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VYNNYKY-LYSIVKA, LVIV DISTRICT. COMPARISON OF THE RESULTS OF ARCHAEOLOGICAL AND GEOMAGNETIC RESEARCH

ABSTRACT

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Archaeological research in 2023 at the Vynnyky-Lysivka site provided the basis for interpreting the results of geomagnetic work carried out in 2017. The excavations in 2016 resulted in the discovery of clusters of fired clay daub fragments, constituting the remains of the Funnel Beaker Culture household. It was assumed that non-invasive research would show the locations of other such features. However, the results of geomagnetic surveys were difficult to interpret- just like in Gordinești II-Stînca goală. In the course of the investigation, numerous anomalies were identified, mainly of a dipole nature and less numerous point-positive anomalies.

A very weak source of anomalies turned out to be a clearly visible Eneolithic ditch cutting of the Funnel Beaker Culture settlement. The discovery in 2023 in the central part of the Vynnyky-Lysivka settlement of a cluster of pits in the place where anomalies were distinguished in non-invasive studies provided the basis for a reinterpretation of geomagnetic surveys.

Keywords: Funnel Beaker Culture, western Ukraine, geomagnetic research, Late Trypillia Culture, Gordinești group

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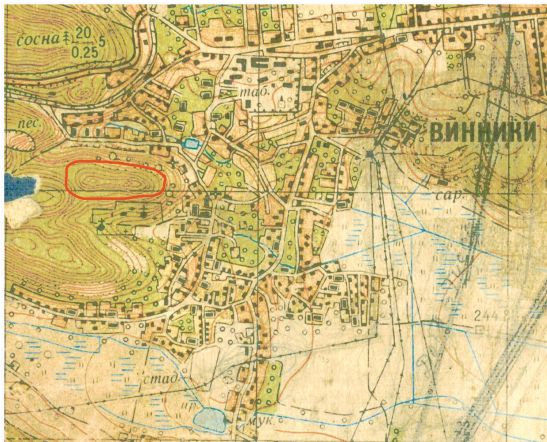
INTRODUCTION

The Funnel Beaker Culture (FBC) site in Vynnyky-Lysivka, near Lviv, is situated upon a plateau of the elevation of land, which is well visible from all sides and afar (Figs 1 and 2). Archaeological excavations have repeatedly been performed there, including those led by Mykola Peleschyshyn, as a result of which, a great series of Funnel Beaker pottery finds as well as some agglomerations of fired clay daub were discovered (Havinskyj 2013). However, it seems not so easy to define the exact function of the latter. The archaeological discoveries have nonetheless clearly signalled that there is a settlement site of the FBC on Mount Lysivka. The most important fact, however, was that in 2013, Andrii Havinskyi identified a series of storage and/or waste pits containing copious finds attributed to the FBC (Havinskyj *et al.* 2021). These pit features became another valuable piece of evidence for a permanent FBC habitation area upon Lysivka.

To answer the questions whether fired clay daub agglomerations recovered upon Mount Lysivka were house debris (since they do not represent some sort of furnaces), and if so, what kinds of structure those houses might have been regular field research was relaunched in 2016, due to which FBC house debris was observed, the residues of which looked like multiple clay lumps of various degrees of burning (Diachenko *et al.* 2019; Hawinskyj and Rybicka 2021). This research was carried out as part of the project entitled: 'Between the East and the West. Dynamic of Social Changes from the Eastern Carpathians to the Dnieper in the 4th – beginning of 3rd Millennium BC'. Both the construction technology



Fig. 1. Location of Vynnyky-Lysivka, Lviv region (Ukraine) and Gordinești II-Stinca goală, Edinet region (Moldova) on the map of Europe



I м 1000 750 500 250 0



A

II



B

Fig. 2. Vynnyky-Lysivka, Lviv region. A: Location of Funnel Beaker culture site. After Hawinskyj and Rybicka 2021, fig. 1; modified. I – map at scale 1: 25000; II – after <https://lv.2ua.org/vynnyky/mapa/sat/>; B: View of the site from the north side. After Hawinskyj and Rybicka 2021

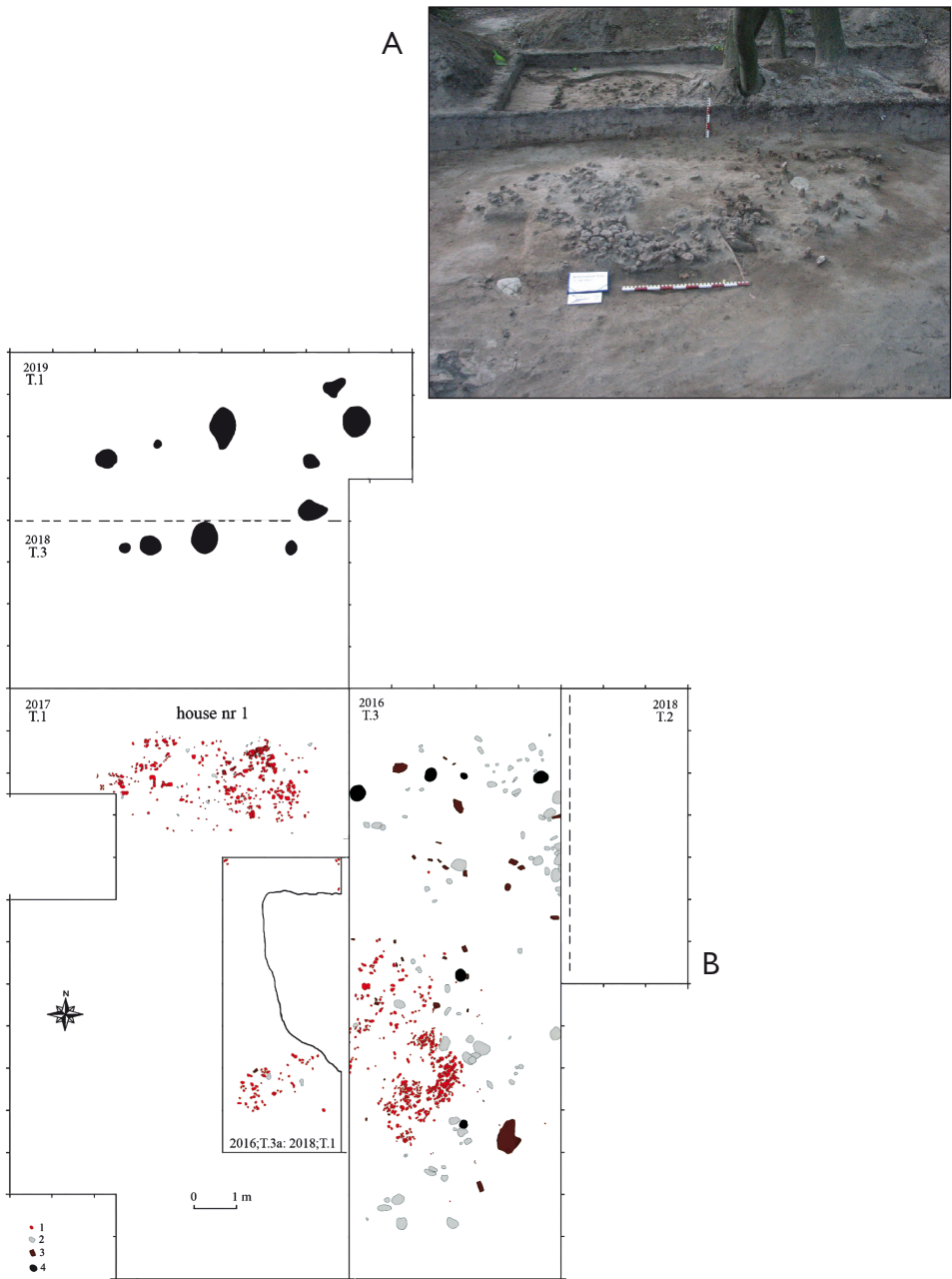


Fig. 3. Vynnyky-Lysivka, Lviv region. A: cluster of burnt daub fragments from the southeastern part of House No. 1 from 2016 (after Hawinskyj and Rybicka 2021); B: distribution of burnt daub in the trenches from 2016-2019: 1 – burnt daub; 2 – sandstone; 3 – preserved wood; 4 – post-holes (after Hawinskyj and Rybicka 2021, fig. 5; modified)

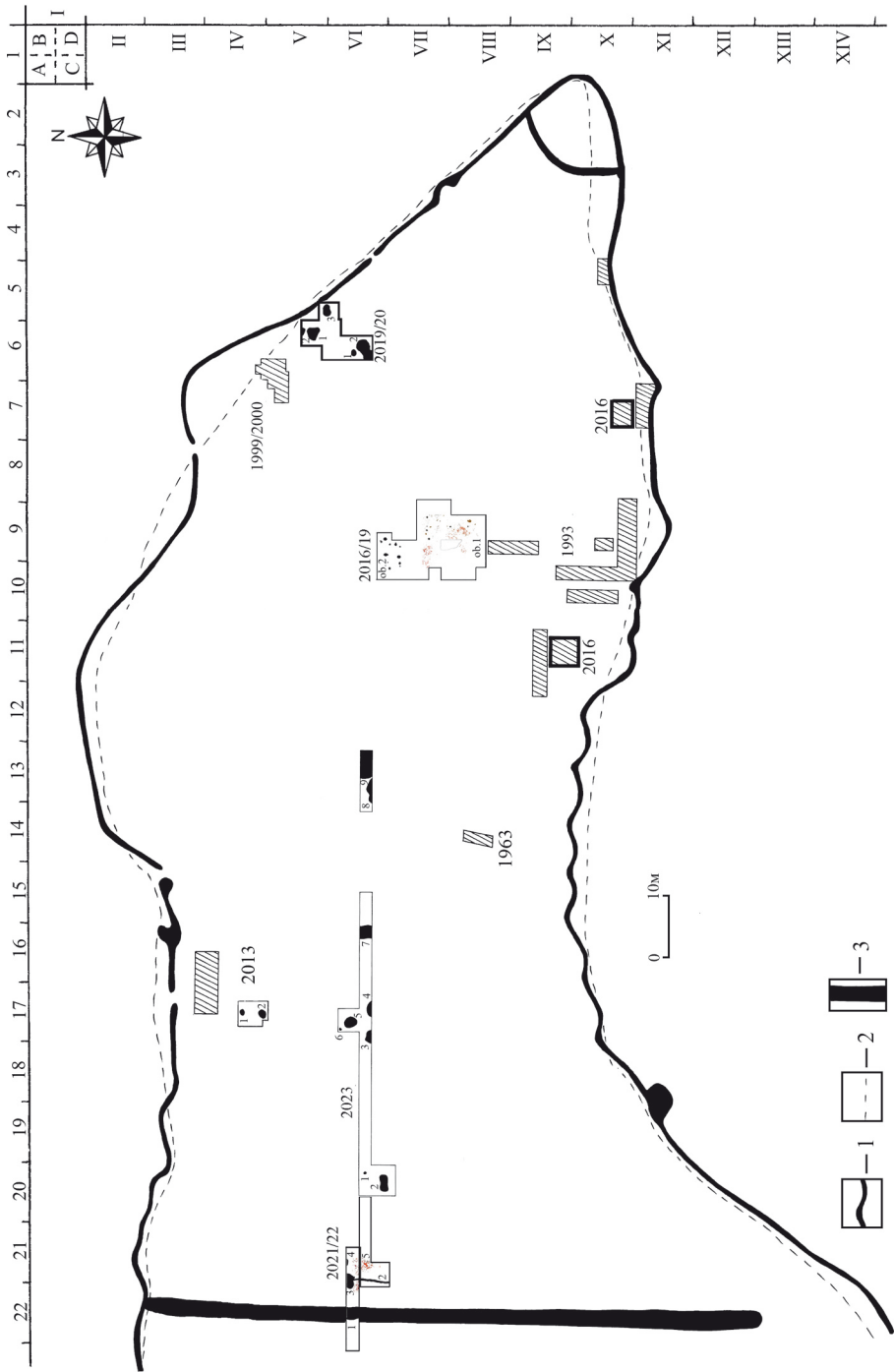


Fig. 4. Vynnyky-Lysivka, Lviv region. Location of trenches: 1 – border of military transects; 2 – elevation flattening border; 3 – ditch (after Hawinskyj and Rybicka 2021, figs 1 and 3; modified)

specific to the building and the structural elements of this latter clearly relate to those of the domestic structures reported to be characteristic of the Eastern Group of the FBC and do not correspond to the famous 'platforms' of the Trypillia Culture (Fig. 3: A; Hawinskyj and Rybicka 2021). The discoveries in 2016 in Vynnyky constituted the basis of defining the research framework for further excavations at the archaeological site upon Mount Lysivka. This aimed above all to specify how many houses might have been there, and then whether all of them had a similar structure, and what the spatial development of the village was; another interesting point was the chronological position of the examined FBC features.

The hill of Lysivka is now covered with an age-old mixed forest, a fact that hinders the search for visible evidence of the earlier habitation, regardless of whether one is observing the surface of the earth or digging through it (Figs 2: B and 3: A). Since 2016, relatively small expanses from 50 to 200 square meters were only covered by field research (Fig. 4). It is the forest upon Lysivka which causes the excavation units to be only placed in the free spaces where they will not harm the trees (Fig. 3: A). In 2016 and 2017, such gentle diggings were primarily located in the centre of the plateau as well as in its southern and northeastern portions. The evidence of dwelling structures is basically marked by clay daub debris (house No. 1), and it was only observed in the unit situated in the south-to-centre part of the highland (Figs 2 and 4). The discovery of the clay daub cluster, along with the difficulties of identifying more similar features, has formed the basis for attempting to use some non-invasive approaches to detecting the archaeological features. Hence, in 2017, the highland's terrain was subjected to geomagnetic surveys by Marcin M. Przybyła. It is again the woods on the hill which cause troubles to geomagnetic surveys, especially in the northeastern part of the site, with dense bushes and thick windfall. It was assumed, however, that it is exactly this approach that enables the identification of further clay daub agglomerations similar to those forming the debris of House No. 1 (Fig. 3; Hawinskyj and Rybicka 2021). Thus, in the following years, 2018-2023, the excavation works continued, the outcome of which partly corresponded to the results of non-invasive fieldwork.

The following section of the paper is going to represent some effects of geomagnetic surveys and provide some introductory data on archaeological exploration that took place throughout the expanse covered by the non-invasive work. The outcomes of these both are then compared with each other.

GEOGRAPHICAL LOCATION OF THE SITE

The free-standing Mount Lysivka is located in the southeastern part of the Roztocze hills (Kondracki 1988). Its height is 321 meters above sea level (Fig. 2: A), and the mountain body is mostly oriented east and west. The broadness of the plateau lies between 80

and 100 meters; it reaches 130 and even 150 meters in its western part, with a length of 400 meters (Hawinskyj and Rybicka 2021, 15). The GPS coordinates for the eastern and western parts of the hill are N49 48'43.9488" E24 7'55.0884" and N49 48'46.2564" E24 7'38.0172", respectively. On its southeastern side, Mount Lysivka borders the broad valley of the Marunka River, a tributary of the Zakhidnyi Buh River, while the FBC settlement is on the plateau of the hill, and the height difference between the plateau and the river valley reaches 80 meters.

The stratigraphy of this area varies greatly. The upper layers are composed of contemporary humus. Beneath it, strata of sediments resembling loess are found, coloured grey to dark grey; in the central part of the hill, they are found at a depth of 0.4 to 1.0 m. Even lower, a level of a dark orange stratum is observed, up to 20 cm thick, with the sandstone and, in places, limestone formations lying underneath it; these both are the bedrock of the place. On the northern edge of the hill, rocks are found already at a depth of c. 0.3 to 0.4 m; the same is true for the south-to-centre part of the hill (*e.g.*, close to House No. 1; Fig. 3; Hawinskyj and Rybicka 2021). The sedimental strata of the upper part of the sequence are not so thick there. The sandstone slabs are so soft that they are often drilled through by the roots of the trees. The level of rocks is uneven. Both in the centre and the north-to-centre part of the area, the fill of the storage and/or waste pits is basically black.

ARCHAEOLOGICAL RESEARCH (2016-2023)

In 2016-2019, remnants of an FBC dwelling feature were investigated (Hawinskyj and Rybicka 2021), represented by loose pieces of baked clay daub along with a row of post-holes that remained from the eastern wall of the building (Fig. 3). The house debris was found lying in the loess-like sediments having c. 0.2 m of thickness just beneath the contemporary humus layer. There were no rather big agglomerations of large-sized pottery sherds around the house. The bedrock was reported to be found already at a depth of c. 0.4 m below the present-day surface (Hawinskyj and Rybicka 2021, Fot. 3: A).

In 2019-2023, both the central and western parts of the site in Vynnyky-Lysivka were subjected to field research. In 2021, the excavations expanded along the segment of the moat, which was well observable against the terrain in the centre of the site. The moat once served as a fortified border in the west of the FBC village, and the excavations have uncovered some 34 square meters of it. The outlines of the moat itself were detected primarily at a depth of 0.6 m below the present-day surface, while at a depth of 0.8 m, they appeared to be well visible (Fig. 5: A). The refill of the moat consisted of black sediments. The moat was 1.9 and 2.1 m wide in its southern and northern parts, respectively. In profile, the moat has a trapezoidal shape, with a flat bottom of some 0.8 m wide and a depth of 1.2 m below the present-day surface (Fig. 5: B). The local bedrock is formed of sandstone lying below the present-day surface at a depth of c. 0.8 to 1.0m. In the fill of the moat, a total of 37 FBC



A



B

Fig. 5. Vynnyky-Lysivka, Lviv region. A: View of the moat (60 cm below ground level); B: Vynnyky-Lysivka, Lviv region. View of the moat (80 cm below ground level)



Fig. 6. Vynnyky-Lysivka, Lviv region.

A cluster of burnt daub, which is a remnant of the sealing of the palisade

pottery shards were recovered, while at a depth of 0.8 m, only two fragments of vessels attributed to the Trypillia Culture were found. It is interesting that at a depth of 0.6 m, a small pottery sherd was recovered, displaying attributes of the technology of making pottery of the Mierzanowice Culture.

In the year 2022, archaeological research continued in the region near the moat. On the eastern side of it, another trench was excavated, with an area of 20 square meters. An agglomeration of burnt clay daub was recovered within the area of 2.2×2.4 m next to the eastern wall of the moat, at a depth of 0.6 to 0.8 m (Figs 6 and 7). In addition, with an eye to clarifying the situation around the moat, a trench (12×2 m) was made east of it (Fig. 4). The agglomeration of the debris was 6×1.2 m east and west, and 3.6×2.2 m north and south. Basically, the pieces of dark orange clay daub in the agglomeration were small, and some pieces of clay appeared to be visibly overheated. It was only in the centre of the agglomeration that the pieces of clay daub were 10 to 20 cm in size. The outside of the burnt clay daub was smooth, with no imprints of wood there, while other pieces displayed impressions of stakes, up to 8 cm in diameter, from the inside; the biggest blocks of daub were observed to contain some timber impressions as well, having 12 to 20 cm in diameter.

In the agglomeration of burnt clay daub, 30 FBC pottery fragments and seven flint artefacts were recovered, while 21 FBC pottery fragments and four flint artefacts were recovered from beneath the agglomeration.



A



B

Fig. 7. Vynnyky-Lysivka, Lviv region.
A: view of the moat and palisade trench; B: View of the palisade trench

Next to the cluster of clay daub fragments, a trench was identified east of the moat. When looking east and west, the clay daub debris was superimposed upon this trench, which showed from under the agglomeration on both sides of the latter (Fig. 7). A metre to the west of the burnt clay debris, the trench was up to 40 cm in width (Fig. 6).

The trench was 14 to 40 cm deep, 40 to 50 cm wide, and had a flat bottom 20 cm across. In some parts of the feature, a series of postholes was observed, with a diameter of 25 to 34 cm. In cross-section, three of these appeared to be placed next to each other and pointed on their bottom. The fill of the trench consisted of black sediment resembling loess; in total, 60 small-sized FBC pottery fragments and some flint artefacts were recovered there. The feature under study was primarily detected at a depth of 80 cm below the present-day surface, and is interpreted as representing the remains of a palisade (Fig. 7) that ran parallel to the moat (Figs 7 and 8). The agglomeration of burnt clay daub could hardly represent debris of a dwelling structure, since the pieces of clay from which it consisted have rather been used for plastering the palisade, as the description of the daub has already shown.

In the year 2023, two more exploratory Trenches (numbered 1 and 2) were excavated in the central part of the hill (Fig. 4). Trench 1 was 50 × 2 m, and Trench 2 south of the first was 1 × 2 m. Trench No. 1 was then expanded to reach 128 square metres, and so it became big enough to cover the newly discovered features Nos 2/2023 (Fig. 9), 4/2023 (Fig. 10) and 5/2023 (Fig. 11). The stratigraphy of the explored area was as follows:



Fig. 8. Vynnyky-Lysivka, Lviv region.
View of post-holes of the palisade



Fig. 9. Vynnyky-Lysivka, Lviv region. Profile of Feature No. 2/2023



Fig. 10. Vynnyky-Lysivka, Lviv region. Profile of Feature No. 4/2023



Fig. 11. Vynnyky-Lysivka, Lviv region. Profile of Feature No. 5/2023

- (a) forest root grass-turf, 10 to 20 cm thick;
- (b) grey sediment resembling loess to a depth of 0.4 to 0.5 m;
- (c) dark grey sediment to a depth of 0.6 to 0.7 m;
- (d) dense sand under-layer, coloured brown, to a depth of 0.7 to 0.9/1.0 m;
- (e) sandstone bedrock.

The layers from 20 to 0.6/0.7 m deep yielded most of the archaeological record.

In Trench No. 1/2023, archaeological material was recovered from within the occupation layer: c. 4000 FBC pottery fragments (Features 2/2023 – Fig. 12 and 4/2023 – Fig. 13), along with a dozen of pottery sherds attributed to the Malice Culture (Feature No. 5/2023 – Fig. 14). Here, a series of large-sized storage and/or waste pits were explored as well; two of these, Nos 4/2023 and 5/2023, were found next to each other in the western part of the unit (Fig. 4).

However, the pit Feature No. 4/2023 was not explored in full since there were many roots of an old tree in its southern part. Its outline was detected at a depth of 0.6m below the present-day surface. The feature had an oval shape, 3.7 m in length and 1.6 m in width, and its uneven bottom lay 0.5 m deep below the pit's mouth. A series of 401 FBC pottery fragments were found there (Fig. 13).

The flat-bottomed and 20-cm-deep pit Feature No. 5/2023 was primarily detected below the present-day surface at a depth of 0.6 m. It had an oval shape, 3.4 × 2.2 m, and

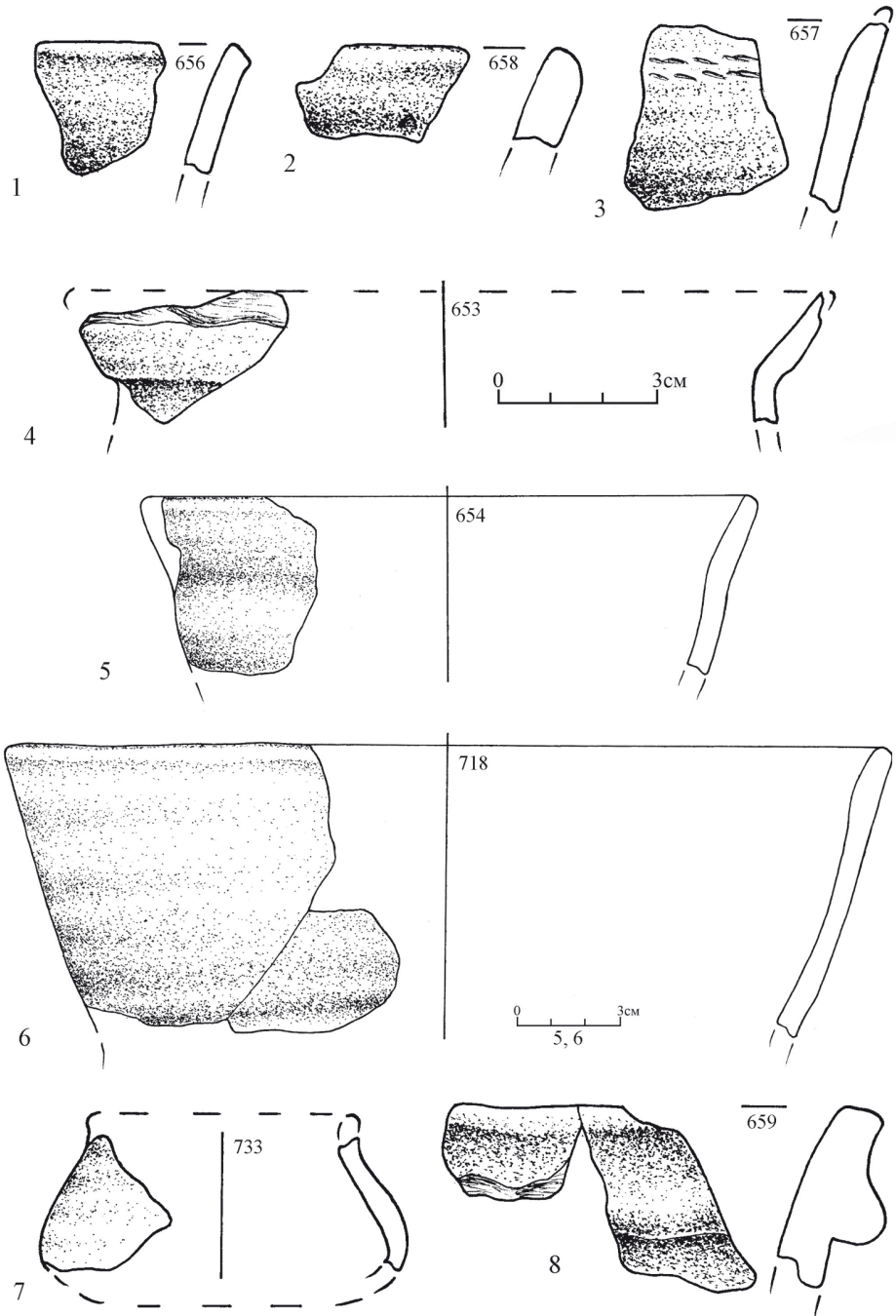


Fig. 12. Vynnyky-Lysivka, Lviv region. Vynnyky-Lysivka, Lviv region. FBC pottery

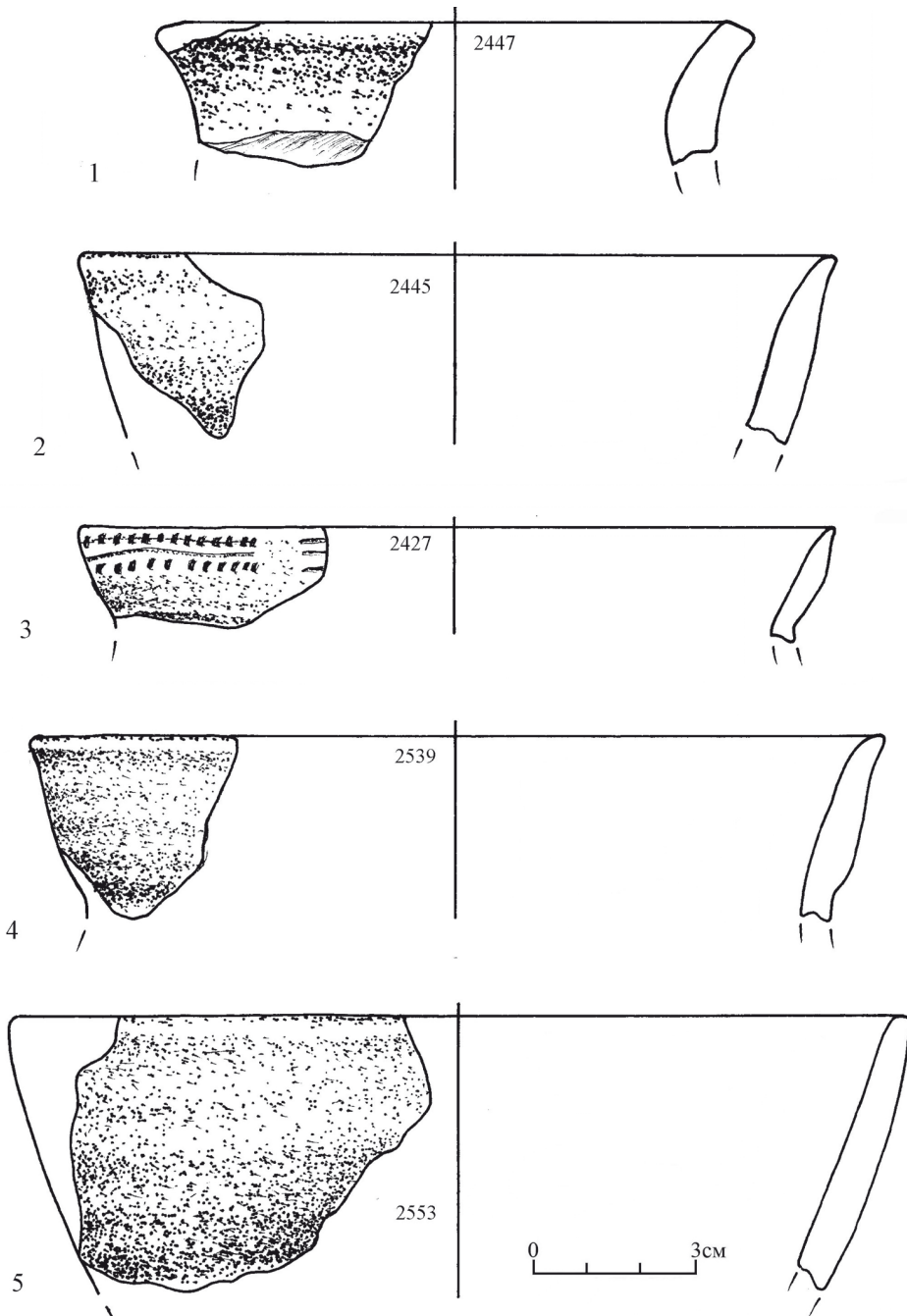


Fig. 13. Vynnyky-Lysivka, Lviv region. Vynnyky-Lysivka, Lviv region. FBC pottery

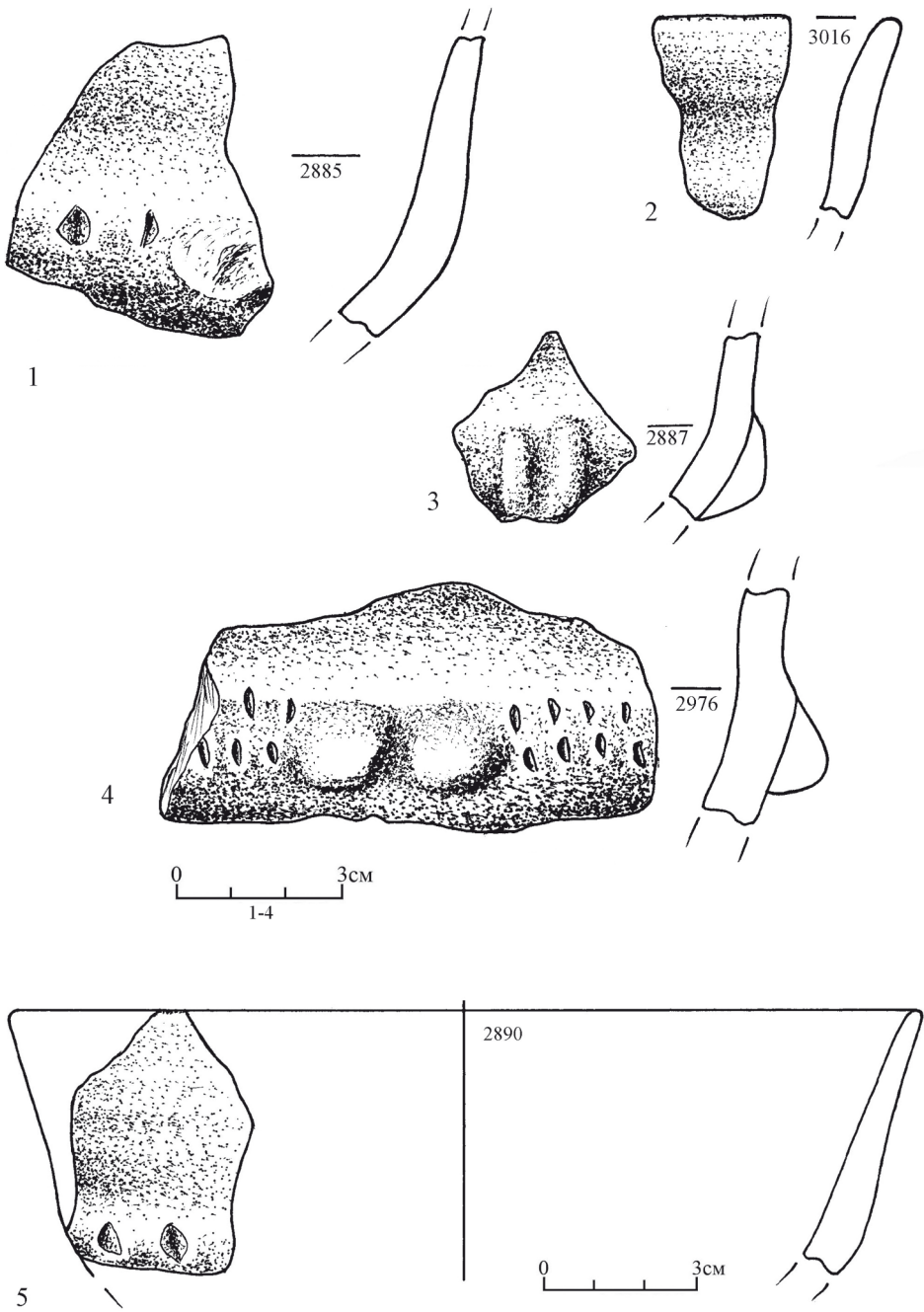


Fig. 14. Vynnyky-Lysivka, Lviv region. Feature No. 5/2023 pottery of the Malice Culture

a basin-shaped outline in profile; a sandstone block was recovered from beneath the bottom of the pit. The fill of the pit consisted of black loess-like sediment containing a series of 597 Malice Culture pottery fragments (Fig. 14). In the eastern part of Trench 1/2023, Feature 2/2023 was found, 34 cm deep with a series of 149 FBC pottery fragments (Fig. 12). It had an oval shape and the fill in the form of a dark-coloured sediment resembling loess.

Overall, the results of the 2021-2023 archaeological campaigns may clearly suggest that the central portion of the plateau upon Mount Lysivka had been intensively used in the past.

GEOMAGNETIC SURVEYS UPON MOUNT LYSIVKA IN VYNNYKY

A. The Research Scope. Magnetic measurements were made using the Foerster Ferrex 4.032 DLG fluxgate magnetometer (Misiewicz 2006, 74-98), which measures the gradient of the vertical component of the magnetic field and was equipped with two probes (0.2 nT resolution). The measurement lines were located 1 m from each other, while the measurement step was 10 cm along the line. The data logging operated in bidirectional mode. When creating magnetic maps, Terra Surveyor 3.0 software was used.

It is not the woodland conditions only that hindered prospecting the terrain. Similar effects are produced by sand- and/or limestone bedrock formations hidden underneath soil sediment strata of variable thickness. Relics of the times and events of World War II, such as trenches, shell explosion craters, and multiple small-sized items of iron, mainly fragments of artillery shells, also cause difficulties in collecting data and interpreting observations.

Non-invasive surveys were focused on a region of the FBC site that was defined on one side by the prehistoric moat (which is still visible on the modern ground surface) and separates the western part of the hill from the rest of it and on the other by the hill's tip with the small portion of land in front of the moat (Figs 4, 15-17). Necessarily, the data logging has stopped in the northeastern part of the area. While this was initially designated for research, the area could not be covered due to the dense thickets and the felling area overcrowded with stumps trunks and branches of trees. Eventually, the surveyed field reached 227 m in length, 50 to 116 m in width, and 1.54 hectares of area (Figs 4 and 15).

B. Results. In the course of the geomagnetic surveys, multiple dipolar anomalies, as well as less numerous point-positive anomalies, have been detected.

The FBC site's borderline, a Chalcolithic moat feature, has only been partially back-filled and, being now well-visible in the terrain, turns out to be a weak anomaly emitter (Figs 16 and 17: 1). Magnetic maps only display it in the northern part of the terrain in the form of an oblong irregular anomaly; some portions display positive values, and some negative, which is probably due to the diversities of the moat's fill. In the southern part of the moat's course, no legible anomalies associated with it were logged at all.

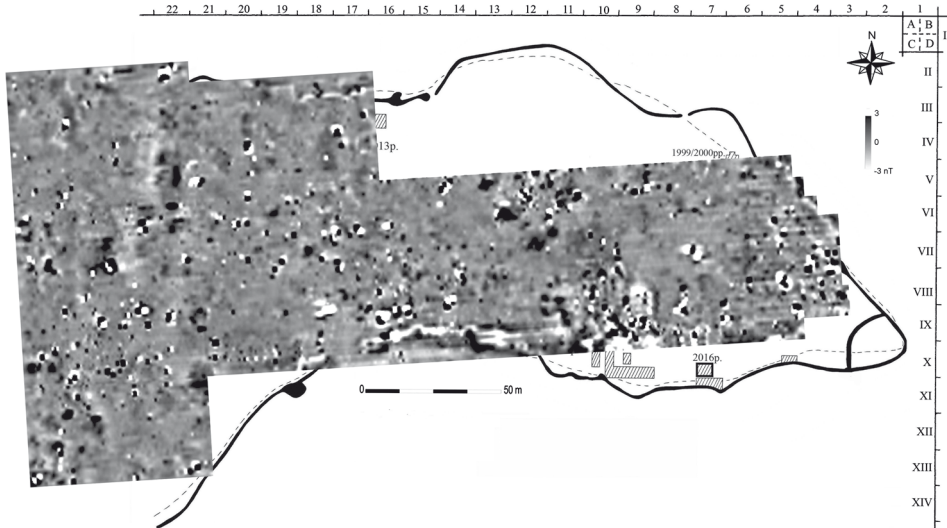


Fig. 15. Mount Lysivka. The geomagnetic map is represented in greyscale; the range is $-3/3$ nT

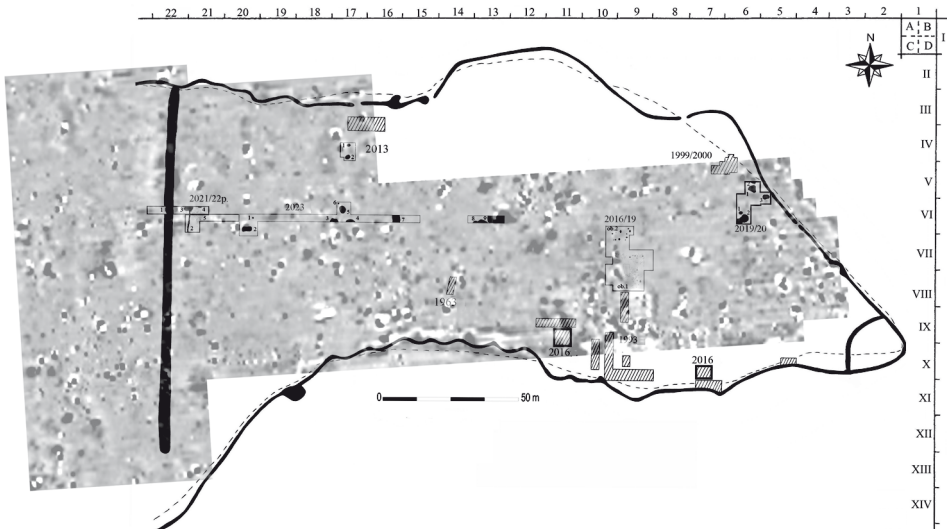


Fig. 16. Mount Lysivka. The geomagnetic map juxtaposed with the effects of excavations

Point-positive anomalies were found in large numbers throughout the surveyed expanse (Fig. 17; green areas). They are the anomalies of higher values and were induced by features like pits and fireplaces. These, of course, may be associated with the prehistoric village, yet it should be kept in mind that things like backfilled artillery shell explosion

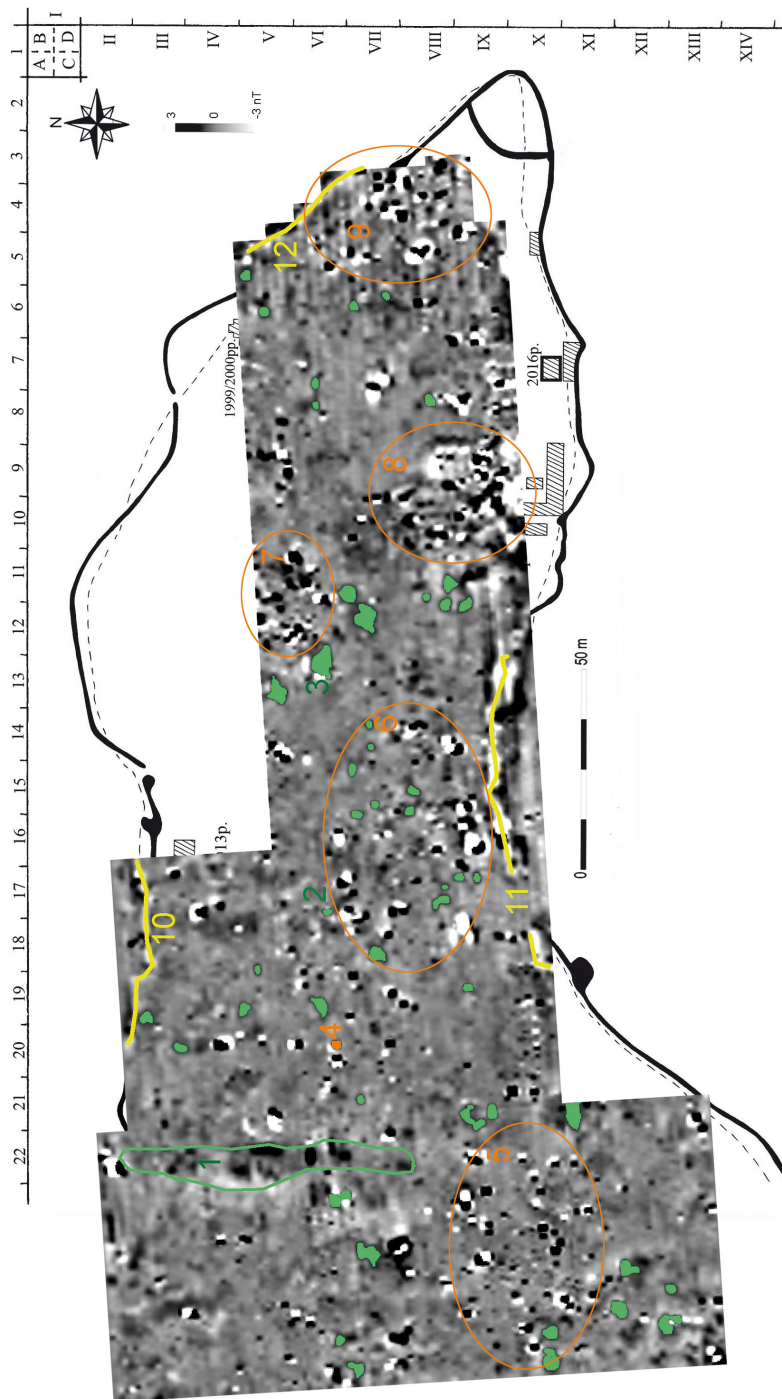


Fig. 17. Mount Lysivka. The magnetic map displaying the most significant geomagnetic anomalies which were mentioned in the paper: Green is the colour to mark the positive geomagnetic anomalies associated with the moat and various sorts of pit features; orange marks the clusters of geomagnetic anomalies presumably associated with the burnt clay daub concentrations; linear geomagnetic anomalies associated with World War II period entrenchment are marked with yellow

craters or the variability of natural pits, such as animal dens, burrows, and tree uprooting hollows, may well have been among these emitters. In 2023, the origins of two point positive anomalies have been positively verified by excavating them (the pits Features 2/2023 and 4-5/2023 – Figs 17: 2, 3; 4). Point positive anomalies are concentrated mainly in the central part of the survey area as well as in the portions where soil sediments are up to 100 cm thick above the bedrock underlayer. Less intensively, they appear, however, throughout the site, particularly west of the Chalcolithic moat.

The vast majority of anomalies in Vynnyky are dipolar anomalies, with their positive and negative poles well accentuated. Among them, minor anomalies dominate, their poles oriented north and south. They are caused by tiny iron artefacts and, therefore, have nothing to do with the Chalcolithic village. Bigger than these, reverse dipolar anomalies are known to have inverted orientation of their poles. Some of these can also be caused by the presence of iron artefacts, yet some others may well represent thermoremanent magnetism. Such anomalies basically demonstrate broad amplitudes of values and thus signalise substances subjected to high temperatures. They are emitted by archaeological features containing signatures of intense burning, such as residues of burnt buildings, furnaces, hearths, *etc.* (Fassbinder 2015, 87; Smekalova *et al.* 2008, 10, 11, 19). By the very nature of the site, it seems most probable to interpret this type of anomaly as the one produced by concentrations of burnt clay daub, which, in turn, are residues of FBC ground-floor buildings (Diachenko *et al.* 2019; Hawinskyj and Rybicka 2021). Both values of the gradient of the vertical component ($-10/10$ to $100/100$ nT) and the shape of the anomalies can be associated with the presence of clay daub that remained from the structures of burnt buildings. This type of anomaly is very often reported from prehistoric tell-sites in the Balkans and, say, Trypillia Culture settlements (Pickartz *et al.* 2019). Moreover, the shape and values of anomalies may positively reflect both structural types of buildings and degrees of ignition. As for the site upon Mount Lysivka, excavations show that house debris takes the form of rather insubstantial irregular agglomerations of clay daub (Diachenko *et al.* 2023; Hawinskyj and Rybicka 2021). The anomalies detected are images which seem to correspond very well to this type of archaeological context, with all irregularities and spread of values. It seems complicated, however, to define the particular types of buildings that could be marked by the anomalies discussed. Concentrations of thermoremanent anomalies are well detectable instead. Three were located in the eastern part of the survey area (Fig. 17: 7-9). Within them, one may be dealing with a large number of anomalies, most probably indicating clay daub concentrations. In the central part of the site, there was another concentration of this type of anomaly (Fig. 17: 6). This one was much more dispersed in kind, and there, point-positive anomalies were many as well, to mark some pit-like terrain features. Finally, a concentration of dipolar anomalies was spotted in the western part of the survey area, where the moat no longer reached (Fig. 17: 5). In this area, the anomalies were relatively few and small. Possibly, they had nothing to do with clay daub fragments but represented another sort of magnetic substance instead, like fragments of

iron or the like. Smaller dipolar anomalies were scattered throughout the survey area as well. Could they indicate the presence of real pits there (Fig. 17: 4)? Whatever they were, they should contain a sufficient amount of materials of high magnetic susceptibility.

The last type of anomalies detected in Vynnyky are linear anomalies with negative values (Fig. 17: 10-12). These anomalies are attributed to the military earthworks created during World War II.

ARCHAEOLOGICAL EXCAVATIONS VS GEOMAGNETIC SURVEYS: A COMPARISON

The 2017 magnetic surveys have contributed to a limited extent to expanding and improving our knowledge of the spatial patterning of the prehistoric settlement upon Mount Lysivka, and it is largely due to the very nature of the hilltop site. Usually, the pit features dug through the loose and sediment sandy or loess soil can hardly accumulate much humus containing organic matter of high magnetic susceptibility. In woodland environs, naturally modified ground should also be considered responsible for many magnetic anomalies still indistinguishable from those associated with prehistoric site contexts. The whole image is additionally complicated because the terrain is densely strewn with ferrous artefacts producing strong anomalies.

The remains of buildings in the form of agglomerations of baked, and less often burnt, clay daub are nonetheless among the positive traits of the site. Obviously, some agglomerations may well correspond to the concentrations of magnetic anomalies. It seems risky, however, in view of local conditions, to try and interpret this or that building, especially when one takes into account well-identified and carefully excavated concentrations of clay daub representing waste material residues called 'House No. 1' (Figs 3 and 4). What was left of it was a series of collapsed structures consisting of slightly burnt clay daub fragments (Fig. 3: A; Hawinskyj and Rybicka 2021). Relatively limited in size, they were not too deep in the ground, while the constituent layers of pieces of clay were neither compact nor dense. On this basis, one may positively suggest that the non-invasively surveyed area might have contained nothing less than four ground-floor buildings of the FBC (Fig. 17). Here, clay was not burnt through and through, yet rather strongly baked and loosely distributed. Neither compact clusters of FBC pottery finds nor pits and pithouses backfilled with humic sediments were found next to the clay daub. All these discoveries may pose sufficient evidence when interpreting dispersed signals visibly provided by geomagnetic maps.

The Eneolithic moat, an essential boundary between the FBC village and the western part of the hill, turned out to be a very weak source of anomalies, although there was no problem observing it on the present-day surface (Figs 4 and 17: 1). An irregular oblong anomaly in the northern part of the moat is all that can be seen on magnetic maps. The

situation was clarified by archaeological means as soon as the unit within the verified area came across a well-defined outline of the moat at a level of 80 cm below the present-day surface; its dark-coloured fill lacked either much organic below the present-day surface material or many pottery finds. Remarkably, the narrow foundation trench of the palisade structure, running alongside the moat, was only testified by the spade and never produced legible magnetic anomalies. The palisade itself, being reinforced with clay in the past, was by no means very well visible too. In the debris that remained, the clay daub was not deeply burnt at all (Figs 6-8). Although sometimes poorly readable, geomagnetic indications are nonetheless important evidence when estimating patterns of spatial development at the prehistoric hilltop village in Vynnyky-Lysivka (Fig. 17).

Significantly, excavations have resulted in confirmation of the fact that dug-out features really existed, producing both dipolar and point anomalies on magnetic maps. Indications like these are scattered throughout the surveyed area. After overburden removal, it transpires that pit features in the central part of the hill were responsible for dipolar anomalies (Fig. 17: 2-4). The stony bedrock was recovered there at a depth of 80 to 100 cm below the present-day surface, while above, a loess-like sediment was found. In 2023, an exploratory trench explored rich samples of both organic and inorganic materials between 40 and 80 cm below the present-day surface, in storage and/or waste pits too (Figs 4 and 9-11); a geomagnetic map shows all of them very well. The verifying experience of such a character gives helpful clues for interpreting similar anomalies in due course.

Conclusively, further discoveries of the moat encircling the village and of its various dug-out features by digging them in 2023 have made the results of early noninvasive works more reader-friendly. The reverse is true as well. The excavations that led to the discovery of House No. 1 (Figs 3 and 4) preceded the geomagnetic surveys, so they are going to give good possibilities for interpreting dispersed thermoremanent anomalies as the signatures of dispersed agglomerations of clay daub.

SYNOPSIS

The question arises whether the difficulty in interpreting the remains of houses built using clay and situated on a stone base is only a peculiarity of Vynnyki-Lysivka.

In the year 2017, in Northern Moldova, geomagnetic surveys of the Late Eneolithic habitation contexts were carried out at the fortified settlement of the Late Trypillia Culture Gordinești Group in Gordinești II-Stînca goală (Przybyła *et al.* 2017). The Gordinești Group dates back to the time range between 3300 and 3000 BC (Król and Rybicka 2022; 2023). Similar efforts have been made at the aforementioned site in Vynnyky-Lysivka, Western Ukraine, where a fortified settlement of the FBC existed between 3600 and 3300 BC (Hawinskyj *et al.* 2021). The sites under study have many similarities in terms of spatial and landscape localisation. Both are situated in fully exposed highland loci, with rocks as

the natural ground of the hills (Hawinskyj and Rybicka 2021; Rybicka *et al.* 2023); this was limestone in Gordinești and sandstone in Vynnyky. Moreover, as invasive techniques like excavations were applied, lightweight dwelling structures were recovered here and there, residually manifested at present in the form of detached clay daub agglomerations of various sizes (Sîrbu and Król 2021; 2023; Hawinskyj and Rybicka 2021; Rybicka *et al.* 2023). Geomagnetic surveys, both at Gordinești and Vynnyky, did not produce exactly the same results that one normally expects, namely, a precise identification of houses and house structure types. They only indicated some loci with minor anomalies originating probably from baked materials such as clay daub, and it is perhaps due to the relatively small amount of the daub remaining after the buildings have crumbled. In the case of Gordinești, no dug-out house features were recovered, and this was obviously due to the fact that limestone was only covered there with a layer of loess sediment 30-40 cm thick, and just below it was the solid rock of Mount Stînca goală. In Vynnyky, the situation was rather different; although the covering sediment upon Mount Lysivka was usually up to 40 cm thick, there were spots as well where this layer had a thickness up to even 100 cm. The deeper was the rock, the greater were chances of finding dug-out features with many movable finds all around. The juxtaposition of the results of the diggings with those of geomagnetic surveys enables the prediction of spaces and loci, many of which may be promising for further invasive works on the sites. Although debatable *per se*, geomagnetic data have triggered many seminal observations and conclusions in the end.

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References

- Diachenko A., Rybicka M., Hawinskyj A., Król D. and Sirbu G. 2019. New excavations in Vynnyky and the issue of the Funnel Beaker culture – Tripolye frontier. In A. Diachenko, M. Rybicka, D. Król and G. Sirbu (eds), *Between the East and the West. Dynamic of social changes from the Eastern Carpathians to the Dnieper in the 4th – beginning of 3rd millennium BC (Preliminary study)*. Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego, 17-30.
- Fassbinder J. 2015. Seeing beneath the farmland, steppe and desert soil: magnetic prospecting and soil magnetism. *Journal of Archaeological Science* 56, 85-95.

- Hawynskiy A. 2013. Poselennia kultury liichastykh kubkiv Vynnyki-Lysivka. In A. Pozikhovski, J. Rogoziński and M. Rybicka (eds), *Na pograniczu kultury pucharów lejkowatych i kultury trypolskiej* (= *Collectio Archaeologica Ressoviensis* 26). Rzeszów: Instytut Archeologii UR, Wydawnictwo Mitel, 55-73.
- Hawynskiy A. and Rybicka M. 2021. *Konstrukcje budowlane kultury pucharów lejkowatych ze stanowiska Winniki-Lisiwka na zachodniej Ukrainie*. Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego.
- Hawynskiy A., Rybicka M. and Król D. 2021. Radiocarbon dating of the Funnel Beaker culture settlement in Vynnyki-Lysivka (Western Ukraine). *Materialy i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego* 42, 15-24.
- Kondracki J. 1998. *Geografia regionalna Polski*. Warszawa: Wydawnictwo PWN.
- Król D. and Rybicka M. 2022. Chronologia radiowęglowa stanowisk grupy Gordinești kultury trypolskiej z północnej Mołdawii i zachodniej Ukrainy. *Archeologia Polski* 67, 9-30.
- Król D. and Rybicka M. 2023. Radiocarbon chronology of the settlement Gordinești II-Stinca goală, Edinet region. In M. Rybicka, D. Król, P. Kittel, M. Makohonienko, W. Pankowski, J. Piątkowska-Malecka, A. Rauba-Bukowska, A. Sady-Bugajska, G. Sîrbu, A. Wacnik, K. Wasylukowa, P. Gębica, K. Cywa, A. Hawynskiy and D. Verteletskiy, *Gordinești II-Stinca goală site and the settlement context in Western Ukraine at the end of the 4th millennium BC*. Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego, 24-30.
- Misiewicz K. 2006. *Geofizyka archeologiczna*. Warszawa: Instytut Archeologii i Etnologii PAN.
- Pickartz N., Hofmann R., Dreibrodt S., Rassmann K., Shatilo L., Ohlrau R., Wilken D. and Rabbel W. 2019. Deciphering archaeological contexts from the magnetic map: Determination of daub distribution and mass of Chalcolithic house remains. *The Holocene* 29/10, 1637-1652.
- Przybyła M., Sîrbu G., Rybicka M., Król D. and Sîrbu L. 2017. Some results of the Geophysical Investigation at the Late Eneolithic Settlement of Gordinești II-Stinca goală, Edineț District, Republic of Moldova. *Analecta Archaeologica Ressoviensia* 12, 49-58.
- Rybicka M., Król D., Kittel P., Sîrbu G., Makohonienko M., Słowiński M., Sucharyna-Thomas L. and Pokutta D. 2023. Late Tripolye Culture Settlement Spatial Patterning: Case study from the Gordinești II-Stinca goală site, Northern Moldova. *Praehistorische Zeitschrift* 98/2. <https://doi.org/10.1515/pz-2023-2009>.
- Sîrbu G. and Król D. 2021. Dwellings and their nearest surroundings in the 4th millennium BC in the Eastern Carpathian area: a case study from the Gordinești-Stinca goală settlement. *Sprawozdania Archeologiczne* 73/2, 93-108.
- Sîrbu G. and Król D. 2023. What is old and what is new in the interpretation of dwellings from the late 4th millennium BC. An analysis based on the results of archaeological research at the settlement of Gordinești II-Stinca goală. In M. Rybicka, D. Król, P. Kittel, M. Makohonienko, W. Pankowski, J. Piątkowska-Malecka, A. Rauba-Bukowska, A. Sady-Bugajska, G. Sîrbu, A. Wacnik, K. Wasylukowa, P. Gębica, K. Cywa, A. Hawynskiy and D. Verteletskiy, *Gordinești II-Stinca goală site and the settlement context in Western Ukraine at the end of the 4th millennium BC*. Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego, 14-23.
- Smekalova T., Voss O. and Smekalov L. 2008. *Magnetic surveying in archaeology. More than 10 years of using the Overhauser GSM-19 gradiometer*. Højbjerg: Wormianum.