

## DISCUSSIONS AND POLEMICS

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### WESTERN FRONTIER OF THE ARCHAIC SCYTHIA: TYPO-CHRONOLOGY VS RADIOCARBON DATING

#### ABSTRACT

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One of the key issues in the chronology of Late Hallstatt period is the so-called Hallstatt plateau in the calibration curve extending the calibrated range of single dates to c. 800-400 BC. Analysis of the <sup>14</sup>C dates of the ash-hill from the Chotyńiec hillfort, indicate its dating to the time range, which does not exceed the interval of 780-469 BC. Typological analysis of the artefact collection allows us to date the ash-hill to the middle of the 7<sup>th</sup> – the first third of the 6<sup>th</sup> century BC (HaC2-HaD1). This dating corresponds to the Early Scythian time and chronology of the Western Podillian group. The analysis of material culture allows us to indicate the immediate closeness of the Chotyńiec agglomeration to the Western Podillian group.

Keywords: Central Europe, Tarnobrzeg Lusatian Culture, East European Forest-Steppe groups, Late Hallstatt period, chronology, typo-chronology, radiocarbon dating

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## INTRODUCTION

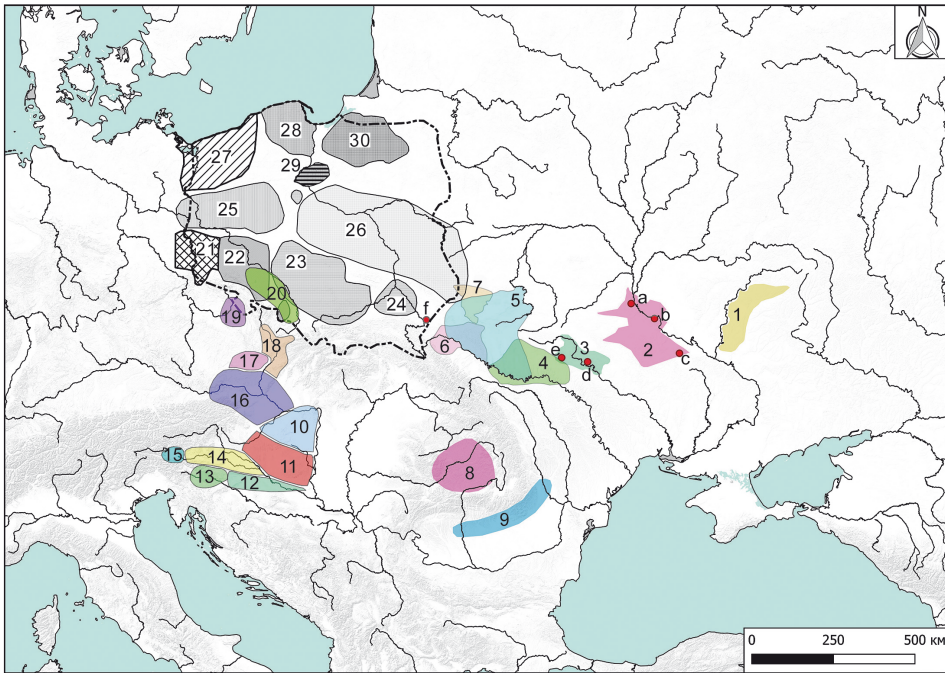
Unification of regional chronological schemes remains one of the key issues in Early Iron Age archaeology of Central Europe. The cornerstone of the ongoing discussion on the chronology of Late Hallstatt period is the so-called Hallstatt plateau in the radiocarbon calibration curve extending the range of single dates to c. 800-400 BC, which complicates our understanding of various demographic, social and cultural phenomena. Pure radiocarbon dating of several complexes may exceed the duration of the whole Late Hallstatt period. Bottom-up approaches to data systematization transfers the issue of sites' chronology to the calendar dating of cultures, periods *etc.* Certainly, we must consider a multi-proxy approach to sites' chronology.

The article focuses on the critical analysis of Chotyniec hillfort radiocarbon chronology and artefact dating, and balancing both approaches. The study discusses the radiocarbon dates obtained for "Scythian" culture and Tarnobrzeg Lusatian culture (further – TLC) with the re-assessment of methods applied to the chronology of key sites in the ongoing discussion, and cross-regional dating of narrow-ranged artefact dating. Specific focus on the Chotyniec hillfort in South-Eastern Poland, the chronology, duration and meaning of which is being actively debated, enables evaluation of the utility of the radiocarbon and typo-chronological approaches to the sites dated in the range of c. 800-400 BC. Detailed chronology makes it possible to trace complex dynamic processes in Late Hallstatt Central Europe.

The territory of the modern Ukrainian Forest-Steppe during the Early Iron Age was a part of the Central Europe in cultural terms, similar to the borderland with a different culture of the Steppe. The Central European area during the Hallstatt period was divided into two zones – Hallstatt, genetically related to Urnfield, and the territory populated by tribes related to Trzciniec Circle communities of the Late Bronze Age, namely the Lusatian culture and the tribes of the Ukrainian Dniestr-Dnipro Forest-Steppe.

In turn, the territory of modern Poland in the 7<sup>th</sup>-6<sup>th</sup> century BC was the frontier between the Hallstatt world and the tribes of the Forest-Steppe and Steppe of Eastern Europe (Fig. 1). Western Poland belonged to the Hallstatt zone (Gediga 2010; Gediga *et al.* 2020), and a part of south-eastern Poland was a part of the Forest-Steppe zone (Trybała-Zawiślak 2020, 58). Katarzyna Trybała-Zawiślak has aptly described the geographical location of the Chotyniec agglomeration: "the location of the settlement in Chotyniec can be treated as a "gateway" to the world remaining in the east under Scythian domination" (Trybała-Zawiślak 2020, 58) and "Many researchers have noted the location of the Chotyniec agglomeration within the so-called Przemyśl Gate, which is a natural western extension of the East European Forest-Steppe" (*e.g.*, Trybała-Zawiślak 2019, 280). As Sylwester Czopek rightly points out, the border between these two worlds passed through the territory of modern Poland (Czopek 2021, 377).

The interest of archaeologists in a wide range of issues of interaction between the tribes of Central and Eastern Europe during the Early Iron Age decreased for a certain period.



**Fig. 1.** Main cultural groups and sites of the middle VII – middle of VI centuries BCE in Central and Eastern Europe. Groups: 1 – Vorskla group; 2 – Kyiv-Cherkassy group; 3 – Eastern Podolian group; 4 – Western Podolian group; 5 – Vysocka culture; 6 – Cherepin-Lagodiv group; 7 – Lezhnica group; 8 – Transylvanian group; 9 – Ferigile group; Eastern Hallstatt: 10 – North-East Pannonian group; 11 – South-West Pannonian group; 12 – Kaptol group; 13 – Lower-Cranian group; 14 – Sulmtal group; 15 – Frög; 16 – Kelenderberg group; 17 – Horákov group; 18 – Platěnice group; 19 – Silesian-Platěnice group (Platěnice part); 20 – North-East group; Lusatian culture: 21 – Saxon-Lusatian group; 22 – Silesian group; 23 – Upper Silesia – Lesser Polish group; 24 – Tarnobrzeg group; 25 – Western Greater Polish group; 26 – Eastern group; 27 – Western Pomeranian group; 28 – East Pomeranian (Kashubian); 29 – Chelmino group; 30 – Warmia-Masuria group. Hillforts: a – Khotiv; b – Trakhtemiriv; c – Motronin; d – Nemyriv; e – Severynivka; f – Chotyńiec (Golec and Fojtik 2020; Gedl 1975; Czopek 2020; Grechko 2021b)

Therefore, it is important that this topic is attracting a wide range of researchers again. In addition to this, except for the so-called “Scythian” campaigns to Central Europe, researchers have drawn attention to the wide contacts of tribes of the Forest-Steppe of Eastern Europe with the tribes of the Lusatian culture and cultural groups of Eastern and South-Eastern Hallstatt (Bryukov 2005; Daragan 2011; Bandrivskiy 2014; Shramko and Zadnikov 2021). The main role of the Scythians in campaigns to the Lusatian and Eastern Hallstatt lands raises doubts. The participation of the Transcaucasia tribes in these campaigns seems to me to be more well-argued (Melankhlens, Sigyns, Gelons, *etc.*; Grechko 2021b, 23). An important role in the work on these issues in this is played by the large-scale research by a group of scientists from the University of Rzeszów led by Sylwester

Czopek. This group is conducting research on a unique site – the Chotyniec hillfort and the other sites of this agglomeration (Czopek 2019; 2021; Trybała-Zawiślak 2019).

Publication of evidence from the Chotyniec hillfort coincided in time with the revision of the dating of the “Scythian” campaigns in Central Europe by the author of this article (Grechko 2020a). It was nomadic raids that left excellent chronological markers in the archaeological contexts of Eastern Hallstatt and Lusatian sites, *i.e.*, the arrowheads of the so-called “Scythian type”, which were deposited at the same time during the assaults of the fortifications and can be considered exactly bundles of arrowheads. This is the main thing that are part of the “pillars” of the “chronological bridge” that can connect the European chronological system of P. Reinecke and “Scythian” chronology of 6<sup>th</sup> century BC.

Thus, we can now use the materials of the contact zone of the TLC tribes and the population of Chotyniec as part of the ethno-cultural massif of the tribes of the Ukrainian Forest-Steppe in south-eastern Poland as the “building material” of the first “spans” from East to West (Grechko 2020b, 587-597).

Furthermore, the evidence for creation of the “chronological bridge” between the materials of the Western Podillian group (further – WPG) of sites includes primarily products of Eastern Hallstatt origin (Mogilov 2020, 152, 153) and from other Forest-Steppe contexts (Daragan 2011, 595, 610-617; Shramko and Zadnikov 2021, 123-132). This exchange took place most actively during the middle of the VII–the first third of the 6<sup>th</sup> century BC. After the “Scythian” campaigns the contacts of the tribes of the Eastern European Forest-Steppe with the cultural groups of Central Europe actually ended.

It is such a pleasure and important at the same time that my discussion article (Grechko 2020b) attracted the attention of Sylwester Czopek (Czopek 2021). My version was the “external” point of view on the chronology of the III phase of the TLC and on certain issues in the context of chronology and periodization of the ethnocultural interaction of the different cultural ethnic groups throughout the Late Hallstatt period. That is why I was looking forward to the reaction of experts with an “internal” point of view to the proposed ideas. The responses I received and clarified position of Sylwester Czopek further convinced me that we are on the right track, and only in close scientific cooperation can we find a consensus, which will correspond to the current state of the source base and the cognitive possibilities of archaeology.

In this article, I will continue the discussion with a slight change in focus to dating by different methods and cultural identity of the Chotyniec hillfort.

## TYPO-CHRONOLOGICAL DATING OF THE CHOTYNIC AGGLOMERATION

Considerable attention of Sylwester Czopek has been devoted to the chronology of the Chotyniec hillfort (Czopek 2019, 126-127; 2021, 379-384). Investigations at the ash-hill resulted in a representative collection of artefacts, including antique imports, analysis of which makes possible the establishment of the time of its functioning.

The *arrowheads* are characterized in the article of Marcin Burghardt (Burghardt 2020). The analysis and dating are generally uncontroversial and it can be agreed that the collection of 38 tips (Fig. 2: C) can be dated to the Kelermes period (further – KP) dated between the middle of the 7<sup>th</sup>–middle of the 6<sup>th</sup> century BC (Burghardt 2020, 352).

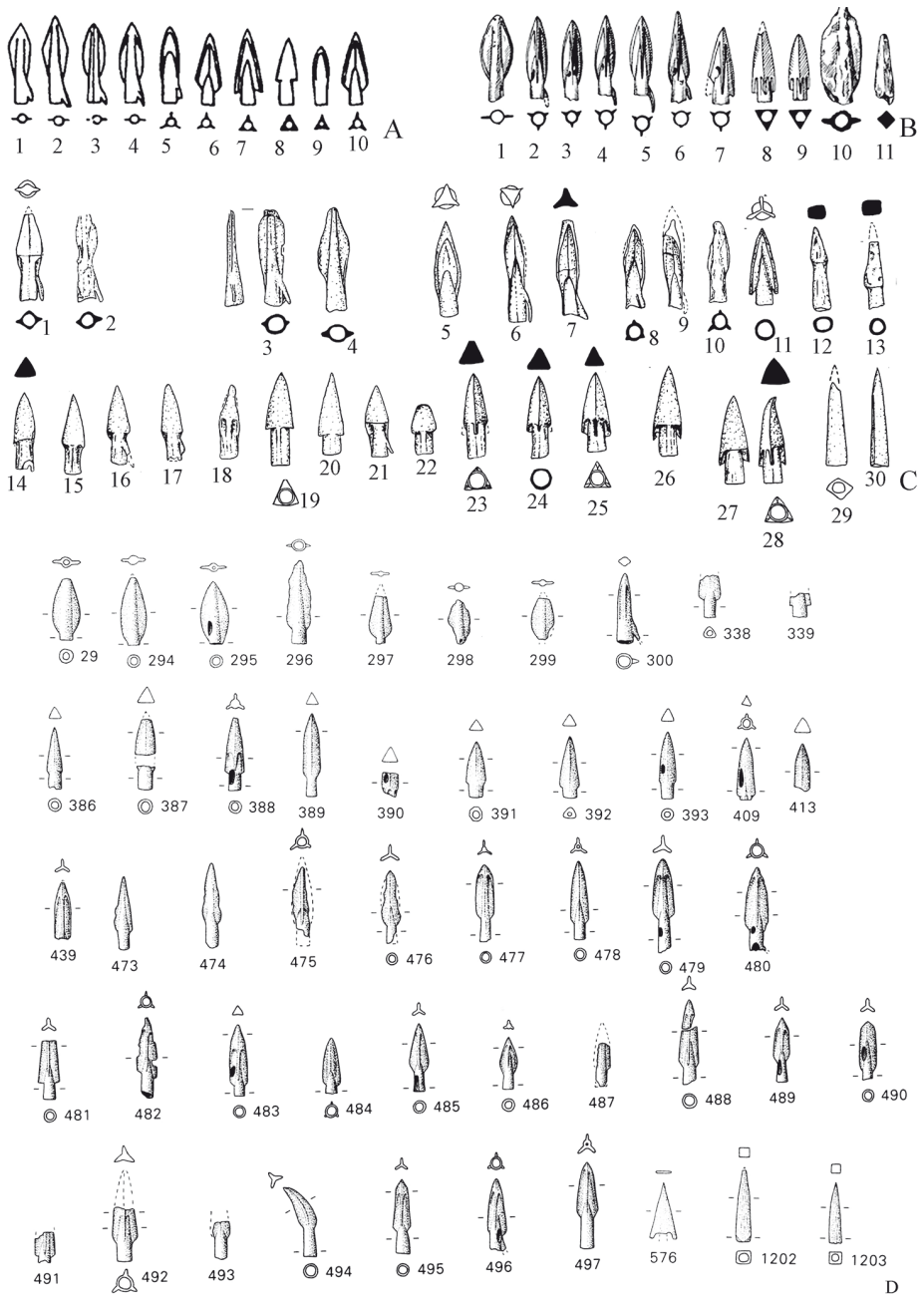
It is worth noting that one of the two arrowheads of the Zhabotyń type had poorly preserved blades (Fig. 2: C, 4) (Burghardt 2020, 335, fig. 7, 4). Therefore, there is no complete confidence in its asymmetric rhombicity. The general outline of the second specimen (Fig. 2: C, 3) is as follows, and its point was probably destroyed by a blow on a solid object (Burghardt 2020, 335, fig. 7, 3). Marcin Burghardt rightly points out that the finds of single items of this type together with the classic Kelermes arrowheads are anachronisms and indicate the dating of the collection to no earlier than the middle of the 7<sup>th</sup> century BC (Burghardt 2020, 345, 346). According to my periodization, this is the first phase of KP, which is characterized by continuing of using some artefacts of the Pre-Scythian time (Grechko 2013, 134-150; 2021a, 15-17).

What is important is a conclusion based only on facts: “Summing up, it can be concluded that the collection of arrowheads from Chotyńiec, found in two different (utility?) levels of the ash-hill, can be considered as a homogeneous assemblage” (Burghardt 2020, 350). The hypothetical selection of two horizons by the arrowheads does not seem to be supported by the context of finds of different types in different horizons (Burghardt 2020, 351).

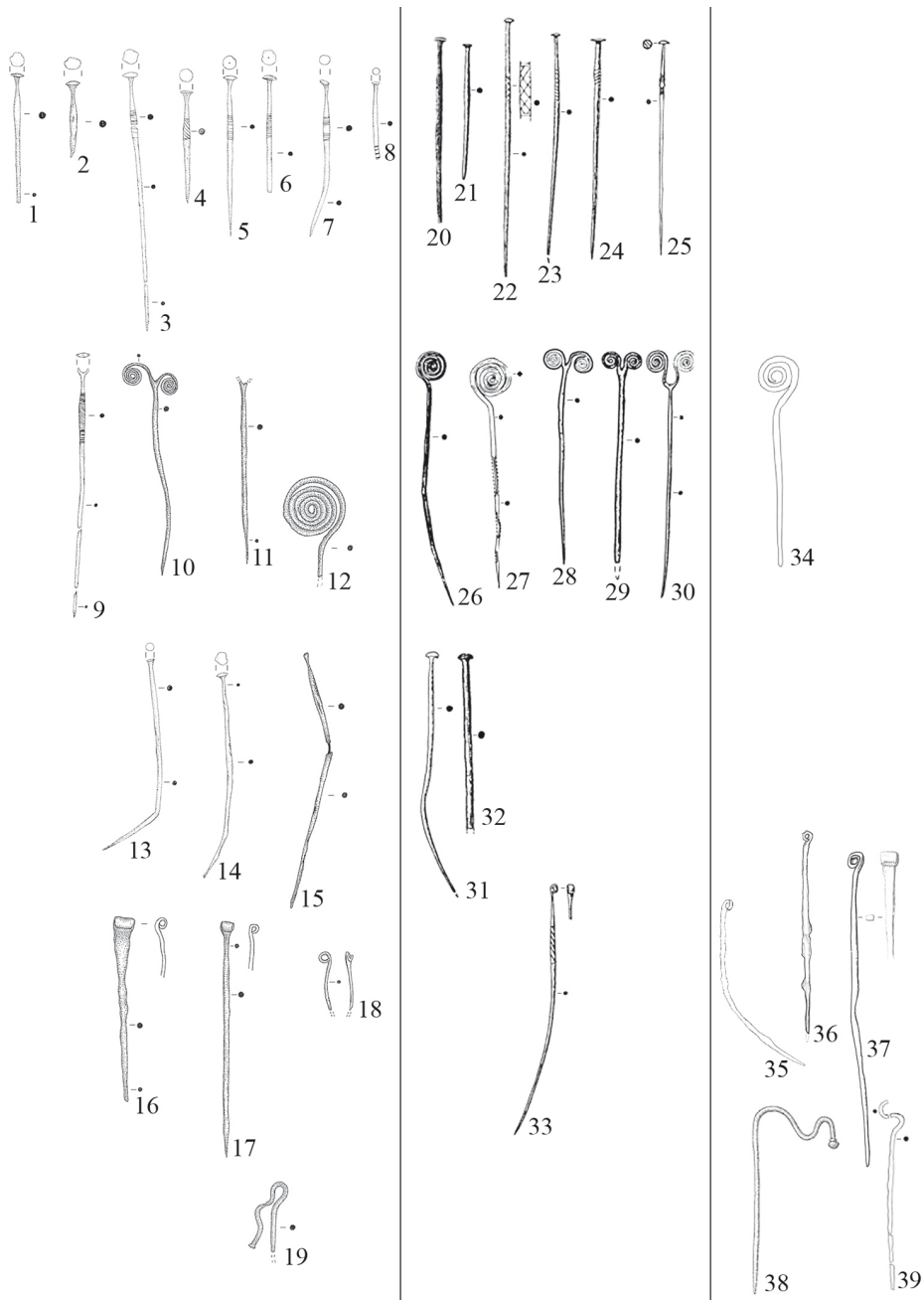
Bone arrowheads with a square section (Fig. 2: C, 29, 30) have analogies in Burial 1 of the Trinka necropolis, where there were also found biconical beads (Levitskiy and Kashuba 2009, 257-263). They are also widely represented in burials and settlements of the WPG (Fig. 2: B, 11) (Mogilov 2020, 144, fig. 6-49, 64, 111-112, 139, 148, 152-154) and burials of the Transylvanian group (Vulpe 1990, Taf. 42, D; 44, B, C; 45, A; 46, B, C). It is also possible to emphasize their uniqueness specifically for the Middle Dniester and Transylvania, although they are also known in other burials of the Dnipro Forest-Steppe.

*Adornments.* This category of material culture of the population that left the is dated by researchers to a wider chronological range than the items of weapons (Czopek 2019, 133). The pin collection, consisting of 21 items (Fig. 3: 1-19), was thoroughly analyzed in a special article (Adamik-Proksa and Ocadyga-Tokarczyk 2021). The researchers suggested dating the main array of pins to the end of the 7<sup>th</sup>–the beginning of the 6<sup>th</sup> century BC and refer the vast majority of them to Early Scythian time (Adamik-Proksa and Ocadyga-Tokarczyk 2021, 157).

According to the researchers, one pin (Fig. 3: 19) does not significantly correspond to the dating of the other products and was assigned to the type 24 according to V. G. Petrenko and, respectively, dated to the 4<sup>th</sup> century BC (Adamik-Proksa and Ocadyga-Tokarczyk 2021, 153, 156, fig. 2:4). Given that such pins are characteristic of Scythian burials exclusively in the Steppe, this exception can have two completely logical explanations: this is not a type 24 pin, but a deformed pin (?) with a small mushroom-shaped top or simply a blank product,



**Fig. 2.** Arrowheads from the Western Podolian group burials. A – Lenkovtsy, kurgan (after Smirnova 1993: fig. 1: 1-10); B – Dolyniany, kurgan 2 (after Mogilov 2020, 144: рис. 6, 54-64), C – Chotyniec (Burghardt 2020); D – Wicina (the numbers correspond with the numbers in the catalog – Gedl 2014)



**Fig. 3.** Pins from Chotyniec ash-hill (1-19), Western Podolian (20-33) and other cultural groups (34-39) (Adamik-Proksa and Ocadyga-Tokarczyk 2021; Mogilov 2021; Golec and Fojtik 2020; Bandrivskiy 2014; Krushelnitska 1976; Lifantii and Shelekhan 2018)

since even in the picture there are visible traces of artificial deformations (impact?) and in the description it is stated that it is “załamana” (broken). The second possible interpretation of this artefact is that before us is an Eastern Hallstatt product, which is known in Moravian burials in complexes of the period HaC2 (Fig. 3: 38-39) (Golec and Fojtík 2020, 110-111, 113, fig. 36, 15). The product could belong to the early group of pins from an ash-hill and can be dated to the middle-third quarter of the 7<sup>th</sup> century BC.

According to the authors of the article, a few more pins fall out of a chronologically complete collection (Adamik-Proksa and Ocadyrga-Tokarczyk 2021, 154-157). It is not possible to agree that the bronze pins (Fig. 3: 4, 8, 13) (Adamik-Proksa and Ocadyrga-Tokarczyk 2021, 149, fig. 1: 1, 4, 6, 154-155) generally date to the whole 6<sup>th</sup> century BC, because they are characteristic for the Early Scythian period. A bronze pin with the ends formed by a cut and rolled up (Fig. 3: 18) is broadly dated to the 6<sup>th</sup>-3<sup>rd</sup> centuries BC (Adamik-Proksa and Ocadyrga-Tokarczyk 2021, 157, fig. 2: 9). Products of a similar shape, which would date back to the second half of the 6<sup>th</sup>-5<sup>th</sup> centuries BC are made of iron (Grechko 2010, 98, 99). The bronze pins with a loop-shaped head are more characteristic of the Zhabotyń period (Andrienko 1996, 353-367).

The iron pins with the ends formed by a cut and rolled up (Fig. 3: 16-17) (Adamik-Proksa and Ocadyrga-Tokarczyk 2021, 157, fig. 2: 5, 7-8) are indeed quite common and have a broad dating. They cannot be used as a chronological indicator and an argument for other assumptions. The dating of products with wide dates is traditionally limited to those parts of the chronological intervals where they overlap with the dates of reliable chronological markers.

Direct analogies to the iron pins with the ends unbuttoned and rolled up come from the Severynivka hillfort (Fig. 3: 35-36) (Lifantii and Shelekhan 2016, 257, fig. 1: 32 44) and are dated exclusively to the Early Scythian period. In addition, the dating of the settlement does not go beyond the second quarter of the 6<sup>th</sup> century BC (Boltryk *et al.* 2021, 30). Taking into account the fact that all reliably dated materials from both layers of the ash-hill are not dated beyond the middle of the 7<sup>th</sup>-the first half (third?) of the 6<sup>th</sup> century BC, this associates these products with this period of time.

Relative to the lower date of the beginning of the functioning of the ash-hill, it can be noted that there are specimens of pins that can be dated even earlier than the end of the 7<sup>th</sup> century BC (Fig. 3: 1-2) (Adamik-Proksa and Ocadyrga-Tokarczyk 2021, 154, 149, fig. 1: 2, 9) and related to the time around the middle of the 7<sup>th</sup> century (Early KP) as well as single type arrowheads of Zhabotyń type (Andrienko 1996, 357). The researchers limit the lower chronological boundary of the functioning of the ash-hill to the end of the 7<sup>th</sup> century BC (Adamik-Proksa and Ocadyrga-Tokarczyk 2021, 168). However, in the analysis of these pins, analogies are given among the materials of the Pre-Scythian period (Adamik-Proksa, Ocadyrga-Tokarczyk 2021, 154). This allows us to agree with colleagues that the time of the beginning of functioning of the ash-hill can be dated to around the middle of the 7<sup>th</sup> century BC (Czopek 2021, 379).



It is worth noting two pins made of wire with heads in the form of two spiral discs (Fig. 3: 10, 11) (Adamik-Proksa and Ocadyryga-Tokarczyk 2021, 151, fig. 2: 1, 2). For the Eastern European Forest-Steppe, some types of pins are quite specific for certain groups (Grechko 2010, 98, 99). These two pins are characteristic of the WPG (Fig. 3: 28-30) (Smirnova 2006, 74), which is important in further cultural interpretation of the CA.

During the analysis of the pins, there is also a noticeable tendency to adjust the dating of archaeological materials to coincide with the  $^{14}\text{C}$ , and not the other way around (Adamik-Proksa and Ocadyryga-Tokarczyk 2021 157, 162-163). In general, the collection of pins, as well as arrowheads, is chronologically homogeneous.

Pins are not only chronological indicators, but they serve as ethnoarchaeological markers of trines, to which I have already devoted several works (Grechko 2010, 98, 99; 2021, 18, 19). The authors of the article note that as an ethnocultural marker, the complex of pins corresponds to the Forest-Steppe variant of the Scythian culture without further clarification (Adamik-Proksa and Ocadyryga-Tokarczyk 2021, 163). Although the “external” point of view immediately indicated to me the identity of the set from the WPG. This is indicated by the presence of very specific pins with double spirals, which among the Forest-Steppe population groups are found only in the WPG and is a specific characteristic of this group (Fig. 3) (Smirnova 2006, 74). The only specimen of such pin was found in TLC at a distance of 100 km from Chotyniec on the San (Kłyżów, Site 2) (Trybała-Zawiślak 2012, 165, pl. 35: 7). A similar shape of pins was quite common from the Caucasus to Western Europe (Maciejewski 2019, 25, fig 5). Therefore, we are talking about comparisons with neighbouring related tribal groups.

The researchers of Chotyniec certainly attribute this population group to the Forest-Steppe people (Czopek 2021, 381-383). A comparison of the pins with other Forest-Steppe groups makes it possible to single out the undisputed main contender for the “closest relative”. The Chotyniec hillfort pin complex is fully comparable with those of the WPG, considering the very specific products with double spirals.

The ash-hill of Chotyniec attracted close attention with massive finds of fragments of Greek amphorae in the “heart of the Europe” (Czopek 2019, 126, 127; Trybała-Zawiślak 2019, 268-272), which is extremely rare for Lusatian and Eastern Hallstatt contexts. Here it is worth noting that for Forest-Steppe sites of the Scythian period in the territory of Ukraine, such finds are mass material, and Chotyniec belongs precisely to this circle of monuments. The dating of the same Klazomenian amphorae today is established within the limits of the end of the 7<sup>th</sup>-the first third of the 6<sup>th</sup> centuries BC (Monakhov 2003, 45; Sergin 2004, 173-175). The set of amphorae fully corresponds with the finds in the Ivan-Puste and Zalissia settlements of the WPG (Daragan 2009, 119-147). This may indicate that the CH belongs to this exchange network with the ancient colonies of the Lower Bug region, which passed along the watershed of the left bank of the Dniester to Central Europe (Trybała-Zawiślak 2020, 107).

The thick-walled vessels with black surface of Hallstatt ware are important as in the case of the findings at the Nemyriv hillfort (Czopek 2021, 379, 380; Smirnova *et al.* 2018, 227, 231), the Trakhtemyriv settlement and the Ivan-Puste and Zalissia settlements (Darağan 2011, 525). Fragments of similar vessels were found in dugout 1-2 of the Nemyriv hillfort together with fragments of Greek imports, which allows them to be attributed to the phase III.1.3. of Nemyriv (Smirnova *et al.* 2018, 227, 231). We can agree with Sylwester Czopek that this vessel together with the arrowheads and pins allow us to assume the beginning of the functioning of Chotyniec in the second half of the 7<sup>th</sup> century BC (Czopek 2021, 379, 383).

It is worth noting that the artefacts and stratigraphy do not seem to correspond to the chronology of the 250–300-year functioning of the ash-hill. Using the example of the ash-hills of the Western Fortification of the Bilsk hillfort, Iryna Shramko came to the conclusion that the vast majority of ash-hills were formed in a period less than about 75 years, two were around 75 years old, and only ash-hill No. 5 (about 150 years old) is an exception (Shramko 2012, 171).

Therefore, the excavators of the Chotyniec hillfort are making attempts to explain the absence of late chronological stratigraphic layers by a post-deposition process, *i.e.*, the destruction of the upper late layers by ploughing, *etc.* (Burghardt 2020, 351). Regarding the last argument, that the layers of the second half of the 6<sup>th</sup>–3<sup>rd</sup> centuries BC were destroyed by ploughing (Czopek and Krąpiec 2020, 1609), I note that these layers are not traced on the slopes of the ash-hill on its edge, and these layers are well preserved according to the stratigraphy (Czopek and Krąpiec 2020, 1602, fig. 4). The periphery of ash-hills always contains later layers and complexes, which are fixed at the level of the ancient horizon. In addition, artefacts from destroyed layers remain in the ploughed layer with a slight displacement. For example, outside the ash-hills of the Western Fortification of the Bilsk hillfort, undisturbed layers from the latest period of existence of the fortification (the first half of the 5<sup>th</sup> century BC) were recorded under the ploughed layer by ploughing on the site of the ash-hill, which destroyed the mound itself. The presence of horizons of the second half of the 6<sup>th</sup>–the first half of the 5<sup>th</sup> centuries BC is always clearly visible in the complex of material culture, including antique imports and arrowheads. I will give an example of how the materials of this time should have looked at the CH hillfort, if it had functioned after the Early Scythian period during the second half of the 6<sup>th</sup>–first half of the 5<sup>th</sup> century BC. When the ash-hill No. 13 was investigated in 2008, the main preserved layers belong to the Early Scythian period and the transition period (horizons Band V according to I. B. Shramko). However, findings from the upper layers indicate the use of an ash-hill until the middle of the 5<sup>th</sup> century BC (Fig. 4) (Zadnikov 2009, 50–52).

Therefore, I consider the option of destruction without any traces and artefacts of the ash-hill layers, which would have been formed for more than 200 years, extremely unlikely. At the same time, I agree with Sylwester Czopek that we cannot completely exclude the presence of later layers in the unexplored part of the settlement (Czopek 2021, 383). Although, judging by the lack of traces of repair of the rampart and the cultural layer outside the ash-hill, the chances of such a discovery are minimal.

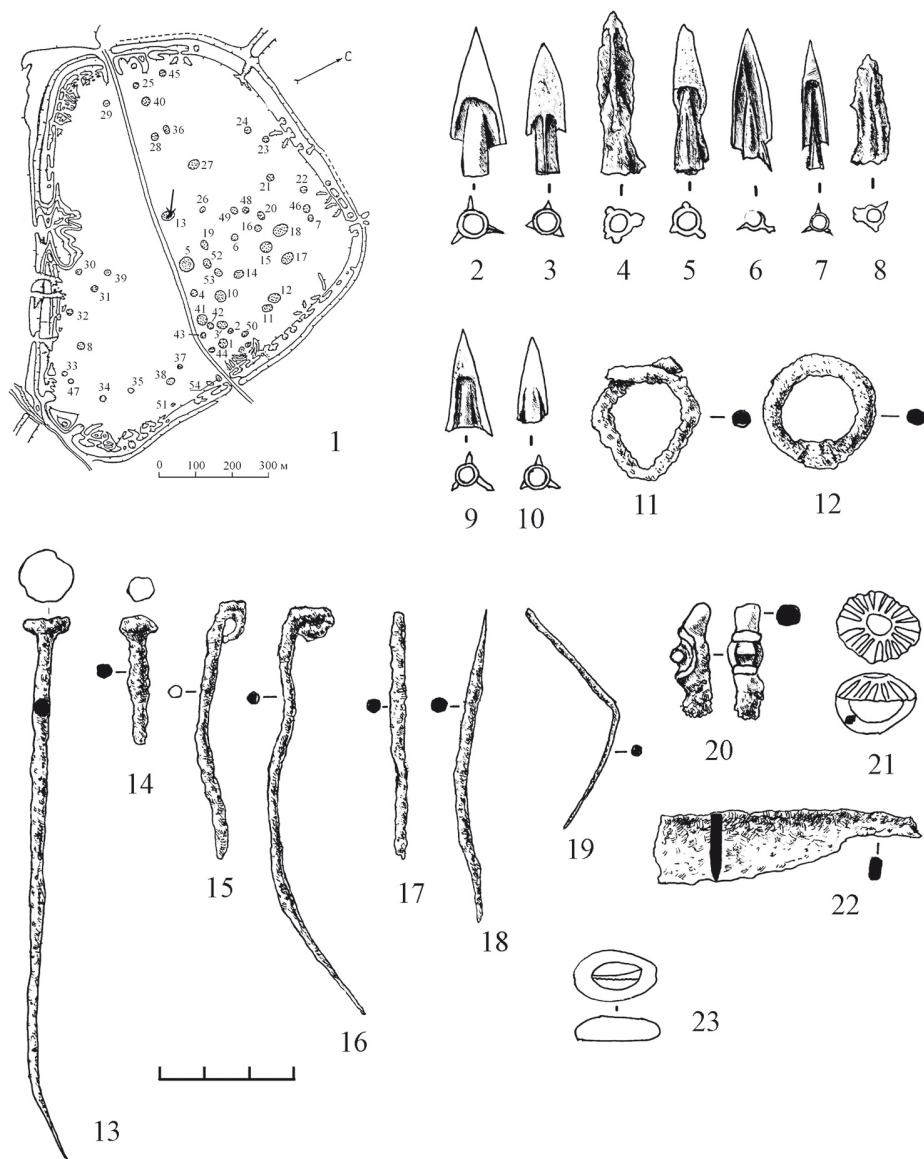


Fig. 4. Materials from the ash-hill No. 13, the Western fortification of Bilsk hillfort (Zadnikov 2009, 50-52)

The settlement Hruszowice, Site 2 and the Chotyńiec hillfort functioned at a very similar period as the results of radiocarbon dating of these sites show. Radiocarbon dates from the settlement Hruszowice, Site 2 cover the time range from the 10<sup>th</sup> to the 5<sup>th</sup> century BC (Adamik-Proksa *et al.* 2022, 267). The majority of the radiocarbon dates obtained from

Site 2 in Hruszowice belong to the period from the 6<sup>th</sup> to the 5<sup>th</sup> century BC. The situation is similar with the Chotyniec hillfort: “At the same time, the sites yielded no artefacts (especially metal objects) that could be unambiguously linked to this stage” (Adamik-Proksa *et al.* 2022, 268). Substantial parts of the settlements near Hruszowice have been excavated and we cannot expect to find the layers or complexes of the second half of the 6<sup>th</sup>-5<sup>th</sup> century BC. I suppose that the situation with unexcavated area of the Chotyniec hillfort will be the same.

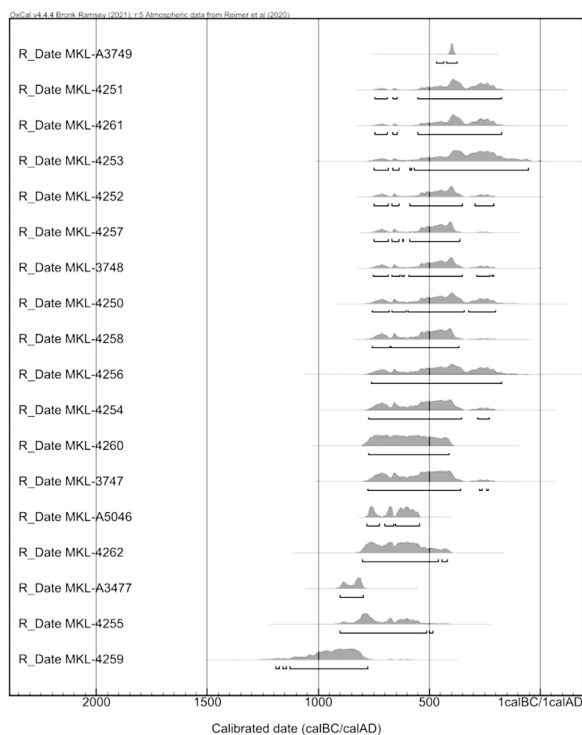
Therefore, typological analysis and stratigraphic observations allow us to draw conclusions on the relatively short period of operation of the ash-hill of the Chotyniec hillfort. The complex of finds is completely homogeneous with the presence of some archaic elements, which allows us to date the ash-hill to the middle of the 7<sup>th</sup>- the first third of the 6<sup>th</sup> centuries BC (Fig. 5).

## CHOTYNIC HILLFORT RADIOCARBON DATING

The issues of absolute the absolute chronology of Hallstatt C and D sites are caused by the so-called Hallstatt calibration plateau, which has actively been discussed since the early 1980s (Pearson *et al.* 1983). Labelled as “the 1<sup>st</sup> millennium BC radiocarbon disaster” (Baillie and Pilcher 1983), this plateau on the calibration curve results in wide calibrated ranges extended from c. 750 to c. 400 cal. BC. Various attempts to overcome these issues include combining <sup>14</sup>C dating with dendrochronology, stratigraphic or typological information (Rose *et al.* 2022) and wiggle-matching analysis (several <sup>14</sup>C dates for the same wooden sample corresponding to individual tree-rings) (Trias *et al.* 2020). However, precise absolute chronology of sites referred to the analyzed time period remains problematic.

Information was recently published on a cremation burial with biconical beads, which was investigated on the western edge of the Volyn’ Upland (Mikulin, Site 9, trench IV/2017, Feature 13). Radiocarbon dating only allowed its creation to be dated within the limits The Hallstatt calibration plateau: “At the same time, despite the objective impossibility of obtaining samples whose <sup>14</sup>C measurements would precisely determine the *terminus a quo* of the burial itself, the modelling implemented allowed the confidence interval for this event to be shifted from about 780-550 to about 610-340 BC (68.2%)” (Chmielewski *et al.* 2021, 558).

The absolute chronology of Chotyniec is based on 18 radiocarbon dates obtained in the Laboratory of Absolute Dating in Skala and Cracow, Poland for the ash-hill (Czopek 2021; Czopek and Krąpiec, 2020). This set includes three AMS and 15 largely overlapping conventional radiocarbon dates made from charred wood samples (Fig. 5). The approach presented by Sylwester Czopek and Marek Krąpiec (2020) naturally attempts to overcome the issue of wide calibrated ranges resulting from conventional dating and calibration curve effects with the application of Bayesian modelling.



**Fig. 5.** Radiocarbon dates obtained for Zolnik in Choryniec (raw data is derived from Czopek, 2021; Czopek and Krąpiec, 2020). Dates were calibrated according to the IntCal20 Northern Hemisphere atmospheric curve (Reimer *et al.* 2020) in OxCal, version 4.4.4 (Bronk Ramsey 2021)

Since the Bayesian approach to radiocarbon dating is based on user-inputted model chronology (*e.g.*, Harper, 2021), it is important to focus on the possible interpretations of the ash-hill. Sylwester Czopek and Marek Krąpiec (2020) interpret the earth and clay layers of the analyzed feature as being formed as a stratigraphic sequence. Three dates (MKL-4259, MKL-A3477 and MKL-4255) in their scheme are considered as predating the ash-hill. Two more dates (MKL-4262 and MKL-4260) are associated with the ash-hill's 'Phase 1'. The other ten dates are referred to its 'Phase 2', while the 'youngest' date is associated with the 'Phase 2'. An AMS radiocarbon date (MKL-A5046) obtained later is referred to the time of feature's construction (Czopek 2021, 380, 381).

Experience in research on ash-hills (Gershkovich 2004, 106-108, fig. 2) suggests an alternative explanation for the formation process of such features (Fig. 6).

According to the stratigraphy and planigraphy of ash-hills, such features could initially have functioned as houses. Their abandonment could have included ritual destruction, followed by covering remains of a dwelling with soil from the surrounding area. For

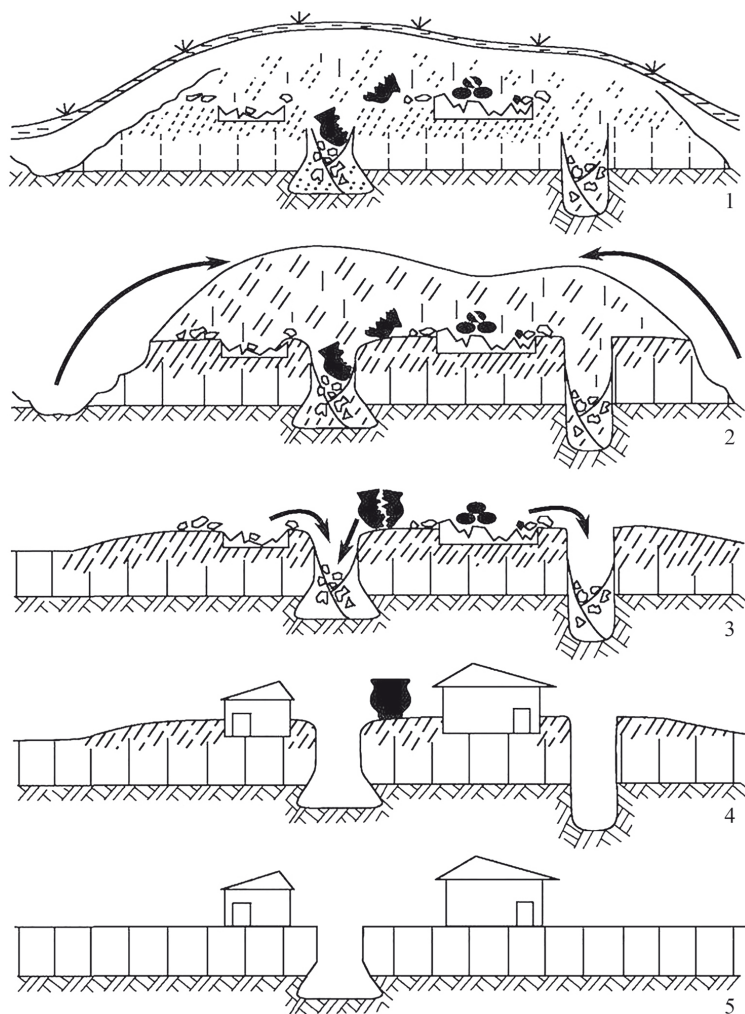


Fig. 6. Scheme of the formation of ash-hills of the Belogradovka type (Gershkovich 2004)

instance, the construction, functioning and abandonment of a house resulted in ash-hill formation may be exemplified by the excavations on Tzarina Mogyla tract in 2016-2017. The dwelling at this site collapsed in a fire, the temperature of which was high enough to fire the clay of the walls. Further on, the area with collapsed walls was turned into a garbage place accumulating ash from ovens and open fire-places, bones, pottery fragments *etc.* Later development of the site structure resulted in the construction of a rampart above the ash-hill. The finds from the dwelling remains and ash stratum are dated to the end of the 7<sup>th</sup>- the middle of the 6<sup>th</sup> centuries BC (Grechko *et al.* 2018, 42-74). Numerous fragments of

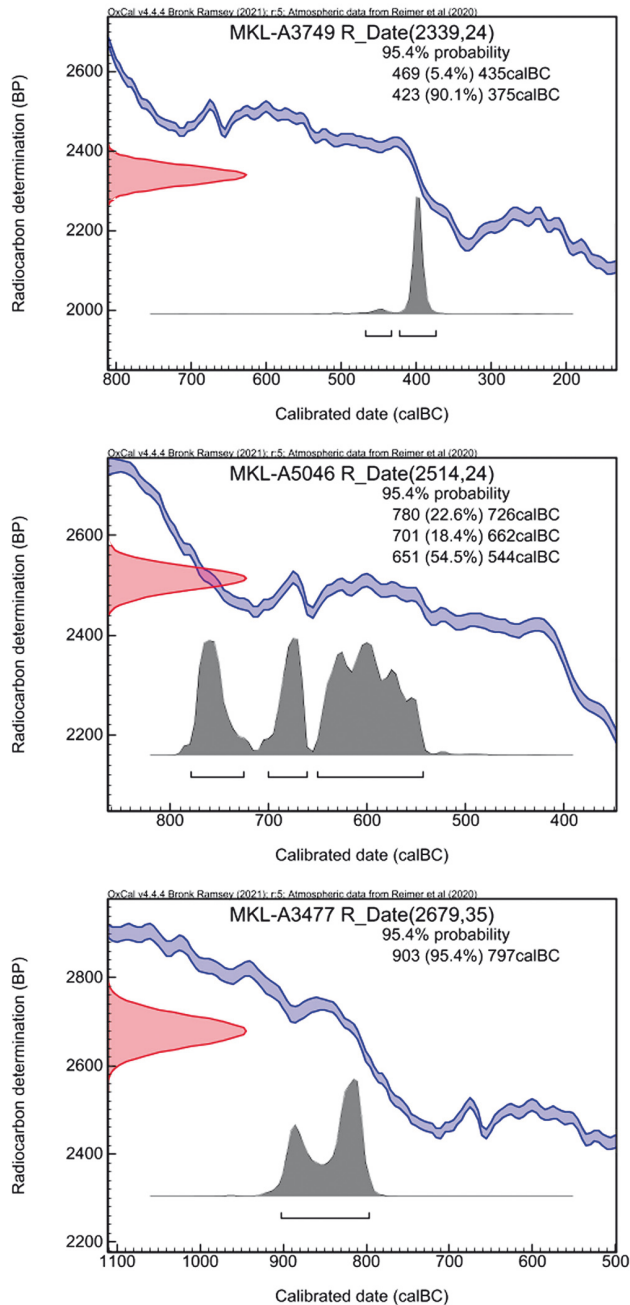
burnt daub come from the excavations of the majority of the Forest-Steppe hillforts and settlements (for example: Ganina 1965, 106; 1984, 69). Considering the experimental research on house destruction, which confirmed the deliberate burning of dwellings, the issue of ritual house abandonment among populations of the Eastern European Forest-Steppe is a promising topic for further research.

The initial functioning of the discovered ash-hill in Chotyniec as a house is confirmed by the significant amount of burnt daub (nearly 30,000 fragments) coming from its excavations (Fig. 7) (Czopek *et al.* 2017, 299, fig. 15; Czopek 2019, 125).

Covering the wooden construction of walls with clay in the Iron Age does not surprise when considering the recently increasing evidence on long-term traditions of wattle-and-daub architecture in the Neolithic and Bronze Age of Central Europe (*e.g.*, Balcer 2012; Bánffy and Höhler-Brockmann 2020; Diachenko *et al.* 2021; Jaeger and Strózyk 2015; Pastor Quiles 2022). Field observations and experimental research identify the degree and duration of heat effects as two factors conditioning formation of the burnt daub (*e.g.*, Chernovol 2012; Johnston *et al.* 2018; 2019). High temperature impacting the construction over relatively short time does not result in burnt daub preservation. Low temperature, even impacting the construction during a relatively long time, leads to the preservation of its elements as layers of clay. In our case, this evidence suggests house burning as a component of its ritual abandonment.



Fig. 7. The burnt daub from ash-hill of the Chotyniec hillfort (Czopek *et al.* 2017)



**Fig. 8.** AMS radiocarbon dating of Zolnik Chotyniec (raw data is derived from Czopek 2021; Czopek and Krąpiec 2020). Dates were calibrated according to the IntCal20 Northern Hemisphere atmospheric curve (Reimer *et al.* 2020) in OxCal, version 4.4.4 (Bronk Ramsey 2021)



The important details of house burning and covering its remains with soil from surrounding area may be addressed referencing the experiment in building, burning and excavation of the model of Eneolithic Cucuteni-Trypillia wattle-and-daub house in Nebelivka, Ukraine (Johnston *et al.* 2018; 2019). The collapse of the walls in this experiment did not occur simultaneously. Instead, wall sections were falling one after the other. It is also important to underline that the bottom part of the windward wall was standing for the longest time, even despite a high overall temperature of house burning. Moreover, a good preservation of a significant amount of the burnt daub requires an additional fuel usage, which indicates the deliberate (ritual) house burning (Johnston *et al.* 2019).

After recording the house model's burning process, its remains were covered with soil by the local workers. Further excavations have shown that this resulted in multiple re-depositions. Therefore, despite the general stratigraphic sequence reflecting the house destruction process, it is impossible to associate every single piece of charcoal with the house building (elements of wooden construction) or burning (additional fuel) (Johnston *et al.* 2018).

Extrapolation of this evidence to the ash-hill in Chotyniec mostly excludes the association between charcoal samples and feature's layers (where clay layers, most probably, represent the remains of walls burnt in low heating). A single stratigraphic "phase" may include charcoals associated with house construction, functioning (charcoals and ash accumulated outside the dwelling and redeposited to its remains with soil), and destruction. For instance, the "oldest" MKL-A3477 and MKL-4259 dates may either reflect natural event(s) predating the site, or the impact of the "old wood effect". The "youngest" MKL-4251 sample corresponds to the Layer 3 which postdates ash-hill's functioning in the scheme proposed by Sylwester Czopek and Marek Krąpiec (2020). However, this date may also be referred to the preceding "phases" based on the presented understanding of the ash-hill formation process.

To sum up, consideration of the "old wood effect" and various assumptions based on "good guesses" regarding the association of a particular sample to the time of dwelling construction, burning or ritual abandonment results in different dating of these "phases" with the application of Bayesian modelling. In order to avoid such "good guesses", the most general conclusions regarding the Chotyniec absolute chronology are derived from the distribution of three AMS radiocarbon dates (Fig. 8). The oldest (MKL-A3477; 903-797 BC) and the youngest (MKL-A3749; 469-375 BC) ones, both not associated with archaeological evidence at the site, respectively, predate and postdate the hillfort's functioning. One more date (MKL-A5046) indicates the house construction in the range of 780-544 BC.

Thus, the Chotyniec ash-hill is dated to the time range, which does not exceed the interval of 780-469 BC. Given the commonly known but often forgotten fact that one date represents a particular second of a particular minute, month and year, all the other dates fit this interval. The only exception is represented by the MKL-4259 date reflecting

a natural event predating the site or caused by the “old wood effect” (Fig. 8). Precise dating of the site’s functioning is possible only through consideration of archaeological chronological indicators.

## THE PLACE OF THE CHOTYNYEC HILLFORT IN THE CULTURAL-CHRONOLOGICAL SYSTEM OF THE EARLY IRON AGE SITES IN CENTRAL AND EASTERN EUROPE

On the basis of the analysis of neighbouring cultural groups of the late Hallstatt period (first of all Cherepin-Lagodivand Lezhnica groups), Sylwester Czopek considers two main variants of interpretation of the Chotyniec hillfort. The first approach presumes its separation into “the Chotyniec complex” distinguished from the WPG. According to the researcher this is supported by the fact that, although both groups came at the same time, but the CA existed longer. The second approach is to recognize the Chotyniec hillfort as part of the WPG. The territorial discontinuity maybe explained by the poor state of exploration of the intermediate territory (Czopek 2021, 99).

The above data indicate that today there are no reliable grounds for dating the existence of the Chotyniec agglomeration beyond the middle of the 7<sup>th</sup> – the first half (third?) of the 6<sup>th</sup> century BC. This is fully consistent with the Early Scythian time and WPG dating. After I have defined my position on the dating of the Chotyniec hillfort, it is important to concentrate on defining this group of sites among synchronous cultural groups.

Sylwester Czopek rightly notes that the historical fate and time of functioning of Forest-Steppe settlements was different (Czopek 2021, 383). For the Motronin hillfort, the upper chronological limit is set within the first half of the 5<sup>th</sup> century BC (Bessonova and Skoryi 2001, 125), and for the Khotiv hillfort – the third quarter of the 6<sup>th</sup> century BC (Daragan 2005, 260, 261) or the last quarter of the 6<sup>th</sup> century BC (Kravchenko 2017, 120). The Trakhtemyriv settlement has a fairly clear date of the end of functioning as a result of the assault and also does not survive the middle of the 6<sup>th</sup> century BC (Fialko and Boltryk 2003, 89). It is worth noting that these hillforts are located in the Dnipro Forest-Steppe Right Bank (Fig. 1).

For the Eastern Podillian group and WPG, the situation looks somewhat different. Sites of both groups do not survive to the middle of the 6<sup>th</sup> century BC.

**Western Podillian group (WPG).** The time of functioning of the group was determined by G. Smirnova to around the middle of the 7<sup>th</sup> – beginning of the 5<sup>th</sup> centuries BC. The upper (later) date was based only on one complex from Verkhnikh Panevtsov. A. D. Mogilov argued that this complex was re-dated to the first half – the middle of the 6<sup>th</sup> century BC (Mogilov 2010, 124). In addition, G. Smirnova noted that no other late materials were found, neither in the graves, nor in the settlements on the Middle Dniestr (Smirnova 1993, 116; 2006). Greek pottery from the settlements of the WPG was considered by M. Daragan

and dated to the middle of the 6<sup>th</sup> century BC (Daragan 2009, 123, 124). M. Bandrivskiy dates the latest sites of the WPG (stage IIIb) to first quarter of the 6<sup>th</sup> century BC (Bandrivskiy 2014, 308).

**Eastern Podillian group.** In the first comprehensive publication of the latest research, the dating of the Severynivka hillfort from the end of the 7<sup>th</sup> century to the end of the 5<sup>th</sup> century BC (Ignaczak *et al.* 2016) looks like a technical error; the upper chronological limit of this fortification is established in the specialist work as not later than the second quarter of the 6<sup>th</sup> century BC (Boltryk, Ignaczak, Lifantii, Shelekhan 2021, 30). Accordingly, the materials of the Severynivka hillfort, as well as Nemyriv (Smirnova *et al.* 2018, 235), do not exceed the first half of the 6<sup>th</sup> century BC.

In general, it is worth noting the absence of traces of repair of the rampart of the Chotyniec hillfort (Czopek *et al.* 2017, figs 8 and 9), which would have occurred if the hillfort had been functioning for 250-300 years (Czopek and Krapiec, 2020, 1609). Here it is also worth noting that the lower chronological limit near the middle of the 7<sup>th</sup> century BC is unlikely to be suppressed, because fortifications are not characteristic for the Zhabotyn period and only open settlements are known (Daragan 2011, 734-737). Large hillforts, including Chotyniec (with its area of about 30 hectares), arise no earlier than the second half of the 7<sup>th</sup> century BC (Daragan 2011, 738-740). The Chotyniec hillfort in terms of parameters has the closest analogues on the Middle Dniestr – Rukhotyn (Mogilov 2010, 121, fig. 14: 2).

The emergence of the Chotyniec agglomeration cantered on the hillfort fully corresponds to the main trends of ethno-cultural development and socio-cultural transformations in the environment of the Forest-Steppe population of the Early Scythian period. This also applies to the upper chronological limit of the functioning of the Chotyniec hillfort. Today, there are no reliable arguments that would confirm its functioning after the middle (the end of the first third?) of the 6<sup>th</sup> century BC, which corresponds to the rhythms of the development of settlement structures of the Dniestr-Dnipro Forest-Steppe (the disappearance of both Podillian groups).

We must emphasize that we are talking about the end of the existence of the sites of the Forest-Steppe population of the so-called Scythian cultural circle in the territory of south-eastern Poland. Regarding the continued functioning of the Chotyniec “enclave” in the second half of the 6<sup>th</sup>–4<sup>th</sup> centuries BC (Czopek 2021, 384), I will note the following. No materials from this time have yet been found at the Chotyniec hillfort and Hruszowice settlement (Adamik-Proksa *et al.* 2022, 268).

In this context, the TLC site Grodzisko Dolne Site 22 deserves attention (Czopek 2007). Indeed, this site includes materials that were not discovered in Chotyniec. This is precisely what indicates that the Chotyniec enclave as a site of the Forest-Steppe population ceases to function, while Site 22 in Grodzisko Dolne (TLC) continues (starts?) to function. The presence in Grodzisko Dolne, Site 22 of Forest-Steppe eastern elements may just indicate that at least partially the Chotyniec population merged into the local TLC group and was gradually assimilated.

The available material analyzed above and other data indicate a synchronous emergence of Chotyniec agglomeration and the WPG. In addition to pins with double spiral heads from the Chotyniec hillfort, pins from Hruszowice Site 2 settlement “are known from the inventories of the WPG of the Early Scythian culture”, and “whose decoration is generally exclusive for the artefacts of the WPG of the «Early Scythian culture» (comp. Smirnova 2004, 423, 424)” (Adamik-Proksa 2022, 280, 281, 392, pl. 84: 2).

Iron pins with rolled plain ends are interesting. Similar items are unknown in the WPG but are known among the materials of the Cherepin-Lagodiv group (Fig. 2: 37) (Krushelnitska 1976, 41, fig. 39, 20) and Late Vysocka culture (Bandrivskiy 2014, fig. 85: 1, 2; 94: 8). This indicates a close interaction of these tribal groups of the region.

Pins as an important ethno-tribal marker indicate the closest proximity of the population that left ash-hill to the WPG and contacts with neighbouring Cherepin-Lagodiv group populations.

In the mound of the Chotyniec ash-hill a large amount of burnt clay plaster was found (Fig. 7) (Czopek *et al.* 2017, 299, fig. 15; Czopek 2019, 125), which may indicate that the ash-hill, as in most cases in the Forest-Steppe, represents the remains of a wattle-and-daub construction, possibly a dwelling. It is worth noting that no traces of ritual activities (altars and sacrifices) were found, and the materials have a pronounced domestic character (garbage). Ground-level dwellings of wattle-and-daub construction are well known in the WPG, for example at Zalissia and Ivan-Puste (Ganina 1965, 106; 1984, 69). The WPG, like the Chotyniec hillfort, arose as a result of the movement of the Forest-Steppe population to the west at the beginning of the Early Scythian period (Mogilov 2020, 135).

Given the similar sets of amphorae (dating and sources) with the above settlements, the Chotyniec hillfort was a part of a trade (exchange) route from the Greeks to Central Europe which runs along the Dnister-San line, and was very important for Baltic-Pontic contacts during the Early Iron Age (Czopek 2019, 123; Trybała-Zawiślak 2020, 107). Logic suggests that this could be the reason for the removal of the Chotyniec hillfort by tribes related to the WPG population to such a distance from the main range. At the same time, it cannot be ruled out that the situation will change with the start of active research on the sites of the Early Iron Age in the region of modern Lviv.

The term “Chotyniec enclave” is very apt, but it is too early to state the degree of isolation and specificity of the territory of the Lviv region without further research of the Early Iron Age sites and to answer the question of which group’s enclave is the Chotyniec hillfort.

**Campaigns to Central Europe.** In addition to the same processes that led to the emergence of a group, the groups also have a similar ending. For some time, the researchers have assumed the participation of the WPG population in campaigns in the Lusatian and Eastern Hallstatt lands (Chochorowski 2014, 43). The researchers of the Chotyniec assume the participation of its population in these actions of nomads (Czopek 2021, 384). Sylwester Czopek supports M. Burghardt’s conclusion (Burghardt 2020, 353), that arrow-

heads from the Chotyniec ash-hill are similar to those found in Wicina (Czopek 2021, 384). I cannot agree with the proposed opinion. I should again draw the attention of researchers to my article, where arrowheads from the layers of destruction are analyzed (Grechko 2020a). The arrowheads of the ash-hill of the Chotyniec hillfort do not belong to the time of the destruction of hillforts in the Lusatian and Eastern Hallstatt lands, but fully correspond to the Kelermes period (Fig. 2: A, B) (Grechko 2013, 133-154; 2020a, 12-19). The complete absence of arrowheads in the collection, even of the transition period (Fig. 2: D), as in the settlements and hillforts of the WPG, once again indicates that these groups did not experience nomadic migrations to the west. It is very likely that the end of the Chotyniec hillfort and both Podillian groups is precisely connected with this global destabilization of the military-political situation around the middle of the 6<sup>th</sup> century BC in the broad areas of Eurasia.

It is interesting to consider the probable participation of the population of Chotyniec hillfort in the campaign to the west along the northern slopes of the Carpathians. This direction of movement of nomads is known in the Middle Ages (Świętosławski 1997) and should be taken into account in the reconstructions, since I preferred following Jan Chochorowski regarding the way to Wicina through Moravia and “Štramberk-Kotouč-Čertovádra” (Chochorowski 2014, 32).

It is quite probable that the movement by different vectors, even simultaneous movement of different groups of nomads (Fialko and Boltryk 2003, 352). It is worth noting that, in addition to nomads from the Transcaucasia, semi-nomads of the Forest-Steppe could most likely take part in the campaign. The participation of the settled agricultural population of the Forest-Steppe raises serious doubts. Further research will show if the residents of the Chotyniec agglomeration were victims of or forced (?) participants in the aggression. The only important conclusion is that after the campaigns, nobody returned to the Chotyniec hillfort.

### TLC tribes: life without Chotyniec (HaD2-3)

TLC tribes definitely continued inhabiting the region during the HaD2-3, which stands out due to finds typical for the Vekerzug culture. I have already indicated that complexes of the Tarnobrzeg Lusatian culture of this time (Obojna-Zaosie, Burial 10; Trójczyce, Burial 102; Ulanów-Zwolaki, Łagiewniki, Burial 7/59) could be distinguished by the presence of specific types of arrowheads in the burials (Gedl 2014, 57, 58) typical for the Vekerzug culture (the Vitova Mohyla horizon and the first phase of the Middle Scythian time according to D. S. Grechko 2016a; 2016b; 2020b). The issue of the population density of the TLC region after the “Scythian” campaigns and the disappearance of the Chotyniec agglomeration requires a special study.

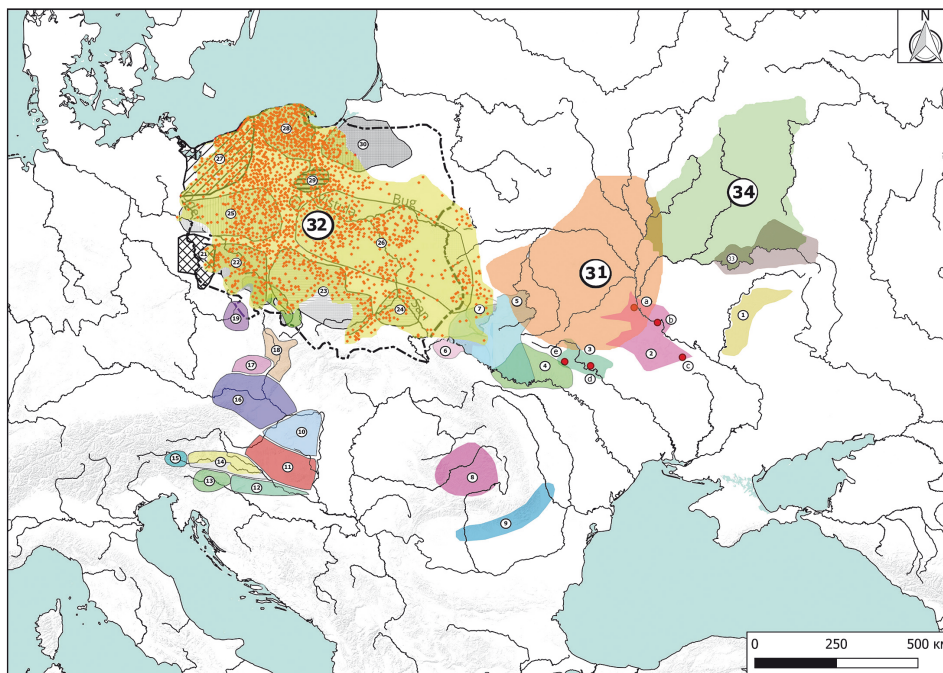
This horizon includes materials from the TLC with Grodzisko Dolne, Site 22 (Czopek 2007). The ceramic complex of this site has the following characteristics: there is practi-

cally no sticky roller, cauldron-shaped pots dominate, almost all the pots have a rusty outer surface -about 56% (Czopek 2007, 183, tab. 9), bowls with pin holes and rollers are single, like this type of cooking ware in general (Czopek 2007, pl. 14, 15, 20, 37: 2). It is interesting that a significant percentage of vessels with a rusted surface is known in the Lezhnica group. L. Krushelnitska pointed out the proximity of similar ceramics in the adjacent territories of Poland, the left-bank of the Western Bug, Hrubieszów County (Krushelnitska 1976, 63-65). There are no dated materials in the materials of the Lezhnica group. It was dated to the Pre-Scythian and Early Scythian times according to the ceramic complex (Krushelnitska 1976, 67-69). The ceramics with a rusted surface are represented among the ceramic complex of the Shankiv Yar settlement (Kozak 2012, 25-27). D. Kozak interpreted the cultural group to which this settlement belongs as a “new cultural community encompassing part of the Tarnobrzeg group of the Lusatian culture, the Lusatian culture in the basin of the Bug River, western Volhynia and a part of the Circumcarpathia” (Kozak 2012, 34, 35). A. Bardetskyi notes “that the ceramic style of the Khrinniki sites is a style of the Western model, the focus of which was the South Baltic basin, and represented in the Late Bronze Age and the Early Iron Age by the Lusatian culture... It is telling in this context that in the following eras, the natives of these territories also brought to Volyn’ ceramics with a rusted surface (Pomeranian, Przeworsk, and Wielbark cultures)” (Bardetskyi 2019, 18, 19). The researcher proposed considering Shankiv Yar and Lezhnica-type sites as the Lezhnica horizon of the Ulvivets-Lezhnica group of Lusatian culture (Bardetskyi 2019, 20, 21). TLC researchers point out an important thing: “The abovementioned Tarnobrzeg group of the Lusatian culture in its youngest phase has similar characteristics” like “Volhynian culture of the Early Iron Age” (the Khrinniki type according D. Kozak) (Czopek 2021, 91).

The arrowhead from the Shankiv Yar settlement (Kozak 2012, 31, fig. 10: 4) indicates the synchronicity of the materials from Grodzisko Dolne, Site 22 and the dating of the Vitova Mohyla horizon (530/520 BC, HaD2). This indicates similar trends in the development of eastern and southeastern Lusatian culture groups after the nomadic campaigns around the middle of the 6<sup>th</sup> century BC.

It can be observed that sites with rusted ware reflect the strengthening of the South Baltic influence (Pomeranian, Cloche graves) (Bardetskyi 2019, 18, 19) in the second half of the 6<sup>th</sup> – beginning of the 5<sup>th</sup> centuries BC, which is consistent with the HaD2-3 phase. The strengthening of influence was also associated with the direct migration of the Pomeranian population to the south and the formation of syncretic population groups during the 7<sup>th</sup> century BC – Cloche graves (Fig. 9) (Dzięgielewski 2016, 22), and in the Bug basin and Transnistrian region, it is fixed by the appearance of the Lezhnica group of sites, which also has an eastern Forest-Steppe component. Even further south, this influence is detectable on the sites of the youngest phase of the TLC (like Grodzisko Dolne, Site 22).

The period after the campaigns and the abandonment of Chotyńiec agglomeration may be worth highlighting in the period of development of TLC III 1b or suppressing phase



**Fig. 9.** The movement of the “forest” cultures to the south (HaD2-LtA) comparing with previous period (Fig. 1). 31 – Mylograd culture; 32 – Pomeranian culture and area of the penetration of their carriers (Dzięgielewski 2016); 33 – Seym group; 34 – Yukhnove culture (<http://www.encyclopediaofukraine.com/display.asp?linkpath=pages%5CY%5CU%5CYukhnoveculture.htm>)

III/2 to the second half of the 6<sup>th</sup>-5<sup>th</sup> centuries BCE, which does not contradict the dating of chronological indicators from the complexes of the late phase of TLC (arrowheads). This topic needs special research.

Researchers in recent years have not considered climate change to be the main factor in the migration of Pomeranian tribes to the south (Dzięgielewski 2010, 173; Trybała-Zawiślak 2019, 356, 357). One of the main reasons for the movement to the south was a significant increase in the number of the population of the Pomeranian culture during the HaD, and it was the lack of agricultural land that could push the movement to the south (Dzięgielewski 2010, 189). It is interesting that the migration took place to the territory of the TLC tribes, which occupied identical ecological niches (Czopek 2005; Trybała-Zawiślak 2019, 356), which should definitely lead to a conflict. If we do not take into account the climatic factor as the main trigger for the movement of the Pomeranian tribes to the south, it can be assumed that this movement could be due to the weakening of the Lusatian tribes due to the campaigns of nomads around the middle of the 6<sup>th</sup> century BC. This could have attracted an excess of Pomeranian population. In this context, the changes

in the composition of livestock of the Pomeranian culture (the main role was played by sheep, goat and horse) in burial traditions (the use of parts of animal carcasses) look interesting, which rightly evoked analogies with the spiritual culture of nomadic peoples (Czopek 2005b, 225, 226; Trybała-Zawiślak 2019, 356). These significant changes are characteristic of the post-migration HaD2-3 in Central Europe, which will certainly be at the centre of future discussions.

It can be concluded that the migrations of nomads to Central Europe in the middle of the 6<sup>th</sup> century BC, which were connected with climate change (Grechko *et al.* 2021, 338, 339), significantly shaped the ethno-cultural map and gave impetus to new trends in the development of the tribes of entire regions. For the territory of modern Poland and Volyn this was reflected in crisis phenomena among Lusatian tribes, the penetration of Pomeranian population groups to the south, and the formation of new syncretic population groups (Dzięgielewski 2016, 32).

Not later than the V century BC, the part of the former territory of the Eastern Podillian group was occupied by forest tribes of the Mylograd culture (Fig. 9; Lobay 1977; Bardetskiy 2019). The activation of the forest population is recorded in the Dnipro region as well. It was at this time that the infiltration of the population took place, which left sites of the Pidhirtsi type (a variant of the Mylograd culture?), in the second half of the 6<sup>th</sup> century BC to the south (Maksimov and Petrovskaya 2008). Perhaps the Forest-Steppe tribes suffered much more as a result of nomadic campaigns through their lands, which allowed the Forest tribes to start moving south. But this is the subject of my future special study. The continuation of a similar vector of development in the 3<sup>rd</sup> century BC was the formation of Zarubinet culture.

## CONCLUSIONS

1. Dating of the Chotyniec hillfort according to archaeological evidence (typo-chronological approach) does not cause difficulties because the material culture complex is homogeneous. The typological analysis of the collection allows us to conclude on the relatively short period of operation of the ash-hill of the Chotyniec hillfort. The complex of finds makes it possible to date the ash-hill to the middle of the 7<sup>th</sup>–the first third of the 6<sup>th</sup> century BC. Revision of dating and determination of individual types of pins do not allow us to consider them as reliable grounds for asserting that the object functioned up to the 4<sup>th</sup> century BC.

2. Analysis of <sup>14</sup>C dating of the Chotyniec, show that we can date it to the time range, which does not exceed the interval of 780–469 BC. It is important to emphasize that the real absolute dating of the ash-hill can refer to any part of this interval. The dating proposed above according to archaeological data (typo-chronological approach) fully corresponds to the specified range.



Therefore, the typo-chronological approach narrows the radiocarbon dating of Chotyniec functioning to the middle of the 7<sup>th</sup> – the first third of the 6<sup>th</sup> century BC.

In my opinion, preference should be given to the dating of artefacts, and <sup>14</sup>C dating should be used as an auxiliary method for determining the absolute dating of the Chotyniec, given the impossibility of specifying the dating through the so-called Hallstatt calibration plateau.

The above data indicate that today there are no reliable grounds for dating the existence of the Chotyniec agglomeration beyond the middle of the 7<sup>th</sup> – the first half (third?) of the 6<sup>th</sup> century BC (HaC2-HaD1). This is fully consistent with the Early Scythian time and WPG dating. The analysis of material culture allows us to talk about the closest proximity of the Chotyniec hillfort to the WPG. Nowadays the term “Chotyniec enclave” is aptly used. Only new studies of the Early Iron Age sites of the territory and group will give an answer to the question whether it was an enclave of the WPG.

3. Clarifying the time of the disappearance of the Chotyniec hillfort allows us to more clearly characterize the changes that took place in the region after the campaigns to the west around the middle of the 6<sup>th</sup> century BC (HaD2-3). The enclave of the Forest-Steppe population near Chotyniec ceased to function. The population of TLC and neighbouring groups of the Lusatian culture were left in place, but the appearance of a crisis in the development of the settlement structure and material culture are clearly visible. Eastern and northern elements are clearly visible among the materials of the Lusatian settlements of this time. The strengthening of the eastern component can be explained by the assimilation of the Forest-Steppe population after the disappearance of the Chotyniec hillfort, the WPG and Eastern Podillian group. The northern component is associated with the beginning of the penetration of the forest Pomeranian population to the south in the area affected by the nomadic campaigns on the lands of Lusatian and Mylograd tribes to the territory of the Eastern Podillian group and the Kyiv Dnipro region.

Such reconstructions would be impossible if we believed in the existence of the Chotyniec hillfort before the 6<sup>th</sup> century BC according to <sup>14</sup>C Dating. This, once again, confirms the superiority of dating according to archaeology (typo-chronological approach) within the so-called Hallstatt calibration plateau time range.

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## References

- Adamik-Proksa J. and Ocadyrga-Tokarczyk E. 2021. Problem chronologii zolnika z grodziska w Choćnińcu i tworzących go poziomów użytkowych w świetle badań nad klasyfikacją i datowaniem szpil. *Przegląd Archeologiczny* 69, 147-169.
- Alekseev A. Yu. 2003. *Khronografiya Evropeyskoy Skifii VII-IV vekov do n.eh.* Sankt-Peterburg: Izdatelstvo Gosudarstvennogo Ehrmitazha.
- Andrienko V. P. 1996. Bulavki s poseleniya u s. Pozharnaya Balka. In O. B. Suprunenko (ed.), *Bilskoe gorodische v konteksti vivchennia pamiatok rannogo zaliznogo viku Evropi.* Poltava: Arkheolohiya, 353-358.
- Baillie M. G. L. and Pilcher J. R. 1983. Some observations on the high-precision calibration of routine dates. In B. S. Ottaway (ed.), *Archaeology, dendrochronology and the radiocarbon calibration curve.* Edinburgh: University of Edinburgh, 51-63.
- Bajda-Wesołowska A., Bochnak T. and Hozer M. 2014. Bogaty grób kobiety z wczesnej epoki żelaza odkryty w miejscowości Zabłotce, pow. Jarosławski, stan. 27. *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 35, 105-125.
- Balcer B. 2012. *Budownictwo mieszkalne i gospodarcze w neolicie ziem Polski.* Warszawa: Instytut Archeologii i Etnologii PAN.
- Bandrivskiy M. 2014. *Kulturno-istorichni protsesi na Prikarpatti i zachidnomu Podilli v piznii period epokhi bronzi – na pochatku dobi rannogo zaliza.* Lviv: Natsionalna Akademiya Ukrainy, Institut Ukrainoznavstva im. Kripiakevicha.
- Bánffy E. and Höhler-Brockmann H. 2020. Burnt daub talking: The formation of the LBK longhouse (a work hypothesis). *Quaternary International* 560-56, 179-196.
- Bardetskiy A.B. 2019. Etyudi do kharakteristiki poselennia rannozaliznogo viku Hrinniki – Shankiv Yar. *Arkheolohiya i daviya istoriya Ukrainy* 1(30), 5-22.
- Bessonova S. S. and Skoryi S. A. 2001. *Motroninskoe gorodische skifskoy epokhi (po materialam raskopok 1988-1996 gg.).* Kyiv, Krakov: Natsionalna Akademiya Ukrainy Institut Arkheologii, Yagiellonskiy Universitet Instytut Arkheologii.
- Boltryk Yu., Ignaczak M., Lifantii O. and Shelekhan O. 2021. Chronological column of the Early-Scythian monuments in Eastern Podolia. In M. Stasiak-Cyran and S. Sadowski (eds), *XXXVI lubelska konferencja: Badania archeologiczne w Polsce środkowowschodniej, zachodniej Białorusi i Ukrainie: streszczenia referatów. 26-27 maja 2021 roku.* Lublin: Instytut Archeologii UMCS w Lublinie, Muzeum Narodowe w Lublinie, 30-31.
- Bronk Ramsey C. 2021. OxCal version 4.4. Available at: <https://c14.arch.ox.ac.uk/oxcal/OxCal.html#> (accessed 19 December 2022).
- Bruyako I. V. 2005. *Rannie kochevniki v Evrope (X-V vv. do r. KH.).* Kishinev: Vysshaya antropologicheskaya shkola.
- Bukowski Z. 1977. *The Scythian influence in the area of Lusatian culture.* Wrocław, Warszawa, Kraków, Gdańsk: Zakład Narodowy im. Ossolińskich.

- Burghardt M. 2020. Classification and chronology of the collection of arrowheads from the ash-hill found in the hillfort of the Scythian Cultural Circle in Chotyńiec, site 1, Jarosław district. *Sprawy i Sprawozdania Archeologiczne* 72/2, 327-355.
- Calvo Trias M., Van Strydonck M., Picornell-Gelabert L., Boudin M., Alberio D., M. Creu J. and Roselló G. 2020. Dying in the Hallstatt Plateau: the case of wooden coffins from Iron Age necropolises in Mallorca (Balearic Islands, Western Mediterranean) and the difficulties in defining their chronology. *Archaeological and Anthropological Sciences* 12/10, 247.
- Chernovol D. 2012. Houses of the Tomashovskaya local group. In F. Menotti and A. G. Korvin-Piotrovskiy (eds), *The Tripolye culture giant-settlements in Ukraine: Formation, development and decline*. Oxford: Oxbow Books, 182-209.
- Chmielewski T. J., Hałaszkó A., Mackiewicz M., Pieńkos I., Sady-Bugajska A., Starkova E. and Ślusarska K. 2021. Einmal ist keinmal. Peculiar burial practices of prehistoric communities settling the Lublin-Volhynia Upland in the Early Iron Age. *Præhistorische Zeitschrift* 96/2, 532-570.
- Chochorowski J. 2014. Scytowie a Europa Środkowa – historyczna interpretacja archeologicznej rzeczywistości. *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 35, 9-58.
- Czopek S. 2007. *Grodzisko Dolne, stan. 22 – od paleolitycznych łowców do wczesnośredniowiecznych Słowian. Część I. Od epoki kamienia do wczesnej epoki żelaza*. Rzeszów: Uniwersytet Rzeszowski.
- Czopek S. 2019. Enklawa scytyjskiego kręgu kulturowego w południowo-wschodniej Polsce. *Przegląd Archeologiczny* 67, 119-148.
- Czopek S. 2020. Znaczenie odkryć w Chotyńcu (południowo-wschodnia Polska) dla interpretacji procesów kulturowo-historycznych na zachodnim Wołyniu i Podolu (Ukraina) we wczesnej epoce żelaza. *Archeologia Polski*, 65, 67-114.
- Czopek S. 2021. On the synchronization of the chronology of phenomena and artefacts. *Sprawy i Sprawozdania Archeologiczne* 73/2, 375-391.
- Czopek S. and Krąpiec M. 2020. The cult area (Zolnik) from a Scythian Hillfort in Chotyńiec near Radymno (southeastern Poland) in the context of radiocarbon dating. *Radiocarbon* 62/6, 1599-1611. DOI: 10.1017/RDC.2020.78.
- Czopek S., Trybała-Zawiślak K., Tokarczyk T., Ocadryga-Tokarczyk E., Burghardt M., Adamik-Proksa J. and Rajpold W. 2017. Pierwsze sprawozdanie z weryfikacyjnych badań na grodzisku z wczesnej epoki żelaza w Chotyńcu, *Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 38, 291-305.
- Czopek S., Trybała-Zawislyak K., Voitseschuk N., Osaulchuk O., Bobak D., Hembitsa P., Yatsyshyn A., Pasterkevich V., Pavliv D., Petehyrych V., Poltovich-Bobak M. and Vatsnik A. 2018. *Kulturno-poselenski zminy v baseyni richky Vyshnya v epokhu bronzy i za doby rannoho zaliza v konteksti zmin doistorychnoyi i rannoseredniovichnoyi oykumeny*. Rzeszów: Instytut Archeologii UR.
- Daragan M. N. 2005. Antichnaya keramika iz Khotovskogo gorodischa skifskoy epokhi. In V. Yu. Zuev (ed.), *Bosporskiy fenomen: problema sootnosheniya pismennykh i arkheologicheskikh istochnikov*. Sankt-Peterburg: Gosudarstvennyi Ermitazh, 256-261.

- Daragan M. N. 2009. Grey pottery from monuments of the Early Scythian Period in the Middle Dnestr region (West Podolian group of monuments). *Pontica* 42, 119-147.
- Daragan M. N. 2011. *Nachalo rannego zheleznoho veka v Dneprovskoy Pravoberezhnoy Lesostepi*. Kyiv: KNT.
- Diachenko A., Stróżyk M., Szmyt M. and Żurkiewicz D. 2021. Why do we need to weigh burned daub? Destruction of wattle-and-daub houses and the internal chronology of Neolithic sites. *Journal of Archaeological Science: Reports* 38(70), 103052. DOI: 10.1016/j.jasrep.2021.103052.
- Dzięgielewski K. 2010. Expansion of the Pomeranian Culture in Poland during the Early Iron Age: Remarks on the mechanism and possible causes. In K. Dzięgielewski, M. S. Przybyła and A. Gawlik (eds), *Migration in Bronze and Early Iron Age Europe*. Kraków: Księgarnia Akademicka, 173-196.
- Dzięgielewski K. 2016. Societies of the younger segment of the early Iron Age in Poland (500-250 BC). In P. Urbańczyk (ed.), *The Past Societies. Polish lands from the first evidence of human presence to the early Middle Ages 4: 500 BC – 500 AD*. Warszawa: Instytut Archeologii i Etnologii PAN.
- Fialko O. E. and Boltryk Yu. V. 2003. *Napad skifiv na Trakhtemirivske gorodysche*. Kyiv: Korvín Press.
- Gabrovec S., Kruh A., Murgelj I. and Teržan B. 2006. *Stična II/1, Gomile starejše železne dobe/Grabhügel aus der älteren Eisenzeit. Katalog (= Katalogi in monografije 37)*. Ljubljana: Narodni muzej Slovenije.
- Ganina O. D. 1965. Poselennia skifskogo chasu u s. Ivane-Puste. *Arkheolohiya* 19, 106-117.
- Ganina O. D. 1984. Poselennia rannoskifskoyi dobi poblizu s. Zalissy. *Arkheolohiya* 47, 68-79.
- Gediga B. 2010. Śląsk – regionalna prowincja kultury halsztackiej. In B. Gediga and W. Piotrowski (eds), *Rola głównych centrów kulturowych w kształtowaniu oblicza kulturowego Europy Środkowej we wczesnych okresach epoki żelaza*. Biskupin, Wrocław: Muzeum Archeologiczne w Biskupinie, Polska Akademia Nauk Oddział we Wrocławiu, Instytut Archeologii i Etnologii PAN, 187-218.
- Gedl M. 1975. *Kultura lużycka*. Kraków: Uniwersytet Jagielloński w Krakowie.
- Gedl M. 2004. *Die Fibeln in Polen (= Prähistorische Bronzefunde XIV 10)*. Stuttgart: Franz Steiner Verlag.
- Gedl M. 2014. *Die Pfeilspitzen in Polen (= Prähistorische Bronzefunde V 6)*. Stuttgart: Franz Steiner Verlag.
- Gershkovich Ya. P. 2004. Fenomen zolnikov belogradovskogo tipa. *Rossiyskaya arkheologiya* 4, 104-113.
- Golec M. and Fojtík P. 2020. *Centrum východoהלštatské kultury na střední Moravě (= Archaeologica Olomucensia 5)*. Olomouc: Univerzita Palackého v Olomouci.
- Grechko D. S. 2010. *Naseleňnia skifskogo chasu na Siverskomu Dinci*. Kyiv: Institut arkheolohyi NANU.
- Grechko D. S. 2012. O vozmozhnykh «prosvetakh» v «temnoye» vremia (VI v. do n.e.) skifskoy istorii. *Stratum plus* 3, 75-106.
- Grechko D. S. 2013. O pamiatnikakh kimmeriytsev i “ranneskifskoy” kulture. *Stratum plus* 3, 133-154.

- Grechko D. S. 2016a. Ot arkhaischeskoy Skifii k klassicheskoy. *Arkheolohiia i davnia istoriia Ukrayiny* 2(19), 33-60.
- Grechko D. S. 2016b. Klassicheskaya Skifiya: nachalo (posledne desiatiletiya VI – pervaya chetvert V v. do n.e.). *Revista arheologică* 12/1-2, 145-168.
- Grechko D. S. 2020a. About the dating of the Scythian type arrowheads of the Late Hallstatt period from Central Europe. *Arkheolohiia* 4, 12-27.
- Grechko D. 2020b. Chronological schemes of the Late Hallstatt period (HaD) in Central Europe: new opportunities for the synchronization and refinement of dates. *Sprawozdania Archeologiczne* 72/2, 585-605.
- Grechko D. S. 2021a. *Etnokulturna istoriya naseleння Dniprovskogo lisostepovogo Livoberezhzhia skifskogo chasu*. Avtoref. dis. d.i.n. Kyiv: IA NANU.
- Grechko D. S. 2021b. How far did the nomads go to the West around the middle of the VIth century BC? *Śląskie Sprawozdania Archeologiczne* 63, 15-24.
- Grechko D. S., Bilinskiy O. O. and Kushnir A. S. 2021. Chelovek i landschaft v skifskoe vremia v Dneprovskom lesostepnom Levoberezhze. *Stratum plus* 3, 321-342.
- Grechko D. S., Kriutchenko O. O. and Rzhеvuska S. S. 2018. Arkheologichni doslidzhennia Bils'kogo arkheologichnogo kompleksu u 2017 rotsi. In I. I. Korost (ed.), *Arkheologichni doslidzhennia Bils'kogo gorodischa 2017*. Kyiv, Kotelva: CP NAN Ukrayini, UTOPIK, Majdan, 42-74.
- Harper T.K. 2021. The absolute chronology of Tripolye settlements in the Southern Bug-Dnieper and Middle Dnieper regions, ca. 4200–2950 Cal BC. In A. Diachenko, T. K. Harper, Yu. Rassamakin and I. Sobkowiak-Tabaka (eds), *Data systematization in the Neo-Eneolithic of Southeastern and Central Europe: Essays in honor of Sergej Ryzhov*. Kyiv: Institute of Archaeology of the NAS of Ukraine, 58-78.
- Ignaczak M., Boltryk Y., Shelekhan O., Lifantii O. and Olędzki L. 2016. The fortresses of Ukraine. The builders of Early Iron Age strongholds in Podolia. *Baltic-Pontic Studies* 21, 277-290.
- Jaeger M. and Stróżyk M. 2015. Remains of buildings inside the settlement and daub finds in the mineral zone. In J. Czebreszuk and J. Müller (eds), *Bruszczewo III: The Settlement and Fortification in the Mineral Zone of the Site*. Bonn, Poznań: Dr. Rudolf Habelt GmbH, Wydawnictwo Naukowe UAM, 285-297.
- Johnston S., Chapman J., Gaydarska B., Diachenko A., Voke P., Nebbia M. and Litkevych V. 2019. The Nebelivka experimental house construction and house-burning, 2014–2015. *Bulgarian e-Journal of Archaeology* 9, 61-90.
- Johnston S., Diachenko A., Gaydarska B., Nebbia M., Voke P., Bondar K., Litkevych V. and Chapman J. 2018. The experimental building, burning and excavation of a two-storey Trypillia house. In S. Țurcanu and C.-E. Ursu (eds), *Materiality and identity in pre- and protohistoric Europe: Homage to Cornelia-Magda Lazarovici*. Suceava: Karl A. Romstorfer Publishing House, 397-434.
- Kossack G. 1987. Von den Anfängen des Skytho-Iranischen Tierstils. In H. Franke (ed.), *Skythika*. München: Bayerische Akademie der Wissenschaften, 24-86.
- Kozak D. N. 2012. *Poseleńnia Neuriv, Slovyan ta Germantsiv na Stiri*. Kyiv: IA NANU.

- Kravchenko E. A., Gorbanenko S. A. and Goshko T. Yu. *et al.* 2017. In E. A. Kravchenko (ed.), *Hotivske gorodishe (novitni doslidzhennia)*. Kyiv: IA NANU.
- Krushelnitska L. I. 1976. *Pivnichne Prikarpattya i Zahidna Volin za dobi rannogo zaliza*. Kyiv: Naukova dumka.
- Levitskiy O. G. and Kashuba M. T. 2009. O kulturnykh traditsiyakh v pogrebalnoy obriadnosti nasele-niya, prozhivayushego na zapadnykh rubezhakh arkhaiskoy Skifii (istochniki, problematika). *Arkheolohiya i davnia istoriya Ukrainy* 0, 250-267.
- Lifantii O. and Shelekhan O. 2018. Metal artefacts from the Severynivka hillfort. *Baltic-Pontic Studies* 21, 255-276.
- Lobay B. I. 1977. Kurgani skifskogo chasu na Vinnichini. In I. I. Artemenko (ed.), *Arkheolohiya* 21. Kyiv: Naukova dumka, 77-84.
- Maksimov E. V. and Petrovskaya E. A. 2008. *Drevnosti skifskogo vremeni Kievskogo Podneprovya*. Poltava: Institut arkheolohii NANU.
- Medvedskaya I. N. 1992. Periodyzatsiya skifskoy arkhaiki i derevniy Vostok. *Rossiyskaya arkheologiya* 3, 86-107.
- Michalak A. and Jaszewska A. 2011. Katalog zabytków metalowych. In A. Jaszewska (ed.), *Wicina. Katalog zabytków metalowych (= Biblioteka Archeologii Środkowego Nadodrza 5)*. Zielona Góra: Stowarzyszenie Naukowe Archeologów Polskich Oddział Lubuski, Świdnica, 55-292.
- Mogilov A. 2010. K arkheologicheskoy karte Severnoy Bukoviny rannego zheleznoho veka. *Revista arheologică* 5/1, 98-129.
- Mogilov A. D. 2020. O formirovanii ranneskifskoy kultury na Srednem Dnestre. *Stratum plus* 3, 129-170.
- Monakhov S. Yu. 2003. *Grecheskie amfory v Prichernomore. Tiplogiya amfor vedushih tsentrov eksporterov tovarov v keramicheskoy tare: Katalog-opredelitel*. Moskva, Saratov: Kimmerida.
- Ocadryga-Tokarczyk E., Adamik-Proksa J., Burghardt M., Tokarczyk T. and Rajpold W. 2022. *Osada społeczności scytyjskiego kręgu kulturowego w Hruszowicach, stan. 2, jako element tzw. aglomeracji chotyńskiekiej*. Rzeszów: Uniwersytet Rzeszowski.
- Parzinger H. 1988. Chronologie der Späthallstatt- und Frühlatène-Zeit. Studien zu Fundgruppen zwischen Mosel und Save. *Acta humaniora* 4. Weinheim: VCH.
- Parzinger H. and Stegmann-Rajtár S. 1988. Smolenice-Molpír und der Beginn skythischer Sachkultur in der Südwestslowakei. *Praehistorische Zeitschrift* 63/2, 162-178.
- Pastor Quiles M. 2022. Studying Daub: Orientations for the Macroscopic Analysis of Earth Building Fragments in Archaeology. *Advances in Archaeological Practice* 10/4, 440-452.
- Pearson G. W., Pilcher J. R., Baillie M. G. L. and Qua F. 1983. High-precision <sup>14</sup>C measurement of Irish oaks to show the natural <sup>14</sup>C variation BC to 4000 BC. *Radiocarbon* 25/2, 179-186.
- Petrenko V. G. 1978. Ukrasheniya Skifii VII-III vv. do n. e. *Svod arkheologicheskikh istochnikov*, D4-5. Moskva: Nauka.
- Reimer P., Austin W., Bard E., Bayliss A., Blackwell P., Bronk Ramsey C. and Talamo S. 2020. The IntCal20 northern hemisphere radiocarbon age calibration curve (0-55 cal kBP). *Radiocarbon* 62/4, 725-757.

- Rose H. A., Müller-Scheeßel N., Meadows J. and Hamann C. 2022. Radiocarbon dating and Hallstatt chronology: a Bayesian chronological model for the burial sequence at Dietfurt an der Altmühl 'Tennisplatz'. *Archaeological and Anthropological Sciences* 14/4, 72.
- Sezgin Y. 2004. Clazomenian Transport Amphorae of the Seventh and Sixth Centuries. In A. Moustaka, E. Skarlatidou, M.-C. Tzannes, and Y. Ersoy (eds), *Klazomenai, Teos and Abdera: Metropolis and Colony. Proceedings of the International Symposium held at the Archaeological Museum of Abdera, Abdera 20-21 October 2001*. Thessaloniki: University Studio, 169-183.
- Shramko I. B. 2012. Zolniki Zapadnogo Belskogo gorodischa: planigrifiya i khronologiya. In O. A. Sherglova and V. M. Goryunova (eds), *Slavyane Vostochnoy Evropy nakanune obrazovaniya Drevnerusskogo gosudarstva*. Sankt-Peterburg: Solo, 168-172.
- Shramko I. and Zadnikov S. 2021. The Bilsk fortified settlement and the Hallstatt world. *Śląskie Sprawozdania Archeologiczne* 63, 123-148.
- Simion G. 2000. Tombes tumulaires de la nécropole de Celic-Déré. Tombes tumulaires de l'Âge du Fer dans le Sud-Est de l'Europe. In G. Simon, V. Lungu (eds), *Actes du II Colloque International d'Archéologie Funéraire*. Tulcea: Institut de Recherches Eco-Museologiques de Tulcea, 69-82.
- Smirnova G. I. 1993. Pamiatniki Srednego Podnestrovia v khronologicheskoy skheme ranneskifskoy kultury. *Rossiyskaya arkeologiya* 2, 101-118.
- Smirnova G. I. 2004. Sostoyane izucheniya Zapadno-Podolskoyi grupy pamiatnikov ranneskifskogo vremeni v Lesostepnoyi Skifii v kontse XX veka. In J. Chochorowski (ed.), *Kimmerowie, Scytowie, Sarmaci: księga poświęcona pamięci Profesora Tadeusza Sulimirskiego*. Kraków: Instytut Archeologii Uniwersytetu Jagiellońskiego, 409-429.
- Smirnova G. I. 2006. Zapadno-Podolskaya grupa ranneskifskikh pamiatnikov v svete issledovaniy k kontsu XX stoletiya. In V. G. Petrenko and L. T. Yablonskiy (eds), *Drevnosti skifskoy epokhi*. Moskva: Nauka, 66-92.
- Smirnova G. I., Vakhtina M. Yu. and Kashuba M. T. 2018. Periodizatsiya i khronologiya Nemirovskogo gorodischa v rannem zheleznom veke. In G. I. Smirnova, M. Yu. Vakhtina, M. T. Kashuba and E. G. Starkova (eds), *Gorodische Nemirov na reke Yuzhnyi Bug*. Sankt-Peterburg: The State Hermitage Museum, Russian Academy of Sciences, 223-236.
- Świętosławski W. 1997 *Archeologiczne ślady najazdów tatarskich na Europę Środkową w XIII w.* Łódź: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.
- Trachsel M. 2004. *Untersuchungen zur relativen und absoluten Chronologie der Hallstattzeit.* (= *Universitätsforschungen zur prähistorischen Archäologie* 104). Bonn: Verlag Dr. Rudolf Habelt GmbH.
- Trybała-Zawiślak K. 2012. *Kłyżów, stan. 2 i Mokrzyśzów, stan. 2 – cmentarzyska ciałopalne z wczesnej epoki żelaza*. Rzeszów: Wydawnictwo Mitel, Instytut Archeologii Uniwersytetu Rzeszowskiego.
- Trybała-Zawiślak K. 2019. *Wczesna epoka żelaza na terenie Polski południowo-wschodniej – dynamika zmian i relacje kulturowe*. Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego.
- Trybała-Zawiślak K. 2020. The Chotyńiec agglomeration and its importance for interpretation of the so-called Scythian finds from south-eastern Poland. *Sprawozdania Archeologiczne* 72/2, 87-116.

- Vulpe A. 1990. *Die Kurzschwerter, Dolche und Streitmesser der Hallstattzeit in Rumänien (Prähistorische Bronzefunde VI 9)*. München: C. H. Beck'sche Verlagsbuchhandlung.
- Zadnikov S. A. 2009. Raskopki zolnika 13 v 2008 g. na Zapadnom ukreplenii Belskogo gorodischa. *Arheologichni doslidzhennia v Ukrayini 2008 r.* Kyiv: IA NAN Ukrayini, 50-52.