

**L'INSTITUT D'ARCHEOLOGIE
DE L'UNIVERSITE JAGELLONNE DE CRACOVIE**

**RECHERCHES ARCHEOLOGIQUES
NOUVELLE SERIE 4**

KRAKÓW 2012

© Copyright by Institute of Archaeology of the Jagiellonian University, Kraków 2012

RÉDACTEUR EN CHEF

Marek Nowak

SÉCRÉTAIRE DE LA RÉDACTION

Marcin S. Przybyła

COMITÉ DE RÉDACTION

Wojciech Blajer, Jan Chochorowski, Krzysztof Ciałowicz, Piotr Kaczanowski, Ulla Lund Hansen, Vjacheslav I. Molodin, Ewdoksia Papuci-Władyka, Jacek Poleski, Pál Raczky, Paweł Valde-Nowak

RÉDACTEURS DU SUJET

Renata Madyda-Legutko, Janusz Ostrowski, Krzysztof Sobczyk, Joachim Śliwa

COMITÉ DE LECTURE

Justyna Baron, Anna Bitner-Wróblewska, Edwin van den Brink, Ursula Brosseder, Morten Hegewisch, Ulla Lund Hansen, Miroslav Popelka, Jan Schuster, Anna Zakościelna

ÉDITEURS DE LANGUE

Piotr Godlewski, Andreas Rau, Jan Schuster, Aeddan Shaw

MAQUETTE DE COUVERTURE

Wydawnictwo i Pracownia Archeologiczna PROFIL-ARCHEO Magdalena Dziegielewska

MISE EN PAGES

Wydawnictwo i Pracownia Archeologiczna PROFIL-ARCHEO Magdalena Dziegielewska

EN COUVERTURE

Michałowice, Czarnocin commune, site 1. The urn from grave 80 (photo Jan Bulas)

ADRESSE DE LA RÉDACTION

Instytut Archeologii Uniwersytetu Jagiellońskiego, ul. Gołębia 11, PL 31-007 Kraków
mniauj@interia.pl
mszprzybyla@gmail.com

www.farkha.nazwa.pl/RechACrac/

www.archeo.uj.edu.pl/RechACrac/

La version originale des Recherches Archéologique Nouvelle Serie est la version papier

“Recherches Archéologiques Nouvelle Serie” est régulièrement sur la liste dans The Central European Journal of Social Sciences and Humanities

ISSN 0137-3285

CONTENU

ÉTUDES

Marzena J. Przybyła: <i>Jünger- und spätkaiserzeitliche Metallnadeln aus dem Südteil Nordeuropas: regionale Differenzierung, Verwendung und sozialer Kontext</i>	5
Natalia Małecka-Drozd: <i>The emergence and development of architecture on the casemate foundation platforms in the Nile Delta</i>	69
Andrey P. Borodovski, Łukasz Oleszczak: <i>Intermountain valley of the Lower Katun during the Hunno-Sarmatian period</i>	97
Joanna Dębowska-Ludwin, Karolina Rosińska-Balik, Marcin Czarnowicz, Agnieszka Ochał-Czarnowicz: <i>Trade or conquest? The nature of Egyptian-South Levantine relations in Early Bronze I from the perspective of Tell el-Farkha, Egypt and Tel Erani, Israel</i>	113

RAPPORTS

Szymon Kalicki, Paweł Valde-Nowak, Barbara Witkowska: <i>Neolithic deposit of flint cores in Zagórze, Kazimierza Wielka district</i>	123
Joanna Zagórska-Telega, Jacek Pikulski, Jan Bulas, Anita Szczepanek: <i>Excavations of multicultural site 1 at Michałowice, Czarnocin commune, Świętokrzyskie province, season 2011</i>	135
Piotr Wroniecki: <i>Discovery of new Iron Age groove-type features from Michałowice in 2010. A geophysical case study</i>	161

Piotr Wroniecki¹

Discovery of new Iron Age groove-type features from Michałowice in 2010. A geophysical case study

Abstract: The archaeological site in Michałowice is located in south-eastern Poland within the Świętokrzyskie Voivodeship, Czarnocin commune. It is thus far the only known site with over a dozen excavated groove-type burials attributed to the Roman Iron Age of the Przeworsk Culture. In 2010 a small geophysical test survey was commissioned encompassing an area of 50×30m. Amongst the many geophysical techniques available for such an investigation, the magnetic method was chosen. The aim of the survey was first of all to test whether the local archaeological features that were assumed to exist within the site, such as groove-type square burial enclosures, urn graves and possible settlement pits or even anthropogenic sediments, would generate a clear, interpretable geophysical anomaly. For this purpose a Bartington Grad601-Dual fluxgate gradiometer was used. Data was collected in parallel traverses with 1×0.12m sampling and within one 30×30m and one 20×30m grid. The systematic analysis and mapping of the anomalies registered with magnetic prospecting confirmed the presence of buried archaeological structures, revealing new details of the Michałowice sepulchral complex. Although the study area was relatively small, the amount of new information acquired from the survey was overwhelming. What came as a surprise is that all of these anomalies were located in an area presumed to be a peripheral part of the archaeological site. Thanks to the experiences of the 2010 survey, the capabilities of the magnetic method on this specific site have been thoroughly investigated and evaluated positively. For now, a basic *modus operandi* for interpreting magnetic data for Michałowice has been created, which hopefully will serve as a roadmap or reference for future integrated non-invasive approaches in the region.

Keywords: Michałowice, archaeological geophysics, non-invasive archaeology, magnetic prospecting, groove-type features

1. Introduction

The archaeological site in Michałowice is located in south-eastern Poland within the

Świętokrzyskie province, Czarnocin commune. Based on the current level of archaeological knowledge it is the only intensely studied site to date with over a dozen excavated groove-type burials (Zagórska-Telega, Pikulski, Bulas, Szczepanek in this volume) attributed to the Roman Iron Age of the Przeworsk Culture.

¹ Białobrzaska St. 15/154, 02-370 Warszawa, Poland; contact author: piotr.wroniecki@gmail.com

The current knowledge of the chronological and spatial components of the site is based on data collected during many seasons of the Jagiellonian University Institute of Archaeology excavations led first by Jacek Poleski (in 1982), Piotr Kaczanowski (in 1990–1991) and subsequently by Jacek Pikulski and Joanna Zagórska-Telega since 2008 (Kaczanowski, Madyda-Legutko, Poleski 1984; Zagórska-Telega, Bulas, Pikulski, Szczepanek 2011). During these years, amongst other features, an untypically large collection of groove-type enclosures has been uncovered. All of these features form a chronologically, spatially and culturally coherent set making Michałowice the largest cluster of such features in Poland. These square burial enclosures, however, are not a rare find themselves, as they are regularly excavated in various other contexts but never in such concentrations. What ultimately makes the Michałowice site unique is mostly the closeness and amount of groove-type burials, causing some to call it an Iron Age necropolis. The reason for this archaeological abundance is as yet unknown. Whether it is caused by a good state of preservation or maybe because of other more elusive factors such as past burial rituals is still a subject of debate.

In 2010 a small geophysical test survey was commissioned. It was carried out by Piotr Szczepanik and Piotr Wroniecki and encompassed an area of 50×30m. Amongst many geophysical techniques available for such an investigation, the magnetic method was chosen (Aspinall, Gaffney, Schmidt 2008; Clark 2000; Gaffney, Gater 2003; Kvamme 2006; Scollar *et al.* 1990). The aim of the survey was first of all to test whether the local archaeological features that were assumed to exist within the site (such as groove-type square burial enclosures, urn graves and possible settlement pits or even anthropogenic sediments)

would generate a clear, interpretable geophysical anomaly and, secondly, to attempt to acquire new data regarding the spatial components of the site.

2. Magnetic method

Since the 1950's when Martin Aitken (1958) first successfully located archaeological features (Romano-British kilns) with the use of a proton magnetometer and subsequently proved that certain archaeological features generate their own, small magnetic field, magnetic surveying has become a widely established and effective tool of non-invasive archaeological prospection.

Magnetic survey relies on the presence of the Earth's natural magnetic field for the source of its signal and also on the local variation of the magnetic field which may be caused by anthropogenic factors such as firing, or for instances of the infilling of abandoned ditches with a different soil type. The Earth's magnetic field is measured in units of nanotesla (nT) and on average has a strength of about 30,000 nT and may vary significantly (up to even 60,000 nT on the northern magnetic pole) depending on where it is measured (Kvamme 2006, 209). This fact is crucial in demonstrating how subtle and precise magnetic measurements have become since most potential archaeological features cause an anomaly on average within 0.5–5 nT compared with the main field.

Amongst the vast arsenal of geophysical and non-invasive prospecting techniques (vide Kuna 2004), the magnetic method was chosen due to three factors: speed, sensitivity & local soil conditions. As a passive method, magnetic survey does not require direct contact with the soil, allowing for rapid data acquisition numbering in the hectares per day. Geologically, the study area is dominated by loess soils, which are mostly non-magnetic. It is to this that we owe high

detection rates, as the fills of archaeological features, even if not strongly magnetized, often create a very clear contrast with the surrounding non-anthropogenic soil. One of the most successful examples from Poland of the large cognitive possibilities of magnetic prospecting on loess soils is the geophysical survey of Stonowice (Herbich, Tunia 2009).

During the 2010 magnetic survey in Michałowice, a 50×30m study area was set up. A Bartington Grad601-Dual fluxgate gradiometer (Bartington, Chapman 2004) was used. Data was collected in parallel traverses with 1×0.12m sampling and within one 30×30m and one 20×30m grid. Grids were staked out with the use of a Total Station and tied in to the national survey grid as well as the local archaeological grid.

Terrain accessibility was high (meadows) allowing for collection of relatively flawless raw data without any staggering or gait. Despite this a slight heading error was observed and was filtered out in the ArchaeoSurveyor software package with the use of the destripe algorithm. The acquired processed data set was interpolated to a 0.25×0.25m matrix and visualized in the 256 shades of grey convention with dark colors symbolizing positive readings and light colors showing negative readings (Fig. 1).

3. Interpretation

The interpretation of the geophysical data was based on observing and describing contrasts between the natural background and visible (possibly archeological) features. Such contrasts are referred to as anomalies. From a methodological point of view, it is wrong to unambiguously attribute them to specific features or chronological periods before verification is carried out. Though exceptions exist to this rule; sometimes anomalies form patterns or shapes that can be interpreted directly and broad chronological



Fig. 1. Results of the 2010 magnetic survey (prepared by P. Wroniecki and P. Szczepanik)

ramification can be estimated based on prior archaeological knowledge and experience. This approach is possible only when it is possible to observe whole features, which are much easier to understand than those that are only partially revealed (Kvamme 2006, 205–206).

Establishing a consistent terminology in interpreting geophysical data is also fundamental and very important for mutual understanding between the surveyor and archeologist. Geophysical data needs to be described by a two tier system of attributes. The first level of information classifies the shape and response strength and allows for a basic interpretation of anomalies. For example,

it is permitted to describe an anomaly as a “dipolar, high amplitude anomaly that aligns itself with the main field” and to interpret it as originating from a ferrous item; however it cannot be determined in this stage if this object is actually an archeological artifact or a modern intercalation.

The second level of interpretation is based on correlating magnetic anomalies and patterns to specific archeological features or past human activities. This is rarely possible based on the application of solely one non-invasive technique (magnetic prospecting in this case). It is appropriate for a strategy to be drawn out that would help enhance the possibilities of a second level interpretation. As any remote sensing technique, the acquired (magnetic) image shows only what is detectable by the applied method. Therefore any previously obtained excavation data is always helpful and should be taken into account. Ground-truthing and, if possible, carrying out test trenches over anomalies deemed “interesting” is also a crucial part of building an interpretation and valuating the effectiveness of the applied survey technique.

In order to attempt a successful archeological interpretation of any geophysical data, a preliminary characteristic of geophysical targets is crucial (Fig. 2). Each of these (based on their supposed state of preservation, depth and fill) will potentially generate a different magnetic signal that could be registered during the survey. Four basic types of archeological features were deemed of specific importance. A brief characteristic of them was created in order to draw out their possible detection rate and possible magnetic signal that they could generate. These types included a) settlement pits b) square burials c) urn graves with possible ferrous goods and d) skeleton burials.

In an archeological trench, each feature is visible and differentiated through its specific imprint left in the soil and material

culture registered within the features. From a purely archeological perspective, pit houses will differentiate drastically from the relics of ramparts and middens will be easily discernible from kilns. Each of these features, based on the material culture found within, will often allow one not only to understand the function but also the chronological and cultural ramifications. In a certain way, the situation known to archaeologists from excavations may be conveyed to the realities of interpreting geophysical data. Of course, as with any archeological technique, the limitations of geophysics (of which the most profound is the impossibility to procure material culture) have to be taken into account in order to avoid over or misinterpretation of data. The foremost limitations are:

- Anomaly shapes do not always correspond to the actual shapes of underground structures,
- The same type of archeological feature may generate a different response based on their state of preservation or topsoil overburden,
- The positive geophysical record does not have to be representative of the actual archeological record.

The systematic analysis and mapping of the anomalies registered with magnetic prospecting in 2010 confirmed the presence of buried archeological structures, revealing new details of the Michałowice sepulchral complex (Fig. 3). Although the study area compared to spatial capabilities of the method was relatively small, the amount of new information acquired from the survey was overwhelming. What came as a surprise is that all of these anomalies were located in an area presumed to be a peripheral part of the Michałowice archeological site.

From the acquired dataset, the easiest to interpret were anomalies stemming from groove-type burials, as they were clearly visible and discerned on the basis of shape and

Feature	Possible source of magnetism	Presumed anomaly	Detection rate	Figure
Settlement pits	Magnetic fill	Positive point magnetic anomaly	High	
Square burials	Magnetic fill	Square shaped magnetic anomaly	High	
Urn graves	ferrous objects (i.e. weapons)	Dipolar anomaly	High, but hard to differentiate from other ferrous detritus	
Skeleton graves	Grave goods, fill	Dipolar anomaly	Low	

Fig. 2. Characteristic of expected archaeological targets in Michałowice

alignment with regards to the Earth's cardinal directions. A total of 4 such features were mapped, the largest of which had an area of 15×15m.

Positive point anomalies characteristic of various settlement pits were not registered at all, perhaps owing to a small study area but also due to the distinct lack of any traces of settlement activity throughout the many years of archaeological excavations.

A series of dipolar anomalies (more than 20) of an amplitude ranging $\pm 5\text{nT}$ were also documented. Many places for possible graves were designated, as each dipolar anomaly was potentially, though unlikely, a burial feature. It needs to be noted that only urn and skeleton graves with ferrous (iron) grave goods or shallowly deposited well-fired pottery could be theoretically detected. Hence the acquired magnetic map cannot be treated as a full inventory of this type of archaeological features. Due to ploughing, urn graves and ceramic vessels are usually in an appalling state of preservation, therefore the magnetic data was an important source of information, giving excavators an

indication where extreme caution was to be applied during exploration.

A large, oval structure of a radius of about 20m was registered in the southeastern part of the magnetic map. This feature type was an entirely new discovery as it had not been registered earlier through excavation. This anomaly however was not a typical enclosure comparable to the anomalies stemming from groove-type features but clearly a buried stratigraphic unit with a relatively unified magnetic fill.

4. Verification through excavation

Results of the 2010 magnetic survey prompted research to wholly adjust the subsequent field campaign of 2011 to study and verify the magnetic anomalies through excavation (Fig. 4). For the purpose of this article, a brief case study of the magnetic signal generated by a selected number of features will be presented (Fig. 5). A precise, purely archaeological analysis of the excavated features is presented in detail in this volume (Zagórska-Telega, Pikulski, Bulas, Szczepanek in this volume)

The four square shaped magnetic anomalies shaping interpreted initially as groove-type burials were positively verified (features nr 27, 85, 90, 95). A further square burial was also excavated but had not been visible in the magnetic data (feature 86). This is probably due to the fact that the feature's fill was not entirely magnetic, making it impossible to discern the characteristic square pattern in the geophysical image.

What was deemed initially as unlikely, a series of urn burials were also positively verified. Feature 80 generated an extremely subtle, barely visible dipolar anomaly generating an amplitude of $\pm 1\text{nT}$. The source of this anomaly was a partially destroyed ceramic vessel that served as an urn grave. Further urn graves (91 and 92) generated a stronger, clearly visible dipolar anomaly oscillating between $\pm 5\text{nT}$. Feature 91 consisted of an iron spearhead embedded horizontally into the subsoil. In case of feature 92, the sources of

the magnetic anomaly were also ferrous grave goods, amongst them a ritually bent sword.

The large positive circular anomaly visible in the southeastern part of the magnetic map was, due to time constraints, only partially excavated. Unfortunately, this was not enough for an unambiguous interpretation of the anomaly source. Despite the partial verification, at this stage there is not enough data and evidence to precisely specify the feature's origin. A thorough excavation of this feature is planned for the year 2012.

5. Conclusions

The magnetic survey in Michałowice not only succeeded as a prospecting tool but also contributed to the understanding of the Iron Age site. Spatially, the survey has redefined the accepted interpretation of the burial complex. Geophysics and excavation works have revealed that the extent of

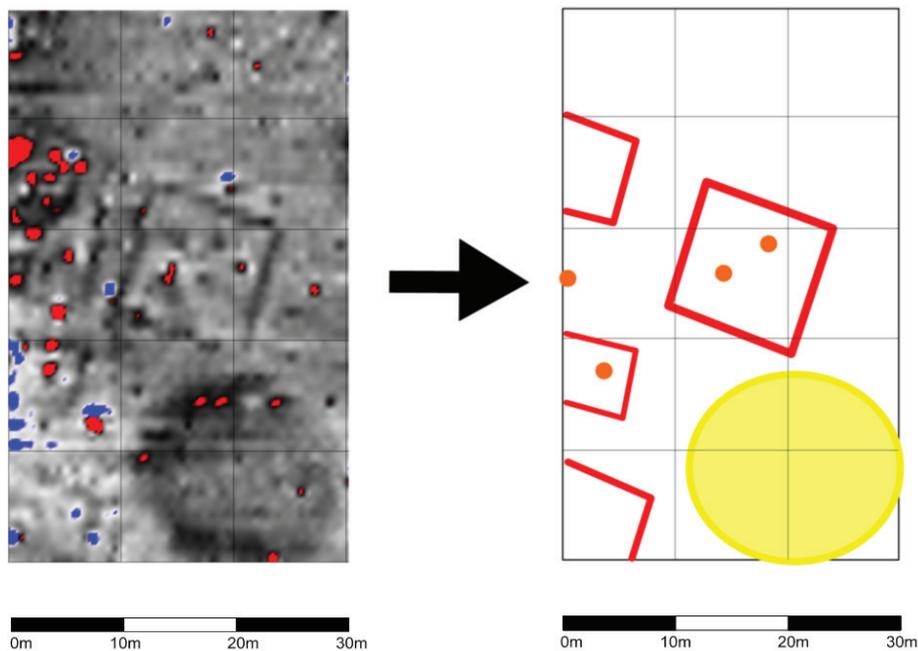


Fig. 3. Map of potential archaeological features derived from the magnetic survey

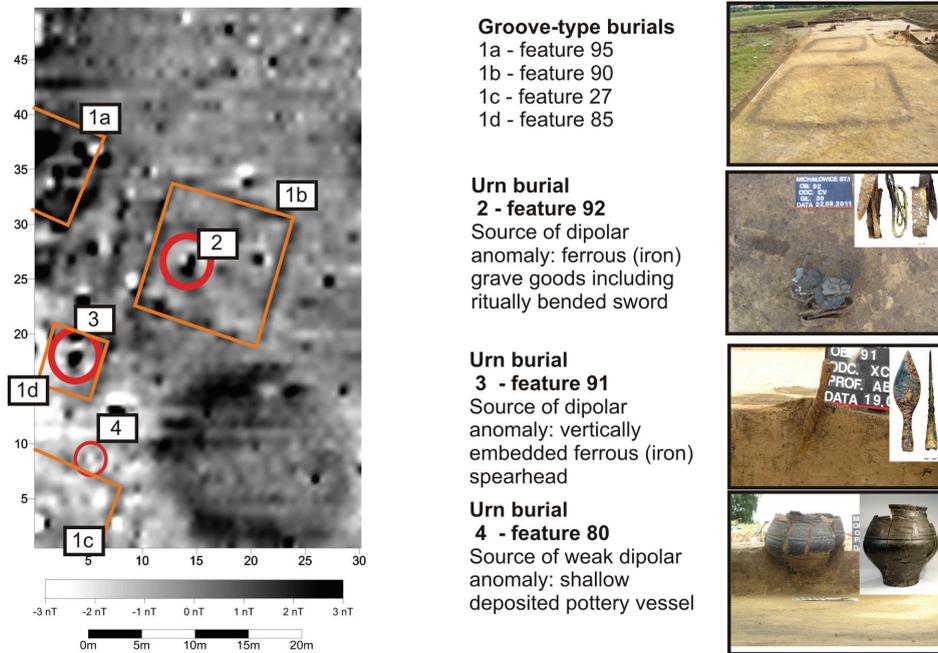


Fig. 5. Magnetic anomalies and their sources verified through archaeological excavations in 2011

archaeological community in non-invasive techniques. It can, however, be observed that the biggest advantages of these techniques – integrated approaches – are still far from being commonly implemented. One of the reasons for this situation is perhaps a notable “fear” or even depreciation of non-invasive techniques as not “real” archaeology. Non-invasive techniques are nevertheless not a threat to “traditional” archaeology, but only a means of augmenting it with new data and spatial capabilities that can be procured with lower financial and time requirements.

As the Michałowice case study has shown, close knit cooperation between geophysicists and archaeologists can foster great and unexpected results. An underlying but very important theme of the research in 2010 and 2011 was the attempt to create a mode of conduct for archaeological-geophysical cooperation. Ultimately, the key to achieving such

a mutual understanding is not the applied technique, used equipment, its sensitivity or “high-techness” but the human factor. As long as there is good will on both sides, progress is within reach. For an understanding to be cultivated, both sides need, however, to readjust their aims and methods which is not always easy. This problem was fortunately overcome in Michałowice, paving the way for new research possibilities and approaches that go beyond the analysis of buried features and material culture.

Thanks to the experiences of the 2010 survey and 2011 verification, the possibilities of the magnetic method on this specific site have been thoroughly investigated, laying the basis for a future roadmap to interpreting geophysical data on loess soils. For now, a basic *modus operandi* for interpreting magnetic data for Michałowice has been developed. Hopefully, experiences from Michałowice

will be a cornerstone for the further advancement of non-invasive methodologies in southern Poland. Further non-invasive research

in Michałowice is planned to include other techniques such as LiDAR, earth resistance and large-scale magnetic prospecting.

Odkrycie nowych obiektów rowkowych na stanowisku w Michałowicach w roku 2010.

Geofizyczne studium przypadku

Badania archeologiczne na stanowisko w Michałowicach, gm. Czarnocin, woj. świętokrzyskie, przyniosły do chwili obecnej odkrycie kilkunastu obiektów rowkowych należących do kultury przeworskiej z okresu wpływów rzymskich. W 2010 roku na stanowisku przeprowadzone zostało na niewielką skalę rozpoznanie geofizyczne. Objęło ono powierzchnię 50×30 m. Wśród wielu technik dostępnych badaniom geofizycznym do rozpoznania tego wybrana została metoda geomagnetyczna. Celem badań było przede wszystkim stwierdzenie, czy struktury, których obecności można było spodziewać się na wytypowanym do poszukiwań wycinku stanowiska (prostokątne obiekty rowkowe, groby popielnicowe oraz ewentualne jamy osadowe lub wręcz nawarstwienia antropogeniczne) mogą dostarczyć wyraźnych, możliwych od dalszej interpretacji anomalii geofizycznych.

Pomiary wykonane zostały z pomocą gradiometru Bartington Grad601-Dual fluxgate, równoległymi pasami z próbkowaniem 1×0,12 m, w ramach dwóch siatek o wymiarach 20×20 m i 30×30 m. Wyniki badań ujawniły obecność podziemnych struktur archeologicznych, wzbogacając o nowe szczegóły naszą wiedzę o zespole sepulkralnym z Michałowic. Choć zbadany obszar był stosunkowo niewielki, ilość informacji pozyskanych podczas rozpoznania geofizycznego jest znacząca. Co jest szczególnie zaskakujące, to fakt, że wszystkie stwierdzone anomalie pochodzą ze strefy, która miała stanowić peryferię cmentarzyska. Dzięki doświadczeniom z rozpoznania w 2010 roku, pozytywnie zweryfikowane zostały możliwości wykorzystania metody geofizycznej w warunkach tego konkretnego stanowiska. Stworzona została też procedura badań i interpretacji danych geomagnetycznych, która będzie mogła służyć, jako punkt odniesienia do dalszych nieinwazyjnych prac archeologicznych w regionie.

References

- Aitken M.**, 1958 *Magnetic Prospecting*, Archaeometry, 1, pp. 24–29.
- Aspinall A, Gaffney C, Schmidt A.**, 2008 *Magnetometry for Archaeologists*, Lanham-New York-Toronto-Plymouth.
- Bartington C., Chapman C.E.**, 2004 *A high stability fluxgate magnetic gradiometer for shallow geophysical survey applications*, Archaeological Prospection 11(1), pp. 19–34.
- Clark A.J.**, 2000 *Seeing Beneath the Soil: Prospecting Methods in Archaeology*, London.
- Gaffney C.F., Gater J.A.**, 2003 *Revealing the buried past: Geophysics for Archaeologists*, Stroud.

- Kaczanowski P., Madyda-Legutko R., Poleski J.**, 1984 *Michalowice, Woiwodschaft Kielce, Gemeinde Czarnocin (Brandgräberfeld der Przeworsk-Kultur)*, Recherches Archéologiques de 1982, pp. 34–37.
- Kuna M.**, 2004 *Nedestruktivní archeologie*, Praha.
- Herbich T., Tunia K.**, 2009 *Geofizyczne badania dużych konstrukcji neolitycznych na terenach lesowych. Casus Słonowice*, Archeologia Polski, 54, pp. 13–35.
- Kvamme K.L.**, 2006 *Magnetometry: Nature's Gift to Archaeology*, (in:) J.K. Johnson (ed.), *Remote Sensing in Archaeology: An Explicitly North American Perspective*, Tuscaloosa, pp. 205–233.
- Scollar I., Tabbagh A., Hesse A., Herzog I. (eds.)**, 1990 *Archaeological Prospecting and Remote Sensing. Topics in Remote Sensing 2*, Cambridge.
- Zagórska-Telega J., Bulas J., Pikulski J., Szczepanek A.**, 2011 *Excavations of multicultural site 1 at Michalowice, Czarnocin commune, Świętokrzyskie province, in the years 2008–2010*, Recherches Archéologiques NS, 3, pp. 195–226.

Guidelines for Authors

Aims and scope

Recherches Archéologiques Nouvelle Serie is an archaeological journal issued by the Institute of Archaeology of the Jagiellonian University in Kraków. In a new form, it continues the tradition of the Recherches Archéologiques, published by the Institute of Archaeology JU since 1968. That journal presented mainly field reports from excavations conducted by archaeologists from the Institute. This formula was changed in 2009 to broaden the journal's scope and open its pages for all researchers. Therefore, a subtitle 'Nouvelle Serie' was added and a new volume numbering was introduced.

The journal presents general syntheses, published in the 'Studies' section, as well as the analyses of archaeological materials (which should be discussed against a broad, multi-aspectual background), published in the 'Reports' section. The contributions may address any aspect of archaeology and any period of prehistory or history, both in the Old and the New World. We look forward to receiving the texts from authors both from Poland and from abroad. Among the contributions accepted are also summaries of MA theses or extracts from them adapted for publication, as well as outstanding papers by students. Basically, there are no restrictions as regards contribution size. Extensive publications which offer a comprehensive and interdisciplinary approach to the discussed issue and which are provided with numerous and adequate illustrations are warmly welcomed. One should note, however, that the journal does not publish reviews. The original version of the journal is the paper version, however all contributions are also freely accessible on-line. The Recherches Archéologiques Nouvelle Serie accepts contributions in all of the so-called congress languages (English, German, French, Spanish and Russian); the preferred language is English.

Submission of mss

The contribution must be submitted both in electronic and paper form (a single printed copy). The electronic version should be a Microsoft Word file in *.doc or *.rtf format. An additional copy in *.pdf format is welcomed. The files should be saved on a CD or DVD and submitted together with the printed copy.

The text must be written in the Times New Roman font at a size of 12 pts with 1.5 line spacing. All margins should be set to 2.5 cm, and all pages should be numbered. It is highly recommended that the contributors avoid undue use of text formatting options, such as word dividing, bolded or underlined words, numbering or bullets, empty lines, different font types, etc. Using such options should be reduced to the necessary minimum.

Suggestions concerning distinguishing certain parts of the text should be given on the margins of the printed copy. It is important that footnotes contain only the necessary additional information. The authors are kindly asked not to automatically generate the footnotes using a text editor, but to attach them as normal text at the end of the paper, marking them in the text with consecutive numbers (introduced from the keyboard, in superscript).

The submitted contribution should consist of the following:

1. Title.
2. Author/s full name/s, together with affiliation, address, e-mail address, phone number and fax number (for each author); when there is more than one author, please indicate the person responsible for contact with the Editorial Board and – after the publication – with the readers.
3. Abstract (up to 300 words, always in English).
4. Keywords (no more than 7).
5. Text (if the text is divided into chapters – which is recommended – their titles must be separated by an additional empty line below and above – the same applies to sub-chapters; chapters and sub-chapters should be given proper hierarchical numbering, introduced manually – please do not use an automatic numbering option in a text editor).
6. Footnotes.
7. Summary in Polish (up to 1200 words; in case of non-Polish author/s this summary will be generated by the Editor).
8. References.
9. Figures, and a complete list of figures with figure captions (in an electronic version, as a separate file).
10. Tables.

Figures and tables

A continuous numbering (as ‘figures’, in the language of the paper – e.g. ‘Figure’ or ‘Abbildung’) should be kept for all the illustrations and photographs, in the order in which they are referred to in the text. Please note that the maximum size of a printed illustration will be 130×180 mm. Due to a two-column layout, another available size is 60×180 mm. The contributors are kindly asked to mark (with a pencil, on the printed copy) which illustrations must be printed in a larger format and which may be printed small. The size of numbers and letters within figures (we recommend using Arial font and Arabic numerals) should be adjusted to the illustration size, to make them readable. All drawings should be provided with a clear and adequate linear scale. Apart from the printed copy (with figure numbers marked with a pencil), all the illustrations should also be delivered in electronic form, each figure being a separate file of TIFF format (minimum 600 DPI for black-and-white and grey-scale drawings, minimum 300 DPI for colour drawings or photos) named using the name of the author/first author (e.g. Nowak_Figure1.tiff). Figures should be referred to in the text using Arabic numerals; a reference to a particular part of the illustration should use colon, space and proper number/s or letter/s (e.g. Fig. 31: 12–14 or Abb. 2: 14, 16). A full list of figures, with complete figures captions and explanations should be delivered separately.

Apart from the printed copy, all the tables should be delivered in electronic version as a Microsoft Word file (*.doc or *.rtf); an additional version in *.pdf format is welcomed. The tables may be saved in a single file or as separate files; in both cases the file name/s

should clearly refer to the content – it is desirable that the author's/first author's name is used (e.g. Nowak_Tables.doc or Nowak_Table1.doc). Each table must be provided with a headline containing its number and title. Any comments, if necessary, must be placed below the table. Tables should be referred to in the text using Arabic numerals (e.g. Table 3 or Tabelle 1); their numbering should follow the order in which they are referred to in the text.

Please do not forget that the printed copy submitted to the Editorial Board should have illustrations and tables placed separately at the end of the paper and not within the text.

Authors are responsible for obtaining permissions from copyright holders for reproducing any illustrations, figures, or tables previously published elsewhere.

References

The bibliography should only contain positions that are referred to in the text or in the illustrations or tables. Journal names should be used in their full form. References in the text should be ordered chronologically, beginning with the oldest quoted position and kept to the following pattern: (Huntley, Birks 1983, 35–38; Ralska-Jasiewiczowa 2004, 32; Hajnalová 2005). If a publication has more than two authors, the expression *et al.* should be used (e.g. Bennet *et al.* 1991). If there is more than one publication of the same author/s within one year, lower case extensions should be used (e.g. Jones 1965a; 1965b; Gardner 2002a; 2002b). Figures and/or tables in quoted publications should be referred to using the following pattern: (Huntley, Birks 1983, fig. 14: 7; Smith 1998, table 6).

The bibliography should be listed according to the patterns presented below. They were drawn up for publications in English. For publications in other languages, the use of upper and lower case, as well as the expressions and denotations like: (in:), (ed.), (eds.), pp., (typescript), should be adjusted to the rules of the given language. Particular attention should be given to provide accurate spelling of authors' names and publication titles, especially in languages where diacritic marks are common (e.g. Czech, Slovak).

- Papers in journals:

Gomes D. C., Vega O., 1999 *Dating organic temper of ceramics by AMS: sample preparation and carbon evaluation*, Radiocarbon, 41, pp. 315–320. [volume numbers only in Arabic numerals, pages separated by a short dash (Ctrl+- on numeric keypad) without a space]

- Papers or chapters in monographs, conference papers, series, etc.:

Kalicki T., Kozłowski J. K., Nowak M., Vizdal M., 2005 *A settlement of the Early Eastern Linear Pottery Culture at Moravany (Eastern Slovakia): palaeogeographical and archaeological perspective*, (in:) E. Gál, I. Juhász, P. Sümegei (eds.), Environmental Archaeology in North-Eastern Hungary, Varia Archaeologica Hungarica, 19, Budapest: Archaeological Institute of the Hungarian Academy of Sciences, pp. 179–198.

- Monographs:

Lityńska-Zajac M., Wasylkowa K., 2005 *Przewodnik do badań archeobotanicznych*, Vademecum Geobotanicum, Poznań: Sorus.

- Typescripts:

Goslar T., 2005 *Raport z wykonania datowań 14C w Poznańskim Laboratorium Radiowęglowym*, Archive of the Institute of Archaeology, Wrocław University (typescript).

- Web sites:

Furholt M., 2003 *Absolutchronologie und die Entstehung der Schnurkeramik*, http://www.jungsteinsite.uni-kiel.de/pdf/2003_furholt.pdf, 20.01.2011. [Access date]

The contributions should be addressed to:

Dr hab. Marek Nowak, Institute of Archaeology, Jagiellonian University, Gołębia Street 11, 31-007 Kraków, Poland; e-mail: mniauj@interia.pl

Procedure of evaluation

All submitted papers undergo a multi-stage assessment process. At the first stage, a contribution's compliance with the editorial requirements is assessed by the Editor-in-Chief and the Secretary. Next, a preliminary evaluation of the paper is carried out by the Thematic Editor. Accepted papers are then sent to two independent reviewers who are not employed by author's/authors' institutions. The review will be made according to double-blind review process rule.

The "Reviewer Evaluation Questionnaire", containing criteria of the evaluation is attached to the web page of the journal:

http://www.farkha.nazwa.pl/RechACrac/wpcontent/uploads/2013/07/evaluation.form_.pdf

Depending on the reviewers' opinion, the paper is qualified for print, sent to the author for amendments, or rejected. The papers qualified for print undergo a comprehensive proof-reading procedure and necessary language corrections by a native speaker.



The Cracow Team for Archaeological Supervision of Motorway Construction, sp.j (located Senacka 3, Kraków)

is a legal identity appointed by the Institute of Archaeology and Ethnology PAN,
Jagiellonian University and The Archaeological Museum in Cracow.

The Team – as a sole contractor – carries out from 1996 (on the basis of an
agreement with the General Management of Domestic Roads and Motorways)
rescue excavations on the line of Motorway A4 under construction
in Małopolskie Voivodship.

Results of the research are systematically published in a dedicated series entitled
VIA ARCHAEOLOGICA



Photo by Adam Golański

THE CRACOW TEAM FOR ARCHAEOLOGICAL SUPERVISION
OF MOTORWAY CONSTRUCTION publishes results of the research on the
line of Motorway A4 under construction in a dedicated series entitled

VIA ARCHAEOLOGICA



VIA
ARCHAEOLOGICA

Zróżnica badań wykopaliskowych na trasie autostrady A4 w Małopolsce



MODLNICZKA, ST. 5

OD NEOLITU ŚRODKOWEGO
DO WCZESNEJ EPOKI BRĄZU

KRAKOWSKI ZESPÓŁ DO BADAŃ AUTOSTRAD
ul. Krakowska 10, 31-111 Kraków
ul. Krakowska 10, 31-111 Kraków
ul. Krakowska 10, 31-111 Kraków



VIA
ARCHAEOLOGICA

Zróżnica badań wykopaliskowych na trasie autostrady A4 w Małopolsce

Agnieszka Czekaj-Zastawny
Marcin M. Przybyła



MODLNICZKA 2, POWIAT KRAKOWSKI
cmentarzysko
kultury ceramiki wstęgowej rytej
i osady neolityczne

KRAKOWSKI ZESPÓŁ DO BADAŃ AUTOSTRAD
ul. Krakowska 10, 31-111 Kraków
ul. Krakowska 10, 31-111 Kraków
ul. Krakowska 10, 31-111 Kraków