

„Alexandru Ioan Cuza” University of Iași
Faculty of History

**INTERDISCIPLINARY ANALYSIS OF POTTERY
FROM THE MIDDLE BRONZE AGE SETTLEMENTS
IN BISTRITA RIVERS'S BASIN**

-Abstract-

Supervisor:
Prof. Dr. Lucrețiu-Ion BÎRLIBA

Candidate:
Ana Doroftei căs. Drob

IAȘI
2021

Table of Contents

Introduction /5

I. Defining the workspace /9

- I.1 The mountain sector /10
- I.2 Subcarpathian sector /12
- I.3 The plateau sector /15
- I.4 Paleoenvironment data /16
- I.5 Conclusions /18

II. Periodization and chronology of the Bronze Age /20

- II.1 Periodization and chronology of the Bronze Age in Europe /20
- II.2 The Bronze Age in Romania /21
- II.3 The Bronze Age in the eastern Carpathians. Absolute chronology data /25
- II.4 Conclusions /29

III. History of archaeometric research /30

- III.1 History of international archaeometric research /30
- III.2 History of archaeometric research in Romania /33
- III.3 Conclusions /37

IV. Analysis of the prehistoric pottery. Methodological and theoretical aspects /39

- IV.1 Pottery manufacturing /39
- IV.2 Methodological aspects /49
 - IV.2.1 Macroscopic analysis /49
 - IV.2.2 Microscopic analysis /66
 - IV.2.3 Chemical analysis /67
- IV.3 Theoretical elements involved in the results interpretation /67
- IV.4 Conclusions /73

V. Pottery typology /75

- V.1 Volumetric typology /76
- V.2 Functional typology /80
- V.3 Pottery decoration /109
- V.4 Conclusions /126

VI. Research methodology/128

VII. Interdisciplinary analysis of pottery from the Middle Bronze Age settlements in Bistrița river's basin. Case studies /133

- VII. 1 The settlement from Costișa-Cețățuia /137
 - VII. 1.1 Macroscopic analysis /146
 - VII.1.2 Interdisciplinary analysis /158
 - VII.1.3 Pigments in the Costișa-Cețățuia settlement /173
 - VII.1.4 Conclusions /180

VII.2	The settlement from Piatra Neamț- <i>Bâtca Doamnei</i>	/182
VII.2.1	Macroscopic analysis	/184
VII.2.2	Interdisciplinary analysis	/191
VII.2.3	B.D. 23 and the presence of pigments	/204
VII.2.4	Conclusions	/209
VII.3	The settlement from Piatra Neamț- <i>Lutărie</i>	/210
VII.3.1	Macroscopic analysis	/212
VII.3.2	Interdisciplinary analysis	/216
VII.3.2.4	LM11 and the presence of organic residues	/224
VII.3.3	Conclusions	/227
VII.4	The settlement from Piatra Șoimului- <i>Horodiștea/Capul Dealului</i>	/227
VII.4.1	Macroscopic analysis	/230
VII.4.2	Conclusions	/232
VII.5	The settlement from Siliștea- <i>Vatra Satului</i>	/233
VII.5.1	Macroscopic analysis	/234
VII.5.2	Interdisciplinary analysis	/235
VII.5.3	Conclusions	/240
VII.6.	The settlement from Siliștea- <i>Pe Cetățuie</i>	/240
VII.6.1	Macroscopic analysis	/245
VII.6.2	Interdisciplinary analysis	/254
VII.6.3	Experimental study for identifying the source of raw material	/279
VII.6.4	Conclusions	/292
	Conclusions	/294
	List of figures, graphs, maps, plates and tables	/301
	List of annexes	/318
	Abbreviations	/319
	Bibliography	/325
	Illustration	/357
	Annexes	/456

Introduction

The interdisciplinary study of prehistoric ceramics is an approach with profound implications in archaeology in the international scientific field. In Romania, this type of investigation is, for the most part, a way of exposing archaeometric data whose results are more or less interpreted and integrated in a coherent discourse about pottery. However, such analyzes have recently begun to be used for Bronze Age materials in the Eastern Carpathian area, but the approaches have remained at the stage of isolated and specific investigations. A larger study addressing this category of artefacts from a quantitative, qualitative and comparative perspective has not been a topic of interest so far. The present doctoral thesis, *Interdisciplinary analysis of pottery from the Middle Bronze Age settlements in Bistrița river's basin*, was determined by the existence of this issue, the main motivation being the need for a comprehensive approach, combining archaeological and scientific methods of investigation, thus contributing in establishing an interdisciplinary discourse as part of current archaeological research.

This paper is a scientific approach that correlates the results of two research directions in order to identify and understand the behavior of Middle Bronze Age communities, by highlighting the active role that pottery has played in these human groups. The first one is focused on the macroscopic study, associated with the archaeologist, which emphasizes the importance of this stage in understanding prehistoric pottery. The data obtained in this phase contribute to the identification of technological elements involved in the process of manufacturing the vessels, providing information on the design and functionality of the pottery. The interdisciplinary direction involves additional information regarding macroscopic observations and identifying new data through physico-chemical analysis, which are related to the raw material used in pottery manufacturing, pyrotechnological skills and the use and reuse of vessels. The merge of these two types of investigations contributes to the knowledge of some

elements related to the whole process of pottery production, from the identification of the source of raw material, extraction, preparation, modeling, firing and use, to its abandonment. The *chaîne opératoire* consists in the technological stages that naturally involve the human component, so that the identification of the phases in this process leads to the understanding of socio-cultural aspects that can only be established through the study of pottery. Therefore, the contribution of this thesis is represented by the creation of a "bridge" between two types of discourses, apparently parallel, by combining the results obtained from the two research directions, highlighting the need for a change in the approach to ceramic studies, and thus overcoming a stage in which pottery is seen only as a static element of cultural identification.

In Chapter I, **Definition of the workspace**, are presented the geological, pedological and physical-geographical features of the Bistrita river's basin. Moreover, the existing information about the paleoenvironment was presented, including the components regarding the paleoclimate, paleobotany and paleofauna. These data highlight the elements that would have led the Middle Bronze Age communities to occupy and use this area.

Chapter II, dedicated to the **periodization and chronology of the Bronze Age**, sets out the main proposals regarding this aspect, at European and local level, focusing on recent radiocarbon data for the Eastern Carpathian area, through which the Romanian Middle Bronze Age is connected to Central European and Aegean chronology.

Chapter III, **History of archaeometric research**, highlights the development of this scientific branch in international context, in accordance with theoretical approaches, and how it was understood and used at national level. Further, are presented all the studies that focus on Bronze Age pottery in Romania.

Chapter IV, **Ceramic Analysis. Methodological and theoretical aspects** represent the scientific foundation of this paper. The first part is dedicated to the macroscopic analysis in which the bibliographic data are presented and

illustrated with examples identified for the pottery of the two studied communities, Costișa and Monteoru. Also, with this occasion were presented the interdisciplinary methods that can be applied in archaeometric studies, and last but not least, the theoretical approaches used in the interpretation of the results obtained through the pottery analysis were highlighted.

Chapter V, **Pottery typology**, presents the types of Costișa and Monteoru vessels that were discovered in Bistrița's basin. In this sense, based on ethnoarchaeological, experimental and macroscopic information, the classification of pottery was made in a functional way, establishing the main categories of pots with numerous variants and subvariants. Moreover, the stylistic elements specific to these two ceramic groups were analyzed according to functional classes.

The next chapter, **The research methodology**, was dedicated to specific methodological elements regarding the performed analyzes. Also, with this occasion were presented the technical specifications of the devices used in this study.

The last chapter, **The interdisciplinary analysis of pottery from the Middle Bronze Age settlements in Bistrița river's basin. Case studies**, presents the interdisciplinary study of Costișa and Monteoru pottery from six settlements. In addition to their macroscopic study, were applied interdisciplinary analysis methods, such as optical microscopy (OM), scanning electron microscopy (SEM) coupled with energy dispersive X-ray spectroscopy (EDX), Fourier transform infrared spectroscopy (FT-IR), thermogravimetric analysis (TGA) and differential thermal analysis (DTA), highlighting the results and contextual interpretations obtained for each group of pottery.

Conclusions

Prehistoric pottery has been, for a long time, an element of identification, dating and classification of "ethnic groups", "tribes", "cultural manifestations" and "cultures". Afterwards, it went through a stage focused on the materials study,

so that, at moment it became a way of recognizing and understanding the "human" component. The manner in which pottery was "viewed" was naturally determined by the evolution of theoretical approaches, which, through the specificity of each, outlined a new perspective on "inert" artifacts.

In this approach I have tried to highlight how pottery is a part of a whole, an active factor, which can provide answers to specific questions. The creation of a distinct image is dependent on the interpretation of the data obtained by applying a wide range of criteria, methods and theoretical approaches, which are rather complementary than different. In this way, based on an interdisciplinary analysis, it was possible to obtain important information about the communities that developed and used pottery. The correlation of the data obtained from the macroscopic and physico-chemical analyzes, helped to partially reconstruct some ancient human behaviors related to the production and use of ceramic vessels.

The study area, Bistrița river's basin, represents an important hydrographic artery of the Subcarpathians and a communication route to the Eastern Carpathians. The Costișa and Monteoru ceramic groups studied in this paper occupied the subcarpathian sector of this river valley, a segment characterized by a high concentration of settlements. The occupation of this space was favored by a combination of factors, including the existence of a high relief with defensive features, fertile soils suitable for agriculture, natural resources such as wood, pastures and salt reserves. The visibility analysis performed for the studied area highlighted the fact that most of the settlements have under observation the main access route represented by Bistrita's main course. Moreover, the possibility of using transport means, such as rafts, to transfer goods, raw materials and "ideas" as part of interregional exchange systems cannot be ruled out, which could justify the special interest given to the main river valley from the studied micro-area.

Although in the mountainous area of the Bistrița River have not been found traces of habitation and in the plateau sector are few presences, these areas have certainly been crossed by the Middle Bronze Age communities. In this

sense, the contacts over the Carpathians are argued, in addition to the questionable existence of the Ciomortan¹ group, also by the isolated metallic discoveries framed in the mentioned chronological level. The archaeological materiality that led to the definition of a “Monteoru-Costița synthesis”² in eastern Transylvania is poorly represented, consistent traces being identified only in the settlement of *Păuleni-Dâmbul Cetății*. Moreover, the absolute dates³ for the level of this “cultural group” in the mentioned settlement indicated a chronological interval between 1830-1680 BC, being contemporary with the settlements from the eastern Carpathians. The radiocarbon results dated the settlement from *Siliștea-Pe Cetățuie* between 1950-1650BC, and the one from *Costița-Cetățuie* offered two intervals, 1750-1650BC and 1950-1750BC. The earlier results obtained for the Costița level from the eponymous settlement were avoided, being considered irrelevant due to the effect of old wood. However, the ¹⁴C dating could call for a reconsideration of the “distinct” character of the Ciomortan group, suggesting rather an extension of the Costița and Monteoru communities to the west.

Although the hypothesis of conflicting relations between the Costița and Monteoru communities was emphasized for a long time, the occupation of the same space and the coexistence in some settlements led to the reconsideration of this idea. In this regard, further studies of the two ceramic groups could provide clues to the nature of the relationship between these communities in terms of the technological behavior involved in the pottery manufacture.

The typology made for the Costița and Monteoru pottery highlighted the existence of the same functional classes. The discrepancies found for certain categories of vessels must be interpreted mainly in the light of the current research stage, diverse quantitative representation being a relevant argument. The Costița

¹ Szekely, 1970, 71-88; Cavruc, Dumitroaia, 2000, 131-154; Dumitroaia, 2000, 140; Cavruc, 2001, 57-65; Cavruc, 2005, 81-123.

² Muscă, 1979, 87-89.

³ Whitlow *et al.*, 2013, 1583-1817.

and Monteoru pottery assemblages in Bistrița's basin illustrate the presence of cooking, preparation, serving and consumption vessels, storage of solid or liquid goods, transport and storage of liquids, as well as drinking or multi-purpose pots, frequently used categories within a settlement. Palaeobotanical studies have shown the presence and usage of cereals such as barley, rye and wheat, and legumes such as lentils, peas and vetch by the Bronze Age communities. These elements indicate the practice of agricultural activities, most likely with a low intensity, but which highlight the need for depositing, storage vessels having an obvious utility in this regard. Also, the stored goods are transformed into food, supplemented by proteins and lipids obtained from domestic and wild animals identified by the osteological remains present in the settlements. Thus, food preparation requires specific containers, with a high resistance to thermal shocks, which allow the cooking of different types of food by various methods, such as baking, frying or boiling. The consumption of dishes requires the existence of various size and shape vessels, depending on the number of individuals. In addition to the necessary food, another essential element of existence is water, which, in turn, involves the use of vessels for transport and storage, as well as for drinking. Vessels with a special function are most likely related to less practical activities, probably linked to the spiritual sphere. The functional typology made in this paper was, in most cases, confirmed through interdisciplinary analyzes. Starting from the visible elements, such as burning spots, use wear and smoking traces, the results of physico-chemical analyzes have made important contributions to the confirmation of functional data. Surface traces indicate, in addition to cooking pots, the use of serving and storage vessels for food preparation. Some of the vessels intended for storage or transport of liquids show traces of rich phosphorus liquids, such as milk or wine, but in the absence of specific analyzes for lipids identification, these results cannot claim certainty, but may constitute possible directions of interpretation.

In terms of stylistic representation, the distinct decorative motifs could, in this case, belong to a certain group. Also, the variety of the same decorative

element, especially within the same settlement, is rather an indication of the existence of several potters and not a cultural difference. In this sense, we could speak of a production at household level, in which the family identity is expressed in a distinct way, an aspect that would determine the stylistic diversity at local level, but also related to the whole spreading area of that communities. Moreover, auxiliary elements can no longer be considered only defining components in the decoration description, they are necessary elements in satisfying needs related to the vessels use. In this sense, their presence only on pots from certain functional categories highlights the fact that they were created with a well-defined purpose to meet a number of needs. Even if the technique used to make the decorative elements Costișa and Monteoru is different, their frequency, the area of the vessel on which they are made and the combinations with the auxiliary elements within certain functional categories seem to be a common point. Whether this is determined by the cohabitation of the two communities or whether it is a widespread "custom" in the middle period of the Bronze Age remains an issue that, for now, cannot be solved.

Based on the functional typology and macroscopic observations, a series of common characteristics of the two pottery packages were identified, which led to a specific a set of questions.

The interdisciplinary analyzes performed on the ceramic groups from the Middle Bronze settlements in the Bistrița basin did not constitute an end in itself, but represented the means by which quantifiable results were obtained for the stated questions. Thus, the archaeometric studies performed for the ceramics of the Costișa and Monteoru groups, allowed to draw some general conclusions regarding the pottery of the two communities.

Thus, the Costișa and Monteoru vessels were made of a local kaolinite clay, modeled by the same coiling technique, having well finished and smoothed surfaces, polished or covered with a ceramic slip, treatments that were adapted to pots functionality. The chemical analyzes indicated that the two communities used the same source of raw material located, most likely, in the immediate

vicinity of the settlement. This behavior can be explained from an ecological perspective, individuals adapting to the environment. The precise identification of the source of raw material used by the communities from Siliștea-*Pe Cetățuie* highlighted the behavior of the Costișa and Monteoru ceramic groups regarding the nearby resources. In this sense, the production of vessels requires a significant amount of clay that involves a considerable effort of procurement and especially transport, thus making it easy to understand the preference for the use of clay from the vicinity of the settlement. Therefore, it can be said that the settlements were positioned by taking into consideration several factors, which in addition to the defensive character, also provided the necessary conditions for subsistence.

All the analyzed vessels contain ceramoclasts in the ceramic paste, which in addition to increasing the degree of plasticity, also offers technical and thermal advantages, having the same characteristics and the same rate of expansion as the clay, thus the risk of breaking vessels during firing and use is diminished. Based on this information, a series of data can be obtained about the potters of these communities, which seem to use the same "recipe" for the paste of all functional categories.

Building resistant pots during pyrotechnological stage suggests a special interest for the work and time spent in the vessels manufacturing process. Moreover, in addition to the effort made, other indispensable elements must be taken into account, such as the quantities of water, clay, but also those of fuel necessary for firing. Thus, by using certain types of inclusions and making quality vessels, it can be observed an attempt to improve the efficiency of the entire process of pottery making. In addition, it can be assumed that the potters of the two ceramic groups used different types of paste, an aspect that suggests common knowledge related to the specific requirements of each functional class. The use of these "recipes" in accordance with the performance characteristics necessary for certain vessels, could suggest the existence of technological or cultural rules, which seem to have been respected by the Costișa and Monteoru ceramic groups.

Consequently, the central and constant element of the pottery manufacturing of the two communities is represented by the use of ceramoclasts, which, in addition to the technological benefits, most likely represent an assumed socio-cultural behavior. Moreover, the use of reused ceramoclasts could have a dual role, one of a practical nature, which involves the integration of damaged containers into the paste of new vessels and which would constitute a "recycling" system, as well as a special one, which could in fact represent a perpetuation of cultural ideas and identities. This hypothesis is supported by the comparison with the pottery of the contemporary Komarov community. The analyzes performed for the vessels of this ceramic group from the Suceava Plateau⁴ illustrated the presence of intentional inclusions such as silicolites. The specialized literature highlights the fact that the lithoclasts present in the paste of the vessels determine a low resistance to mechanical and thermal shocks, the resulting vessels having a reduced quality. Moreover, although it may be assumed that the preference for other types of inclusions is a distinct technological approach, the implications of this action may be much deeper. In this respect, the use of silicolites does not seem to be justified, since the ceramic fragments used by the Costișa and Monteoru groups were not lacking in the Komarov communities, but nevertheless were not used. Therefore, the use of these lithoclasts involves identification and extraction, then crushing and adding to the paste, which implies a considerably greater effort, suggesting a socio-cultural preference related to group identity.

Through macroscopic observations were identified a series of residues that were verified through interdisciplinary analyzes. Thus, in the case of a Monteoru vessel from the Piatra Neamț-*Lutărie* settlement was noticed the existence of a black layer on the inner surface, the chemical analyzes performed indicating its organic nature.

Moreover, in the case of a special purpose vessel from Piatra Neamț-*Bâtca Doamnei*, was highlighted the preparation of pigments by the Costișa

⁴ Niculică *et al.*, 2013; Popescu *et al.*, 2015, 237-245.

community, and in the settlement from *Costișa-Cetățuia*, were discovered reddish marks on *Costișa* and *Monteoru* vessels. The correlation of the data obtained from the pigments analysis provides a series of interesting data about this practice. Thus, the Middle Bronze Age communities used a mineral pigment, which they prepared by mixing it with an aqueous solution, with the possibility of using organic binders, such as milk, blood or resins. Emphasizing such a practice in the Bronze Age represents a new element, which can have both practical and spiritual explanations. In this respect, the use of obtained "paints" in the coloring of fabrics would be a valid working hypothesis. Also, the application of these pigments on the surfaces of the vessels is another novelty related to the behavior of these ceramic groups. Moreover, the use of these mixtures for body painting, most likely in special activities, would not be a precedent, such practices being known since the Early Bronze Age. However, the functionality of the pigments remains, at the current stage, only in the assumptions sphere, but their presence represents a new and interesting discovery for the Middle Bronze Age in Eastern Romania.

Also, the study of the surfaces through physico-chemical analyzes contribute to the discovery of salt traces on certain vessel categories from *Siliștea-Pe Cetățuie*, which led to the hypothesis that the *Costișa* and *Monteoru* communities from this settlement were involved in brine processing. Although the subject is not new, the present approach contributes with verifiable arguments to support this idea. Firing traces, macroscopically visible, and chemically confirmed, indicate the use of the evaporation process and the obtaining of a solid or semi-solid salt. The presence of sodium chloride traces on specific vessels, as well as the proximity of the brine springs is an important indication that illustrates the concern for obtaining and processing this resource. The presence of such traces on the vessels underlines the need for a careful analysis of the surfaces, which are often neglected, thus losing important information on the content and functionality of the pots.

The pyrotechnological elements identified through interdisciplinary studies have led to excellent results in this regard. The analytical methods applied

for the pottery of the Costișa and Monteoru ceramic groups from the Bistrița basin indicated that the vessels were generally fired at temperatures between 500/550°C-700/750°C. The various colors of the pottery, the different firing atmosphere and the temperatures reached in this process show that the vessels firing was most likely carried out in pits or above the ground. This aspect highlights an interesting technological and behavioral component; outdoor firing has the advantage of allowing the processing of multiple vessels or large containers, and pit firing helps to reduce energy loss. Consequently, the connection with archaeological discoveries such as burnt pits, or rather their absence, suggests that the two communities fired their pottery in outdoor bonfires. A recent experimental study that focused on both outdoor and pits firings, showed that obtaining high temperatures in a short time causes the destruction of vessels⁵. In this sense, it can be suggested that prehistoric potters were aware of these aspects, and lower temperatures are not evidence of technological deficiencies, but on the contrary, would demonstrate a precise control of combustion.

In conclusion, this approach, built on several case studies, highlighted that the connection of archaeological knowledge and physico-chemical methods provides results that contribute to understanding the active role of pottery, which involves the whole process of manufacturing and how it was used. The functional typology, macro- and microscopic observations and compositional details suggest the existence of stable Middle Bronze Age communities, which maintained peaceful relations, based on common technologies and behaviors regarding pottery.

⁵ Vuković, 2018, 25-35.

Selected Bibliography

- Anghel, 1998** Anghel, D., 1998, *Aspecte generale ale tehnologiei prelucrării ceramicii*, BCȘS, 4, 133-139.
- Anghel, 2000** Anghel, D., 2000, *Influența condițiilor de ardere asupra ceramicii*, BCȘS, 6, 171-173.
- Anghelinu, 2014** Anghelinu, M., 2014, *Evoluția gândirii teoretice în arheologia din România. Concepte și modele aplicate în Preistorie*, Editura Cetatea de Scaun, Târgoviște.
- Arnold, 2005** Arnold, D., 2005, *Linking society with the compositional analysis of pottery: a model from comparative ethnography*, in Livingstone, A., Bosquet, D., Martineau, R., (Eds.), *Pottery Manufacturing Processes: Reconstitution and Interpretation*, BAR IS 1349, Archaeopress, Oxford, 15-21.
- Benea et al., 2015** Benea, M., Diaconu, V., Dumitroaia, Gh., 2015, *Preliminary data on Bronze Age pottery from Săvești (Neamț county, Romania)*, Studia UBB Chemia, LX (1), 89-98.
- Bodi, Solcan, 2010** Bodi, G., Solcan, L., 2010, *Considerații asupra unei posibile tipologii funcționale a formelor ceramice cucuteniene specifice fazei A*, ArhMold, XXXIII, 315-323.
- Bolohan, 2013** Bolohan, N., 2013, *On clay and pots in the Middle Bronze Age. A case study from Siliștea-„Pe Cetățuie”*, Neamț County, în Rezi, B., Németh, R.E., Berecki, S. (Eds.), *Bronze Age crafts and craftsmen in the Carpathian Basin, Proceeding of the International Colloquium from Târgu Mureș, 5-7 October 2012*, BMM VI, Editura Mega, Târgu Mureș, 33-56.

- Bolohan, Drob, 2020** Bolohan, N., Drob, A., 2020, *Cercetare de suprafață în zona Aroneanu – Șapte Oameni, com. Aroneanu, jud. Iași. Analiza multiplă a olăriei (OM, SEM-EDX)*, Peuce, XVIII, 7-34.
- Braun, 1983** Braun, D., 1983, *Pots as tools*, Moore, in J., Keene, A., (Eds.), *Archaeological Hammers and Theories*, Academic Press, New York, 107-134.
- Butzer, 2006** Butzer, K.W., 2006, *Archaeology as Human Ecology: Method and Theory for Contextual Approach*, digital printed version, Cambridge University Press, New York.
- Cavruc, Dumitroaia, 2000** Cavruc, V., Dumitroaia, Gh., 2000, *Descoperirile aparținând aspectului cultural Ciomortan de la Păuleni (campaniile 1999-2000)*, Angvstia, 5, 131-154.
- Cavruc, 2001** Cavruc, V., 2001, *Sat Păuleni, com Păuleni, jud. Harghita*, în Cavruc, V., Dumitroaia, Gh. (coord.), *Cultura Costișa în contextul Epocii Bronzului din România*, Editura „Constantin Matasă”, Piatra-Neamț, 57-65.
- Cavruc, 2005** Cavruc, V., 2005, *The Ciomortan Group in the light of new researches*, Marmatia, 8 (1), 81-123.
- Chelaru, 2013** Chelaru, D.-A., 2013, *Dinamica peisajului în valea subcarpatică a Bistriței*, Teză de doctorat, Facultatea de Geografie a Universității „Alexandru Ioan Cuza” din Iași, Iași.
- Cârciumaru, 1996** Cârciumaru, M., 1996, *Paleoetnobotanica, Studii în preistorica și protoistoria României (Istoria agriculturii în România)*, Glasul Bucovinei Helios, Iași.
- Dietler, Herbich, 1998** Dietler, M., Herbich, I., 1998, *Habitus, techniques, style: an integrated approach to the social understanding of material culture and boundaries*, in

- Stark, M., (Ed.), *The Archaeology of Social Boundaries*, Smithsonian, Washington, 232-263.
- Djordjevic, 2003** Djordjevic, B.V., 2003, *Some ethno-archaeological possibilities in the pottery technology investigations*, in Prudencio, M., Dias, M., Waerenborgh, J. (Eds.), *Understanding People Through Their Pottery: Proceedings of the 7th European Meeting on Ancient Ceramics*, Instituto Portugues de Arqueologia, Lisbon, 61-69.
- Dobres, Hoffman, 1994** Dobres, M., Hoffman, C., 1994, *Social agency and the dynamics of prehistoric technology*, J. Archaeol. Method Theory, 1 (3), 211-258.
- Dornan, 2002** Dornan, J., 2002, *Agency and Archaeology: Past, Present and Future Directions*, J. Archaeol. Method Theory, 9 (4), 303-329.
- Drieu et al., 2020** Drieu, L., Lepère, C., Regert, M., 2020, *The Missing Step of Pottery chaîne opératoire: Considering Post-firing Treatments on Ceramic Vessels Using Macro- and Microscopic Observation and Molecular Analysis*, J. Archaeol. Method Theory, 27, 302-326.
- Drob et al., 2021** Drob, A., Vasilache, V., Bolohan N., 2021, *The Interdisciplinary Approach of a Pile of Shards from the Middle Bronze Age in Eastern Romania*, App.Sci., 2021, 11, 4885.
- Dumitroaia, 2000** Dumitroaia, Gh., 2000, *Comunități preistorice din nord-estul României. De la cultura Cucuteni până în Bronzul Mijlociu*, BMA, VII, Editura „Constantin Matasă”, Piatra-Neamț.

- Evershed, 2008** Evershed, R.P., 2008, *Organic residue analysis in archaeology: The archaeological biomarkers revolution*, *Archaeometry* 50 (6), 895-924.
- Feurdean et al., 2008** Feurdean, A., Klotz, S., Mosbrugger, V., Wohlfarth, B., 2008, *Pollen-based quantitative reconstructions of Holocene climate variability in NW Romania*, *Palaeogeogr., Palaeoclimatol., Palaeoecol.*, 260, 494-504.
- Ghergari et al., 2003** Ghergari, L., Ionescu, C., Horga, M., 2003, *Ceramica din epoca bronzului din Transilvania: situl Ilișua (jud. Bistrița-Năsăud)*, *St., Cerc. Geogr.*, 8, 129-137.
- Ghergari, Stâncel, 2012** Ghergari, L. Stâncel, C., 2012, *A mineralogical study of Late Bronze Age ceramics from Palatca (Transylvania, Romania)*, *Studia UBB Geologia*, 57 (1), 13-21.
- Goffer, 2007** Goffer, Z., 2007, *Archaeological Chemistry*, Second Edition, A John Wiley & Sons INC, New Jersey.
- Harding, 2000** Harding, A.F., 2000, *European Societies in the Bronze Age*, Cambridge University Press, Cambridge.
- Hoeck et al., 2009** Hoeck, V., Ionescu, C., Ghergari, L., Precup, C., 2009, *Towards mineralogical and geochemical reference groups for Bronze Age ceramics from Transylvania (Romania)*, *Studia UBB Geologia*, 54 (2), 41-51.
- Hodder, Hutson, 2003** Hodder, I., Hutson, S., 2003, *Reading the past. Current approaches to interpretation in archaeology*, Third Edition, Cambridge University Press, Cambridge.
- Ionescu, Hoeck, 2020** Ionescu, C., Hoeck, V., 2020, *Ceramic technology. How to investigate surface finishing*, *Archaeol. Anthropol. Sci.*, 12, 204-220.
- Jones, 2004** Jones, A.M., 2004, *Archaeometry and materiality: Materials-based analysis in theory and practice*, *Archaeometry* 46 (3), 327-338.

- Kreiter, 2007** Kreiter A., 2007, *Technological Choices and Material Meanings in Early and Middle Bronze Age Hungary: Understanding the active role of material culture through ceramic analysis*, BAR IS 1604, Archaeopress, Oxford.
- Maritan, 2020** Maritan, L., 2020, *Ceramic abandonment. How to recognize post-depositional transformations*, *Archaeol. Anthropol. Sci.*, 12:199.
- Munteanu, 2010** Munteanu, R., 2010, *Începutul epocii bronzului mijlociu în depresiunile marginale ale Carpaților Orientali*, BMA, XXIV, Editura „Constantin Matasă”, Piatra-Neamț.
- Muscă, 1979** Muscă, T., 1979, *Unele observații în legătură cu fenomenul cultural Ciomortan*, *Apulum*, XVII, 87-89.
- Niculică et al., 2013** Niculică, B.P., Vasilache, V., Boghian, D., Sandu, I., 2013, *An archaeometric Study of Several Ceramic Fragments from the Komariv (Komarow) Settlement of Adâncata – Sub Pădure, Suceava County*, in Cotiugă, V., (Ed.), *Third Arheoinvest Congress. Interdisciplinary Research in Archaeology, 6-8 June 2013*, Editura Universității „Alexandru Ioan Cuza” din Iași, Iași, 67-68.
- Orton et al., 1993** Orton, C., Tyres, P., Vince, A., 1993, *Pottery in archaeology*, Cambridge University Press, London.
- Pfaffenberger, 1992** Pfaffenberger, P., 1992, *Social Anthropology of technology*, *Ann. Rev. Anthropol.*, 21, 491-516.
- Pollard, Heron, 2008** Pollard, A.M., Heron, C., 2008, *Archaeological Chemistry*, Royal Society of Chemistry, RSC Paperbacks, London.

- Popescu, 2005** Popescu, A.D., 2005, *Așezarea de epoca bronzului de la Costișa (jud. Neamț). Monografie arheologică*, Teză de doctorat, Facultatea de Istorie a Universității București, București.
- Popescu, 2017** Popescu, A.D., (ed.), 2017, *Costișa: o perspectivă interdisciplinară*, Editura Cetatea de Scaun, Târgoviște, 5-15.
- Popescu et al., 2015** Popescu, D., Popescu, L., Dulucianu, C., Niculică, B.P., 2015, *Ceramica din așezarea de la Adâncata-Sub Pădure (jud. Suceava)*, în Niculică, B.P., *Epoca Bronzului în Podișul Sucevei*, K. A. Romstrofer, Suceava, 237-245.
- PCRG, 2010** Prehistoric Ceramics Research Group, 2010, *The study of prehistoric pottery: General policies and guidelines for analysis and publication*, 3rd Edition Revised, Wessex Archaeology Ltd.
- Rice, 1987** Rice, P.M., 1987, *Pottery Analysis: a Sourcebook*, University of Chicago Press, Chicago.
- Rye, 1981** Rye, O.S., 1981, *Pottery Technology. Principles and reconstruction*, Manuals on Archaeology, Taraxacum Washington.
- Santacreu, 2014** Santacreu, D.A., 2014, *Materiality, Techniques and Society in Pottery Production. The Technological Study of Archaeological Ceramics through Paste Analysis*, De Gruyter Open Poland, Warsaw/Berlin.
- Schiffer, 2004** Schiffer, M.B., 2004, *Studying Technological Change: A behavioral perspective*, World Archaeol., 36, 579-585.
- Sillar, Tite, 2000** Sillar, B., Tite, M., 2000, *The challenge of `technological choices` for materials science approaches in archaeology*, Archaeometry, 42 (1), 2-20.

- Skibo, 2013** Skibo, J.M., 2013, *Understanding pottery function*, Springer, New York.
- Skibo, Schiffer, 2008** Skibo, J.M., Schiffer, M.B., 2008, *People and Things. A Behavioral Approach to Material Culture*, Springer, New York.
- Shepard, 1954** Shepard, A. O., 1954. *Ceramics for archaeologists*, Carnegie Institution of Washington, Washington DC.
- Szekely, 1970** Szekely, Z., 1970, *Cultura Ciomortan*, Aluta, I, 71-88.
- Tencariu et al., 2015** Tencariu, F.-A., Alexianu, M., Cotiugă, V., Vasilache, V., Sandu, I., 2015, *Briquetage and salt cakes: an experimental approach of prehistoric technique*, JAS, 59, 118-131.
- Tite, 2008** Tite, M.S., 2008, *Ceramic production, provenance and use – a review*, Archaeometry, 50 (2), 216-231.
- Trigger, 1971** Trigger, B., 1971, *Archaeology and ecology*, World Archaeol., 2 (3), 321-336.
- Van As, 1995** Van As, A., 1995, *Pottery Technology: The Bridge Between Archaeology and the Laboratory*, SHAJ, 5, 541-544.
- Vasilache et al., 2020** Vasilache, V., Kavruk, V., Tencariu, F.A., 2020, *OM, SEM-EDX, and micro-FTIR analysis of the Bronze Age pottery from the Băile Figa salt production site (Transylvania, Romania)*, MRT 83 (6), 1-14.
- Vuković, 2015** Vuković, J., 2015, *Secondary use, reuse and recycling of ceramic vessels: evidence from late neolithic Vinča*, Archaica, 3, 111-126.
- Vuković, 2018** Vuković, J., 2018, *Late Neolithic Vinča pottery firing procedure: reconstruction of neolithic technology through experiment*, Opvsc. Archæol., 39-40, 25-35.
- Vulpe, Zamoșteanu, 1962** Vulpe, A., Zamoșteanu, M., 1962, *Săpăturile de la Costișa (r. Buhuși, reg. Bacău)*, MCA, VIII, 309-316.

- Weller, Dumitroaia, 2005** Weller, O., Dumitroaia, Gh., 2005, *The earliest salt production in the world: an early Neolithic exploitation in Poiana Slatinei-Lunca, Romania*, *Antiquity*, 79 (306), hal-03036529 (online).
- Whitlow et al., 2013** Whitlow, R., Kavruk, V., Buzea, D.-L., Briewig, B., 2013, *Radiocarbon data from the Cucuteni-Ariusd levels at Păuleni-Ciuc (Ciomortan) „Dâmbul Cetății”, Harghita County*, *ActaTS*, XII, 1583-1817.