PETR NERUDA

DECONSTRUCTING THE MIDDLE / UPPER PALAEOLITHIC TRANSITION IN MORAVIA (CZECH REPUBLIC)

Abstract

Archaeological sites in Europe provide evidence for the interactions between local Neanderthal groups and newly arriving groups of Anatomically Modern Humans. Traditionally, the models targeted at solving the relation between the Middle Palaeolithic, the Bohunician, the Szeletian, and the Aurignacian. The limited number of stratified and well-dated sites and unknown bearers of the industries provides a major problem to these models. Moreover, genetic studies indicate a complicated interaction between local Neanderthal groups and arriving Anatomically Modern Humans. Moravia (Czech Republic) is one of the regions where this cultural mixture could be complicated. One way to revitalise the discussion on this topic is the implementation of assemblages that are not representative from the methodological point of view, but that contain mixed elements, which could reflect interaction between different groups of both Neanderthals and anatomically modern humans.

Keywords

Middle/Upper Palaeolithic transition, Micoquian, Mousterian, Szeletian, Bohunician, Aurignacian, Líšeň I/Podolí industry, Míškovice industry, Moravia

INTRODUCTION

For a long time, the Middle to Upper Palaeolithic transition has been an important archaeological research topic. The appearance of Anatomically Modern Humans (AMH) in Europe, their influence on local Neanderthal populations, and the associated changes in material cultures are very complex and are open to many interpretations. The Middle Danube region is one of the important areas crucial to this topic, with significant sites such as Willendorf II, Krems, Mladeč, Vedrovice, Brno-Bohunice, Stránská skála, Dzeravá skála, Szeleta and others (**Fig. 1**). One of the key spots within this area is the region of Moravia (the eastern part of the Czech Republic) where different technocomplexes have been recorded (**Fig. 2**) and where we can study the relationship among these, and consequently the relationship between Neanderthals and AMH.

Unfortunately, there is a limited number of human remains in the archaeological context, affecting the potential for reconstructions of the cultural developments. From the aforementioned area, Neanderthal remains have been reported from several sites, from Kůlna Cave (Jelínek, 1988), Švédův Stůl Cave (Jelínek, 1962), and Šipka Cave in Moravia (Maška, 1886; Vlček, 1969), Stajnia Cave (Picin et al., 2020) and Ciemna Cave in Poland (Willman et al., 2019), Šaľa in Slovakia (Jakab, 2005; Sládek et al., 2002), and Subalyuk in Hungary (Bartucz and Szabo, 1940). The presence of AMH is recorded in the Mladeč Caves in Moravia, where a number of skulls and postcranial bones were uncovered, within the context of an Aurignacian industry (Teschler-Nicola, 2006). For other technocomplexes however, such as the Bohunician, the Szeletian and the Jerzmanowician, we do not know who created these industries.

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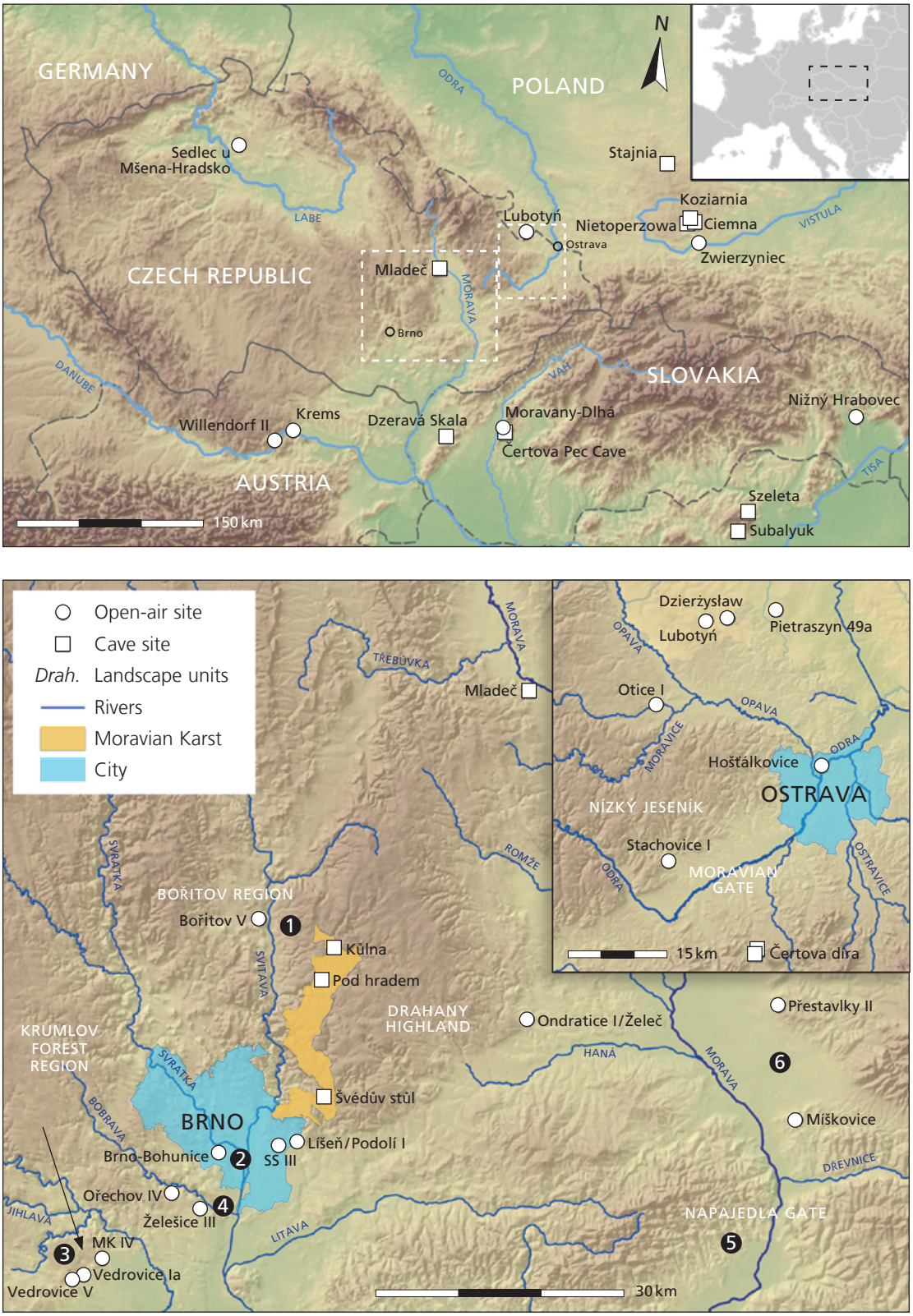

Fig. 1 Map of the eastern part of Central Europe with sites mentioned in the text. – (Model by P. Neruda).

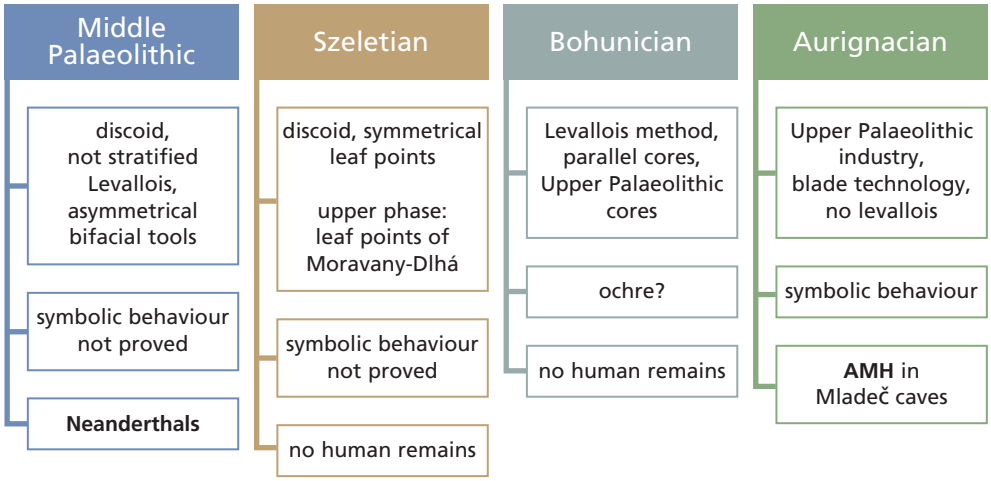

Fig. 2 Traditional technocomplexes identified in Moravia during the Middle/Upper Palaeolithic transition.

Considering the dating of sites, we see that Neanderthal populations persisted in the Middle Danube Region until at least 45 ka cal BP (**Fig. 3**)[1]. Their appearance overlaps partly with both the Szeletian and the Bohunician occupation of Moravia. Dated Aurignacian sites in Moravia are younger[2] however, AMH appeared in Austria, Slovakia, and likely Hungary earlier (Bolus and Conard, 2001; Conard and Bolus, 2003; Haesaerts and Teyssandier, 2003; Kaminská et al., 2005; Nigst et al., 2009).

Constructed models of cultural development are mostly based on stratified and dated sites. This is an obvious approach. Nevertheless, it should be mentioned that despite new archaeological analyses, excavation of new sites, and more accurate dating methods, research is somewhat stagnant. For a long period of time, we have been unable to find new sites with a superposition of individual Early Upper Palaeolithic (EUP) technocomplexes (except for the the Bohunician and Aurignacian in Stránská skála). In addition, for the majority of EUP cultures, it is still unknown whether Neanderthals or AMH were responsible.

In this context, the probability for the discovery of new human fossils is low, as the majority of caves have been explored, and conditions at open-air sites in the Middle Danube Region are not suitable for organic preservation as the records are located in fossil soils. Adding to this, genetic research often suggests that anthropogenesis was more complicated (Green et al., 2010; Peyrégne et al., 2019; Posth et al., 2017; Slatkin and Racimo, 2016) than indicated by osteological remains and archaeological finds. It is obvious that human evolution was significantly influenced by interbreeding (Fu et al., 2015; Sankararaman et al., 2012; Slon et al., 2018; Trinkaus, 2007), which must result from some form of co-existence of different populations (e. g., Neanderthals and AMH or Neanderthals and Denisovans), and we must ask how this process is reflected in the archaeological record. The problem is that well-dated and stratified sites represent only a small fraction of human imprint on the landscape. We cannot be sure that this evidence reflects the main characteristics of human behaviour. Moreover, we typically treat individual technocomplexes as isolated entities that developed more or less independently from each other, with processes of acculturation or copying of some features only occasionally taken into consideration[3]. It is clear, however, that even in a small area, e. g., Moravia, the interaction among different groups can be expected to be rather intensive and complex.

1 For earlier occupation of Europe by AMH see the problem of the Protoaurignacian (Conard and Bolus, 2015).

2 E. g., we should treat the radiocarbon data for the human fossils from Mladeč as being more precise than those obtained from carbonates.

3 Discussion about the relationship between the Châtelperronian (Roussel, 2014), the Szeletian and the Bohunician (Oliva, 2016, 2019).

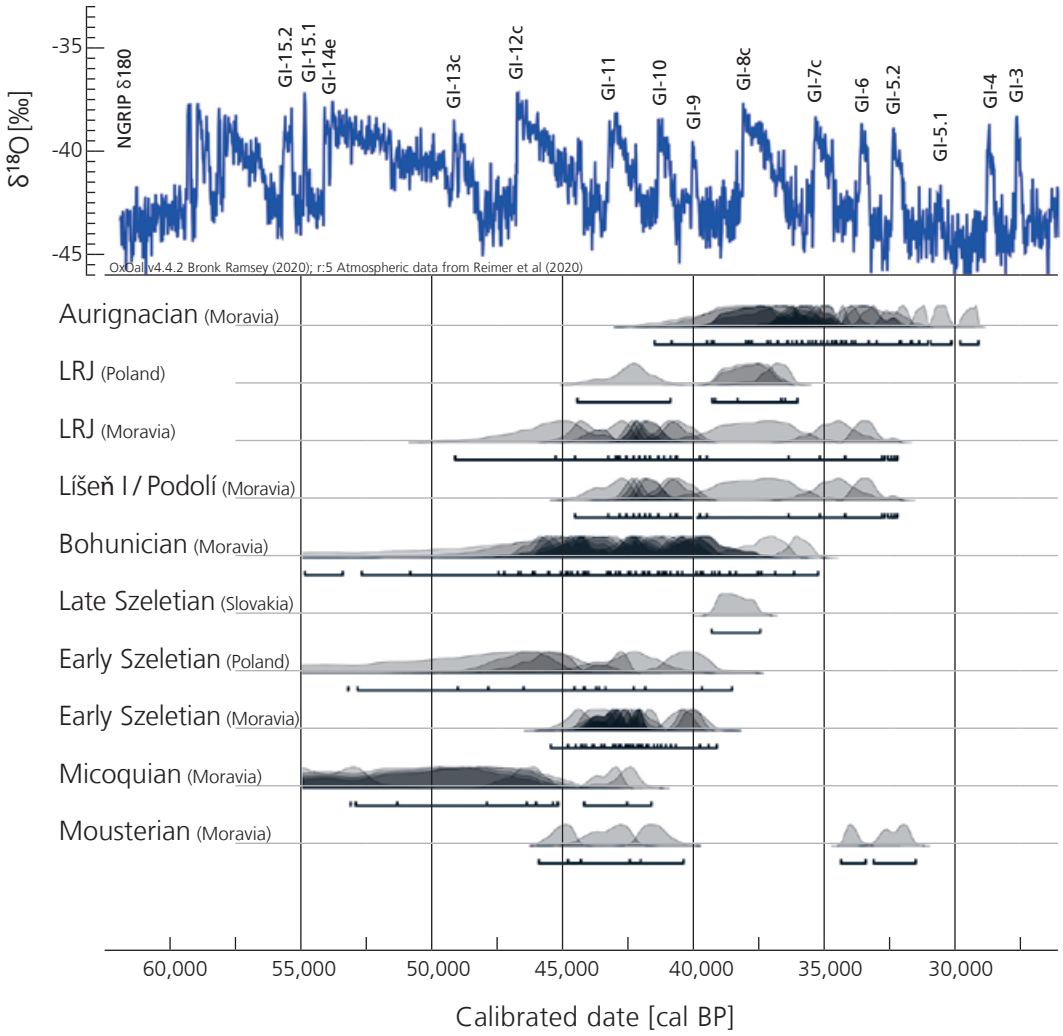

Fig. 3 Chronological position of individual technocomplexes using stacked data. Data for LRJ (Poland) according to (Kot et al., 2020), for Líšeň I/Podolí and LRJ (Moravia) two youngest data (Poz-76201 and Poz-76152) were removed. Modelled in OxCal 4.4., the calibration curve IntCal20 (Reimer et al., 2020).

Therefore, we should ask if the high-resolution data we usually prefer to use has an effect on our interpretative repertoire, and whether deconstruction of the subject with a special focus on "problematic" finds can open new research perspectives. Moravia and the surrounding areas provide evidence indicating that our current models could be more complex, to reflect the complexity of the archaeological record.

This contribution is focused on lesser-known finds from Moravia and the surrounding areas, which are not taken into consideration in current model building. The main aim is the identification of new possible relationships among individual technocomplexes in Moravia, focusing on broaching the following subjects:

- The Middle Palaeolithic substrate of the transition,
- The origin and chronological division of the Szeletian,
- Aurignacian features in the context of Middle and Early Upper Palaeolithic industries,
- The origin of the Bohunician and its relation to the Szeletian,
- The Líšeň/Podolí I type of industry,
- The problem of the Jerzmanowician in Moravia,
- And, the problem of the Míškovice type Industry.

DECONSTRUCTION

Middle Palaeolithic substrate of the transition

Within the time range under analysis, only one technocomplex is well documented – the Micoquian. This industry is represented in the upper part of the stratigraphic sequence at Kůlna Cave and is characterised by the presence of bifacial tools, and the use of the discoid method for blank production (Valoch, 1988). The Levallois method is absent. This same characteristic has also been noted at another dated site – Šipka Cave (Neruda, 2011).

Focussing on the Levallois method, which appears to have been significant for the Bohunician, an interesting question is related to its presence in a further Late Middle Palaeolithic technocomplex – the Mousterian. Rich and characteristic Mousterian sites directly dated to the period around 50 ka cal BP are absent in Moravia. Finds from Čertova díra Cave in northern Moravia probably date to this period (Neruda, 2011; Neruda and Nerudová, 2013; Valoch, 1965b), but the number of finds are limited, and the Levallois method seems not to have been applied. Industries from Švédův stůl Cave, where we have also found Neanderthal remains, are attributed to the Mousterian, though absolute dates are missing (Jelínek, 1962; Klíma et al., 1962). This also applies for evidence for the application of the Levallois method. It is apparent that sites with typical Levallois production have not been unearthed in Moravia[4]. Isolated pieces mostly collected from surface sites (Oliva, 2006) cannot be taken into account here because the presence of an isolated Levallois-like core does not automatically imply that the method was applied, and, without dating, we can hardly identify lithics from the time range under analysis.

Therefore, the possible existence of a Mousterian with Levallois production in Moravia is solely based on a surface collection from Hošťálkovice Ia. In addition to "Upper Palaeolithic" lithic components (see below) several Middle Palaeolithic side scrapers have been recorded, showing that the Levallois technology was applied for preferential flake production.

However, the lack of well-dated sites makes it impossible to substantiate if the Mousterian in Moravia during the transitional period is autochthonous or allochthones. Based on European analogies, we can expect Neanderthals to be the bearer of this industry.

Szeletian

The majority of contexts attributed to the Szeletian are known from surface collections, however Szeletian sites have also been found during excavations in Moravia relatively often. Due to the technological composition and presence of bifacial leaf points, the relation of the Szeletian to the Micoquian is broadly accepted (Allsworth-Jones, 1986; Kaminská et al., 2011; Oliva, 2005; Svoboda, 2005; Valoch, 2012)[5].

Several problems and questions are related to the Szeletian with significant consequences for model(s) of EUP developments. One key question is whether the Szeletian represents a late phase of the Micoquian, or a technocomplex that originated from the Micoquian and developed in parallel with the Micoquian during the EUP? Stemming from this, there is also the problem of how to consistently distinguish the Szeletian from the Micoquian.

4 Western Bohemia has provided better evidence for Levallois production in the Czech Republic, where such industries are related to outcrops orthoquarzite of Bečov type.

5 The probable genetic relation between the Szeletian and the Middle Palaeolithic (at that time i. e., Mousterian) was first proposed by František Prošek who defined the Szeletian (Prošek, 1953).

This problem recently appeared in the context of the classification of Layer 0 at Moravský Krumlov IV (MK IV), due to the discovery of unfinished leaf points, which are very similar to Micoquian bifacial backed knives. Both refitting (Neruda and Nerudová, 2019) and scar pattern analyses (Neruda and Kot, 2019) show that the main strategy for bifacial tool production was different at MK IV in comparison to the known Micoquian examples, e. g., Layer 7a at Kůlna Cave. The described technology from Layer 0 at MK IV shows leaf points (and their symmetry) to be the discriminatory tool type because they are not typical for the Moravian Micoquian. On the other hand, the technology of the Early Szeletian (Vedrovice V, Moravský Krumlov IV) is similar enough to the Micoquian (it proves a familial relation), and we can therefore understand the Szeletian as a late phase of the Micoquian.

However, some evidence indicates that the late Micoquian could be penecontemporaneous with the early phase of the Szeletian. This is supported by calibrated ^{14}C data that show a temporal overlap between the Micoquian and the Early Szeletian (an interval of calibrated dates of ~40-46 ka cal BP) (Haesaerts et al., 2013; Neruda and Nerudová, 2013). In this context, the wide data range and varying quality of dates for Kůlna Cave Layer 7a must be taken into account (**Fig. 2**). The first dates, obtained during the 1980s are generally younger than the new dates that were based on improved sample cleaning (Neruda and Nerudová, 2014). On the other hand, Layer 7a is not the last Micoquian layer at Kůlna Cave. The uppermost Layer 6a is stratigraphically younger and should date to the interval for the overlap between the Micoquian and Early Szeletian. However, the radiocarbon dataset for Layer 6a also contains dates comparable to the Upper Palaeolithic sequence (Neruda and Nerudová, 2014: Tab. 2) and one radiocarbon date is significantly older than data for Layer 7a (Neruda and Nerudová, 2013).

For these reasons, the assumption of overlapping of dates should be taken into consideration as it supports the hypothesis that the Szeletian occupation represents a new group (probably of Neanderthals), and is related to the Micoquian but including a specific discriminatory tool – the leaf point.

It is important to note that the settlement dynamics for both technocomplexes differ. With the exception of isolated leaf points in Rytířská (Valoch, 1965c) and Pod hradem caves (Valoch, 1965a), Szeletian occupations have not been located in caves, contrary to the Micoqiuan occupation[6]. Moreover, Szeletian open-air sites are situated in different regions compared to the Micoquian. A similar strategy can be identified in southern Poland. Here, the early Szeletian is also only known from open-air sites, e. g., at Lubotyń 11, a site penecontemporaneous with Vedrovice V and MK IV in Moravia (Bobak et al., 2016). Micoquian sites found in the same region as Lubotyń are older, and could rather represent a previous occupation phase on the Głubczyce Plateau. This hypothesis supports the dates from the site of Pietraszyn 49a, which can be correlated with Layer 9b at Kůlna Cave (Wiśniewski et al., 2017). Micoquian sites contemporaneous with the Early Szeletian are known from the caves of the Kraków-Częstochowa Upland.

Another important question is whether we are able to distinguish the internal development of the Szeletian. Due to the lack of well-dated archaeological sites and the superposition of Szeletian assemblages[7], answering this question is still a challenge, although research has focussed for quite a long time on the inner division of the Szeletian in Moravia, Slovakia or Hungary (e. g., Kaminská et al., 2011; Mester, 2010, 2018; Oliva, 2004, 2019; Ringer, 1990; Valoch, 1957)[8].

6 Base camps or hunting camps in caves are represented in the Szeleta Cave in Hungary, in Dzeravá skála (Prošek, 1951) and in Čertova Pec (Bárta, 1971) in Slovakia. Dzeravá skála is probably only one site were the Micoquian and the Szeletian could be in superposition. Unfortunately, the last excavation (Kaminská et al., 2005) did not locate the Szeletian layer and all bifacial items were related to the Micoquian (for this issue see also Valoch, 2012).

7 Only the Szeleta Cave in Hungary recorded a probable superposition, but both, stratigraphy and dating of horizons is very complex and the data should only be used with care (Adams, 2002; Mester, 2002; Ringer and Mester, 2000).

8 For this issue see Mester (2014).

The Early Szeletian (~46-40 ka cal BP) is relatively well documented at Vedrovice V (Valoch et al., 1993), Moravský Krumlov IV, Layer 0 (Neruda and Nerudová, 2009), and Želešice III (classified as Jerzmanowician in: Demidenko and Škrdla, 2020; classified as Szeletian in: Škrdla, 2017). The site of Lubotyń in Poland located near the border to the Czech Republic (**Fig. 1**) may also belong to this group of sites (Bobak et al., 2016). Younger phases of the Szeletian are difficult to establish due to the lack of dated sites and indications are given that later phases differ regionally. Oliva proposed techno-typological criteria for the identification of the Late Szeletian in the region of Moravia, based on collections from Drahany Highland (e. g., Ondratice Ia, Oliva, 2004). He saw the developed character of such industries in an increase of blade technology, a high proportion of imported raw materials (e. g., chert of Zdislavice-Troubky, **Fig. 1**), the presence of long-distance imports, the higher ratio of burins, and an increase of Aurignacian-like tools (mostly end scrapers). A high ratio of side scrapers is still present. Partly retouched leaf points (cf. Jerzmanowice) prevail over completely bifacially retouched pieces. He compares such industries with the Míškovice-type (Oliva, 1990; for more see the chapter below) which might represent the late (final?) phase of the Szeletian in the region of the eastern bank of the Morava river (Oliva, 2004).

The late phase of the Szeletian can also be represented by the Szeletian of the Moravany-Dlhá type typical for western Slovakia (for this issue see Kaminská, 2014). It is possible to date the leaf point with convex base group (Freund, 1952) to ca. 39 ka cal BP (Kaminská et al., 2011; Nemergut, 2010) based on a charcoal sample (Poz-29011; 33,600 ± 300 ^{14}C BP) from the eponymous site Moravany-Dlhá, excavated by L. Zotz (Zotz, 1943a, b), J. Bárta (Nemergut, 2010), K. Absolon (Nerudová and Valoch, 2009) and others.

In Hungary, the so-called Developed Szeletian is distinguished. However, there is no concurrence regarding the definition of this industry (for a summary see Mester, 2014). While we can identify some technological roots related to the Moravian Late Szeletian industries in the previous early phase, from the technological point of view, industries, e. g., of the Moravany-Dlhá type differ significantly, and the question remains if they represent the development of the same technocomplex (Oliva, 2016).

The discontinuity of cultural traditions between the Early and Late Szeletian (the Moravany-Dlhá Szeletian included) is supported by technological analyses from Hungary where the Early and the Developed Szeletian also differ significantly (Mester, 2010).

Behind these technological considerations is the question of who was responsible for the Szeletian. Due to the similarity with the Micoquian, we generally expect Neanderthals to be responsible for the Szeletian (Neruda and Nerudová, 2019; Oliva, 1991b; Svoboda, 2006; Škrdla, 2017). However, the possible independence of the Late Szeletian provokes the hypothesis that this younger phase could have been produced by AMH, given that AMH also produced leaf points (Oliva, 2019).

Besides the local independent development of the Szeletian from the Micoquian (Neruda and Nerudová, 2013; Oliva, 1991b) some scholars propose that the Szeletian developed in a process of acculturation from the Micoquian to the Aurignacian (Allsworth-Jones, 1986; Valoch, 1973, 1990a, 1990b). For the time being, this is problematic due to the dating of AMHs arrival to Moravia, which is later than the Early Szeletian. In concordance with the previously postulated hypothesis, Nigst (2012) also considers the Szeletian as the result of the acculturation of the Micoquian by the first wave of AMH, which are assigned to the Bohunician (Svoboda and Bar-Yosef, 2003; Tostevin, 2000a). Nigst based his hypothesis on attribute analysis, which showed a higher degree of similarity between the Szeletian and the Bohunician than between the Szeletian and the Micoquian. On the base of this analysis, he even attributed Layer II in Willendorf II to the Szeletian despite the fact that it contains no bifacial components. Controversies to this hypothesis arise as we lack proof to relate the Bohunician to AMH (see below as to whether the Bohunician is a truly independent technocomplex) and when we compare the complexity of the *chaine operatoires* we see different strategies for blank production in the well-defined Bohunician from Stránská skála compared to those identified for the

Szeletian (Neruda and Nerudová, 2005). Moreover, although there is overlap between the Micoquian and the Bohunician, we lack evidence for direct contact.
On the other hand, sites reflecting the Szeletian/Bohunician contact zone indicate interaction between these technocomplexes. Moreover, if we consider sites like Ondratice I, Ia, and Vincencov etc. to be homogeneous (e. g., Late Szeletian) their Aurignacian-like features and imported raw materials from Aurignacian zones (e. g., Napajedla Gate) support the assumption that the local population was in contact or directly acculturated by Aurignacian AMH.

Bohunician

Though many new stratified sites have been excavated during the last two decades, there are still many problems related to the Bohunician (definition: Oliva, 1979; Oliva, 1981; Svoboda, 1980). The "pure" Bohunician is known mostly from several locales on the outcrop of chert at Stránská skála (Svoboda and Bar-Yosef, 2003) and it is characterised by the coexistence (Valoch et al., 2000) or fusion (Škrdla, 1996) of both Levallois and Upper Palaeolithic blade production. Interestingly, the use of chert from Stránská skála decreases significantly with increasing distance from the outcrop. Moreover, bifacial leaf points appear in some assemblages, e. g., on the eponymous site Brno-Bohunice (Tostevin and Škrdla, 2006; Valoch, 1976). They are usually made from rock different from the Stránská skála chert, which is typical for the Bohunician. Such cases have been interpreted variably, as the Szeletian of Levallois facies (Valoch, 1956), an intrusion/contamination/imports into the Bohunician (Nerudová, 2002; Oliva, 2016; Škrdla, 2017), or an integral part of the Bohunician (Škrdla, 2014). We also note Levallois products in assemblages classified as Szeletian (e. g., Vedrovice V; Valoch et al., 1993). Sometimes, cultural classification of distinct assemblages varies (for this issue Oliva, 2016) between the Bohunician and the Szeletian and recently, reclassification of some sites to the Jerzmanowician (or LRJ) has been proposed (Demidenko and Škrdla, 2020). The situation is further complicated by the low number of Bohunician sites in the surrounding areas. Only lithic industries from Sedlec u Mšena-Hradsko (Neruda and Nerudová, 2000; Škrdla et al., 2013; Vencl, 1977) and Nižný Hrabovec (Kaminská et al., 2009) can be attributed to this technocomplex. Superposition of both the Bohunician and the Szeletian in Poland at Dzierżysław is revised and the presence of the Bohunician at this site is dubious (A. Wiśniewski, pers. comm.).
If we, for the argument of this contribution, accept the Bohunician as an independent technocomplex, the origin of the Bohunician and its creator becomes an important topic.
Traditionally, two theories have tried to explain the origin of the Bohunician. One group of scholars have pointed out the similarity of the Bohunician with some industries from the Near East, based on a typical example from Boker Tachtit (comparison with the Bohunician: Škrdla, 2003). Consequently, this group expects the bearers of the industry to be AMH. In this conception, the Bohunician is an intrusional (allochthonous) technocomplex that might represent the arrival of AMH before the Aurignacian (Demidenko and Škrdla, 2020; Nigst, 2012; cf., Richter et al., 2008; Svoboda and Bar-Yosef, 2003; Škrdla, 2014, 2017; Tostevin, 2000b).
The second theory is based on the lack of direct evidence for migration. Sites classified to the Bohunician are rare. If its origin is assumed in the Near East, we should expect to find raw materials from southern and south-eastern direction at the Moravian sites (Oliva, 2016). We also lack direct evidence that the industry of Boker Tachtit type was produced by AMH. Moreover, it should be stressed that there are very similar industries observed in Western Europe, of Middle Palaeolithic origin (e. g., Seclin, Rocourt, and Riencourt-les-Bapaume) that contain both the Levallois method and Upper Palaeolithic-like blade production (Valoch et al., 2009; Valoch et al., 2000). Migration of the creators of these industries from the west to Central

Europe also cannot be supported, due to the same reasons that support the rejection of a Near Eastern origin, namely no raw materials from Western Europe. Therefore, the autochthonous origin should also be considered. There is, however, no well-documented substrate for the Levallois method (see above).

Aurignacian features in other industries

The Aurignacian is the single technocomplex discussed here we know to have been created by AMH, because we have found typical lithic and organic industries associated with human remains at the Mladeč Caves (Teschler-Nicola, 2006). In Central Europe, the impact of the Aurignacian on EUP technocomplexes differed regionally. The oldest dates for the Middle Danube region (Adams and Ringer, 2004; Kaminská et al., 2005; Nigst et al., 2014) are recorded at Willendorf (~ 43-39 ka cal BP), Peskő (> 40 ka cal BP), and Dzeravá skala (~ 42-36 ka cal BP). If we take into account these dates from Moravia, we see, for now, that AMH entered Moravia later, at ca. 37 ka cal BP (Neruda and Nerudová, 2013). This is in concordance with the stratigraphy at Stránská skála, where the Aurignacian is stratigraphically located above the Bohunician (Svoboda, 2003) and it appears that the arrival of AMH terminated the development of the Bohunician.
The stratigraphic relation between the Aurignacian and other EUP and Middle Upper Palaeolithic technocomplexes is poorly documented. This stratigraphic relation is however documented for the Pod hradem Cave (Nerudová et al., 2012; Valoch, 1965a) where a layer containing a leaf point is stratigraphically located below Aurignacian horizons (Nejman et al., 2018; Nejman et al., 2013). Dzeravá skala preserved the stratigraphical superposition of Micoquian, Szeletian, and Aurignacian (Kaminská et al., 2005; Prošek, 1951), but due to the history of research at the site the relation between the technocomplexes, i. e., the Szeletian and Aurignacian, cannot be studied with modern methods (for this issue see Valoch, 2012). In this context it is interesting to note that for the Kumlov Forest region, superposition of Szeletian and Aurignacian was not documented, although both technocomplexes are represented at stratified sites.
The best example of the presence of UP (Aurignacian) features in other technocomplexes that has been noted so far, comes from the uppermost Micoquian Layer 6a at the southern entrance of Kůlna Cave, where K. Valoch discovered Aurignacian-like end scrapers on blades and another fragment of an end scraper (Valoch, 1988: Abb. 18). As this horizon at the southern entrance of the cave also contains Gravettian and Magdalenian finds, intrusion cannot be excluded (Neruda and Nerudová, 2014; Nerudová and Neruda, 2014). But, contrary to such an argument is the absence of an intact Aurignacian layer in Kůlna Cave and the lack of any significant assemblage related to the Aurignacian. The presence of a few blades was noted but blade technology was applied in the Micoqian Layer 7c. Except for one excellent Aurignacian-like blade core originating from Layer 7a, blades and cores are technologically imperfect and were not transformed into formal tools. We recorded mostly use-wear on edges[9]. Taking the dates for Layers 7c, 7a and 6a into account, all upper Micoquian layers predate the appearance of the Aurignacian in Moravia.
The presence of isolated Aurignacian-like elements in the Micoquian at Kůlna Cave is not an isolated example. In the region of the Svitava River Valley (Bořitov Region), near Kůlna Cave, we discovered a cluster of Middle Palaeolithic surface sites. Most of them contain typical Middle Palaeolithic tools, including side scrapers and bifacial backed knives associated to the Micoquian. Upper Palaeolithic elements such as blade cores, carinated end scrapers, and burins were also quite often associated with these surface sites (Oliva, 1987, 1991a; Oliva and Štrof, 1985; Valoch, 1978).

9 Only basic macroscopic observation was performed.

Scenario	Pros	Cons
Coincidence	e. g., end scrapers on a thick blank may resemble carinated end scrapers	repeated coincidence in many cases
Palimpsest	– for surface collections: probable – for Kůlna Cave: possible for Layer 6a, not probable for Layer 7a and older layers	missing technological stages indicative for the Upper Palaeolithic
Co-existence of Neanderthals and AMH	possible for undated surface collections if Neanderthals survived later than 35 ka cal BP (AMH in Moravia) or AMH in Moravia earlier than 35 ka cal BP	for stratified collections: not probable, because of appearance of AMH in Moravia
Independent innovation by Neanderthals	according to dating, blade technology before AMH in Moravia	does not explain Aurignacian-like tools in assemblages, individual appearance of same type of tools in two different technocomplexes created by different human groups?

Tab. 1 Explanation of Aurignacian-like features in Middle and Early Upper Palaeolithic assemblages.

A similar combination of Middle Palaeolithic industry with some Aurignacian elements was documented at several sites in northern Moravia and the Czech part of Silesia. The site of Hošťálkovice I – Dubiček represents a typical example, is where we not only discovered typical Middle Palaeolithic side scrapers, Levallois cores and flakes (therefore, the industry is dedicated rather to the Mousterian), but also carinated end scrapers and Upper Palaeolithic-like cores (Neruda, 1997). The site of Otice u Opavy (Klíma, 1974) yielded a similar industry, though Levallois elements and bifacial tools were absent. Upper Palaeolithic (Aurignacian) elements at the site are represented by a carinated end scraper (Neruda, 2018). More Upper Palaeolithic artefacts were documented at the site of Stachovice, showing a decrease in the proportion of Middle Palaeolithic components. Unfortunately, all of these sites are unstratified and undated (Neruda, 2018).
It is important to note that Aurignacian-like artefacts are also commonly represented in Szeletian and Bohunician assemblages. If we take this into account, these collections should be older than the appearance of the Aurignacian in Moravia. However, we confront the same problem as for the Middle Palaeolithic assemblages. Several explanations have been brought forward. The common explanation for these surface assemblages is the mixing of two individual occupational events. This cannot be excluded, but it is however important to point out that several sites in different regions exist where these particularly characterised assemblages have repeatedly been documented (for the issue of homogeneity see e. g., Oliva, 1987). Dating does not prove the parallel development of the Aurignacian and the above-mentioned technocomplexes. The problem is complex, and we can postulate several scenarios (**Tab. 1**).

Líšeň I / Podolí type of industry

The site of Líšeň I/Podolí near Brno provides an interesting contribution to the discussion. This stratified open-air site yielded an industry with Bohunician components (e. g., points), and Jerzmanowice points (Škrdla, 2017). The surface collection also contained Szeletian leaf points and Aurignacian-type end scrapers (Oliva, 1981). The importance of this site is related to 36 Tertiary mollusc shells and their fragments, representing different species and coming from two different geological formations. At least two of these shells were perforated and some have traces of hematite or manganese on their surface. Ochre lumps were also

noted at the site. The raw material for lithic production is the same as the raw-material used at the Bohunician site of Stránská skála (Škrdla, 2017). P. Škrdla classifies this industry as a specific new EUP industrial type. Radiocarbon dating of charcoal places the site within the time range ~40-42.5 ka cal BP, which is close to contemporaneous to dates for both the Szeletian and Bohunician.
The problematic classification of the industry from Líšeň I/Podolí was recently solved by re-classification to the Jerzmanowician (Demidenko and Škrdla, 2020).

Jerzmanowician

The assessment of Jerzmanowice points in Moravian assemblages is still a point of discussion. They appear in almost all assemblages but only prevail over bifacial forms at Ondratice I and Ia (Oliva, 1991b, 2004). This tool type specific to Moravia is generally attributed to the Szeletian.
Demidenko and Škrdla (2020) have recently proposed to assign some of the Moravian collections to the Jerzmanowician or more generally to the Lincombian-Ranisian-Jerzmanowician (LRJ). They point out that the current state of knowledge is affected by the lack of residential campsites. In their opinion, such sites are preserved in Moravia, at e. g., Želešice III (classified as Szeletian in: Škrdla, 2017), Líšeň I/Podolí (a distinct type of industry in: Škrdla, 2017), Líšeň I/Líšeň-Čtvrtě, and Tvarožná X/Tvarožná-Za školou (classified as Bohunician in: Škrdla, 2017).
In their conception, the Moravian LRJ toolkit features parameters typologically relevant for the UP (Upper Palaeolithic) and a lack or only occasional presence of MP tools. Bifacial leaf points are absent[10]. Finally, the appearance of personal ornaments, an important aspect of Moravian LRJ residential sites is exemplified by the coloured and perforated mollusc shells uncovered at Líšeň/Podolí I and Líšeň I/Líšeň-Čtvrtě.
If we accept the theory of Demidenko and Škrdla (2020), it follows that the Moravian Jerzmanowician overlaps with the Early Szeletian and the Bohunician in time and space. According to their definition, the beginning of LRJ can be dated to around ~46-42 ka cal BP (Demidenko and Škrdla, 2020)[11]. This technocomplex could have survived up to ~39-36 ka cal BP, based on new data from Jerzmanowician layers from Koziarnia Cave in Poland (Kot et al., 2020). This younger phase could be contemporaneous with collections from the Drahany Highland, especially with Ondratice I and Ia, traditionally attributed to the Late Szeletian. The question is if these sites represent the Late Szeletian or rather Jerzmanowician contexts, according to this new hypothesis.
The creator of the LRJ in southern Moravia and the relationship to other technocomplexes are topics that are rather controversially debated. Demidenko et al. relate the above-mentioned assemblages to the Bohunician-LRJ "evolution line" and attribute both the Bohunician (Initial UP) and LRJ (Late Initial UP) to AMH (Demidenko et al., 2020). They discuss a concept proposed by D. Flass, who understands the Lincombian-Ranisian-Jerzmanowician (LRJ) as an independent technocomplex that appears more likely to have been authored by Neanderthals and is unlikely to be the result of acculturation processes (Flas, 2011). According to Demidenko and Škrdla, the Neanderthal remains from the Belgian Spy Cave dated to ~41 ka cal BP are rather weak evidence for the argument that Neanderthals were responsible for the LRJ. Nevertheless, it should be mentioned that the relation between the Bohunician and AMH is equally hypothetical and still remains an assumption (see chapter: Bohunician).

10 The surface collection, for example, from Želešice III contains bifacial leaf point.

11 The Polish Jerzmanowician is newly dated (Kot et al., 2020).

Furthermore, they emphasize the presence of personal ornaments, in the form of a coloured and perforated shell, from the site of Líšeň I/Podolí I. It remains an open question if the presence of personal ornaments *per se* supports the attribution of industries to AMH. Use of personal ornaments is evident during the Aurignacian, and we can therefore consider them as typical for the behavioural repertoire of AMH, although the behaviour of Neanderthals was sometimes "modern", as application of ochre and/or use of shells or bird feathers was important for some groups (e. g., Hoffmann et al., 2018; Peresani et al., 2013).

Míškovice

Another specific technocomplex usually related to the EUP complex industries is called the Míškovice Type after the eponymous site Míškovice – Křemenná Hill. It contains Szeletian features (side scrapers and triangular bifacial leaf points), Aurignacian tools (carinated end scrapers and Aurignacian burins), and Gravettian tools (backed bladelets and points). This specific industry was recorded east of the Morava River (Oliva, 1990). These collections (Míškovice, Lhota near Lipník, Přestavlky, Pavlovice, and others) are not dated and it is therefore complicated to establish their relation to other EUP technocomplexes. Oliva assumes the Míškovice Type to represent a specific group within the Late Szeletian, with contacts to the Aurignacian and Gravettian. In his synthesis of the Moravian and Szeletian Palaeolithic, J. Svoboda assigned these industries to the Aurignacian though additionally assumes a relation to the Szeletian (Svoboda et al., 2002) or the so-called "Pomoravský" Aurignacian *sensu* B. Klíma (see the critical comment of the term: Klíma, 1978; Oliva, 2005). Unfortunately, we also have no evidence who was responsible of this industry. Due to the combination of features we can expect a rather autochthonous origin.

A HYPOTHETICAL MODEL

Against the context of the interpretations mentioned above, several possible scenarios can be constructed for the Middle to Upper Palaeolithic transition. **Figure 3** illustrates a hypothesis, explaining the cultural setup in Moravia and its surrounding areas.

Neanderthals survived in Moravia during the time of the EUP complex, and are represented by Late Micoquian, the Late Mousterian, and by the Szeletian industries. The Szeletian technocomplex was either autochthonous and penecontemporaneous with the Micoquian (parallel; this variant on **Fig. 4**), or represents a late development of the Micoquian (consecutive).

We cannot exclude the possibilities that both Micoquian and Mousterian Neanderthals experienced acculturation by AMH, and therefore copied UP tools and/or that Neanderthals and AMH lived together in some regions and created specific industries with both Middle and Aurignacian features. Given both these scenarios, we would have to assume an earlier arrival of AMH in Moravia (before 35 ka cal BP) or a longer persistence of Neanderthal groups (after 35 ka cal BP). Both possibilities (**Fig. 4:** dash line) are an option, as AMH appeared in the Danube region before 35 ka cal BP (Haesaerts et al., 2013; Nigst et al., 2008, 2009), and it might be possible that some of the Micoquian surface sites are younger. Moreover, it looks as if Szeletian Neanderthals persisted for a long time period (given they are bearers of the Szeletian) and they could have met with AMH (especially, if the Szeletian represents the Late Micoquian). If we accept the postulated contacts between the Late Szeletian and the Aurignacian, this late phase could have been created by both Neanderthals and AMH. This is in contrast to the Early Szeletian, which is attributed to Neanderthals.

It is most likely that Micoquian Neanderthal hunters had no contact with groups responsible for the Bohunician and it appears as if they respected their preferred landscapes. Nevertheless, if Neanderthals were creators of the Szeletian industry then we do expect contact between Szeletian Neanderthals and Bohunician groups due to industries with features of both Szeletian and Bohunician technocomplexes recorded in contact zones. If we accept the Bohunician as an allochthonous technocomplex (the applied Levallois method is unique in the area under study), then the main questions remaining relate to its origin, both in terms of responsible group and geographic origin. According to the preferred conception, the Bohunician came from the Near-East and could be produced by one of the first groups of AMH. Nevertheless, due to similar collections from Western Europe, we still cannot exclude the possibility that the Bohunician is a Neanderthal Late Middle Palaeolithic industry.

The traditional model for the EUP is complicated by the inclusion of a new type of industry (Líšeň), related to the problem of the co-existence of the Szeletian and Bohunician. It remains an open question if this industry results from the co-existence of EUP technocomplexes, as is the question of who created these industries. Again, AMH, Neanderthals, or both could be responsible here. A recent hypothesis proposes that this industry belongs to the LRJ complex (Jerzmanowician), leaving different options for interpretation.

While stratigraphic sequences at Stránská skála indicated that the Aurignacian ended the development of the Bohunician, evidence from the site of Sedlec u Mšena-Hradko suggests contact between the technocomplexes. The site is still an isolated example and the possibility that it represents a palimpsest has not yet been excluded.

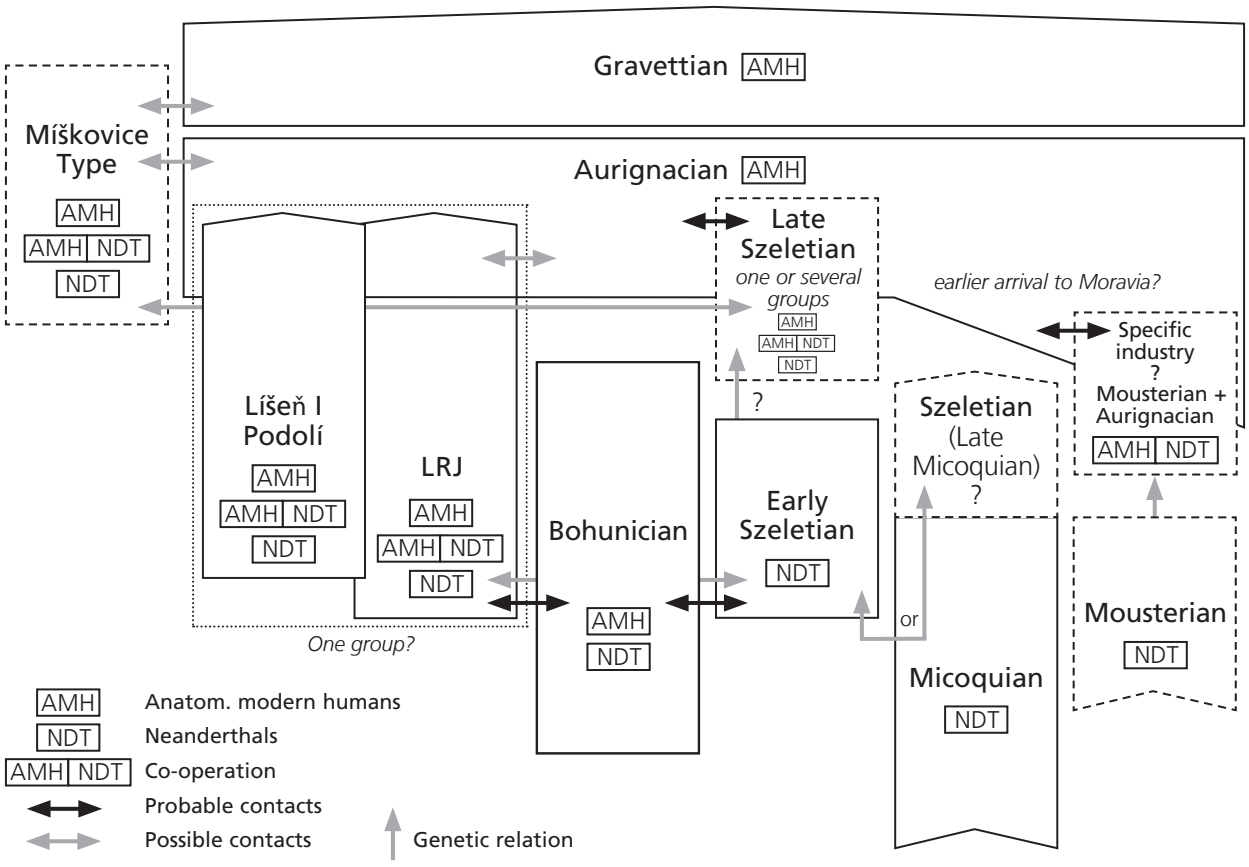

Fig. 4 Model for the Middle/Upper Palaeolithic transition in Moravia.

It is difficult to place the Míškovice Type of industry in this model because the homogeneity of its collections has not yet been definitively proven, and the industry is as yet not absolutely dated. We assume a later age, though this assumption is purely based on typological arguments. If the industry is autochthonous one would have to outline the long persistence of the leaf point tradition, at least until the transition from Aurignacien to Gravettian.

CONCLUSION

Given the hypothesis that all identified industries represent independent technocomplexes and that the mixed character of some industries results from the interaction between different groups of Neanderthals and AMH, the model explaining the Middle/Upper Palaeolithic transition and EUP technocomplexes appears to be very complicated, more complicated in fact than stratified and dated sites indicate. Nevertheless, the mixture of characters in some collections can reflect the physical interaction between Neanderthals and AMH, as indicated by ancient DNA studies. It seems our classificatory system and traditional terminology cannot reflect these complicated processes. Therefore, we should leave or rebuild our concept of independent cultures and, in future rather refer to techno-typological tendencies (Oliva, 2016).

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Petr Neruda
Moravian Museum
Historical Museum
Anthropos Institute
CZ - Brno
pneruda@mzm.cz