

Uncovering Neolithic and Early Bronze Age landscapes: new data from southwestern Poland

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An increasingly important role in the study of prehistoric cultural landscapes is played nowadays by various methods of non-invasive archaeological prospection, such as aerial photography, remote sensing, airborne laser scanning and terrestrial geophysical surveying. In Polish archaeology, which has pioneered in many aspects the use of aerial photography and geophysical methods, investigations of this kind have a long history and can boast many successful applications, but the intensity of their use continues to be uneven. In the case of the region of Silesia (southwestern Poland), non-invasive prospection has been sporadic and hardly regular. However, recent projects have yielded data that will most likely increase the number of known Neolithic and Early Bronze Age sites in Silesia, especially ditch enclosures and other monuments. The implementation of modern archaeological prospection methods has often contributed to a better understanding of already recorded sites and has been beneficial not only in furthering knowledge about the past, but also in protecting the archaeological heritage.

KEY-WORDS: Silesia, Neolithic, Early Bronze Age, magnetic prospection, aerial prospection, enclosures, landscape

Cultural landscape as a space for interaction between the natural environment and past and present socio-cultural behavior is an important element of contemporary heritage protection doctrines, as well as the subject of research in the humanities, and the natural and social sciences. It also provides a unique platform for integrating various disciplines and research methods dealing with the study of contemporary cultural landscapes and their past transformations, and it is in this sphere that archaeology plays a fundamental role.

Cultural landscape surfaced as a topic of interest in the late 19th and early 20th century in German geographical studies. At the beginning of the 20th century this legacy gave rise to the American landscape school. At the same time, the French school of human geography, which derived from Durkheim's sociology, was developed by Vidal de la Blache.

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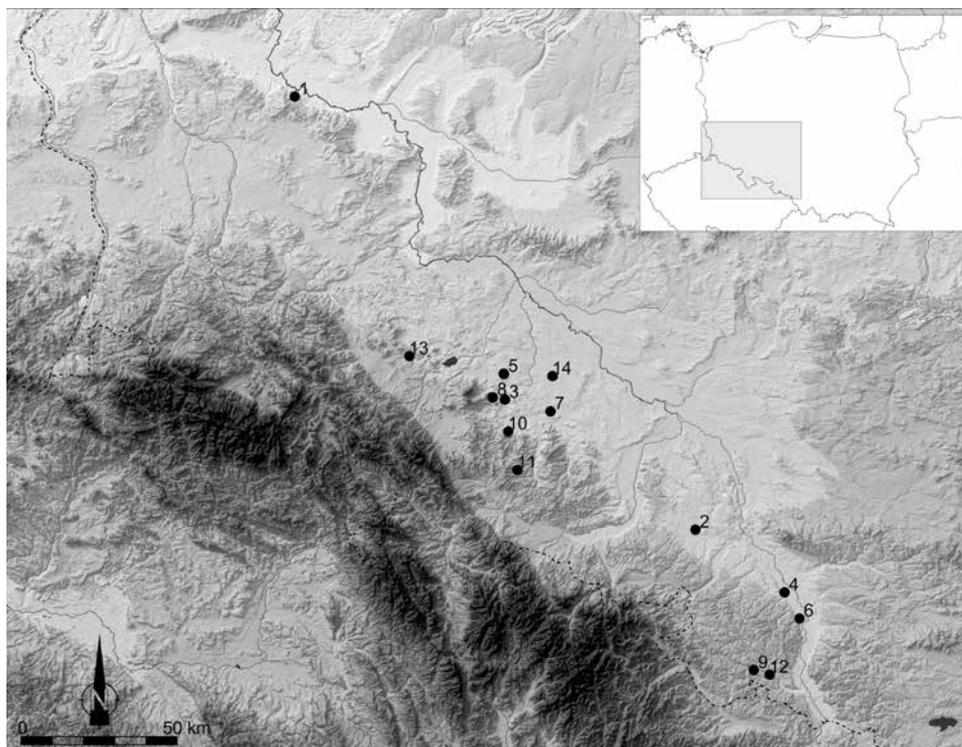


Fig. 1. Map of Silesia (southwestern Poland), showing sites mentioned in the text. 1 – Bodzów, 2 – Chrzelice, 3 – Dankowice, 4 – Dębowa, 5 – Dobkowice, 6 – Dzielnica, 7 – Górzec, 8 – Janówek, 9 – Kietrz, 10 – Księginice Wielkie, 11 – Muszkowice, 12 – Pietrowice Wielkie, 13 – Przyłęgów, 14 – Radłowice

These ideas were also backed by Polish researchers (e.g., M. Dobrowolska, L. Krzywicki, K. Potkański, E. Romer, F. Bujak, W. Semkowicz) (Myga-Piątek 2005).

The history of cultural landscape studies, especially the development of landscape archaeology, is relatively short. The term was first coined by Mick Aston and Trevor Rowley in the mid 1970s (Aston and Rowley 1974); however, the intertwined relationship between man and environment, especially in spatial contexts, has a much longer history and is one of the more significant issues undertaken in archaeology. Landscape research began in the 1980s and developed rapidly in the following decade, taking advantage of methodological advances that confronted various empirical and conceptual approaches. The main focus initially was on analyzing transformations in time and man's relationship to his environment. More recently, landscape has started to be treated as more of an integral part of everyday social and cultural life rather than merely a backdrop for human activities (e.g., David and Thomas 2008)

The meaning of landscape and its significance is different for different groups and individuals operating in it and is a variable of the prevalent actions and practices

implemented within it. For instance, the cultural landscape experience will be distinctive for the hunter-gatherer and for the farmer, its role not being reduced to aspects related to daily activity or economic behavior. The so-called Neolithic Revolution, often reduced to the opposition of the hunter-gatherer and agricultural economies, was focused primarily on symbolic and social transformations, in which the Neolithic sensory revolution, which was part of the new Neolithic 'mode of thought', played an important role (Tilley 2007). Hunter-gatherer communities treated themselves on the whole as part of the cultural landscape and their contribution to its physical transformation was minimal. With the advent of agriculture man's attempt to master his surroundings became apparent as he began to clear forests, build houses, tombs and ceremonial objects.

Non-invasive archaeological prospection plays an ever more important role among the different approaches to the study of prehistoric cultural landscapes. Aerial photography, remote sensing, airborne laser scanning and terrestrial geophysical surveying are among the methods used. These techniques have proved successful in discovering and documenting previously unknown forms of archaeological sites and features. A number of recent and ongoing projects are proof of their multifaceted usefulness. Examples include:

- BREBEMI Project, aimed primarily at evaluating the threat to archaeological resources by planned road construction. The systematic use of non-invasive methods provided a vast amount of new information useful in the study of changes in the cultural landscape (Campana and Dabas 2011).

- Stonehenge Hidden Landscape Project, carried out in a study area with a long history of intensive archaeological investigations, but still capable of uncovering many previously unknown elements within a unique landscape formed by the Stonehenge surroundings (Gaffney *et al.* 2012).

- Tripilye Megasites Project, large-scale recognition of "mega structures" of Tripilye Culture using magnetic prospection techniques, providing at the same time new data for demographic, economic and social studies (Rassmann 2014).

In Polish archaeology, which has pioneered in many aspects the use of aerial photography (e.g., Biskupin; Nowakowski *et al.* 2005; Kobyliński 2005) and geophysical methods, investigations of this kind have a long history and can boast many successful applications, but the intensity of their use continues to be uneven. In the case of the region of Silesia (southwestern Poland), aerial and geophysical prospection has been sporadic and hardly regular compared to that in Małopolska or Wielkopolska, this despite a highly complex and diverse cultural landscape resulting from favourable conditions related to the presence of numerous natural resources and fertile soils. The potential for the recognition of this landscape through the application of non-invasive techniques is high and has been confirmed by recent studies of Neolithic and Early Bronze Age communities, designed to take full advantage of non-invasive prospection as a fundamental element of the applied research methodologies.

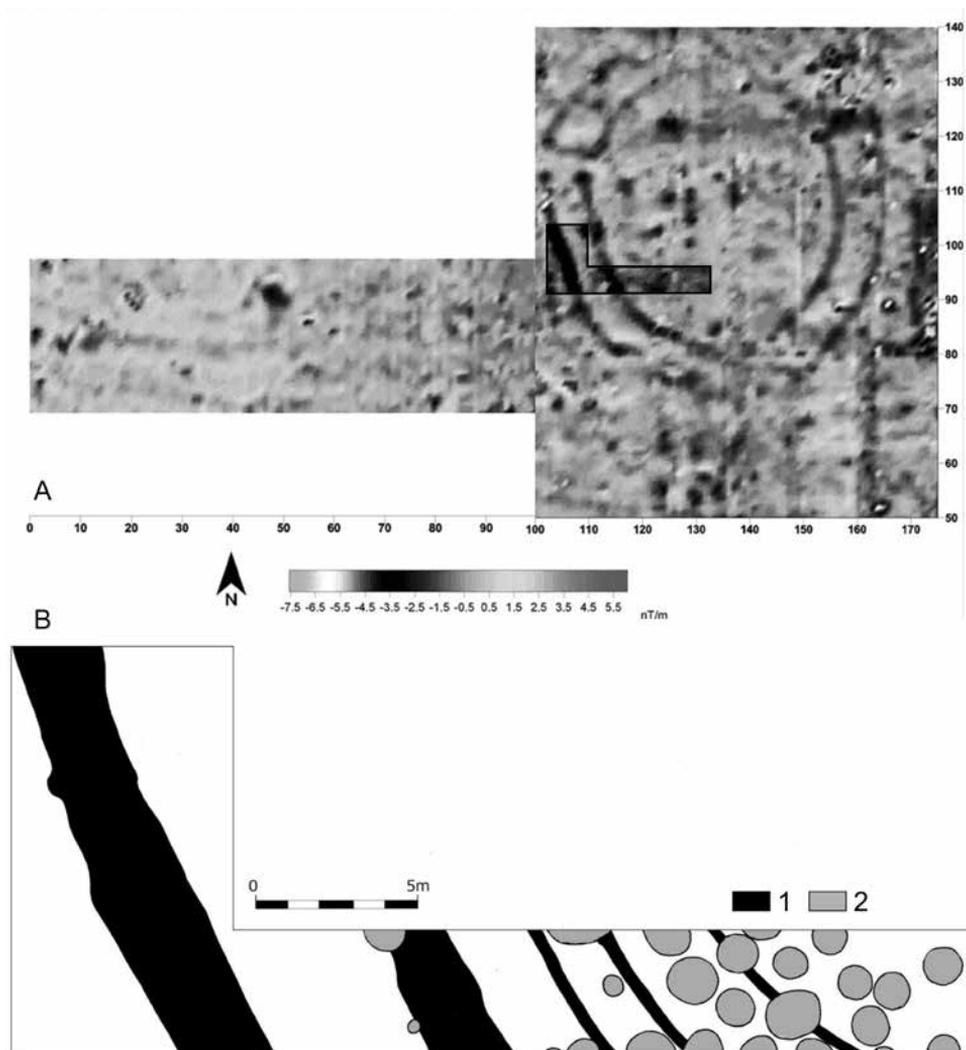


Fig. 2. Bodzów (Lubuskie province). A rondel-type enclosure of the Stroke-Ornamented Pottery Culture. A – magnetic map; B – trench plan: 1 – Neolithic ditches and palisades; 2 – later pits (after Kobyliński *et al.* 2012)

Silesia was one of the first regions in modern Polish territory to be settled by pre-historic agricultural communities. Initial settlement took place on soils most agreeable to farming activities. With time the ecumene gradually grew in proportion to the demographic growth. Between approximately 5300–5200 BC and 1500 BC, the trajectory of social and economic transformation was reflected in the functioning of the

past cultural landscape. These changes, both anthropogenic and natural, were recorded using non-invasive methods of prospection, especially aerial photography, geophysics and to a lesser extent geochemical methods.

Ditched enclosures are among the settlement activities from the Neolithic and Bronze Ages that have attracted particular attention. These features are very diverse in terms of form, size, layout and chronology. The interpretation of their function is also a source of controversy and ongoing debate. Until recently Silesia and Poland in general were pointed out as having a disproportionately low number of known ditched enclosures compared to other parts of Europe. Only three Neolithic ditched enclosures: Racibórz-Ocice (Silesia province), Tyniec Mały (Lower Silesia province) and Zarzyca (Lower Silesia province), were marked on a map published at the end of the 20th century (Andersen 1997). Excavations since then have added a few more sites to this map: the Neolithic site in Dobkowice (Lower Silesia province; Czarniak 2011), as well as Early Bronze Age fortified settlements in Jędrzychowice (Opole province), Nowa Cerekiew (Opole province) and Radłowice (Lower Silesia province) (Gedl 1985; Kosińska 1985; Lasak and Furmanek 2008). Earth resistance surveys were carried out in 1978 in Tyniec Mały (Lower Silesia province), a site associated with the Jordanów culture, but failed to help in determining the form of the site (Noworyta 1986).

A turning point in the application of non-destructive methods in Silesia came in 1998 with the discovery by Otto Braasch of a circular ditched enclosure in Bodzów (Figs 1 and 2). Further research in Bodzów, including magnetic and earth resistance surveys, took place in 2006–2009. Excavations confirmed the existence of a rondel-type enclosure, consisting of two concentric ditches with a diameter of 64 m and 55 m, as well as three internal palisades (Kobyliński *et al.* 2012). The discovered structure was associated with Stroked Ornamented Ware culture communities and classified in terms of morphology as a Lochenice–Unternberg rondel-type enclosure (according to Podborský 1999). Currently, there are approximately 150 rondel-type enclosures known from Central Europe, most of them discovered through the application of non-invasive techniques (e.g., Trnka 1991; Podborský 1999; Kovárník *et al.* 2006; Melichar and Neubauer 2010; Kuzma and Tirpák 2012; Literski and Nebelsick 2012). They are characterized by a diameter of over 40 m, palisades on the inner side of the trenches, V- or Y-shaped ditches with few artifacts in the fill, one or more regularly spaced gates/entrances and a lack of notable architecture within the enclosure. Their chronology requires further research based on radiocarbon dating, but was most likely relatively short and can be placed between 4850 and 4700 BC. These structures are assumed to have some kind of ceremonial function, playing an important role related to social integration and remembrance.

A large circular soil mark observed in 2009 to the south of Księgienice Wielkie was assumed to be a rondel-type enclosure (Fig. 1; Czarniak *et al.* 2011). The discovery requires archaeological verification as soil marks are often not open to unambiguous interpretation and may in fact attest to natural geological activity. Another circular structure located near Przyłęgów (Lower Silesia province) was noted during a 2014 aerial survey

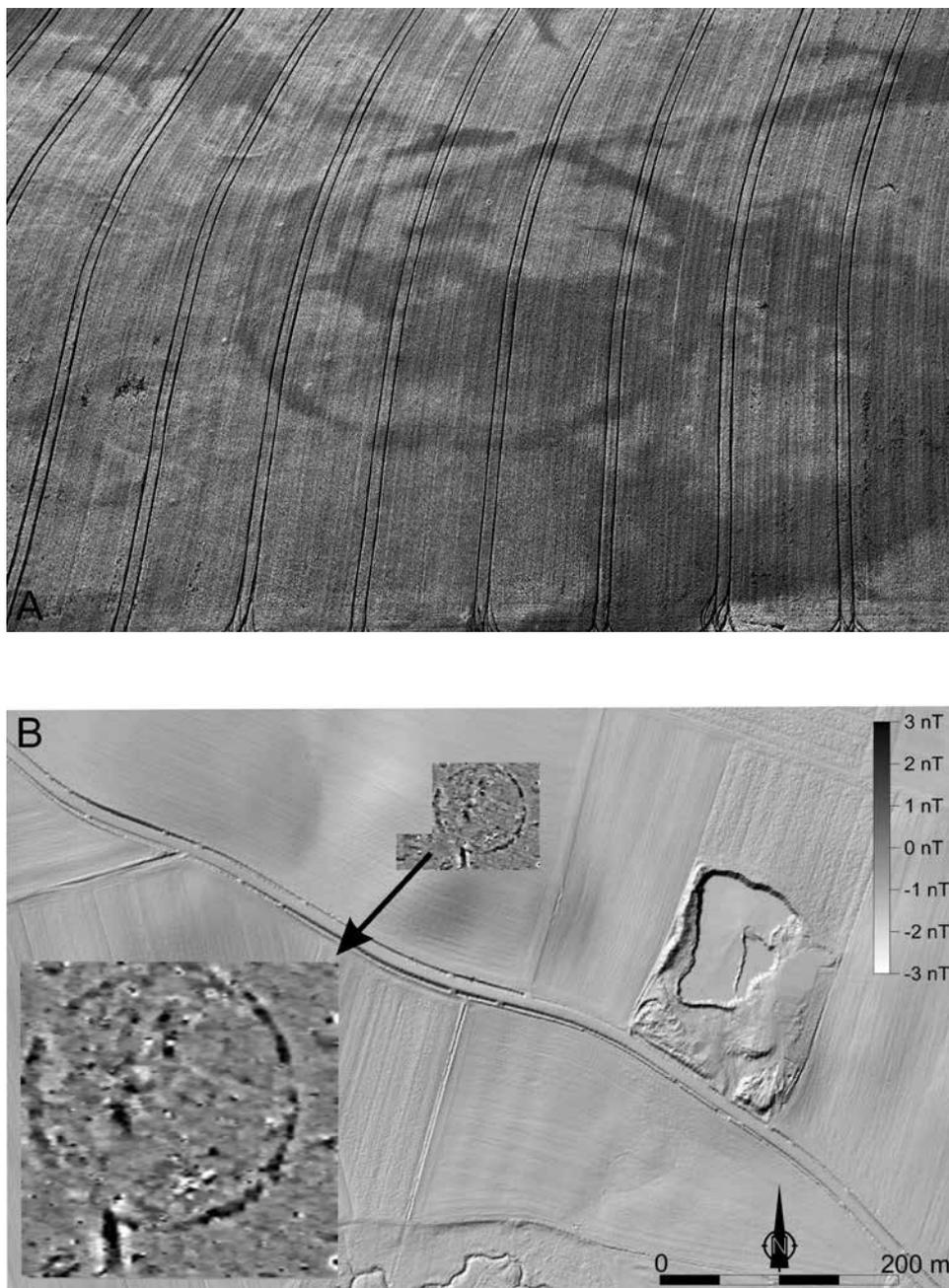


Fig. 3. Przyłęgów (Lower Silesia province). The Eneolithic or Early Bronze Age circular enclosure.
A – aerial image (Piotr Wroniecki); B – magnetic map

(Figs 1 and 3). It was a regular circular crop mark, about 80 m in diameter, indicating the existence of a single ditch enclosure. A magnetic survey conducted in the same year verified the aerial data without revealing traces of further ditch features. The width of the ditch was approximately 4–5 m and it was truncated symmetrically in two places, at the southeast and the northwest. There was no evidence in the results of the magnetic prospection either of inner buildings or of an inner palisade. Test trenches confirmed the presence of a single moat with U-shaped profile. The few and very fragmented potsherds discovered in the ditch were hardly a sufficient chronological indicator. Most likely, it was not a typical rondel-type enclosure, but rather a later feature, dating to the Bronze Age or Eneolithic, sometimes referred to as rondeloid-type enclosure. Sites of this sort consisted in most cases of circular ditches, one or more concentric ones (although semi-circular structures adapted to the ground relief are also known, e.g., Hrušovany) and no architecture inside them. In some cases, however, post-built structures and burials or small cemetery enclosures were discovered. They differed from their Neolithic counterparts primarily in the U-shaped sections of the ditches. The assumption is that these structures may have served similar social, symbolic and ceremonial or funeral purposes (Kovárník 1999; 2003; 2004; Trnka 2011; Spatzier 2012).

Another circular structure that can be dated to the Early Bronze Age based on finds from test trenching was located near Pietrowice Wielkie (Silesia province) through an analysis of publicly available satellite imagery from Google Earth. Magnetic surveying of 2.68 ha revealed that the structure consisted of two concentric ditches, the outer one with a diameter of 190 m and the inner one of about 120 m. The ditches had a width ranging from 8 m to 10 m. Gaps in the ditches in two places suggested the existence of entrance ways. Finally, a smaller linear anomaly located on the inner side of the smaller ditch could be interpreted as a palisade. This anomaly was also truncated in the same places as the ditches, providing further evidence of a passage function (Figs 1 and 4). A large number of diverse magnetic anomalies, other than ditches and palisades, was also registered within and beyond the ditches. A 10 m wide swath near the inner part of the ditches had a much less intensive occurrence of anomalies, suggesting the existence of ramparts in this area. The few visible point anomalies may be associated with features of a different chronology than the ditches and alleged embankments.

Most of the registered point anomalies are oval or circular in shape and possess a diameter of approximately 1–3 m. They are present along the outer edge of the two ditches, particularly in the space between them, as well as in the central part of the site. Excavations revealed as their source trapezoidal pits that may be interpreted as relics of storage pits, which were subsequently turned into places of ritual activity involving animal sacrifices. Other anomalies are to be interpreted most likely as relics of sunken dwellings and production facilities (such as hearths, kilns etc.). Not all need to be related to the enclosure and could represent chronologically different settlement horizons.

Despite the circular morphology of the structure, which may imply association with the previously mentioned Early Bronze Age rondeloid-type enclosures, the large number

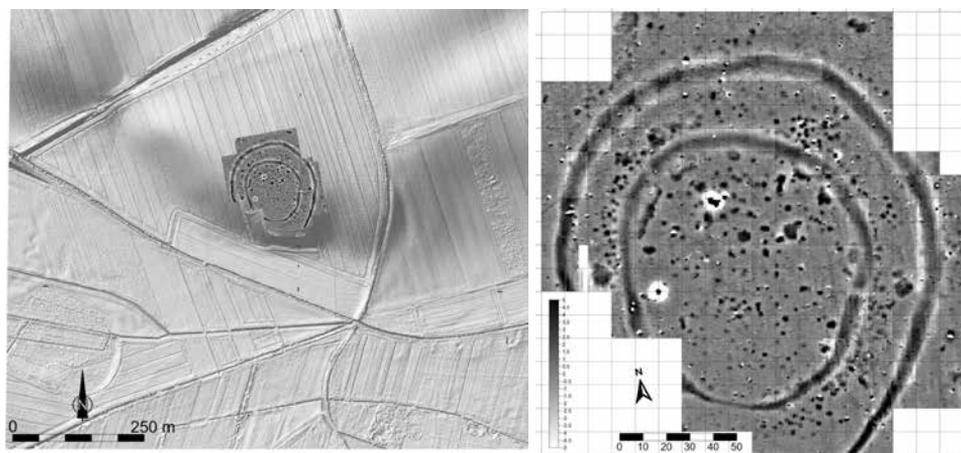


Fig. 4. Pietrowice Wielkie (Silesia province). The Early Bronze Age enclosure, magnetic map

of features revealing settlement activities clearly distinguishes the Pietrowice Wielkie site. The current state of research does not allow for an unambiguous interpretation of functions and forms, but the accumulation of storage pits, especially their concentration in the space between the ditches, is extremely interesting. This may suggest the existence of a centralized system for the storage of agricultural produce, which was common at the time in different parts of Europe and was linked to the advent of social complexity, stratified society, a structured settlement system and division of labor. The Pietrowice Wielkie structure most likely had a defensive function, but its main aim was associated with centralized control over agriculture and craft production. This does not preclude symbolic, social or ritual activities taking place there. Fortified settlements from the same chronological period are known from various parts of Europe, including the immediate neighborhood of Pietrowice Wielkie (e.g., Nowa Cerekiew, Jędrychowice), but they seldom took on the form of regular, circular structures (e.g., Vrábale-Fidvár, Budmerice; Bátorá *et al.* 2008; 2012; Jelínek *et al.* 2013).

Non-invasive prospection has also brought forth new information about other, mostly irregular sites from the Neolithic, Eneolithic and Early Bronze Ages. One of these, located in Dobkowice and associated with the Jordanów culture, was subjected to a magnetic gradiometry survey (Figs 1 and 5), which covered an area of 1.59 ha (Furmanek *et al.* 2013). The survey recorded a significant number of magnetic anomalies, which could be attributed to diverse human activities as well as possibly geological formations. Of particular prominence was a system of elongated anomalies revealing most likely the presence of ditches or elongated pits. These could be interpreted as remains of a vast enclosure with two ditch/elongated pit systems. The full extent of this enclosure remains unknown as the survey needs to be continued in the northern and western parts of the site.

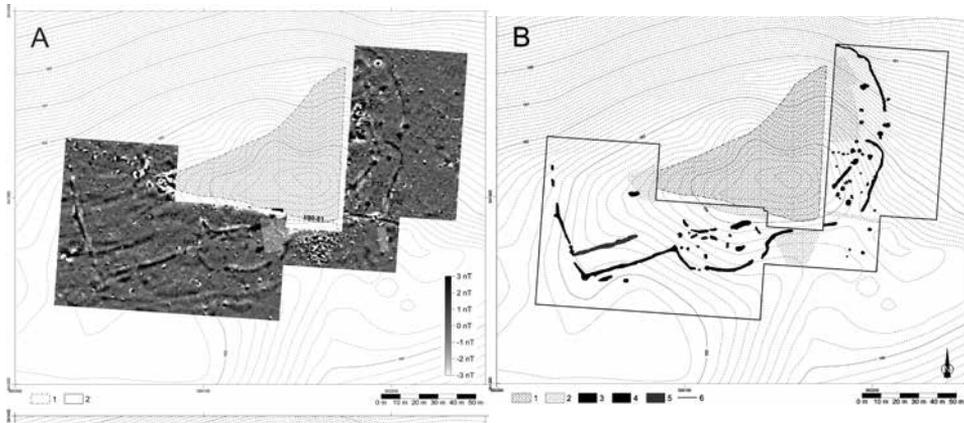


Fig. 5. Dobkowice (Lower Silesia province). Plan of the Jordanow Culture enclosure. A – magnetic map: 1 – location of 1980–1981 excavation trenches; 2 – location of 2012 excavation trenches; B – magnetic survey interpretation: 1 – destroyed area; 2 – modern anomalies; 3 – ditches; 4 – other pits; 5 – possible ditch; 6 – extent of the magnetometer survey

A similar ditched enclosure in Dzielnica (Silesia province) comes from around the same time, but related to the Upper Silesian communities of the Lengyel culture; it was studied with the extensive use of geophysical and geochemical methods (Furmanek *et al.* 2015).

Previous to these investigations the Dobkowice site was interpreted as a corral for cattle (Czarniak 2011). Other settlement features (containing very little remains typical of permanently settled areas) were considered as evidence of temporary camps visited by cattle breeders, only in some instances giving protection to bigger groups of people. Nowadays, there is reason to think that the structures in question played some role in social interactions and ritual activities. This supposition is supported by the presence of burials within the enclosed area and in the ditches, allowing places of this kind to be considered in terms of funeral areas, post-consumption deposits dominated by cattle bones, which may be regarded as remains of feasting, low levels of phosphate content in ditch infill, presence of feather grass (*Stipa* sp.) utilized as decoration or ornament possibly in social and symbolic context. Summing up, although it cannot be denied that the enclosed areas might have played a considerable role in the local taskscapes, it is also certain that they were used as places for different social events (burials, feasts etc.).

The results of recent aerial prospection campaigns have yielded new data that will most likely increase the number of known Neolithic and Early Bronze Age ditch enclosures in Silesia. These results, though promising, require however further field verification, especially with regard to their chronology (Figs 1 and 6). Among the candidates for new enclosure sites are structures located in Chrzelice (Opole province), Dębowa (Opole province), Dankowice (Lower Silesia province) and Górzec (Lower Silesia province), which often occupy surprisingly large spaces.

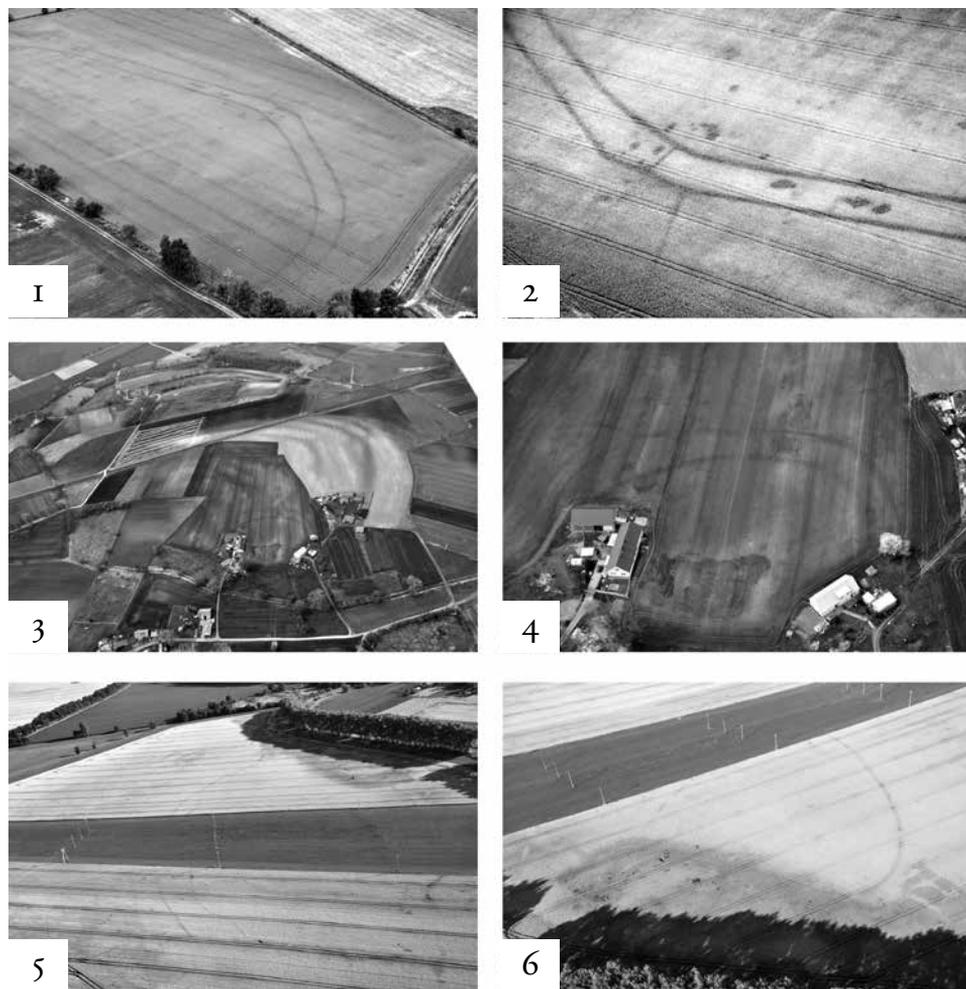


Fig. 6. Examples of recent aerial prospection results: 1–2 – Chrzelice (Opole province), 3–4 – Dębowa (Opole province), 5–6 – Górzec (Lower Silesia province) (Piotr Wroniecki)

The aerial surveys have also helped to better understand places that are known and studied. One such site is located in Janówek (Lower Silesia province) and was occupied by representatives of the Lengyel, Funnel Beaker and Únětice cultures (Figs 1 and 7; Wojciechowski 1973). Traces of known settlement were registered on a promontory that was cut off from the edge of a plateau by a system of ditches and palisades discovered recently and visible as crop marks. These alleged defensive features were positively verified by a small-scale magnetic survey (Figs 1 and 8). On another Neolithic (Funnel Beaker

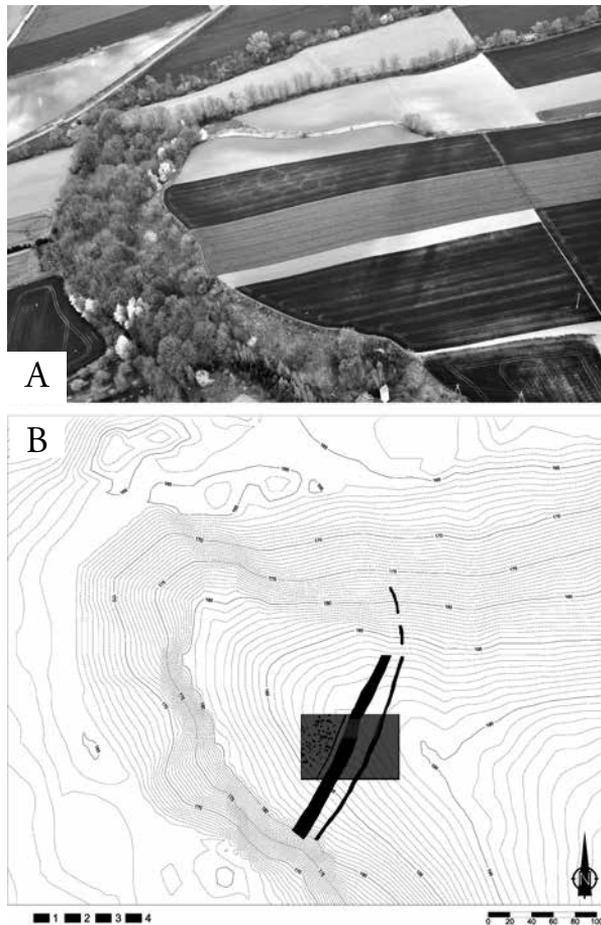


Fig. 7. Janówek (Lower Silesia province). The Neolithic and Early Bronze Age site. A – aerial image (Piotr Wroniecki), B – interpretation of the aerial and magnetic prospection: 1 – extent of the magnetometer survey; 2 – possible settlement pits; 3 – possible ditches (based on cropmarks); 4 – possible ditches (based on the results of the magnetometer survey)

culture) site located in Kietrz (Opole province), the magnetic survey noted, among others, dense clusters of point anomalies forming an oval the size of 35 m by 50 m (Fig. 8; Furmanek *et al.* 2015). These boundaries suggest that the space could have been initially delimited in some way (e.g., palisades, fences) and the features causing the anomalies were created over a relatively short period of time and were associated with similar well-defined activities. Excavations revealed the presence of a diverse range of probable storage pits with few artifacts and some human bones. This area probably did not function as a living

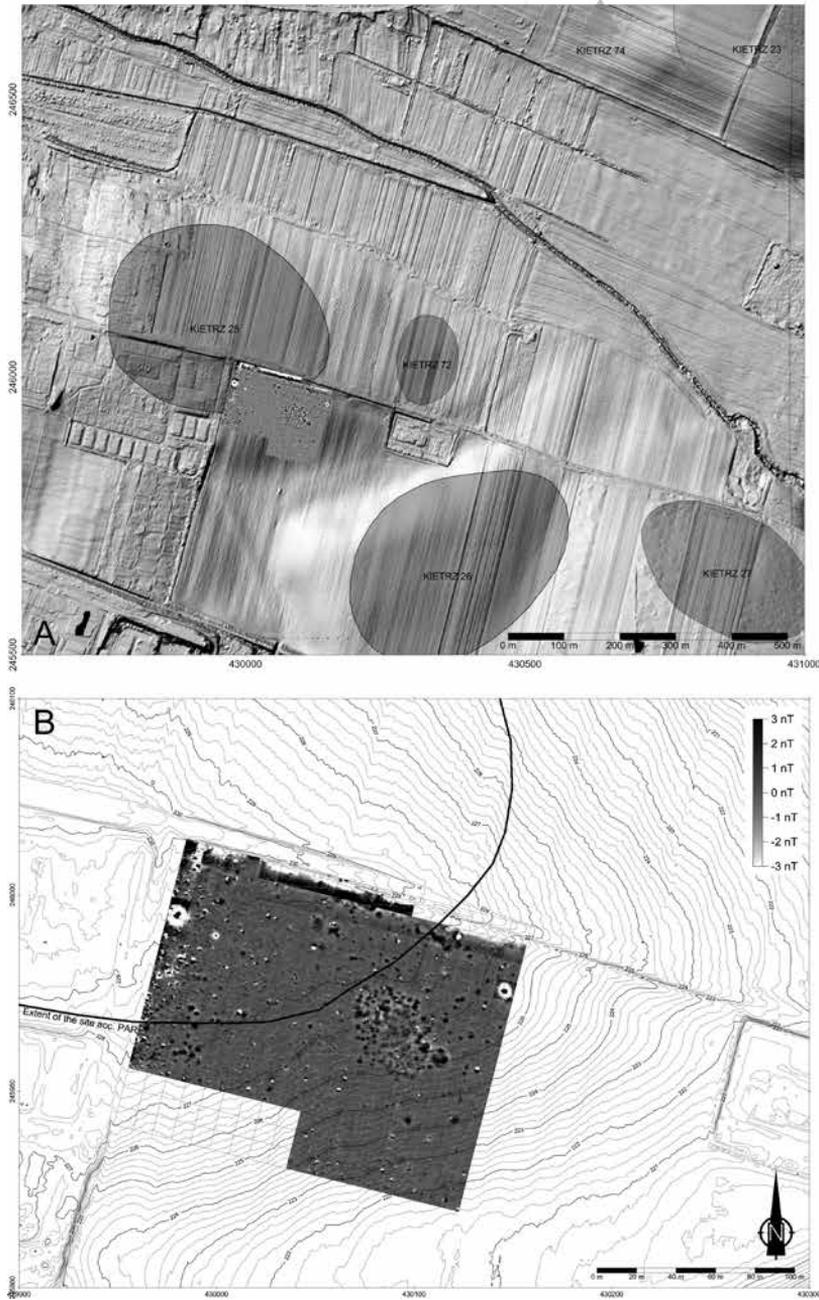


Fig. 8. Kietrz (Opole province). The Neolithic and Early Bronze Age site. A – location of the magnetometer survey, B – magnetic map

space, but rather was associated with the initial processing or storage of agricultural crops. The presence of human remains may also suggest ceremonial activities.

Extremely promising information was also obtained for the Únětice culture defensive settlement in Radłowice (Lower Silesia province). New aerial images show that previous interpretative attempts based on archival aerial imagery and excavation data require a thorough reevaluation (Lasak and Furmanek 2008). The settlement form was probably much larger and more complex than previously thought and covered an area of almost 50 ha.

New research perspectives have also opened for forested areas thanks to the widespread development of Airborne Laser Scanning (ALS) technologies and methodologies. ALS data formed the basis of the Muszkowice Forest project and yielded particularly interesting results (Furmanek and Przybył 2011; Przybył 2014). Until recently megalithic tombs, which are a characteristic element of the European Neolithic landscape, were not known from Silesia. The first megalithic tombs were investigated, or more precisely rediscovered, in Muszkowice in the 1990s. With the application of ALS the number of known monumental cemeteries associated with the Funnel Beaker culture within the Muszkowice forest complex (about 850 ha) increased to 16; within these, at least 26 earthen longbarrows were documented. Three cemetery sites were selected for magnetic surveying and confirmed the presence of megalithic tombs, providing data about their subsurface structural elements, such as stones and boulders that made up the tombs, both *in situ* and displaced as result of subsequent damages. Determining the original shape and size of the tombs was also possible as the currently preserved earthworks are more often than not the result of subsequent destructive natural processes. This was crucial in the verification of previous interpretations of social organization, according to which the size of the tombs and overlying mounds marked the rank and status of the buried individual.

While the effectiveness of both geophysical and aerial prospection in the discovery, documentation and study of monumental Neolithic and Bronze Age features and sites is beyond dispute, these techniques are also capable of registering spatial patterns within settlements and their ranges. Although registration of residential features, particularly timber houses, is problematic, it is possible to discern buildings that followed strict, regular and duplicative rules. Such houses were not only residential structures, but also played important roles in society. Their form and the activities that took place within them, related to their construction, use and ultimately abandonment, were concerned with various aspects, such as identity creation, for example. Thus, even everyday common structures became part of the Neolithic cultural landscape. The morphology of buildings and accompanying features may even be attributed to specific cultural and chronological units, such as Linear Pottery culture. In this case, even if traces of structural elements (evenly spaced timber posts) do not show up in non-invasive survey results, the arrangement and orientation of long pits located alongside houses

suffice for an analysis of the settlement layout, as well as for interpretations regarding demographic and social aspects. This is evidenced by numerous examples of Linear Pottery culture settlements surveyed in Europe. In Silesia, the magnetic prospection in Dzielnica (see Furmanek *et al.* 2015) made it possible to determine, despite the large number of anomalies connected with later habitation phases, the extent of residential forms associated with Early Neolithic farmers; the results revealed at least three rows of buildings and enabled an estimate of the number of houses.

An important effect of the application of non-invasive methods is the possibility to document with greater precision the site extents. This is crucial not only for cultural landscape studies, but also for the protection of cultural heritage. In Poland, archaeological resources are evaluated based on the results of extensive fieldwalking surveys as part of the Polish Archaeological Record project (AZP). The implementation of aerial and geophysical prospection (along with large-scale rescue investigations) has demonstrated that many archaeological sites go in fact beyond the recorded extent. The sites presented in this paper all had areas of past human activity that fell beyond the officially registered site ranges. This constitutes the best empirical reason for implementing different methods of non-invasive prospection, such as geochemical, remote sensing and geophysical techniques alongside fieldwalking.

The implementation of modern archaeological prospection methods has produced results that have demonstrated the methods' surprising effectiveness in the study of Neolithic and Early Bronze Age communities. Their application has led to the discovery and documentation of many new, previously unknown archaeological sites, including structures believed not to exist in the Silesia region. They have often contributed to a better understanding of already recorded sites and have been beneficial not only in furthering knowledge of the past, but also in protecting the archaeological heritage. At the same time, they have become equally important as a supplier of multi-faceted empirical data for use in archaeological excavations, not only as basic information about the site, but also as evidence with considerable potential for interpreting social, economic, symbolic and demographic issues. Data obtained by non-invasive techniques are an important, sometimes even fundamental source for the study of prehistoric communities, irrespective of the paradigms applied by researchers.

ACKNOWLEDGMENTS

The research was funded by the National Science Centre, Poland, within the frame of the Sonata-Bis 3 project DEC-2013/10/E/HS3/00141 and project 11H 11 015580 financed under the Minister of Science and Higher Education National Program for the Development of the Humanities.

REFERENCES

- Andersen, N. H. 1997. *The Sarup Enclosures: The Funnel Beaker Culture of the Sarup Site Including Two Causewayed Camps Compared to the Contemporary Settlements in the Area and Other European Enclosures*. Moesgaard.
- Aston, M. and Rowley, T. 1974. *Landscape archaeology: an introduction to fieldwork techniques on post-Roman landscapes*. Newton Abbot.
- Bátora, J., Eitel, B., Falkenstein, F. and Rassmann, K. 2008. Fidvar bei Vrable: eine befestigte Zentralsiedlung der Frühbronzezeit in der Slowakei. In J. Czebreszuk, S. Kadrow and J. Müller (eds), *Defensive Structures from Central Europe to the Aegean in the 3rd and 2nd millennia BC*, 97-107. Bonn.
- Bátora, J., Behrens, A., Gresky, J., Ivanova, M., Rassmann, K., Tóth, P. and Winkelmann, K. 2012. The Rise and Decline of the Early Bronze Age Settlement Fidvár near Vrable, Slovakia. In J. Kneisel, W. Kirleis, M. Dal Corso, N. Taylor (eds), *Collapse or Continuity? Environment and Development of Bronze Age Human Landscapes*, 111-129. Bonn.
- Campana, S. and Dabas, M. 2011. Archaeological Impact Assessment: The BREBEMI Project (Italy). *Archaeological Prospection* 18: 139-148.
- Czarniak, K. 2011. Ślady osadnictwa kultur lendzielsko-polgarskiej i jordanowskiej na stanowisku 12 w Dobkowicach, pow. wrocławski. *Silesia Antiqua* 47: 11-48.
- Czarniak, K., Pankiewicz, A. and Lisowska, E. 2011. Neolityczne osiedle obronne z Księginic Wielkich, pow. Strzeliński. *Śląskie Sprawozdania Archeologiczne* 53: 325-331.
- David, B. and Thomas, J. 2008. Landscape Archaeology: Introduction. In B. David and J. Thomas (eds), *Handbook of Landscape Archaeology*, 27-43. Walnut Creek.
- Furmanek, M., Gediga, K., Piszcz, U. and Rapiński, A. 2015. Geochemical and magnetic prospection of a Neolithic site: case study from Dzielnica (Poland). *Archaeologia Polona* 25: 84-87.
- Furmanek, M., Hałuszko, A., Podgórski, A., Mackiewicz, M., Myslecki, B., Sady, A. 2015. Wyniki badań interdyscyplinarnych realizowanych w Kietrz, stan. 25, woj. opolskie w 2013 r. In A. Molenda (ed.), *Opolski Informator Konserwatorski*, 183-190. Opole.
- Furmanek, M., Krupski, M., Ehlert, M., Grzeškowiak, M., Hałuszko, A., Mackiewicz, M. and Sady, A. 2013. Dobkowice revisited. Interdisciplinary research on an enclosure of the Jordanów culture. *Anthropologie. International Journal of Human Diversity and Evolution* 51 (3): 375-396.
- Furmanek, M. and Przybył, A. 2011. Wyniki wstępnej prospekcji geomagnetycznej cmentarzyska megalitycznego kultury pucharów lejkowatych w Muszkowicach, woj. dolnośląskie. In J. Jasiewicz, M. Lutyńska, M. Rzeszewski, M. Szmyt and M. Makohonienko (eds), *Metody geoinformacyjne w badaniach archeologicznych*, 25-26. Poznań.
- Gaffney, C., Gaffney, V., Neubauer, W., Baldwin, E., Chapman, H., Garwood, P., Moulden, H., Sparrow, T., Bates, R., Löcker, K., Hinterleitner, A., Trink, I., Nau, E., Zitz, T., Floery, S., Verhoeven, G. and Doneus, M. 2012. The Stonehenge Hidden Landscapes Project. *Archaeological Prospection* 19: 147-155.
- Gedl, M. 1985. Frühbronzezeitliche befestigte Siedlung in Jędrychowice und die Probleme der Nowa Cerekiew-Gruppe in Oberschlesien. In M. Gedl (ed.), *Frühbronzezeitliche befestigte Siedlungen in Mitteleuropa*, 27-43. Warszawa.
- Jelínek, P., Hlavatá, J., Vavák, J., Beňuš, R. and Jamrichová, E. 2013. Natural Scientific Analyses at the Archaeological Excavations in Budmerice: Methods, Results, and Perspectives. *Interdisciplinaria Archaeologica* 4(1): 39-61.
- Kobyliński, Z. 2005. *Archeologia lotnicza w Polsce. Osiem dekad wzlotów i upadków*. Warszawa.
- Kobyliński, Z., Braasch, O., Herbich, T., Misiewicz, K., Nebelsick, L. D. and Wach, D. 2012. Confirmation of the first Neolithic rondel-type enclosure in Poland. *Antiquity* 86 (334): 1084-1096.

- Kosińska, E. 1985. Wyniki dotychczasowych badań założeni obronnych osady wczesnobrązowej w Nowej Cerekwi. *Silesia Antiqua* 27: 83-91.
- Kovárník, J. 1999. Troskotovice, okr. Znojmo. In V. Podborský (ed.), 1999. *Pravěká sociokulturní architektura na Moravě*, 139-163. Brno.
- Kovárník, J. 2003. Jungneolithische und bronzezeitliche Kreisgrabenanlagen in Mähren. In J. Burdukiewicz, A. Justus, L. Fiedler, E. Brühl and H. Meller (eds), *Erkenntnisjäger. Kultur und Umwelt des frühen Menschen*, 325-336. Halle.
- Kovárník, J. 2004. Nově zjištěná pravěká příkopová ohrazení na Moravě. Rondely, rondeloidy a jiné příkopy – stručné shrnutí problematiky. In V. Hašek, R. Nekuda and M. Ruttkey (eds), *V službach archeologie* 5: 11-38. Brno.
- Kovárník, J., Květ, R. and Podborský, V. 2006. Europe's oldest civilisation and its rondels: the real story. *Antiquity* 80(310).
- Kuzma, I. and Tirpák, J. 2012. Kreisgrabenanlagen in der Slowakei. In F. Bertemes and H. Meller (eds), *Neolithische Kreisgrabenanlage in Europa/Neolithic Circular Enclosures in Europe*, 239-270. Halle.
- Lasak, I. and Furmanek, M. 2008. Bemerkungen zum vermutlichen Wehrobjekt der Aunjetitzer Kultur in Radlowice in Schlesien. In J. Czebreszuk, S. Kadrow and J. Müller (eds), *Defensive Structures from Central Europe to the Aegean in the 3rd and 2nd millennia BC*, 123-134. Bonn.
- Literski, N. and Nebelsick, L. D. 2012. Katalog der Kreisgrabenanlagen und verwandten Tells der ersten Hälfte des 5. Jt. v. Chr. In Mittel- und Südeuropa. In F. Bertemes and H. Meller (eds), *Neolithische Kreisgrabenanlage in Europa/Neolithic Circular Enclosures in Europe*, 433-531. Halle.
- Melichar, P. and Neubauer, W. 2010. *Mittelneolithische Kreisgrabenanlagen in Niederösterreich*. Wien
- Myga-Piątek, U. 2005. Historia, metody i źródła badań krajobrazu kulturowego. *Problemy Ekologii Krajobrazu* 17: 71-77.
- Nowakowski, J., Prinke, A. and Rączkowski, W. (eds). 2005. *Biskupin i co dalej? Zdjęcia lotnicze w polskiej archeologii*. Poznań.
- Noworyta, E. 1986. Osada grupy jordanowskiej kultury lendzielskiej w Tyńcu Małym, gm. Kobierzyce. *Silesia Antiqua* 28: 7-73.
- Podborský, V. 1999. *Pravěká sociokulturní architektura na Moravě*. Brno.
- Przybył, A. 2015. Newly recorded Neolithic earthen long barrows in south-western Poland: unexpected discoveries, expanded perspectives, new interpretations. *Préhistoires Méditerranéennes, Colloque | 2014*. <http://pm.revues.org/996>.
- Rassmann, K., Ohlrau, R., Hofmann, R., Mischka, C., Burdo, N., Videjko, M. and Müller, J. 2014. High precision Tripolye settlement plans, demographic estimations and settlement organization. *Journal of Neolithic Archaeology* 16: 96-134.
- Spatzier, A. 2012. Nach Bandkeramik und Lengyel – Kreisgrabenanlagen in Sachsen-Anhalt und Mitteleuropa vom Jungneolithikum bis zur frühen Eisenzeit. In F. Bertemes and H. Meller (eds), *Neolithische Kreisgrabenanlage in Europa/Neolithic Circular Enclosures in Europe*, 363-388. Halle.
- Tilley, C. 2007. The Neolithic sensory revolution: monumentality and the experience of landscape. In A. Whittle and V. Cummings (eds), *Going over: The Mesolithic-Neolithic Transition in North-West Europe*, 329-345. Oxford.
- Trnka, G. 1991. *Studien zu mittelneolithischen Kreisgrabenanlagen*. Wien.
- Trnka, G. 2011. Zur Problematik frühbronzezeitlicher Kreisgrabenanlagen im Mitteldonauraum. In H. Meller and F. Bertemes (eds), *Der Griff nach den Sternen - Wie Europas Eliten zu Macht und Reichtum kamen*, 333-350, Halle.
- Wojciechowski, W. 1973. *Osada ludności kultury pucharów lejkowatych w Janówku pow. Dzierżoniów*. Wrocław.