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A SPATIAL PATTERN(S) OF THE ENEOLITHIC
MULTI-PHASE SETTLEMENT OF BRÎNZENI IV
(NORTH-WESTERN MOLDOVA) FROM THE PERSPECTIVE
OF NON-INVASIVE GEOPHYSICAL SURVEYS

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ABSTRACT

Non-invasive geophysical methods are often very useful and efficient in the investigation of various archaeological sites. Using one of the most popular of them, i.e. magnetometry, we carried out a survey of the area of the multi-phase Eneolithic site of Brînzeni IV (north-western Moldova) in 2019. As a result, the spatial arrangement of the site and its current state of preservation were preliminarily identified.

Keywords: non-invasive surveys, magnetometry, spatial patterns, Eneolithic, Brînzeni IV

Nowadays, magnetometry is one of the most important components of comprehensive activities preceding the planned excavation at various archaeological sites [e.g. Schmidt 2007; Fassbinder 2016]. With the knowledge of elementary characteristics of prehistoric structures hidden underground, we are able to choose precisely the most informationally promising parts of sites that should be investigated. Therefore, we decided to use this method to identify the spatial specificity of the multi-phase Eneolithic site of Brînzeni IV as well as to determine its state of preservation. The latter, however, has particular relevance due to agricultural activities and their potential harmfulness in the context of the quality of archaeological data [e.g. Król, Niebieszczanski 2019]. Various disturbances of archaeological materials, especially in the case of multi-phase sites as Brînzeni IV, may lead to some interpretation problems that can be resolved only through invasive excavations. For this reason, the results presented below should be treated as a starting point for more detailed spatiotemporal studies of this interesting site in the context of the whole Eneolithic region of north-western Moldova.

LOCATION AND BRIEF HISTORY OF RESEARCH

The multi-phase site is located nearby the modern village of Brînzeni, actually in its SE periphery within an area called by local residents *Tîrla lui Ștefan*¹ (48°4'59.95"N, 27°11'32.12"E). It occupies a part of a promontory flanked on several sides by a steep bank at a distance of 130 m from the Bucșa rivulet, a left tributary of the Racovăț River (Fig. 1 and 2).

This site was discovered by V. Markevich in 1970. During his field reconnaissance at this place, he observed the intensive seasonal erosion of prehistoric structures caused by ploughing up of extremely numerous fragments of burnt daub, ceramics, flint, clay and bones [Markevich 1970: 60]. We noticed exactly the same destructive process at the beginning of the non-invasive research in the spring of 2019.

Several years after the discovery of the site of Brînzeni IV, in 1977, excavations were carried out in order to estimate the degree of destruction of the Eneolithic cultural layer(s). During this campaign, the surfaces of two dwellings with various materials attributed to the Cucuteni B – Tripolye CI phase (or

¹ This place is also referred to as *La livada din deal* [Markevich 1973: 60], *Tîrla lui Ștefan* [Markevich 1981: 14; 1982; Țerna, Heghea 2017: 308] or *Gîrla lui Ștefan* [Markevich 1987: 293].

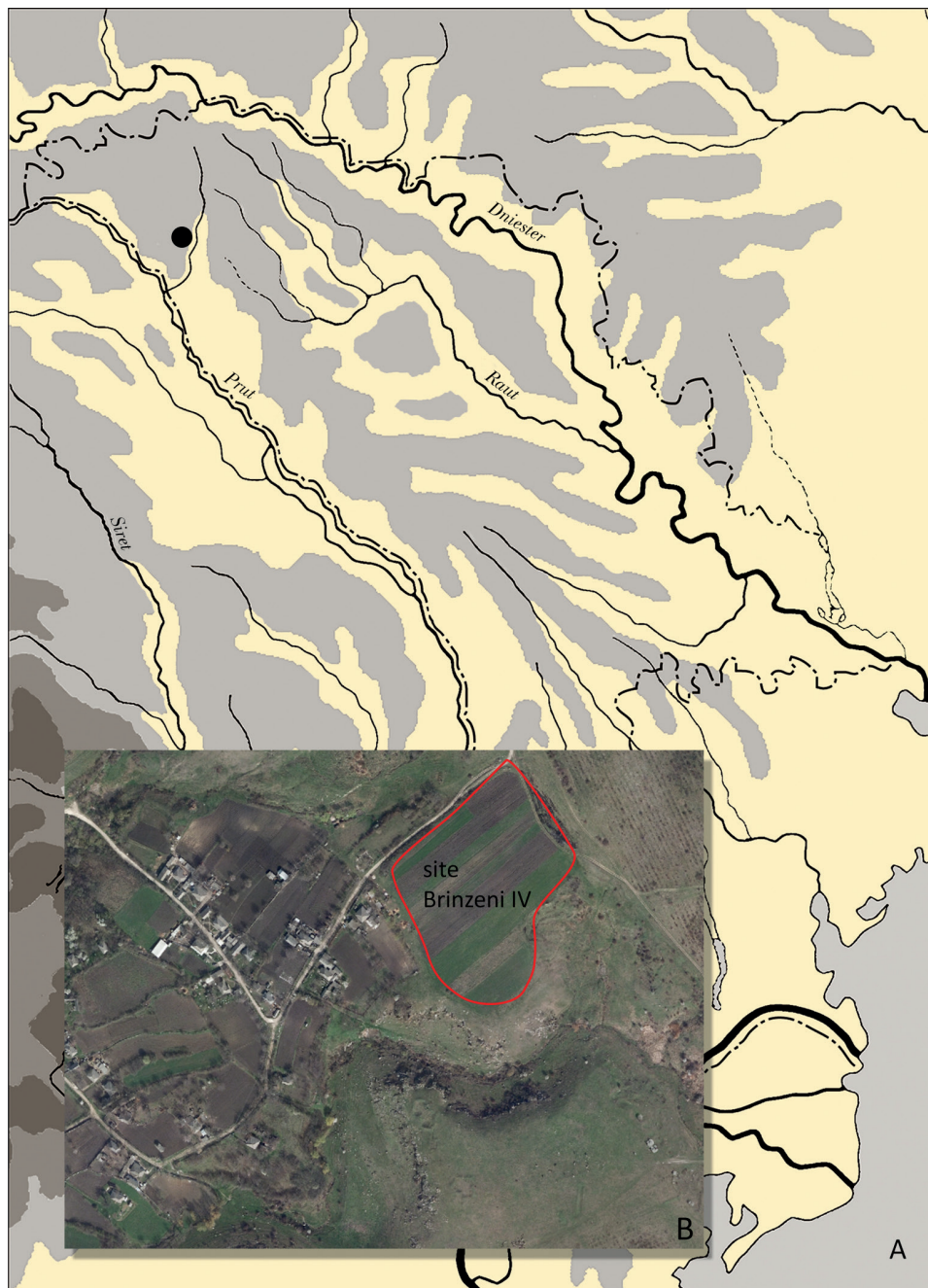


Fig. 1. A – location of the Brinzeni IV site on the map of the Republic of Moldova; B – location of the site on the orthophoto plan



Fig. 2. Brînzeni IV site, view from the south

Caracușeni type according to V. Markevich's typology) [Markevich 1982] were examined. Simultaneously, shards of vessels that could be similar to the Brînzeni and Gordinești phase ones were also found, however, it was unclear whether they occurred in a scattered or compact form. It is only known that they were registered at various depths. Moreover, the excavations identified some further remains in the form of three cremation graves of the Sîntana de Mureș-Cherniakhov culture [Markevich 1982; 1987: 293; Țerna, Heghea 2017: 308].

Four years later, excavations on this multi-phase site were undertaken once again and focused on the pit identified in the cross-section of the eroded edge of the Bucșa stream valley. The remains recorded within this feature allowed researchers to complete the list of inhabitation levels of this site within the phase of Cucuteni A/A-B – Tripolye BI-BII [Markevich 1982].

Unfortunately, due to the poor quality of documentation of the two above-mentioned surveys, including the compilation of results, there are many difficulties with the comprehensive analysis of the data. Nevertheless, we could comment on one of the housing complexes (*Dwelling no. 1*) related to the Cucuteni B – Tripolye CI phase and *Pit no. 1* that contained relics of the Cucuteni A/A-B – Tripolye BI-BII phase.

Dwelling no. 1. There is no drawing of this structure, but merely a brief technical description. According to the head of excavations, this dwelling was well

preserved along the NE-SW axis and measured 14×5 m. It consisted of two rooms with square 1.2×1.2 m ovens.²

Pit no. 1. Likewise, there are no sketches for this feature. The head of the excavation reported that the pit was circular-shaped with a diameter of 1.3 m, and its outline was registered at a level of 0.6 m below the ground. The total depth of the feature was 1.89 m, while its cross-section was pear-shaped. The pit contained the shards of as many as 23 vessels [Markevich 1982].

Notwithstanding a few gaps, the results obtained through these investigations allowed scholars to clarify the basic picture of the cultural affiliations of this site. However, let us observe that its spatial nature – arrangements of households and other settlement features – was still unrecognized. The following questions were left unanswered: what was the spatial nature of the site in the various settlement phases and its variability over time? What were the kinds of development of this place in the Cucuteni A/A-B – Tripolye BI-BII and Cucuteni B – Tripolye CI phases? Can we perceive these spatial patterns as similar to those identified, for instance, in the nearby Brînzeni III-*Țiganca* settlement, dated to phase CII? [Markevich 1981; Țerna, Heghea 2017: Fig. 19]. These questions are relevant not only in the context of this particular multi-phase settlement, but also to the entire micro-region of the Prut basin in north-western Moldova and the formation of Cucuteni-Tripolye communities, especially during the transition from the middle to late stage, which is represented by the two cultural phenomena: the Brînzeni and Gordinești groups [Levițki *et al.* 2016: 255-271; Țerna, Heghea 2017; Sîrbu 2019].

NON-INVASIVE SURVEYS

As mentioned previously, in order to reveal the state of preservation of the site and its internal specificity, the magnetic method was applied. Equipment used in the prospection was the FoersterFerrex 4.032 DLG magnetometer with two channels with the probing precision of 0.2 nT/m. This type of device allows prospectors to assess the disturbances in the Earth's magnetic field and provides a measurement of the earth's vertical magnetic gradient. The distance between the survey lines was 1 m, while the number of measurements per 1 m² was 10. The obtained results were presented on magnetic maps developed in the Terra Surveyor 3.0.29.3 software.

Basically, three sectors (nos. 1-3) of a total area of 5 ha have been selected for the magnetometric survey. However, only 2.45 ha of this area lay within the

² Here, we will not present more detailed information about it because it was widely commented upon in other publications [Markevich 1987: 293; Țerna, Heghea 2017: 308].

known range of the site, with the rest extending in the unknown area indented for verification (Fig. 3).

Of particular interest are the results of the survey in *Sector no. 1* (Fig. 3), owing to the discovery of numerous anomalies related to archaeological features.



Fig. 3. The results of the magnetic surveying inserted on the orthophoto plane

The vast majority of them are thermoremanent anomalies, caused by the effects of a very high temperature [Fassbinder 2015: 87; Smekalova *et al.* 2008: 10-11]. They are visible in the form of distinct dipoles. Based on the value of their vertical component gradient (from -30 to 30 nT) and their shape, we can interpret them as daub residues from the structures of burnt dwellings. Such anomalies have also been noted on other sites of the Tripolye culture [Pickartz *et al.* 2019]. Their shape and values depend on the type of dwelling structures and the degree of their burnout. It is worth mentioning that apart from the discussed dipole anomalies, the

presence of point positive anomalies has been noted on the site. Such anomalies are caused by pits or furnaces [Fassbinder 2015: 88].

In the generated image of *Sector no. 1*, we can observe anomalies that may indicate an interesting arrangement of dwellings in several oval rows (Fig. 3, no. 1). Moreover, the distribution of some single anomalies seems to suggest the presence of many pits in the immediate vicinity of the dwellings. This is not surprising because such accompanying features are also known in the other Eneolithic settlements of Cucuteni-Tripolye societies [Popa *et al.* 2010: 145-157; Chapman *et al.* 2014: 364-406; Țerna *et al.* 2016c: 41-52; Scholz *et al.* 2018]. Turning to the matter of dwellings, the results received for *Sector no. 1* show that the intensity and shape of the anomalies are directly related to the clusters of burnt daub that occur on today's surface of the site. The size of those 'disturbances' varied from about 3 to 10 m in width and from 6 to 25 m in length.³ Overall, it can therefore be concluded that there are remnants of at least 33 dwellings in the examined area of the site (Fig. 4).

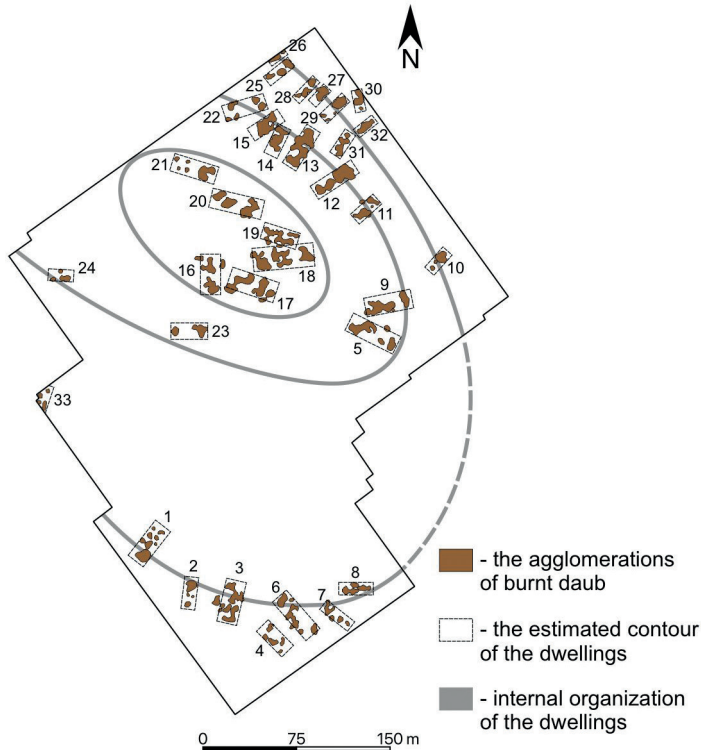


Fig. 4. Deciphering the magnetometry results obtained for *sector no. 1*

³ The estimated size of dwellings was calculated using the Qgis software (see Table 1).

Table 1

The estimated size of dwellings from Brînzeni IV site.

| No. | Complex | Length | Width | sq.m. |
|-----|-------------|--------|-------|-------|
| 1 | Dwelling 1 | 15.6 | 8 | 124.8 |
| 2 | Dwelling 2 | 10.8 | 4 | 43.2 |
| 3 | Dwelling 3 | 15.8 | 7 | 110.6 |
| 4 | Dwelling 4 | 11.7 | 6.4 | 74.8 |
| 5 | Dwelling 5 | 20 | 9.7 | 194 |
| 6 | Dwelling 6 | 16.9 | 6.7 | 113.2 |
| 7 | Dwelling 7 | 13.2 | 5 | 66 |
| 8 | Dwelling 8 | 11.5 | 5 | 57.5 |
| 9 | Dwelling 9 | 18.9 | 6.9 | 130.4 |
| 10 | Dwelling 10 | 9.2 | 5 | 46 |
| 11 | Dwelling 11 | 10.1 | 7.2 | 72.7 |
| 12 | Dwelling 12 | 17.5 | 7.1 | 124.2 |
| 13 | Dwelling 13 | 16.3 | 8.2 | 133.6 |
| 14 | Dwelling 14 | 9.3 | 5.6 | 52 |
| 15 | Dwelling 15 | 10.5 | 6.4 | 67.2 |
| 16 | Dwelling 16 | 14.4 | 9 | 129.6 |
| 17 | Dwelling 17 | 19.3 | 10.8 | 208.4 |
| 18 | Dwelling 18 | 25.5 | 8.4 | 214.2 |
| 19 | Dwelling 19 | 14.2 | 6.6 | 93.7 |
| 20 | Dwelling 20 | 19.4 | 8.5 | 164.9 |
| 21 | Dwelling 21 | 17.2 | 6.3 | 108.3 |
| 22 | Dwelling 22 | 17.3 | 7.5 | 129.7 |
| 23 | Dwelling 23 | 14.8 | 5.5 | 81.4 |
| 24 | Dwelling 24 | 8.2 | 5 | 41 |
| 25 | Dwelling 25 | 11.9 | 5 | 59.5 |
| 26 | Dwelling 26 | – | – | – |
| 27 | Dwelling 27 | 6 | 4.6 | 27.6 |
| 28 | Dwelling 28 | 10.8 | 4.6 | 49.6 |
| 29 | Dwelling 29 | 12.3 | 4.8 | 59 |
| 30 | Dwelling 30 | 8.7 | 4.2 | 36.5 |
| 31 | Dwelling 31 | 10.3 | 4.6 | 47.3 |
| 32 | Dwelling 32 | 8 | 3.3 | 26.4 |
| 33 | Dwelling 33 | – | – | – |

As mentioned earlier, these dwellings were arranged in three rows of elongated ovals (Fig. 4). In the first external row, which is interrupted in the south-eastern edge of the site, there are 17 dwellings with different orientations. The second one has 10 dwellings, most of which are clustered while the rest is dispersed. These dwellings, however, are generally oriented towards the centre. The third one is actually an elongated oval consisting of six dwellings with varied orientations. Interestingly, there is also a south-eastern part of the site that seems to be undeveloped. In contrast, several dwellings overlap one another. This may suggest that some can be associated with different phases.

It is worth mentioning that also during a simultaneous field survey a lot of archaeological material has been collected within *Sector no. 1*, which gives some indication of the scale of site erosion caused by agriculture. The material includes interesting Brinzeni type finds (Fig. 5). They were gathered near dwellings nos.



Fig. 5. Brinzeni type materials. 1 – anthropomorphic figurine; 2 – flint nucleus; 3-7, 9-10 fine pottery; 8 – coarse pottery

16-18 located in the centre of the site. Moreover, a few shards of the subsequent Bronze Age Noua culture were found at a distance of 5-6 m from other Eneolithic dwellings nos. 5, 9-10 (Fig. 6). These field observations enrich the general knowledge of this stratigraphically complex site.

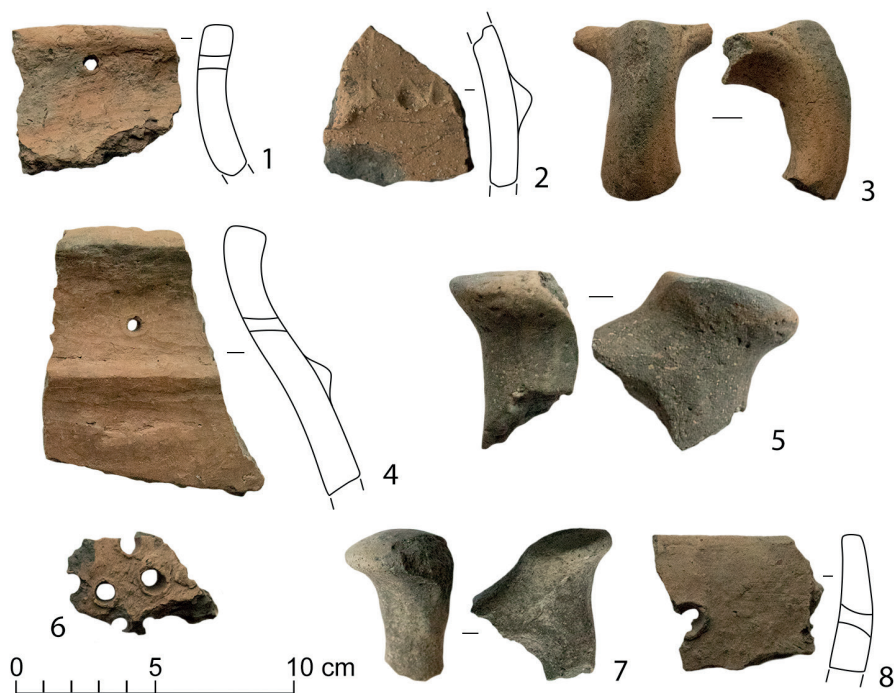


Fig. 6. Noua type pottery

In the case of *Sector no. 2*, anomalies that can be interpreted as the indicators of dwelling remains were recorded only in its western part (Fig. 3, no. 2). There are also single anomalies that seem to point to the presence of pits. The study of old satellite maps shows that this sector was used as an orchard for many years and this may be the cause of linear anomalies visible in the geophysical image (Fig. 3, no. 2). Therefore, it cannot be ruled out that some archaeological features have been destroyed in this part of the site. However, despite the disturbances visible in this section of the multi-phase settlement, it can be easily assumed that the north-eastern border of the settlement coincided with the western part of *Sector no. 2*. This may be evidenced by the occurrence of the aforementioned anomalies, probably related to the remains of buildings (Fig. 3, no. 2; 4).

There are no relevant anomalies in *Sector no. 3*. This is probably the result of land preparation for planting trees, which led to the complete destruction of the archaeological substance (Fig. 3, no. 3).

The results produced by the magnetometric survey in Brînzeni IV are an important addition to previous non-invasive studies conducted in the Brînzeni micro-zone [Țerna *et al.* 2018: 22-24; Scholz *et al.* 2018: Abb. 8; Sirbu *et al.* 2020: 28-30], as well as on other Neo- and Eneolithic sites in the forest-steppe [Popa *et al.* 2010: 145-157; Hofmann *et al.* 2016: 18-22; Țerna 2016: 189-225; Przybyła *et al.* 2017: 49-58; Țerna *et al.* 2016a: 29-34; Țerna *et al.* 2016b: 81-116; Țerna *et al.* 2017: 13-15; Țerna *et al.* 2020: 19-21], and the Prut-Dniester steppe [Goveardica *et al.* 2012; Mistreanu, Przybyła 2019: 17-39; Mistreanu, Przybyła 2020: 5-20; Sirbu *et al.* 2020: 28-30]. The multi-phase settlement of Brînzeni IV is undoubtedly very promising for further exploration. Despite its partial destruction, it offers some hope for tracing the spatiotemporal relations between the four stages of the existence of local Eneolithic populations. But just as importantly, the exploration of this site may turn out to be very useful for a broader study of cultural changes in the Eneolithic of north-western Moldova in the 4th millennium BC. Therefore, we would like to take steps in order to make a closer acquaintance with this place in the future.

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REFERENCES

- Chapman J., Videiko M. Yu., Hale D., Gaydarska B., Burdo N., Rassmann K., Mischka C., Müller J., Korvin-Piotrovskiy A., Kruts V.
 2014 The Second Phase of the Trypillia Mega-Site Methodological Revolution: A New Research Agenda. *European Journal of Archaeology* 17 (3): 369-406.
- Fassbinder J.W.E.
 2015 Seeing beneath the farmland, steppe and desert soil: magnetic prospecting and soil magnetism. *Journal of Archaeological Science* 56: 85-95
 2016 Magnetometry for Archaeology. In: A.S. Gilbert, P. Goldberg, V.T. Holliday, R.D. Mandel and R.S. Sternberg (Eds) *Encyclopedia of Geoarchaeology*, 499-514. Encyclopedia of Earth Science Series. Dordrecht.
- Govedaritsa B., Zidarov P., Manzura I.
 2012 Otchet o geomagnitom izuchenii poseleniya rannego eneolita kultury Bolgrad-Alden u s. Chalyk, r-n Tarakliya v 2011 godu. Archives of the National Museum of History of Moldova, inv. no. 532. Kishinev.
- Hofmann R., Țerna S., Rud V., Shatilo L., Sîrbu Gh.
 2016 Geomagnetic surveys and archaeological test-trenches on Early Neolithic – Late Copper Age sites from Republic of Moldova. In: *Beyond excavation. Geophysics, aerial photography and the use of drones in eastern and south-east European archaeology*, 18-22. Piatra-Neamț.
- Król D., Niebieszczęński J.
 2019 Skołoszów 16 – A Spatial Arrangement of the Eneolithic Settlement of the Funnel Beaker Culture in the Rzeszów Foothills (South-Eastern Poland) in the Light of Previous Excavations and Geophysical Survey. *Interdisciplinaria Archaeologica. Natural Sciences in Archaeology* 10(2): 121-128.v
- Levițki O., Sîrbu Gh., Bajureanu I.
 2016 Microzona Trinca în contextul eneoliticului est-carpatic. In: S. Țerna, B. Govedarica (Ed.) *Interactions, Changes and Meanings. Essays in honour of Igor Manzura on the occasion of his 60th birthday*, 255-271. Kishinev.
- Markevich V.I.
 1973 *Pamyatniki epokh neolita i eneolita*. Arkheologicheskaya karta Moldavii 2. Kishinev.
 1981 *Pozdnetripolskiye plemena severnoy Moldavii*. Kishinev.

- 1982 Raskopki na poselenii Brynzeny IV (yama etapa B I) v 1981 g. Archives of the National Museum of History of Moldova, inv. no. 188 II. Kishinev.
- 1987 Arkh. Selishche Brynzeny IV. In: N.A. Demchenko (Ed.) *Svod pamyatnikov istorii i kultury Moldavskoy SSR. Severnaya zona*. Kishinev.
- Mistreanu E., Przybyła M.
- 2019 The Gumelnița culture settlements in the Prut-Dniestr rivers area, in light of old and new research from Taraclia I (Republic of Moldova). *Analecta Archaeologica Ressoviensia* 14: 17-39.
- 2019 Despre planimetria așezării gumelnițene Taraclia I în cercetări vechi și noi. *Revista Arheologică, serie nouă* 16 (1): 5-20.
- Pickartz N., Hofmann R., Dreibrodt S., Rassmann K., Shatilo L., Ohlrau R., Wilken D., Rabbel W.
- 2019 Deciphering archeological contexts from the magnetic map: Determination of daub distribution and mass of Chalcolithic house remains. *The Holocene* 29 (10): 1637-1652.
- Popa A., Musteață S., Rassmann K., Bicbaev V., Munteanu O., Postică G., Sîrbu Gh.
- 2010 Rezultatele preliminare privind sondajele geofizice din anul 2009 și perspectivele folosirii magnetometriei în Republica Moldova. In: S. Musteață, Al. Popa, J.-P. Abraham (Eds) *Arheologia între știință politică și economia de piață*, 145-157. Chișinău.
- Przybyła M. M., Sîrbu Gh., Rybicka M., Król D., Sîrbu L.
- 2017 Some Results of the Geophysical Investigation at the Late Eneolithic Settlement of Gordinești II-*Stîncă goală*, Edineț District, Republic of Moldova. *Analecta Archaeologica Ressoviensia* 12: 49-58.
- Scholz R., Rassmann K., Țerna S.
- 2018 Stolniceni, Petreni, Brînzeni, Republik Moldau. Luftbildaufnahmen mit Drohnen (UAV) von kupferzeitlichen Siedlungen in Moldawien im Kontext magnetischer Prospektionen und Ausgrabungen. Die Arbeiten der Jahre 2009 bis 2017. *iDAI. Publications* 1, 76-83.
- Schmidt A.
- 2007 Archaeology, magnetic methods. In: D. Gubbins, E. Herrero-Bervera (Eds) *Encyclopaedia of Geomagnetism and Palaeomagnetism*, 23-31. Encyclopaedia of Earth Sciences Series. New York.
- Sîrbu Gh., Przybyła M., Rybicka M., Podsiadło M., Król D., Mistreanu E., Sîrbu L., Heghea S.
- 2020 Cercetări non-invazive în siturile eneolitice Taraclia I și Brînzeni IV: o perspectivă pentru viitor. *Cercetări arheologice în Republica Moldova*:

Campania 2019: Sesiunea Națională de Rapoarte, Chișinău, 18 aprilie 2020, 28-30. Chișinău.

Țerna S.

2016 Geomagnetic surveys of the Neolithic and the Copper Age sites from the Republic of Moldova (1968-2016): main results, current state and future perspectives. *Raport 11*: 189-225.

Țerna S., Heghea S.

2017 Middle and Late Copper Age settlements from the Brînzeni microzone on the Prut River: Older research in a modern background. *Sprawozdania Archeologiczne 69*: 297-325.

Țerna S., Dêbiec M., Vornicu-Țerna A.

2016a Geophysical and archaeological research on the neolithic and early copper age site of Nicolaevca V in northern Moldova. In: *Beyond excavation. Geophysics, aerial photography and the use of drones in eastern and south-east European archaeology*, 29-34. Piatra-Neamț.

Țerna S., Saile T., Dêbiec M., Posselt M.

2016b Scanări geofizice și cercetări arheologice pe situri din neoliticul târziu – eneoliticul timpuriu de pe teritoriul Republicii Moldova (2014-2015). *Tyragetia, serie nouă 10 [25] (1)*: 81-116.

Țerna S., Rassmann K., Vasilache M., Radloff K.

2016c Stolniceni I – new research on a Cucuteni-Tripolye large site. In: A. Zanoci, E. Kaiser, M. Kashuba, E. Izbitser, M. Băț (Eds) *Mensch, Kultur und Gesellschaft von der Kupferzeit bis zur frühen Eisenzeit im Nördlichen Eurasien. Beiträge zu Ehren zum 60. Geburtstag von Eugen Sava. Tyragetia International I*, 41–52. Chișinău.

Țerna S., Hofmann R., Rud V., Shatilo L., Sîrbu Gh., Heghea S., Levițki O.

2017 Scanări geofizice și sondaje arheologice în situri neo-eneolitice din raioanele de nord ale Republicii Moldova din anul 2016. In: *Cercetări arheologice în Republica Moldova (Campania 2016)*, 13-15. Chișinău.

Țerna S., Rassmann K., Kalmbach J.

2018 Prospecțiunile geofizice din anul 2017 în siturile cucuteniene de dimensiuni mari Stolniceni I și Brînzeni VIII (r-nul Edineț). In: *Cercetări arheologice în Republica Moldova (Campania 2017)*, 22-24. Chișinău.

Țerna S., Rassmann K., Hohle I., Kalmbach J., Grundmann A., Kohle M.

2020 Prospecțiuni geofizice pe situri Cucuteni-Tripolie din Nordul Republicii Moldova. In: *Cercetări arheologice în Republica Moldova (Campania 2019)*, 19-21. Chișinău.