in hunter-pastoralist's areas of north-western Siberia, which resulted in the impacted journal article:

- **Sázelová, S., Svoboda, J., Kosintsev, P. A., Novák, M.:** *Patterns of change in a Nenets landscape: An Ethnoarchaeological Study of Yangana Pe, Polar Ural Mts. Russia. Human Ecology 43:2, 2015, 283-294.*

The article, based on field ethnoarchaeological data and GIS analysis, examines the Nenets sites formation, seasonality and landscape usage in controlling reindeer herds in area over 100 km<sup>2</sup> and a time-span of several decades (from 1966 to present). Furthermore, it points to an impact of road and rail construction for the Yamal gas mining industry on the life of recent hunting and pastoral Siberian societies.

During the evaluation period the team also carried out another two expeditions abroad. In 2018, as part of a cooperation agreement with the Ural Department of the Russian Academy of Sciences, there was an expedition to north-western Siberia to study the settlement strategies, sacrifice rituals and burial practice of the Nenets in the lake-tundra region of Gydan Peninsula. In 2019, ethnoarchaeological expedition in collaboration with Faculty of Sciences at Masaryk University, Brno, was realised in Australia, with an emphasis on documentation of rock art in selected areas of the Northern Territory. Data from both expeditions are currently being processed.

## Research activity and characterisation of the main scientific results

### (1) Roman Period and general protohistory

During the period in question, research was intensively focused on the comprehensive and systematic study of Roman temporary camps. Research activities were conducted within the framework of informal multilateral cooperation, in which the team played a leading role as the creator of the research strategy, the main author of publications, conducting field works and also coordinating interdisciplinary research (for a summary of the thematic scope and methodical parameters of the research strategy see *Groh, S./Komoróczy, B./Vlach, M./Sedlmayer, H., Basis of the International Research Project of the Roman Military Camps in the Barbarian Territory to the North of Carnuntum. Izvestija na Nacionalnija archeologičeski institute 42/1, 2015, 749-754*). The interdisciplinary methodology of the project was fully represented by a whole range of disciplines and activities (e.g. GIS analyses, aerial, geophysical and surface prospection of the landscape, pedology, geology, archaeobotany, malacology, etc.). A series of research activities was carried out within the Czech Republic, but also at camps in the Roman army's zone of operations in the Slovak Pomoraví region. A series of important works was published as proof of the broad scope of the research strategy.

Members of the team played a considerable role in an interdisciplinary study, which, for the first time in the field of Roman archaeology, applies the results of geoarchaeological analyses in the interpretation of the process by which sediments form in the ditches of temporary military camps (*Lisá, L./Komoróczy, B./Vlach, M./Válek, M./Bajer, A./Kovárník, J./Rajtár, J./Hüssen, C.-M./Šumberová, R., How were the ditches filled? Sedimentological and micromorphological classification of formation processes within graben-like archaeological objects. Quaternary International 370/3, 2015, 66–76*). Of exceptional importance are the results of an analysis of sediments generally interpreted as the redeposited remnants of the structure of the above-ground part of the fortifications, i.e. as the assumed result of one-off human activity (intentional backfilling). The presence of unfired bricks from the fortification structure was verified macroscopically and using natural science methods (micromorphology, malacology) for the very first time in the Middle Danube region (or at Roman temporary camps in all areas of the world, in which they occur (*Komoróczy, B./Vlach, M./Bíšková, J./Rajtár, J./Hüssen, C.-M., A contribution to use of mudbricks in Roman military context in the Middle Danube Barbaricum. Proceedings of the 24th International Roman Frontier Conference in Viminacium 2018, in print*)). In the context of the Marcomannic Wars, they had previously been discovered only in the fortifications of the central Roman fortress at Hradisko near Mušov; they have now also been found at the camps of Charvátská Nová Ves, Přibice and Závod. This finding has a far-reaching impact as regards the interpretation of temporary camps. Unfired bricks are a technologically demanding building material that take several weeks to make. Their presence indicates that Roman soldiers stayed at the site for longer than was previously assumed for short one-off campaigns.

The results of research conducted at temporary camps have been presented at a number of prestigious international professional forums and in synthesising studies, always with the team members' contributions playing a dominant role. They are currently being collected to form a monograph covering the whole of the territory settled by the Marcomanni. Some extraordinary discoveries have been made at the camps sited by the main route along the lower reaches of the River Morava into the heartland of barbarian territory (*Komoróczy, B./Vlach, M./Rajtár, J./Ölvecky, R./Hüssen, C.-M., Temporäre Lager aus der Zeit der Markomannenkriege entlang der militärischen Vormarschroute an March und Thaya. In: Sommer, C. S./Matešić, S. (Hrsg.), Limes XXIII – Akten des 23. Internationalen Limeskongresses in Ingolstadt 2015. Beiträge zum Welterbe Limes, Sonderband 4/1. Mainz, 296-304*). A key role in this region is attributed to the Charvátská Nová Ves camp, which was reduced in size and evidently retained part of its original garrison to keep watching over this important crossroads. Important findings have also

been made at the Závod camp, which apparently served as a logistics base with close links to river transport. Excavations at camps in the core of the Marcomannic settlement zone in southern Moravia have also resulted in some new, breakthrough discoveries (Komoróczy, B./Vlach, M./Hüssen, C.-M., Die Dislokation römischer Truppen im Kerngebiet der Markomannen. In: Sommer, C. S./Matešić, S. (Hrsg.), Limes XXIII – Akten des 23. Internationalen Limeskongresses in Ingolstadt 2015. Beiträge zum Welterbe Limes, Sonderband 4/1. Mainz, 305–314). As a matter of fact, a huge number of cooking ovens have been evidenced in every camp, generally placed in one or more rows next to one another along the inner side of the rampart embankment. In the case of the camps at Mušov – Na Pískách, a unique “superstructure” was discovered that is a quarter of the size of the area of the camp. The complex trace of a massive expeditionary army at the beginning of one of its offensive operations has been identified at Přibice site.

The excavation of temporary camps has so far not found any features that may be considered as closed archaeological contexts suitable for archaeological dating. So far, the chronology has been based on isolated superposition relations to Germanic settlement, or on historical data obtained through fragmentary literary sources. There is a hypothetical link with an assumed although not yet fully corroborated Roman expedition against Maroboduus at the beginning of the century. A fundamental change in this matter was brought about by the identification of cooking ovens contemporary with the camps and the archaeobotanical and anthracological material obtained from them. Thanks to the systematic collection and evaluation of this material, including radiocarbon dating, we now have more than 80 instances of absolute data. Of these we were able to select and publish in a prestigious high-impact journal a representative sequence of 26 radiocarbon data, which constitutes a step forward in the quality of the chronological determination of the individual temporary camps (Komoróczy, B./Vlach, M./Hüssen, C.-M./Rajtár, J., 14C Dating of the Roman military interventions in the middle Danube barbarian world. Radiocarbon 61/2, 2019, 515–530). As discussed in detail in another significant output, radiocarbon data may only be used for the individual camps in a fundamental critique of exterior and interior parameters corresponding to the archaeological contexts. Even so, the relevant absolute radiocarbon data from temporary camps to the north of the Danube do not enable us to identify any indications of significant chronological differences. There is nothing to indicate that any of the camps correspond to the era of the known military operations at the beginning of the era or in Late Antiquity, so far removed from the time of the Marcomannic Wars (Komoróczy, B./Vlach, M./Hüssen, C.-M./Rajtár, J., Absolutchronologische Daten aus Römischen temporäre Lagern im Markomannischen Siedlungsraum im Mitteldonauegebiet. In: Karwowski, M./Komoróczy, B./Trebsche, P. (Hrsg.), Auf den Spuren der Barbaren – archäologisch, historisch, numismatisch (Archäologie der Barbaren 2015). Spisy Archeologického ústavu AV ČR Brno 19, Brno 2019, 151–183). Both of these articles on radiocarbon data from Roman camps were mostly based on the team's activities (90%).

The research strategy focused on temporary camps has significantly enriched and clarified our previous interpretation of the historical events that occurred during the Marcomannic Wars. At the methodical level, the team was secure in its internationally acknowledged standing as far as research into this topic is concerned. Besides the series of invited lectures at international forums, further proof of this lies in the fact that the team members acted as consultants and also partly implementers invited to study camps discovered by other archaeological institutions in the Czech Republic (the camps at Jevíčko or Brno – Vojtova ulice). These new discoveries thus considerably expanded the range of methodical tools used; a paper was published about them on the international scene (Komoróczy, B./Vlach, M./Rajtár, J./Hüssen, C.-M., The Latest Discoveries and Research Results of the Roman Military Presence in Middle Danube Barbaricum. Proceedings of the 24th International Roman Frontier Conference in Viminacium 2018, in print). At the end of the period in question, the team's own work enabled it to discover a new, previously unknown camp in Drnholet (see below), thus increasing the number of

camps known in Marcomannic settlement territory to 25. This adds further detail to our archaeological picture of the Romans' strategy during the Marcomannic Wars, indicating that supremacy lay with Rome and its army, both on the battlefield and in terms of conceptual and logistic aspects (*Komoróczy, B./Vlach, M., Archeologická stopa (vel)moci na nepřátelském území. Rekonstrukce a experiment v archeologii [The Archaeological Trace of a (Super)Power in Enemy Territory. Reconstruction and Experiment in Archaeology]: Živá archeologie 19, 2017, 35–41*).

The central fortified base at Hradisko near Mušov was not a major focus of the team's research during the relevant period (primarily due to capacity reasons). Even so, minor trial trenching continued and large-scale geophysical prospecting work was conducted in particular. During the period in question, the team's emeritus member published a study that principally summarised the results of his previous research and his own historical interpretation framework (*Tejral, J., Mähren zur Zeit der Markomannenkriege. Forschungsstand und neue Probleme. Stúdiijné zvesti Archeologického ústavu Slovenskej akadémie vied 61, 2017, 149–188*). During the period, greater attention was given to the scientific evaluation of the extensive complex of Roman military structures at Mušov, which were studied at Neurissen during the course of older rescue excavations carried out in 1993–1994. A study was presented (with the team member's contribution being 50%) focused on the technological details of the well and how it related to the unique large wooden building thought to be an unfinished Roman baths from the beginning of the 1st century CE (*Knápek, R./Šedo, O., The well at Mušov – technical and technological aspects of the construction project dating to the beginning of the common era. Sborník vědeckých prací Vysoké školy báňské - Technické univerzity Ostrava. Vol. 18, No. 1, 2018, 37-43*). Details of the cultural and anthropological context of the well and the interpretation of the occurrence of specific archaeozoological finds in its backfill were then published by this collective (with the team member again making a 50% contribution) in another study (*Knápek, R./Šedo, O., Manipulace s těly jelenů v době římské a možnosti interpretace nálezu ze studny zkoumané při výzkumu v trati Mušov-Neurissen [The Handling of Deer Carcasses in the Roman Period and the Potential for Interpreting a Find from a Well Examined during Research at Mušov-Neurissen]. Přehled výzkumů 59-2, 2018, 9-43*). The architectural design of the actual wooden structure from the same site was analysed and compared with other Roman structures dating from the Marcomannic Wars at Hradisko near Mušov in a study to which team member O. Šedo contributed with 75% (*Šedo, O./Knápek, R., Stopy působení římských architektů na jižní Moravě. Rekonstrukce a experiment v archeologii [Traces of Roman Architects in South Moravia. Reconstruction and Experiment in Archaeology]: živá archeologie. Vol. 18, December 2016, 43-48*). In the field of Neurissen, contexts were repeatedly identified containing an accumulation of anthropological and archaeozoological finds on the bottom or in the backfill of Roman ditches. A comparison of these finds with analogous contexts from other periods of time or geographical units and their interpretation as the archaeological records of intra-barbaric ritualised behaviour was presented in a study to which the team member contributed with 50% (*Knápek, R./Šedo, O., Depozita identifikovaná v římských příkopech na lokalitě Mušov-Neurissen a jejich příklady zaznamenané ve vybraných areálech s doklady pobytu římských vojsk [Deposits Identified in the Roman Moats at Mušov-Neurissen and Examples of Them Recorded in Selected Areas with Evidence of the Presence of Roman troops]. Přehled výzkumů 60-1, 2019, 77-108*). All the field phenomena from the Neurissen site were then published by team member O. Šedo in collaboration with an external colleague (the team member's contribution was 75%) in a summary monograph (*Šedo, O./Knápek, R., Mušov-Neurissen 1993-1994. Nálezové kontexty z doby římské [Archaeological Contexts from the Roman Period]. Spisy Archeologického ústavu AV ČR Brno, 63, Brno 2019*).

Research into the archaeological traces of the Roman military campaigns in Germanic settlement territory was also enhanced by the use of GIS spatial tools. This approach provides a new, additional layer of analytical methods for gaining further understanding of various

aspects of the Roman military occupation and is wholly organically linked to other archaeological heuristic methods and thus was developed by the team members in parallel with other research activities (for the general background and perspectives on the theme of the Roman military presence see Komoróczy, B./Vlach, M., *GIS application in Roman military invasion survey within barbarian territories during the Marcomannic wars – introduction into problems and perspectives*. In: Hodgson, N./Bidwell, P./Schachtmann, J. (eds.), *Roman Frontier Studies 2009. Proceedings of the XXI International Congress of Roman Frontier Studies (Limes Congress) held at Newcastle upon Tyne in August 2009*. Archaeopress Roman Archaeology 25, Oxford 2017, 545-551). The use of GIS tools in understanding the spatial strategy of the Roman army was covered in a number of studies. M. Vlach focused in detail on Tiberius' intensively discussed campaign against the Germanic chief Maroboduus in 6 CE. (Vlach, M., *Modelování tras a prostorové aspekty římského tažení proti Marobudovi [Modelling the Routes and Spatial Aspects of the Roman Campaign against Maroboduus]*. *Přehled výzkumů* 59-1, 2018, 89–110). Unlike the Roman campaign against Maroboduus, for the period of the Marcomannic Wars we possess a wide range of ever-increasing archaeological data with a representative spatial distribution. Thanks to this, geoinformation analyses show even greater potential for relevant, historically interpretable testimony. GIS least cost path tools, coupled with representative input data, were used to model the assumed routes of roads and corridors in the Marcomannic settlement zone (Komoróczy, B./Vlach, M., *Viae militares a modelování vybraných prostorových aspektů římsko-barbarských konfrontací na území středodunajského barbarika [Viae Militares and the Modelling of Selected Spatial Aspects of Roman-Barbarian Confrontations within Middle Danube Barbaricum]*. *Vlastivědný věstník moravský* 70, Supplementum 3, 2018, 7-34). Evaluation of the geospatial parameters of the individual camps and analysis of their mutual spatial relationships using modelled land and water routes have enabled us to determine representative intervals in terms of difficulty and the length of marching distance stages between them. GIS-formulated hypotheses regarding communication corridors and the stages used by the Roman army when moving around in hostile territory are also used to predict potential areas containing as yet undiscovered camps (Komoróczy, B./Vlach, M., *Römische Lager im mittleren Donauraum als geographisch, militärstrategisch und kulturell definierte Orte der Mobilität*. *Siedlungsforschung* 36, 2019, 21–58).

Another of the team's core themes is the development of the Germanic population in our territory during the Roman Period. Although the period in question saw constant research, publication and educational activities in this area, due to capacity constraints not all the plans could be fully implemented. In 2016–2018, work was carried out within the Czech Science Foundation project "The Roots and Transformations of Germanic Society during the Middle and Late Roman Period in the Light of Evidence from the Cremation Burial Site at Modřice-Sádky" (principal investigator was B. Komoróczy). The aim was to process this Roman Period necropolis with almost 300 graves. The team succeeded in saving a set of sources, a collection of great scientific value, which was at serious risk of a substantial portion of the information being lost. Drawing on a wide range of applied methods the project enabled the study of a range of historical, cultural, social and technological aspects of the Germanic population during the middle and late Roman Period in South Moravia (team of authors B. Komoróczy, M. Erdrich, B. Mikulková, M. Zelíková, M. Vlach, S. Sázelová, M. Hložek). The positive results in the form of partial studies and related research activities (including digital modelling and non-ferrous metallurgy) will be rounded off by a monograph, which is currently being prepared for print. One important aspect of theoretical studies of the Germanic archaeological environment, whether settlements or burial-related matters, is the presence of Roman products, or imports (Komoróczy, B., *Bemerkungen zu den Formen des Zustroms der Importgüter in das germanische Siedlungsmilieu während der Römischen Kaiserzeit im mittleren Donauraum*. In: Hodgson, N./Bidwell, P./Schachtmann, J. (eds.), *Roman Frontier Studies 2009. Proceedings of the XXI International Congress of Roman Frontier Studies (Limes Congress) held at Newcastle upon Tyne in August 2009*. Archaeopress Roman Archaeology 25, Oxford 2017,

284-291). The dating and interpretation potential is quite clear in the case of the lavish imports of grave goods in grave complexes, although the number of such imports is very limited. As shown by a study by the team's emeritus member, these also provide important data for the relative chronology of less sensitive complexes (Tejral, J., *Die Metallgefäßausstattung des Königsgrabes von Mušov in Mähren im Vergleich mit früh- und spätkaiserzeitlichen Elitengräbern*. In: Voß, H.; Müller-Scheeßel, N. (Hrsg.), *Archäologie zwischen Römern und Barbaren. Zur Datierung und Verbreitung römischer Metallarbeiten des 2. und 3. Jh. n. Chr. im Reich und im Barbaricum - ausgewählte Beispiele (Gefäße, Fibeln, Bestandteile militärischer Ausrüstung, Kleingerät, Münzen)*. Internationales Kolloquium Frankfurt am Main Vol. 1. Kolloquien zur Vor- und Frühgeschichte, 22, Bonn 2016, 271–307). However, these complexes are conclusively usable only in comparisons where there are relatively precisely datable closed grave complexes and from comparable relative chronological stages, respectively in those periods, where archaeology can also apply external absolute data derived from the historical sources in the dating process (Tejral, J., *Some remarks on the transitional phase between Early Roman and Late Roman Periods in the region north of the Middle Danube*. *Přehled výzkumů* 56-2, 2015, 43–101). This is why Germanic archaeological contexts are becoming increasingly important, as their chronological position is at least partially determined by documented links to Roman features and structures dating from the Marcomannic Wars (Šedo, O., *Gegenstände barbarischer Provenienz aus dem Graben Mušov-Neurissen IV*. *Přehled výzkumů* 56-2, 2015, 9–42; Knápek, R./Šedo, O., *Barbarská keramika z kontextů se stratigrafickými vztahy k římskému zdivu v trati Neurissen v Mušově [Barbarian Pottery from Contexts with Stratigraphic Links to Roman Masonry at Neurissen in Mušov]*. *Zborník Slovenského národného múzea* 109, 2015, 347–377).

In recent years, there has been an increase in the number of so-called Roman imports, particularly in the settlement context, the great majority of which have been discovered by metal detectors. Although this component lacks the chronological sensitivity of grave complexes, it does enable these finds to be quantified and studied, not only individually but also as statistically evaluable entities, and allows us to interpret their occurrence in terms of the living world. The increasingly huge amount of metal objects found by metal detector users presents new challenges for protohistorical archaeology, both in shaping the basic behavioural schemes of the discipline, and particularly as regards the potential of the newly conceived strategy for research into previously unknown settlement complexes and in the theoretical assessment of such artefacts (Komoróczy, B., *Obečná úvaha na téma utajení jako nástroj ochrany v archeologii [General Reflection on the Topic of Secrecy as a Means of Protection in Archaeology]*. *Zprávy památkové péče* 78/1, 2018, 24–29). A case study conducted by members of the team clearly showed the fundamental transformations in the quantitative and spatial parameters of the material base and highlighted the urgent need for a critical approach to the historical interpretation of surface finds (Komoróczy, B./Vlach, M./Zelíková, M., *Dokumentace, publikace a interpretace detektorových nálezů na příkladu spon typu Jobst 4F [Documentation, Publication and Interpretation of Detector Finds Using Jobst 4F Fibulae As an Example]*. In: Droberjar, E./Komoróczy, B. (Eds.), *Římské a germánské spony ve střední Evropě [Roman and Germanic Fibulae in Central Europe]* (Archaeology of the Barbarians 2012). *Spisy Archeologického ústavu AV ČR Brno* 53, 2017, 31-61). The systematic recording of protohistorical finds discovered by metal detector users is a major impulse in the process of gaining a further understanding of Roman Period settlement complexes, including components of an extraordinary nature. In order to verify this hypothesis, the team members conducted a series of non-destructive and minimally invasive heuristic fieldwork at Drnholec "Holenická pole", not far from the Roman military base at Mušov. Through a combination of the results from the individual methods, sites from the La Tène and Roman periods were identified with a relatively high degree of certainty. One completely new discovery was the presence of a Roman temporary camp in this densely settled location (Komoróczy, B./Vlach, M./Zelíková, M./Sedláček, J./Růžicková, P., *Revize stavu archeologických komponent v trati Drnholec "Holenická pole" pomocí prospekčních a málo invazivních výzkumných metod [Revision of the*

*Archaeological Components at Drnholec "Holenická pole" Using Prospection and Minimally Invasive Methods]. Přehled výzkumů 60-2, 2019, 9–56). With regard to the archaeology of settlements of the Germanic population during the Roman Period, during the period in question, work was completed on the comprehensive processing of the settlement at Jevišovka-Nová, uncovered by the team's rescue excavations. This topic was taken up by M. Zelíková as a technical employee involved in the team's activities and, supervised by team member B. Komoróczy, covering this topic in a successfully defended Master's diploma thesis (Zelíková, M., *Sídliště střední doby římské v Jevišovce a jeho postavení v kontextu osídlení soutok řek Jevišovky a Dyje [The Mid-Roman Period Settlement at Jevišovka and Its Role in the Context of Settlement at the Confluence of the Jevišovka and Thaya Rivers]. Unpublished Master's thesis, Faculty of Arts, Masaryk University Brno, 2019). A modified version is currently being prepared for print in the form of an extensive study.**

Besides traditional forms of archaeological research, during the period in question, the team also focused a great deal of attention on the implementation of methods for the theoretical study of structures in archaeological data using computer agent-based modelling and the simulation of theoretical questions (for a general background, see *Komoróczy, B./Vlach, M., Simulating archaeological models: Perspectives in Protohistory. In: Sázelová, S./Novák, M./Mizerová, A. (Eds.), Forgotten Times and Spaces. New Perspectives in paleoanthropological, paleoethnological and archaeological studies. Brno 2015, 494-506). This method enables researchers to investigate the behaviour of dynamic complex systems, such as various aspects of human society (economic, demographic, political and social). The pilot subject chosen for the study was the demographics of the Germanic populations of Middle Danube Barbaricum during the first two centuries CE. The model is based on data derived from known settlement structures throughout the whole of the barbarian-controlled part of the Middle Danube region (Vlach, M., *Germanic Settlement Structure in the Middle Danube Region as a Complex System of Agent-Based Modelling. Izvestija na Nacionalnija archeologičeski institute 42/1, 2015, 741-748). One of the key results is a model of the size of the population, which, depending on various scenarios derived from the input data (the size interval of the population of a single community/settlement, the potential to identify the density of the settlement structure), varies from 130 to 200 thousand. The application of methods used for the digital modelling of the demographic development of Germanic society during the Roman Period in the Middle Danube region is an innovative approach to the evaluation of archaeological data. In the conceptual model those data are aggregated from the whole of the territory settled by the Marcomanni and are continuously updated with the available anthropological and environmental data from the region. The resulting model based on those data shows the basic structures in the temporal and spatial development of the Germanic settlement structure, the quantitative characteristics of population distribution and other related categories from the field of archaeological demographics. These include testing the impact of the maximum spatial availability of burial sites from the individual settlements (Vlach, M., *Demography modelling and simulation of the barbarian populations of the "Marcomannic" settlement structures of the Middle Danube region. Přehled výzkumů 59-2, 2018, 45–86). The data predicted by the model can then be used in the traditional archaeological and historical interpretation of various phenomena.***

Of crucial importance in the effort to gain a comprehensive understanding of the key stage in the development of the Middle Danube region in the second half of the 2nd century CE is the potential impact of the pandemic known as the Antonine Plague. Within the framework of the expansion of the Roman Empire as a whole, this is considered to have been one of the determining development factors during the Marcomannic Wars and in the following century. The importance of this topic can also be seen in the fact that it formed the subject of a specialised international conference organised by the team together with its foreign partners in 2016, and which led to the publication of a collective monograph on the topic (Erdrich, M./Komoróczy, B./Madejski, P./Vlach, M. (eds.), *Marcomannic Wars and Antonine Plague.*

*Selected essays on two catastrophes that shook the Roman World. Spisy Archeologického ústavu AV ČR Brno, in print).* Team member M. Vlach conducted a detailed analysis of the potential for making a quantitative determination of the likely impact of the pandemic through modelling and simulations (e.g. *Vlach, M., Epidemiological Modelling and Impact Evaluation of the Antonine Plague. In: Arnott, R./Breitwieser, R. (eds.), Proceedings from the conference Disease in Ancient World (Oxford). Oxbow Publishing, Oxford, in print).*

Besides key archaeological and historical questions, the team's research also generates a range of associated sub-topics, in which specialists from other institutions participate in resolving. The team members always play a crucial, if not dominant role in the outputs of these activities. Intensive heuristic research was conducted during the period in question on the topic of non-ferrous metallurgy in protohistorical communities. An extensive series of metallographic analyses has been conducted in recent years (particularly XRF measurements, SEM electron microscopy), focused on a large set of protohistorical metal artefacts found in South Moravia. This has taken place both within the framework of institutional research, during the evaluation of the Germanic necropolis in Modřice (see above) and especially due to the financial support of the project under the programme Strategy AV21 (project entitled "Pure" Metals and "Barbarian" Metals, 2018–2019). Partial results and their cultural-historical aspects have already been applied in some of the team members' aforementioned outputs and have also formed the material basis for the master's thesis supervised by team member B. Komoróczy and defended at the Institute of Archaeology and Museology at the Faculty of Arts, Masaryk University (*Kmošek, M., Měď a její slitiny jako surovina kovové industrie v pravěku a protohistorii na území jižní Moravy [Copper and Its Alloys as a Raw Material for Metal Industry in Prehistoric Times and Protohistory in South Moravia]. Unpublished Master's thesis FF MU, Brno 2019).* Detailed attention was given to a specific group of Roman metal objects decorated with enamel, which represent an extraneous element unknown in this country in contemporary Germanic non-ferrous metallurgy. XRF analyses, spectrometry and chemical analyses were used to examine the elements contained in the individual non-ferrous components and a rare combination of decoration comprising enamel and millefiori was identified on some objects (*Hložek, M./Trojek, T./Komoróczy, B./Prokeš, R., Enamel paint techniques in archaeology and their identification using XRF and micro-XRF. Radiation Physics and Chemistry 137, 2017, 243–247).* These analytical processes not only highlight the difficulty in terms of material and technology in producing metal objects decorated with enamel, but have also made a considerable contribution to determining the chronology of specific finds (*Hložek, M./Trojek, T./Prokeš, R./Komoróczy, B., Recent or Roman enamel? Resolution of dating of the unique find from Mušov-Burgstall using techniques of X-ray fluorescence analysis. Radiation Physics and Chemistry 167, 2020 (2019).* The findings concerning enamel techniques made during this long-term interdisciplinary cooperation have also been presented as a chapter in a collective monograph on techniques used to decorate metal, intended for, amongst others, conservationists and specialists working in specialised archaeological institutions (*Hložek, M., Komoróczy, B., Trojek, T., Techniky emailu v archeologii a jejich identifikace metodami SEM-EDX, XRF a micro-XRF [Enamel Techniques in Archaeology and Their Identification Using SEM-EDX, XRF and Micro-XRF Methods]. In: Bárta, P./Fogaš, I./Hložek, M./Komoróczy, B./Krkošková, A./Matoušek, J./Mazík, M./Pelíšková, R./Rapouch, K./Rusnák, V./Urganová, M./Selucká, A./Šumbera, A./Trojek, T., Výzdobné techniky kovů II. Brno 2015, 39–50).* Collaboration has also continued with archaeozoology and anthropology specialists in the assessment of representative skeletal sets acquired during the course of the team's own excavations. In connection with the aforementioned work on processing the Germanic settlement at Jevišovka-Nová, anthropological and osteological analyses have also been conducted on the material obtained there (*Jurkovičová, L., Mrázková, R., Komoróczy, B., Osteologická analýza lidských a zvířecích pozůstatků z polykulturní lokality Jevišovka – Nová [Osteological Analysis of Human and Animal Remains from the Polycultural Site of Jevišovka – Nová]. Česká antropologie 67/1, 2017, 24–29).*



The members of the team that specialise in research into the Roman Period are also actively involved in both small- and large-scale archaeological rescue excavations. This activity also generates a smaller number of outputs that overlap with a wide variety of studies of the relevant periods of prehistory, protohistory and the Middle Ages.

## (2) The Migration Period

Research activities conducted within the themed group focusing on the Migration Period were considerably affected by the team's staffing conditions. Even so, it succeeded in publishing a number of outputs and carrying out certain field activities (the excavation of a small, as yet unpublished 5th-century burial site in Pasohlávky in 2017). Z. Loskotová, currently the only active specialist on the team, concentrated primarily on processing the Lombard cemetery at Mušov-Roviny, which she herself had explored in the field between 2009 and 2013. The completion of the documentation was followed by demanding conservation work, material analyses and a detailed anthropological analysis. The comprehensive publication of a monograph is currently being prepared, covering the explored part of the necropolis. However, selected aspects have already been made available to the professional community in partial studies. The most important of these is perhaps the bioarchaeological study publishing 87 new complete mitochondrial sequences from nine Central European Lombard and "non-Lombard" burial sites in one of the world's most prestigious journals focusing on genetics (Vai, S./Brunelli, A./Modi, A./Tassi, F./Vergata, C./Pilli, E./Lari, M./Susca, R. R./Giostra, C./Baricco, L. P./Bedini, E./Koncz, I./Vida, T./Mende, B. G./Winger, D./Loskotová, Z./Veeramah, K./Geary, P./Barbujani, G./Caramelli, D./Ghirotto, S., *A genetic perspective on Longobard-Era migrations. European Journal of Human Genetics* 27/4, 2019, 647-656). Population genetic analyses and ABC modelling, for which material was collected from the territories of what are now the Czech Republic, Hungary and Italy, explain the degree of genetic continuity of the Lombards and their interaction with the local communities. The study has proven that the Lombard community in the territory of modern-day Moravia also played an important role in furthering our understanding of the dynamics of the Migration Period. Although the team member only played a minority part in the overall study (5%), the Lombard necropolis at Mušov-Roviny, which has been subject to long-term and systematic research, provided her with an important contribution to the genetic analyses. Her participation in the collective of authors reflects the team's long involvement in the international network of modern research into the Migration Period, its establishment in interdisciplinary bioarchaeological research and the great potential for other activities. A partial study has thoroughly analysed one bow-shaped fibula found at the necropolis in Mušov, with a square head studded with knobs. This form is completely unique for the Czech Republic; its shape and character make it part of the Herbrechtingen group, most commonly found in southern Germany. Its surprising occurrence in southern Moravia may clearly be associated with the presence of Lombard tribes during the second half of the 6th century (Loskotová, Z., *Late Migration Period square-headed bow brooches decorated with knobs in the context of the recent find in Mušov, Moravia. Přehled výzkumů* 60-1, 2019, 143–156).

During the period in question, emeritus member J. Tejral also contributed to the team's results with a series of partial studies on various aspects of the Migration Period, particularly its origins and earlier phase during the 5th century. Taking the occurrence of weapons as an example, particularly swords, in the inhumation graves of Germanic tribes on the one hand, and the late inhabitants of the Roman Empire on the other, he traced the interaction of these two milieus during the final era of the Roman Period and at the beginning of the Migration Period (Tejral, J., *Spätantike Körperbestattungen mit Schwertbeigabe in römisch-barbarischen Grenzzonen Mitteleuropas und ihre Deutung. In: Vida, T. (Hrsg.), Romania Gothica II. The Frontier World. Romans, Barbarians and Military Culture. Proceedings of the International Conference at the Eötvös Loránd University, Budapest, 1–2 October 2010. Budapest 2015, 129–236*). He devoted one article to the complete end of Late Antiquity provincial relations, the gradual

infiltration of eastern groups and the forms of material culture they brought with them, i.e. the process that formed the basis for the newly emerging ethnic and power groups at the beginning of the Migration Period (*Tejral, J., Nochmals zum archäologischen Niederschlag der frühen Völkerwanderungszeit in Nordprovinzen des römischen Reiches. Přehled výzkumů 57-1, 2016, 123-147*). He published another study on the synchronous topic of the beginning of the Migration Period taking the example of the grave complexes of the elites belonging to the Untersiebenbrunn stylistic group (*Tejral, J., Die frühvölkerwanderungszeitlichen Elitengräber und das Problem der Stilgruppe Untersiebenbrunn. In: Geisler, H. (ed.), Wandel durch Migration? 26. internationales Symposium "Grundprobleme der frühgeschichtlichen Entwicklung im mittleren Donauraum", Straubing 2014. Arbeiten zur Archäologie Süddeutschlands Bd. 29, Büchenbach 2016, 39–84*). His analysis of jewellery-crafting in the 5th century thoroughly explores the archaeological traces of the production activities of small metal industry in the Middle Danube region and defines certain characteristic local products. Despite the dynamically changing circumstances of the era, this region became one of the important distribution centres with contacts extending as far the peripheral regions of Eastern and Northern Europe (*Tejral, J., Zum Problem der Feinschmiedeproduktion im Mitteldonaauraum während des 5. Jahrhunderts nach Chr. Památky archeologické 106/1, 2015, 291-362*). In another study, he presented a synthesis of the basic characteristics of the transformations in the cultural relations in the Middle Danube region during the whole of the 5th century (*Tejral, J., Spätantik - merowingisch - frühmittelalterlich. Strittige Übergänge im mittleren Donauraum aus der Sicht der Archäologie. In: Bugarski, I.; Heinrich-Tamáska, O.; Ivanišević, V.; Syrbe, D. (Hrsg.), GrenzÜbergänge. Spätromisch, frühchristlich, frühbyzantinisch als Kategorien der historisch-archäologischen Forschung an der mittleren Donau. Akten des 27. Internationalen Symposiums der Grundprobleme der frühgeschichtlichen Entwicklung im mittleren Donauraum, Ruma, 4-7. 11. 2015. Forschungen zu Spätantike und Mittelalter Bd. 4, Remshalden 2016, 103–120*). In a separate study J. Tejral again returned to the extraordinary grave finds dating from the end of the 5th and 6th centuries in Moravia (Blučina, Žuráň), the grave goods and ascertainable funereal practices of which enable a number of external influences to be identified (*Tejral, J., Les élites princières du pays nord-danubien au début de l'époque mérovingienne. Přehled výzkumů 58-1, 2017, 103-137*). In the case of Blučina, he sees them heavily influenced by the culture of the steppes, especially in the "magnate" culture of the Hun period. He then clearly differentiates the grave in the barrow at Žuráň from the Lombard graves known in Moravia, and derives the burial practices that can be identified there from analogies discovered in the East German and Scandinavian environments. He attributes the burial to a Heruli princess, retaining specific characteristics of her cultural environment, even though she lived and was buried in the Lombard retinue.