05TH INTERNATIONAL SCIENTIFIC CONFERENCE

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Zagreb, 30th November – 1st December 2017

PROCEEDINGS

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Content

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Preface

Ina Miloglav

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Methodology and Archaeometry is an annual scientific conference organized since 2013 by the Department of Archaeology of the Faculty of Humanities and Social Sciences of the University of Zagreb, and the Croatian Archaeological Society.

The goal of the conference is to entice interdisciplinarity, critical thinking, new insights and approaches as well as new theoretical frameworks in contemporary archaeological science. A wide spectrum of themes and scientific disciplines every year result in contributions that promote new approaches in the field of archaeological methodology, archaeometry, interpretation of archaeological data and challenge traditional approaches.

With the intent to publish those contributions in fool text publicly and freely available we made a digital edition of the Proceedings from the conference. The first digital edition includes papers from the *5th scientific conference Methodology and Archaeometry* which was held at the Faculty of Humanities and Social Sciences of the University of Zagreb, from 30th November – 1st of December 2017.

Six scientific papers presented in this volume are focused on different aspects of archaeology, including case studies from Slovenia, Croatia, Bulgaria, Albania and Spain.

Topics cover the range from the role of archaeological methodology in preventive archaeology; archaeological surface survey methods; identification of the cultural landscape as a part of the procedure for the protection of cultural heritage sites; analytical techniques applied to ceramic assemblages, and the development, benefits and shortcomings of the archaeological research and its impact to the understanding of the past.

In order to create a volume of high scientific quality, each of the conference paper was reviewed by the Editorial board to whom I am especially thankful for their comments, opinions, and remarks. I also want to thank a review of the publication, and all the authors who contributed to this volume.

Methodological Challenges in 'Hostile' Environments of Preventive Archaeology

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In the last three decades, one could witness the radical transformation of archaeology from mostly academic discipline to an applied research practice with a statutory role in spatial planning and development in the domain of heritage safeguarding. The very fact that today preventive archaeology[1] *comprises more than 90% of all archaeological research practices, makes the question of the context of preventive research in general and of archaeological methodology in particular extremely important.*

The increase of preventive or development-led archaeology was, indeed, of several orders of magnitude; the quantity of excavations alone is more than ten times greater than some thirty years ago. However, parallely increased also the 'openness' of (preventive) archaeology to a series of influential factors coming from outside the discipline and academia. The issues, such as funding, the scale of projects, time-planning, types of stakeholders involved etc. greatly differ compared to the archaeology in the academic domains. Indeed, these external factors may, and frequently do, act in the opposite way of the goals of the statutory aims of preventive archaeology, attempting to make it as cheaper and faster as possible. While this pressure had certain positive effects on archaeological practice in terms of better organization, cost efficiency and increased social responsibility, and catalysed some important improvements in its performance, we still must not forget that what developers are *de facto* paying is a piece of land "freed of archaeological heritage" and not the best solution for the archaeological heritage. In this sense, it is logical to expect constant challenging not only of the individual archaeological preventive projects but the whole system of prevention and safeguarding of heritage as well. Willems and Brandt (2004: 9) pointed out the obvious fact that market principles can only be permitted if the quality of the necessary archaeological preventive research has been secured; otherwise commercial logic will prevail. That such pressure exists on higher governmental levels illustrate well recent attempts in the legislation in many European countries aimed at 'creating more friendly

1 In this paper we use the tem preventive archaeology as a general term for all archaeological research activities in heritage safeguarding. It is used instead of other freequent terms such as development-led archaeology, rescue archaeology, conservation archaeology etc.

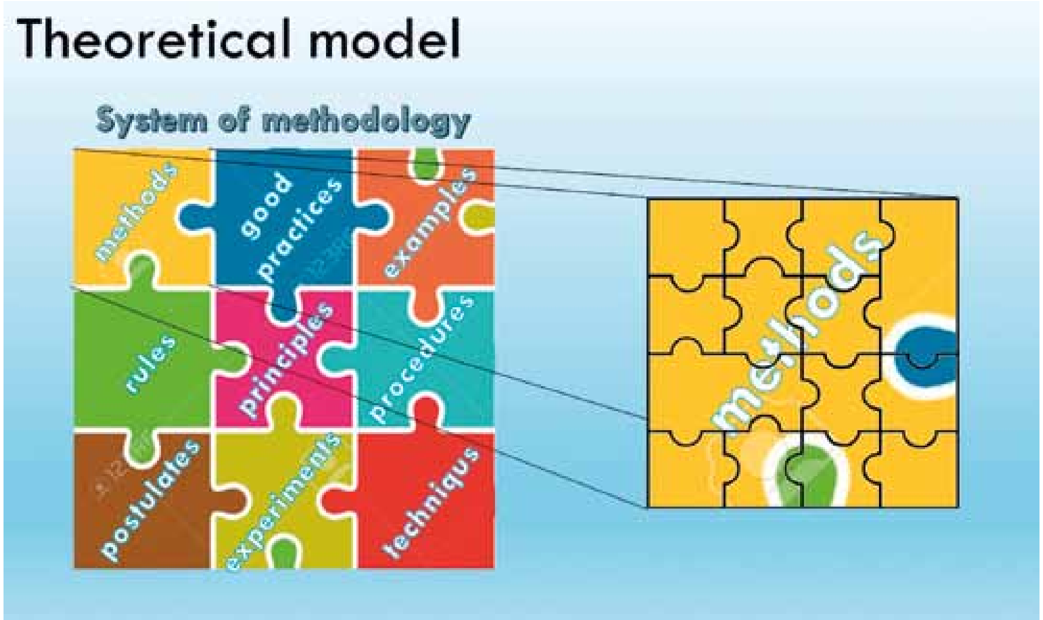

FIGURE 1. Theoretical model of archaeological methodology

environment for the investors' (e.g. Slovenia: Novšak (2016), Italy: Guermandi (2016), Hungary: Czifra and Fabian (2016), Bozoki-Ernyey (2016), Romania: Simion (2016), Măgureanu and Măgureanu (2016), general situation: Demoule (2010). One could easily imagine an equation – more friendly the environment for the investors, more hostile for preventive archaeology.

The aim of this paper is not to discuss all aspects of hostile environments but, primarily, to reconsider the role of archaeological methodology in such a context. The legal, economic and social pressures posed on professionals in preventive archaeology (working in public or private institutions) have direct consequences also on the ways how research in day-to-day practice is performed and its results reported. While it is clear that archaeological discipline is constantly developing common methodology, and consequently also the standards and good practices of what is accepted as correct research methodology, in practical situations, most frequently in preventive archaeology, the idea of standards common with academic archaeology have been frequently challenged, or better to say 'readjusted' according to individual situations.

To start with, in Figs. 1 and 2 we have presented two models for archaeological methodology, one theoretical and the other in the applied situation (practice). In both contexts, we have considered a system of methodology as composed of interrelated subsets or domains: methods, rules, postulates, principles, experiments, techniques, procedures, examples and good practices. Each of these domains can be further broken down into its constituent elements.

Practical model (Fig. 2) illustrates the dialectic of theory and practice. Each research situation in practice is unique, has its own set of methods which at one hand draw its knowledge from the general system of archaeological methodology by selecting and readjusting elements of this system according to its particular needs and research questions, while, on the other hand, it is also shaped by the influences of a series of practical factors, conditions and circumstances in which the actual research is taking place. In this sense, preventive projects can be considered as typical contexts of archaeological research practice with specific external determinants having an influence on its methodology (Fig. 3).

At this point it is necessary first to answer one general question – is practice in preventive archaeology in terms of it research nature comparable to the academic research. Our answer is yes! The fundamental nature of research in both contexts, academic and preventive, is the same, as well as the methods applied. The evident differences in goals, social roles and practical circumstances are just elements in the dialectic of archaeological practice and should not be overestimated. However, in practice, the differences may have been perceived as constituents for 'two' archaeologies. Later, in this text, we have dealt in more detail with this issue.

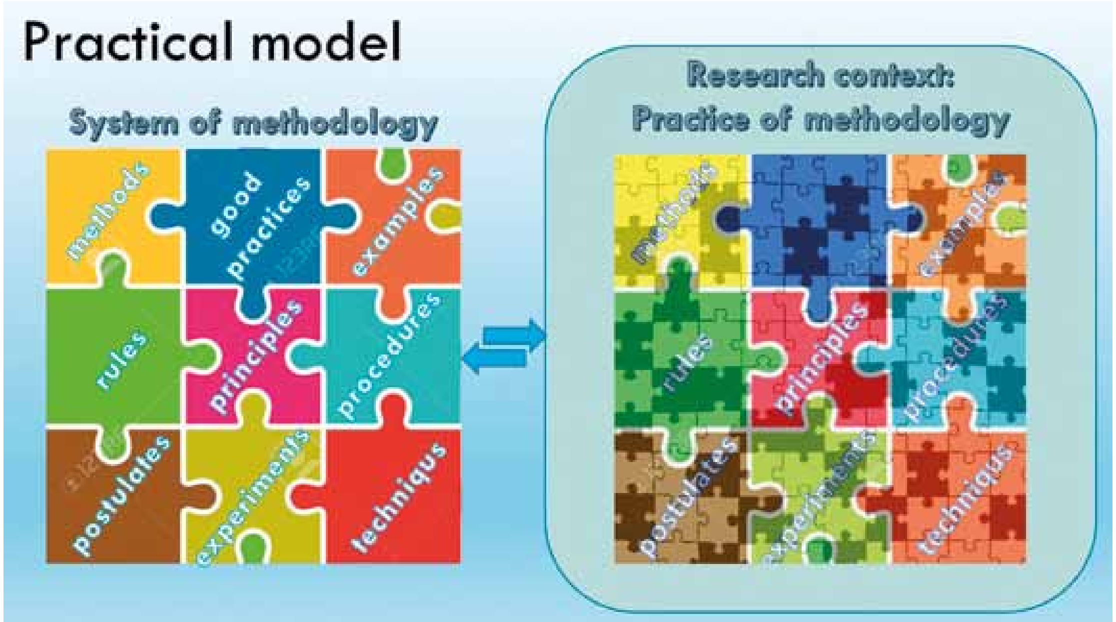

FIGURE 2. Model of archaeological methodology in practice.

If we look at the goals of academic and preventive archaeology these differences may arise from different tasks ascribed to two archaeologies. Regardless of a number of different individual goals of academic archaeology, they all can be comprised under the task of 'producing new knowledge about the past', while the primary goal of preventive archaeology is normally considered under 'safeguarding the heritage'. Theoretically speaking, preventive archaeology is then seen as 'applied' archaeology implemented in practical contexts. It is clear that we are talking here about two different primary social roles. However, these roles are not exclusive but interrelated. As academic archaeology assists in different ways to the safeguarding of heritage also the preventive archaeology produces new knowledge about the past.

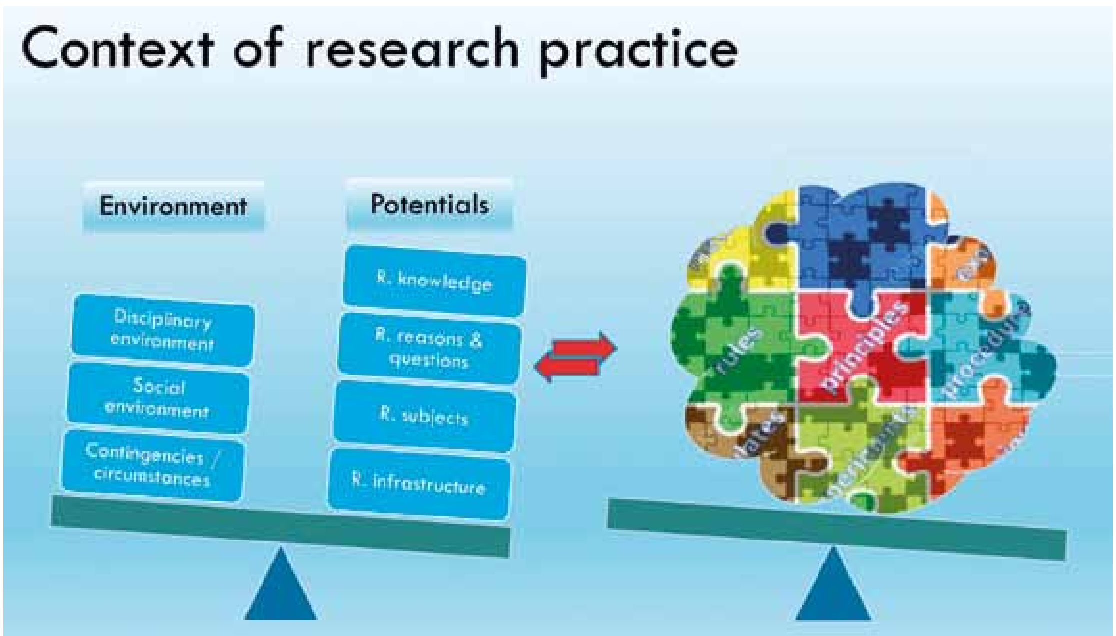

FIGURE 3. Formal model of research practice in archaeology.

In Fig. 3 we have presented a model of research practice where the elements influencing the research methodology are grouped into two major groups: elements deriving from the environment in which research is taking place (disciplinary environment, wider social environment and local contingencies and circumstances) and potentials of archaeological discipline and practice (research knowledge, research reasons, questions, motives, subjects performing research and infrastructure available for research). Again, these two groups are not mutually exclusive; in fact, each individual element can be observed for its environment and potentials. If one would plot the elements of different projects, academic and preventive, according to the presented model, the existing differences between them would, again, not be so large to seriously deconstruct the disciplinary unity of archaeology.

However, in actual practice in many countries, this does not seem so obvious. Since the introduction of modern preventive archaeology based on the principles of the Convention from La Valletta (1992) one could, indeed, observe the widening gap between the academic and preventive archaeology, not only in practice but also in a number of conceptual issues. The situation can vary from one country to another. But accepting divergent development and doing nothing to abridge this gap poses great threats to the unity of discipline, and could easily challenge its relevance in all its social contexts. For this reason, it is important to reflect some major facts regarding the differences between the academic (purely research-oriented) archaeology and preventive archaeology (applied, heritage-oriented), and to reflect the methodology in both.

a) Differences in motives/reasons for research
In principle, academic archaeology is fully autonomous in selecting research topics and constructing its research agenda. Preventive archaeology has much more limited range in this domain. Here, the areas, types of sites and other archaeological phenomena to be researched are not selected in advance for archaeological research purposes but simply because certain areas containing archaeological evidence are threatened by different external factors, mostly by development. In terms of methodology, or better to say in terms of maintaining the correct level of its implementation, the reasons for research should not have any considerable effect.

b) Compared to the academic domains, preventive archaeology works in a much less control environment and conditions. Many external factors (e.g. funding, extent and duration of the projects, weather conditions, the subject of research etc.) can condition a great deal of the preventive research. Here it is of essential importance the system of funding. The truth is that the introduction of principle 'polluter pays' enabled considerable improvement in funding, and is directly responsible for the recent enlargement of preventive archaeology, but it also deserves some reflection regarding some negative practices. The principal question here is who estimates the costs of preventive projects and how they are estimated. In countries where a great deal of preventive archaeology, especially fieldwork and associated activities, is a matter of market competition, one could witness several negative outcomes. The most concerning is predatory pricing which mostly derives from the fact that the final price, and frequently also the initial estimates, are frequently set without full comprehension and consideration of the archaeological research requirements (and standards if they exist). The philosophy of market competition is based on assumption that the buyer will always weight the price and quality of the product he is buying, and the outcome should be the optimal solution for the buyer. But, such philosophy completely fails if the buyer is not interested in the product at all? As we have said before, the developers are not interested in the results of preventive research. Leaving to them to set the price they are willing to pay for 'emptying the land of heritage', without any regulations and mechanisms allowing authorised public (state, regional, local) bodies to secure a minimum of necessary funds based on expert estimates is bound to undermine the quality of research. Public bodies must have some statutory role for at least one simple reason – in all countries, the heritage is considered public good and the public, via its authorities, must have some power in protecting it. Otherwise, the environment for preventive research would soon turn into extremely hostile, and the consequences for the whole discipline of archaeology would soon become catastrophic. In such a hostile environment the implementation of methodology would be among the first to suffer serious setbacks.

c) While the academic archaeology, by its virtue, can and should experiment and test new methods and techniques, preventive archaeology, in practice, tends to limit the methodological arsenal to the set of 'routines' to perform research as efficiently as possible according to the 'agreed' or 'standard' level of practice. This, of course, does not mean that there are no methodological innovations in preventive archaeology, the pressures of the business context in its own ways catalyses the progress, but the motives for development of new methods may considerably vary between the academic and preventive archaeology. In simple words, while in practice the academic archaeology would invent new methods or improve the existing ones to enlarge the knowledge and to provide new ways of getting the knowledge, the preventive archaeology would seek for methods to get such knowledge faster and more efficiently. But do we speak of the same 'knowledge'? In theory yes, but not necessarily in practice. While academic archaeology is, in principle, unlimited in seeking new knowledge, in the everyday practice of preventive archaeology the 'knowledge' takes on additional meanings – the one associated with the knowledge of cultural resource protection and management systems which are frequently based on a set of regulations.

d) Decisions derived from the results of preventive research have normally much greater weight and longer-lasting implications, especially from the point of view of heritage protection. It is nothing new to say that the responsibilities of the academic archaeology are primarily within the disciplinary and scientific contexts while the professionals in preventive archaeology have much larger responsibilities in wider social, economic and community contexts. Of course, they are not excluded from the responsibilities in the disciplinary context. When speaking of responsibilities in preventive archaeology we must be aware of the fact that there are at least two different positions in the preventive archaeology with different responsibilities. The first group are those professionals who decide whether the preventive projects are necessary, they normally prescribe its size, basic methods, and they may also decide on different stages of preventive research, and frequently also how to proceed with heritage safeguarding in the future. The other group are professionals who actually implement archaeological research based on such prescriptions. The monitoring of the research and evaluation of the results is normally the task of the professionals from the first group.

In practice, both groups can be exposed to various external pressures. In practice, these pressures very much depend on how in general the development, real estate and building activities are regulated and environmental protection respected. In countries with a lot of illegal constructions, one could hardly expect positive public culture towards heritage. There the pressures may come from illegal lobbying and political pressure to 'make things go', and come very close to corruptive practices.

These four points, though not completely covering the issue of methodology in the context of the hostile environment in preventive archaeology, nevertheless, give clear orientation for the discussion about the actual challenges in this domain. To this end, we would further focus our paper on the following issues we find essential for 'safeguarding ' the methodology in the future:

a) The relationship between two archaeological 'professional cultures' from the perspective of methodology application and development

b) Quality of research and presentation of results

c) 'Big data' problem

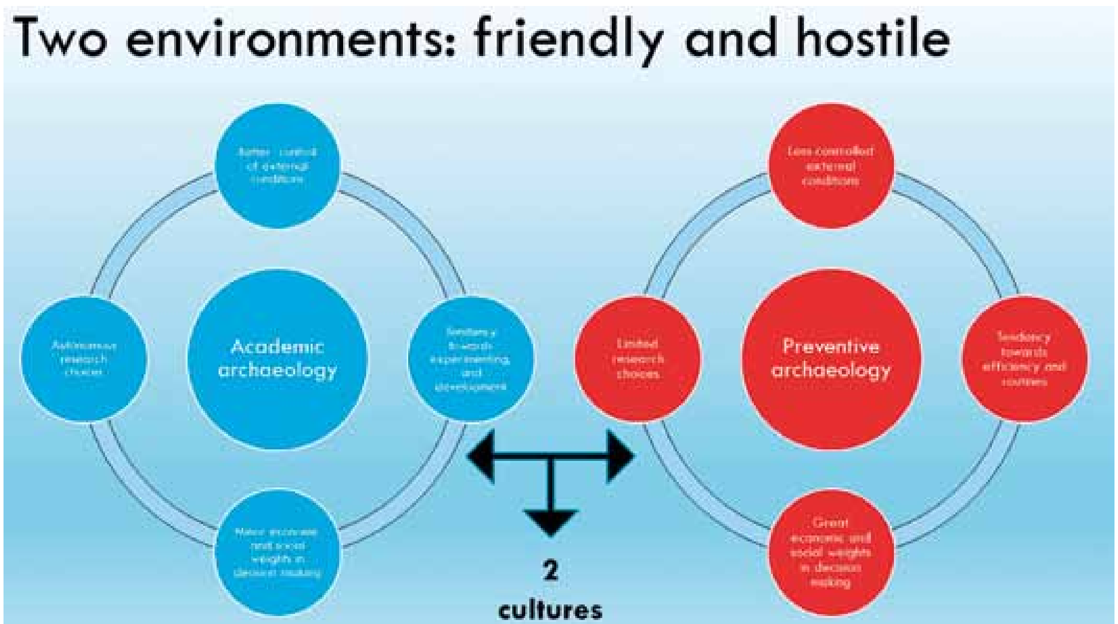

FIGURE 4. Diagram of friendly and hostile environments in archaeology

Fig. 4 just illustrates the well-known fact, that in spite of a number of external factors influencing the nature, content and size of academic archaeology, it, generally, operates in an environments which are far less 'hostile' (i.e. much fewer external criticism of relevance and needs for such research) than in the case of preventive archaeology. Again, we do not insist on a strict division between the two environments, what we would like to illustrate here is the distinction between the two extreme situations.

Two archaeological professional 'cultures'

Much about this has already been said by other authors (e.g. Bradley 2006) who points to the fact that this divide to a great extent originates from self-perception of the professionals in archaeology. We find this observation very important; what follows from it is that archaeology (and archaeologists) are seen as much more homogenous by the non-expert public. Most of the people simply do not distinguish between the 'two' archaeologies and very frequently project stereotypes, criticism and simplifications on whole archaeology, regardless whether it is academic or preventive. This is even more accentuated in the 'hostile' environments where archaeology (preventive) is considered as one of the obstacles to development.

Bradley (2006: 6) warns that the research aspect is becoming marginalized in the preventive archaeology since major regulative frameworks and documents give priority to conservation agenda. Similarly argued Carver (1996) who sees research and the creation of knowledge being replaced by the management of heritage assets - research of unknown gave a way of research of known. Fitzpatrick (2012: 150) notices that practice-based research is frequently perceived as in some way inherently inferior to academic research', and that exists a belief which distinguishes between 'thinkers' and 'doers' of archaeology and that research is commonly seen as a creative process while commercially organized research is mundane. Everill (2009) also notes the 'invisibility' of researchers in the contexts of preventive archaeology while in the academic domain the visibility of very strong. And, last but not least, many argue that the speed and number of development-led projects cause a decrease in the quality of work.

One of the major reasons for the emergence of two archaeological professional cultures are definitely different business conditions and circumstances. While the competition for jobs and projects in the academic archaeology is mostly based on evaluation by peers (i.e other academics), this is definitely not the case in preventive archaeology, especially in those countries which introduced a 'commercial' status of the preventive research as marketable services. There the competition is based almost entirely on commercial factors. This is also the case when investors are public bodies or agencies; the EU directives regulating public procurement order them to select the bidders which offered the lowest price. This, of course, sheds a different light on the issues of quality and its control. It is not a surprise that in countries with highly 'commercialised' archaeology the differences between the two cultures are much more enhanced (e.g. in the UK, Ireland, Italy). In spite of the fact that the principle product of both, academic and preventive archaeology – new archaeological knowledge produced and cultural heritage enriched (and/or saved in preventive research) – the quality of work seem to be measured differently and have different effects. Since we would not go into more details here it suffices to point to the cases where preventive archaeology is still the domain of public authorities, and where the practices of quality control seem closer to those in the academic world (e.g. in France or Germany). In the case of 'commercial' preventive archaeology, quality control contains several other aspects than just the archaeological contents or results, which are measured by non-academic or non-disciplinary criteria.

Bradley (2006) points to a major problem of the relationships between the two cultures – their lack of communication and understanding which is the major reason for mutual criticisms. While the academic archaeology questions the quality of research (i.e. its reductionism), recording and publication in preventive archaeology, and less-than-adequate contribution to the general knowledge of the past and heritage, while on the other side the preventive archaeology accentuates its social relevance and its role in sustainable development strategies, high skills learned in research practice, deeper engagement with public etc. And, least but not last, its vast contribution in the domain of new discoveries, the quantity of data obtained through preventive greatly exceeds those from the academic archaeology. However, the academic archaeology still to a great deal insists on the scholarly image of archaeology. Carver (1996) sees this as a structural difference between creating and safeguarding of heritage (cultural resource management) and production of new knowledge *per se* (academic scholarship). On the other hand, Rajkovača (2017: 29) argues that the challenges in the system of cultural resource management and academia appear to be the same.

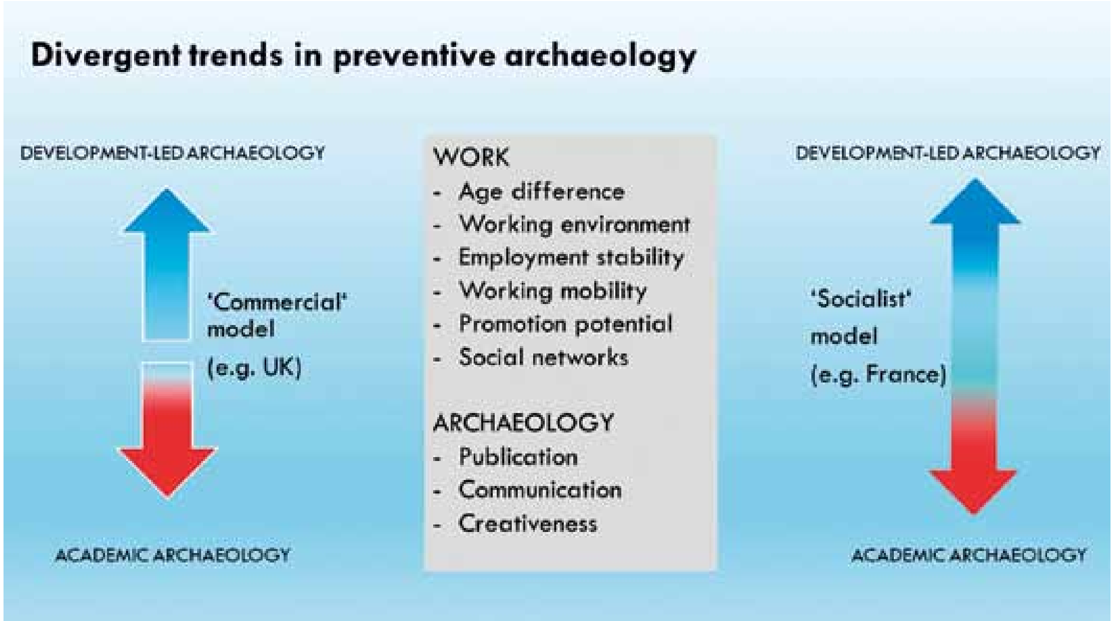

FIGURE 5. Characteristics of friendly and hostile environments for archaeological research.

This mutual criticism contributes in its own way to a 'hostile' environment for archaeology. If preventive archaeology becomes increasingly separated from academic archaeology it also becomes more exposed to the criticisms from outside the discipline, especially from the stakeholders who can have direct benefits from making it weaker. In such a scenario where heritage safeguarding is losing its powers and statutary roles, there is a great responsibility also on the academic archaeology to actively intervene to remediate the situation. Though the academics and their institutions are frequently not the stakeholders directly involved in the processes of negotiating the individual preventive research projects, they can contribute in a different way, by being actively involved in the creation of research standards and quality control systems in archaeology. In other words, if a preventive research project should not methodologically differ from a standard academic research project, then why it is not evaluated as such. The fact is that majority of preventive field projects end with reports, which are in many cases more technical and descriptive than scientific and interpretative in their nature. If the data presented in these reports are not fully scientifically evaluated and reports themselves subjected to peer reviewing the potential of the preventive research far from being optimally exploited.

Criticising exclusively the professionals in preventive archaeology for poorer quality of reporting and otherwise presenting their work would be a great error. It is the system of heritage safeguarding which is not recognizing the full scientific evaluation of data as inseparable part of preventive research and is not providing adequate means for such an evaluation. This is especially the case in highly commercialized national preventive archaeologies, where legislation, describing the concept of 'preservation by record', insists on dividing the safeguarding of heritage into a series of individual activities, mostly those 'technical' in nature (e.g. excavations and primary processing of finds and documentation), which are compulsory for funding by developers. More complete scientific expertise is mostly left out of the funding scheme as if the excavations and removal of the 'sites' to museums and record archives make the safeguarding of heritage 'accomplished'.

The domain of scientific evaluation seems to me the most authentic field for fruitful cooperation between the professionals from academic and preventive worlds. Provided that the funds for are secured this cooperation can be implemented in all aspects and stages of the preventive projects, from the preparation of projects, counselling on certain archaeological issues, monitoring, active engagement in post-excavation analyses, peer reviewing etc. What it takes is to create a system where such cooperation becomes a routine. The benefits would be great for both sides, the academics would get far more familiar with many aspects of doing business in archaeology, organization, logistics, would gain experiences of working in very demanding and challenging conditions, they would extend their professional networks, and they would also be in more direct touch with finds and sites and other phenomena they are professionally interested in. And, why not, they could also upgrade the university curricula with topics relevant for professional careers in preventive archaeology. If anything, then it is the development of new or faster and improved techniques of field methods which is taking place primarily in preventive archaeology.

Of course, it is easy to put such proposal on paper, but the truth is that if look more closely on the organization and practice of preventive archaeology in different countries in Europe, one can find a number of cases of good cooperation between these two professional groups. Most practitioners in preventive archaeology operate on local or regional levels having so less opportunities for international cooperation than the academic archaeology and also for being informed about the practices and achievements abroad. Academic networks and means for disseminating information can be far more easily mobilised than asking a number of small private enterprises to look for potential partners outside their country. This is also very frequently the case where preventive research is done by public institutions. These institutions, national or regional, effectively implement preventive projects with their local staff who could easily spend decades of their career working in one region. While this may make them excellent connoisseurs of the archaeological situation in their regions, it does not make them equally good researchers, especially if their access to information abroad is limited.

There is also one domain worth exploring that of the decisions made upon the results of research. Here, the preventive archaeology, in all stages of the research process, has a much greater responsibility than the academic one, and the decisions made are much more open to criticism by many parties. Research aimed at creating a dataset of archaeological potential of the individual area or site to support further decisions on size and type of development to be eventually permitted has a set of important short- and long-term consequences. And these consequences are felt in both, in the ways how archaeological heritage is safeguarded and in archaeological knowledge in general. In fact, this can be observed as one of the most critical points in implementing a suitable methodology.

Quality of research and presentation of results

The effects of the hostile environment are probably the best felt in the domain of quality of research and presentation of the results. Though, in theory, there should be no difference in terms of methods and standards between the two contexts, academic and preventive, in practice, this is not so much the case. It would be too simple and erroneous, to say that the reason for this is in the limited scope of the preventive research – to "*save the archaeology by the record*" while academic archaeology pursues 'deeper' insights and research which goes beyond the safeguarding of heritage.

Quality of research is directly associated with the methodology planned and implemented in practical situations. In both contexts, academic and preventive, every single project is unique and unrepeatable enterprise. Official standards and guidelines, if they exist, as well as cases of good practice must be always interpreted in the context of the individual project. This does not mean, that the standards can be ignored, indeed they have to be strictly referred to in all phases of the projects, and their requirements carefully studied and reflected against the goals of the project. While this may not be so difficult in the academic research contexts, it may prove more challenging it the preventive one. By challenges, I do not think only of pressures on preventive works to be as efficient and cheap as possible, but also on another fact deriving from the so-called 'conveyer belt' archaeology where standards and guidelines are often perceived as compulsory 'manuals of modus operandi' which need to be followed. Subduing to such philosophy denies the most essential characteristic of archaeological projects, they are all highly creative enterprises. Creativity is essential to any research, and taking it away from a great number of archaeological projects (let us not forget that more than 90% of the projects are preventive) is a great mistake, and, literally, the end of archaeology as we know it.

It is my opinion that it would be irresponsible from academic archaeology not to be involved in the safeguarding of heritage, and to pursue academic agenda alone. The quantity of new data coming from the preventive research exceeds for several order of magnitude the quantity deriving from the academic archaeology. One could say that in practice the data from preventive research may not be as structured and detailed as the data from academic research and that its quality could not always match the level of the quality in academic research. But, if there is a domain for good and logical cooperation between preventive and academic archaeology, then there is quality control. In the previous chapter, we have already proposed some steps for improving the quality of reporting by involving academic archaeologists into the processes of evaluation and peer-reviewing of the reports of the results from preventive research. This would not only increase the quality of reports themselves but also help both sides, preventive and academic, to understand the conditions and circumstances of the other. The other possible step towards the improvement of the quality is also involving academics into monitoring of research work, or at least of those parts for which they are competent. The benefits of such cooperation are definitely mutual. The skills, experiences and knowledge required for running large-scale projects are definitely much more developed among the field professionals in preventive archaeology. They have probably researched far more different sites, encountered far more complicated situations and worked in much more challenging conditions than academic archaeologists. Moreover, whoever had directed preventive project had to take into account different agendas, academic challenges had to be considered together with safeguarding priorities and rules, and business requirements. In this context, the issue of research quality has to be equally considered also outside the more narrow domain of academic standards.

In practice, in the last twenty or so years, as a major tool for ensuring the quality of research in archaeology in a number of European countries became standards. Though the standards are not the only tool in the system of quality securing and management, one should also think of other types of regulations, good practices, recommendations, ethic codes, tutorials etc., in practice the standards are probably the most important elements of such system. However, there are many types of standards, and not all 'standards' can be considered as equally important. In the first place, they can be distinguished according to their issuer, or better to say, according to the principle intention of the issuing body. We will best illustrate this with the cases of the Dutch archaeological standards (Willems and Brandt 2004) and the standards issued by the Chartered Institute for Archaeologists in the UK (CifA). The Dutch standards were issued by the public body responsible for heritage protection within the Dutch legal system), while the CIFA standards were issued by an organization of the professionals, which is essentially an NGO aimed in the first place at protecting the professional archaeology (and its professionals). They both have an important role in their respective countries, but when observing legal powers, the standards issued by public or even governmental bodies have much greater powers. However, also the powers of CIFA should not be ignored. CIFA, as leading professional body in the UK archaeology, represents archaeologists to the government, policy makers and industry. In this sense, CIFA directly acts towards mitigating the conditions of hostile environments. The Dutch-type of standards, which are more frequently oriented towards '*how the archaeological heritage is researched in the correct (prescribed) way*' may also have important mitigating effects, but they not directly deal with professionals in archaeology. The other distinction between these two types of standards is, that some Dutch-type forms of 'standards' exist in a number of European countries, while CIFA-type standards can be found mostly in countries with larger numbers of professionals in archaeology working in 'commercial' conditions. Smaller countries, with only a few hundreds of professionals, have rarely if at all, professional bodies similar to CIFA. In fact, their role is assumed, but very partially, by the professional societies, especially in the former Eastern European countries (e.g. national societies of archaeologists).

The standards I would focus on in my text are primarily those issued by public (or governmental) bodies aimed at ensuring the quality of heritage protection. By saying this. I do not want to diminish the importance of professional ('guild') bodies and their standards and/or their ethic codes, but they gain in importance mostly in larger systems of professional archaeology, especially in 'commercial' environments where situations considerably varies from one country to another. Moreover, also the standard issued by public bodies responsible for heritage protection may considerably vary, some of them try to cover all major aspects of archaeological works, while others are dedicated to individual aspects only (e.g. data archiving, data classification, storage etc.).

However, not all texts, acts, and documents issued for the protection of heritage can be standards proper. Governmental acts (laws) are documents which normally define concepts and objects heritage, its legal status and system of their protection, stakeholders in heritage protection process and liable practices of protection. In other words, such documents normally define the general basis for the practice of heritage protection. More detailed regulations and standards proper normally appear at lower levels of legislation and regulation, and their status may also depend on the legal status of the issuing body. It is beyond the scope of this paper to discuss archaeological standards in all European countries. Indeed, the situation varies considerably, from countries with standards issued by their ministries responsible for archaeological heritage (smaller number of countries) to countries with no such standards where their role is assumed by some regulations which may cover only some aspects of the archaeological work in heritage protection, and are not as detailed as one would expect from standards. It is interesting to note here, that in comparison with the archaeology and heritage protection in the USA, which practices highly commercialized system, the standards in the European countries are much less present and developed.

Why we find standards so important? I would not go into the obvious: standards are making work more unified, ease the communication and understanding of research activities within the professional community, make the results more widely comprehensible etc., my point here is that standards protect archaeological professionals at all levels of the archaeological research process, and especially in the hostile environments. Of course, not all standards have the same protecting powers, but the standards issued by major public bodies definitely have them. And, here again, there is a place for fruitful cooperation of professionals from preventive and academic archaeology.

The Dutch standards are a good example of such cooperation. There, in 1999, a special national committee was established composed of all major expert parties involved in heritage protection (and preventive archaeology): universities, private enterprises, local, regional and national governments, the Dutch Association of Archaeologists, representatives of the developers (Willems and Brandt, 2004: 10, see also Appendix VI). Such a wide representation and exhaustive discussion was essential for successful adoption and implementation of standards. A similar process can be seen in Slovenia. There, the new Cultural Heritage Protection Act (2008) required from the Ministry of Culture also the adoption of the Regulations for Archaeological Research (*Pravilnik o arheoloških raziskavah* 2013), which were adopted in 2013 and in its appendices contained standards for all major aspects of archaeological research, from types of fieldwork allowed, compulsory forms and contents of records etc. to archiving of the results and final deposition of documentation and finds in museums. Special committee appointed by the Minister of Culture, composed of experts coming from heritage protection institutes, research institutes, university museums, and experts from the ministry itself, worked on regulations and standards for about 2 years. The standards alone were created on the basis of a special study commissioned by the Ministry of Culture already in 2006 (Novaković et. al. 2007).

The adoption of standards is an important step but it is not enough. The truth is, that, for example in Slovenia, the situation in preventive archaeology considerably improved, but crucial is the implementation. Without proper mechanisms and tools enabling efficient implementation, the standards may easily be ignored. Here again, we point to hostile environments where the implementation of standards is mostly challenged (e.g. as 'bureaucratic', non-practical, difficult to respect, state-enforced regulations etc.). It is also true that implementation and respect of standards has also much to do with the general culture of respecting the state laws and regulations, appreciating the heritage and environmental issues. I do not intend to go into this in more details but just to recommend careful consideration of all aspects which may hinder the implementation of standards. Better some standards than none.

'Big data'

The concept of Big Data (re)emmerged in the field of the digital and is associated with a rapid increase of computers ability to accumulate and process quantities of data much larger than ever before. Archaeology has already passed the threshold of 'Big Data' without being fully aware of this passage. Not so much internally as a discipline but externally, as a practice done in environments and contexts which are using big data. What changed for archaeology, in the first place, are the environments and social and economic contexts and activities which increasingly take advantage of Big Data ideas, solutions and technology, and which directly or indirectly exercise influence on archaeology and its practice. [1]

Much of this paper is dealing with the relevance of archaeology, and its relevance can be again at stake if archaeology would ignore or delay in accepting the challenges provided by Big Data. There is much more to Big Data than just large datasets and technology to effectively manipulate with them. It is true that the initial definitions of Big Data spoke of large scales and quantities of data whose processing exceeded the capacities of 'normal' computers, but the potential of Big Data was soon revealed in dimensions and perspectives hard to predict some 10 years ago. Some scholars (e.g. Mayer-Schönberg and Cukier 2013) speak of a genuine revolu-

1 At the moment, the best example of Big Data associated with archaeology is the project Europeana (https://pro.europeana.eu/our-mission). The project is very ambitious and includes all types of cultural heritage. It started as a platform for communication between libraries but it soon grew into more ambitious project – general information platform (and archive) for European cultural heritage open to all citizens and creative industries.

tion affecting not only the way how we treat data but also how we understand and organize our society.

Presenting and explaining Big Data concept is beyond the scope of this paper and we will just remind on some of its major aspects which we find especially relevant for archaeology. Mayer-Schönberg and Cukier (2013: 13-15) speak of three major shifts associated with Big Data. In the first place, there is a shift from sampling small (and as representative as possible) samples to sampling *all*. All users of Facebook or Amazon are taken as a sample, their every individual click or word or number they type, or even time spent on a certain web page are recorded and can act as a sample for analysing their behaviour. Then there is a shift from exactitude of data on smaller scales of observation towards their messiness on larger scales which, instead, enables insights at macro levels. And, finally, there is a shift from searching principal causality within data towards revealing correlations, sometimes very unexpected correlations. The correlations may not tell us precisely *why* something is happening, but they can alert us *that something* is happening (Mayer-Schönberg and Cukier 2013: 14). In this sense new, sometimes completely unexpected patterns and correlations may be revealed. This, in turn, opens the question whether narrowing down our research to test exact and clear hypotheses is fruitful approach; the common phrase is 'Big Data can be let to speak for itself'.

Current definitions of Big Data frequently stress 3Vs when describing its nature – Volume, Variety and Velocity. Some (eg. Harwitz et. al. 2013) add another 2Vs to it – Veracity and Value. Each of the individual Vs brings major changes. Today volumes of a number of datasets may exceed petabytes or even hexabytes (e.g. Microsft Academic has a dataset nearly 18 million publications by nearly 212 million authors, Google Books are nearly at 30 million publications) and their processing and services require computing power not of a single (super) computers but of computer grids and networks. The level of the velocity of data gathering is another phenomena not experienced some ten years ago. Today, almost unimaginably large amounts of data from various social networks, sensors, cameras etc. can be collected and shipped to servers in a blink of an eye.[2] Dealing with such velocity obviously requires a completely different approach to data and what can be done with it.

Variety deals with structuration of data and datasets. In traditional data analyses, some kind of the structuration of data is normally the first step to be done, but it is estimated that after decades of digital data collecting and analysing only 30% of datasets are structured, the rest is simply messy, and can be extremely messy. Since it is difficult to apply rules on an unstructured data this, again, requires different approach and tools to deal with. The importance of the last 2 Vs: veracity (i.e. reliability or trustworthiness or accurability of data) and value (adding new values based on data) only increase through time and with accumulation of more and more data, and they also require suitable tools for filtering out the anomalies, inaccuracies etc. or new predicting tools.

Many practitioners in archaeology would agree that what is the most obvious aspect of Big Data experienced in the discipline is the increasing volume of data. This increase is directly associated with the application of digital technologies in archaeological research. Since around the year of 2000 when digital cameras were introduced the number of photos taken at excavations increase enormously, as also various measurements taken by surveying instruments, and millions of various datasets were created in digital forms. This, of course, speeded up the process of recording, made it more accurately, increased the structuration and standardization of data and eased data processing. While this seemed at the first sight a great relief for those working in the field, the price was paid in later stages of archaeological work. If one would stick to the conventional approach to data he would spend much more time sorting, classifying, filtering, and discarding redundant data as ever before. There was a clear negative correlation - more data is taken in automatic modes and time saved, more time is spent making it understandable let alone usable in later stages. To illustrate this phenomenon it is enough to look at how much data was collected and how much of it was published, and how much work on data is distributed along this axis. It is becoming clear that if we would like to successfully fight the incoming 'data flood' that not only new and faster tools are needed, but much more than that – new considerations about data.

The issue of velocity brought by Big Data technologies may at the moment seem not that relevant for archaeology. Today we are rarely using if at all, sensorial technologies to record different archaeological activities in real time. We simply do not have such needs yet. But, if we look in wider context and include heritage, perceptions of archaeology and past, and similar notions, then the importance of velocity becomes soon very important. It is possible to imagine a large number of things where different kinds of sensor-collected data can be very useful, for example, one could get a much better insight about ideas, expectations and impact on

2 Facebook generates som 250 million posts per hour.

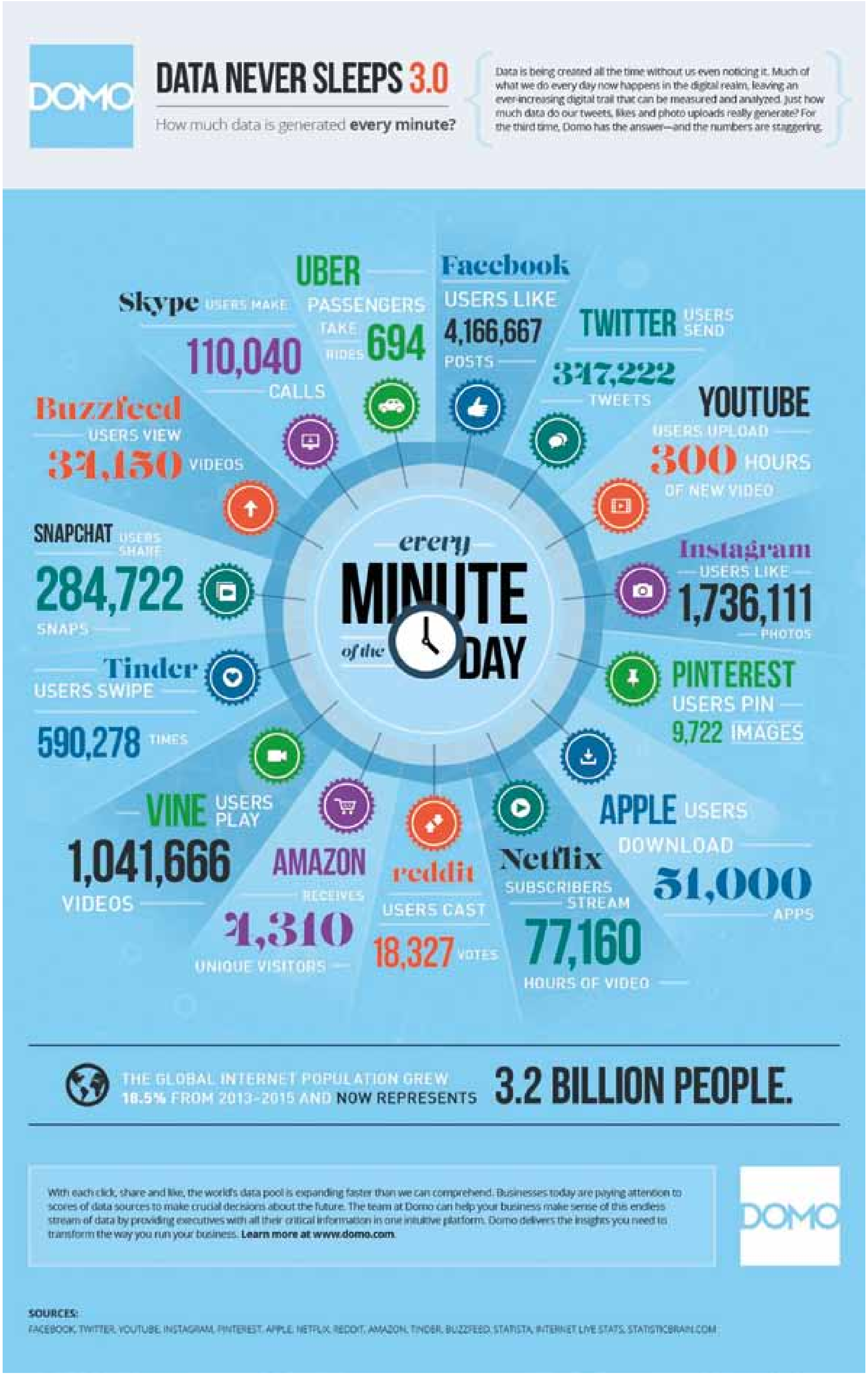

FIGURE 6. Data generated per minute in 2018. Source: https://wersm.com/how-much-data-is-generated-every-minute-on-social-media/

the behaviour of visitors, internet users and many other different populations. For many years large supermarkets and malls arrange their shelves and products according to the behaviorial patterns of different groups of customers in order to keep them as long as possible in their stores and boost impulse buying. One museum display or exhibition is not that far away. On the other hand, one can look at 'likes' and 'dislikes' at Facebook associated with some archaeological issues, and immediately act to decrease 'dislikes'. For example, if in media there are frequent news or opinions about excavations in town centres which are causing problems for traffic, local inhabitants, commuters etc., generally depicting archaeology as obstacle or unnecessary spending of money, the time to launch positive and better conceived online campaign is during the excavations and not months after they have been completed.

Variety of data is a long-standing problem in archaeology. The answer to this were great efforts to structure data in several, but still not many, standardized categories (morphological or functional types, chronological sequences, stratigraphic contexts, and other units of observation or categorization). In this way, data was collected and processed in ways shared by professionals in archaeology, as well as their results. But, as every practitioner in archaeology knows from its own experiences, the data is not that easily accommodated to 'default' categories, there are still many 'transitional', 'anomalous' and idiosyncratic forms which in many cases required their own individual 'category'. The other problem is more of epistemological nature. If one defines standard categories in advance (or just follow the prescribed standards), then it is very likely that the data will be 'normalized' in order to fit well in those categories. This may prove more efficient and coherent but there is also a great chance of loosing or ignoring 'strange' data. Equally goes when one looked for the patterns in data. If one would focus on patterns for which he knows major determinants, he would limit his observation to proving or disproving these patterns, but he would also limit the potential of revealing other, not expected patterns.

Archaeology has very ambitious goals – to discover and interpret as many as possible aspects and phenomena of human life and activities in the past in every corner of our world and to assist with its knowledge in heritage protection, presentation and management in our societies. From this, it is clear that archaeology is constantly expanding its field of expertise and research, together with its ability to deal with the increasing quantity of data. But it is not the sheer quantity of data which requires reconsideration of data management in archaeology, it is the structure of data which is actually causing greater problems. Seeing the increased quantity as the only major problem would lead us to the 'conveyer belt philosophy', in this sense it would suffice to develop appropriately faster and more efficient ways for data retrieval, storage and processing. This is a classical positivist view from which stems that more data means more accurate and better answers. But this ignores basic dialectic of science and research where theory, practice and environment in which science is practised, contrasted to each other, resulting in new ideas and concepts in all three fields. In other words, new discoveries or new types of research always open the question of whether actual theories or interpretations (and their basic assumptions) can accommodate them or they need to be changed and improved.

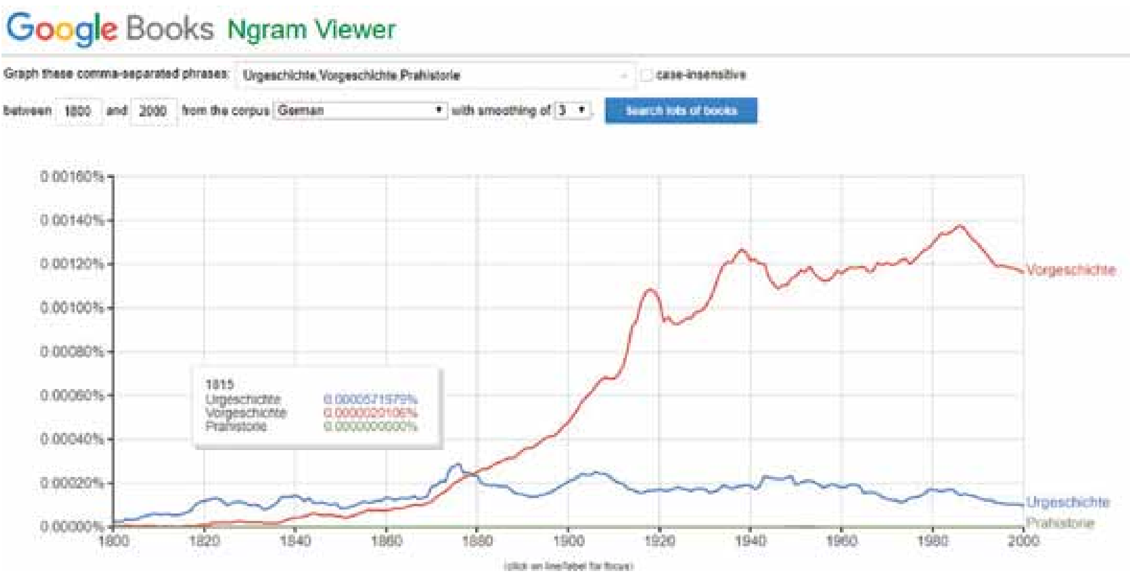

FIGURE 7. Ngram's relative frequency (in %) of words 'Urgeschichte', 'Vorgeschichte' and 'Prahistorie' in German texts stored in Google books.

It is clear that archaeology should very soon introduce Big Data concepts and tools in its methodology. It is expected that this will be first done in the academic domains which have more space and time for testing. It is hard to predict in which areas concepts of Big data in archaeology will prove successful. One possibility is using existing Big Data services such as Google Books and their highly attractive *ngrams* which compute the frequency of specific words in their large book repository spanning from the last decades of the 19th century onwards. This possibility opened completely new insights into cultural patterns of modern society and is responsible for the new term 'culturomics' - a special type of computational lexicology (Aiden and Michel 2013).

To demonstrate the potential of ngrams with one simple case, the frequency of words 'Urgeschichte', 'Vorgsechichte' and 'Prahistorie' in German books recorded by Google Books.

From the graph above it is very clear that the word 'Vorgeschichte' appeared later than 'Urgeschichte' and become more frequent than 'Urgeschichte' at around 1880 and only increased through time. What does this mean? At this point it would be probably premature to jump to conclusions, e.g. that 'Vorgeschichte' became more frequent as archaeology became more cultural-historical oriented in German-publishing world, but having ngrams gives us the opportunity to research this change in a reasonable amount of time, and to test this hypothesis within a context of German language, archaeology and culture. However, what is important to note here is that in spite of a number of inconsistencies of Google Books, possible errors during the datafication process (e.g. OCR of scanned texts), non fully representative samples of German texts etc., the result of ngram would not be much different even if all the errors would be corrected. Big data simply does not have to be full exact.

There are also many other existing Big Data service the archaeology can take advantage of, e.g. in environmental monitoring, people's behaviorial monitoring (on-line and off-line), monitoring of public opinion etc. And then there are also tools for dealing with archaeological Big Data (data produced by archaeology). In this domain, we expect first the adoption of tools for dealing with unstructured or poorly structured data, especially the adoption of different nonrelational (nonSQL) databases which offer much greater flexibility and scalability than traditional SQL databases. Another field where we expect successful employment of Big Data is GIS and manipulation with environmental data sets.

Preventive archaeology, I firmly believe, will start using Big Data concepts very soon after they will be applied and tested in the academic domains. I do not predict here any radical changes in field methods and recording, much greater potential lies in manipulation with datasets from many projects. Large collections of pottery, bones etc., from dozens or even hundreds of sites or excavations, provided they are accessible online, can be analyzed regardless of the fact that they are not fully uniformly recorder or are stored on different servers. One can only imagine not only how this may assist in preparing reports from large-scale excavations, but the whole archaeological syntheses on regional or even larger scales. To reach this level there must be a serious investment in networking and Gig Data clouds. The truth is that archaeology, at the moment, is still not commercially attractive for Big Data companies to be engaged more intensively in our field, but this will not last long.

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The Late Prehistory in Albania: a Review of Theory, Strategies of Research, and Valorization of Archaeological Heritage

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In almost eight decades of explorations, the research in the field of prehistory in Albania demonstrated considerable dynamics, a series of seminal efforts to delve into the distant past, effects of external factors to instrumentalize the archaeological interpretations, various research strategies, and, of course, numerous efforts to valorize and preserve the data as a crucial testimony of culture heritage. Many different strategies of data collection, including systematic excavations, regional surveys, test pits and so on, has been extensively applied in a large number of field projects. However, while considering cohesively research agendas, scientific queries that yet remain to be addressed, as well as the potential for further explorations and the value that archaeological sites have gained beyond their discovery, some crucial matters need to be discussed. In this paper, I deal with the character of the archaeological research of prehistory in Albania and to what extent it impacts the understanding of the past, including both, flaws and achievements. In three chapters, in this discussion, I attempt to analyze the conceptual setting of research of the Neolithic, Bronze and Iron Ages, focusing on theoretical questions, research design, and valorization of the prehistoric heritage.

The Cultural-Historical Tradition and the Prehistoric Studies in Albania

In the cultural and academic context of Albania in the second half of the 20th century, nationalistic ideology has loomed large, and this has had an enormous and often overlooked influence on a broad array of issues such as cultural continuity, historicity, and ethnogenesis.

Indeed, these have become loaded assumptions and have resulted in a particular type of research agenda that still continues to determine and define the archaeological studies. Such an agenda has turned its back on more anthropological aspects that focus attention on the ways communities lived, built interactions or explored the landscape. In the first chapter, I am focusing on two main issues: the theoretical concepts that have lead archaeological research and reasoning, and subsequent approaches in pottery analysis.-

Formation of the modern Albanian state, especially the vicissitudes of the Second World War, and the establishment of a Communist regime and isolationist doctrine forced a heavily nationalistic agenda on humanities, which led to approaches that did not naturally stemmed from a scientific background. Indeed, in archaeology, this political and ideological intervention had an immense impact on its conceptual and institutional foundations. Any interpretation and work undertaken regarding the so-called 'reconstruction of the past' was sharply envisaged within limited conceptual agendas with exclusive attention given to the glorious ethnogenesis of the Albanian people and their direct continuity with the Illyrians. The question of ethnogenesis became increasingly popular, to the point that, currently, it is difficult to come across a publication from the totalitarian period that does not emphasize it as a pivotal issue (Aliu 1969; Korkuti 1969; Anamali 1972; 1973; 1980; Stipčević 1973; Buda 1976; Tirtja 1976; Prendi 1985; 1988; 1989; Spahiu 1986; Bodinaku 1990).

What kinds of theoretical approaches are involved, if any, in this research? In Albanian archaeological studies, the theory has rarely if ever been considered an integral part of the research strategy. The discipline was mostly built on the conceptual pillars of culture-history and these have never been challenged or called into question, as was also the case in most of the Balkan archaeologies of that time. This has produced a situation where every archaeological study had similar predefined queries, and this was often the case even before the process of collection of data started. Consequently, the results were arbitrarily attached to a research agenda often created at a considerable distance from the data. In most cases, this conceptual strategy yielded predictably similar interpretations, avoiding altogether any type of more focused discussion or controversy.

In the symposium dedicated to the 50th anniversary of the foundation of Albanian archaeology, Lorenc Bejko offered a penetrating overview regarding the general development of the discipline (Bejko 1998: 195-207). Among other remarks, especially those relating to the immense contribution made by the first generation of Albanian archaeologist, which largely started from scratch, Bejko in cogent terms pointed out that three main piers of the theoretical frameworks based on historicism, Marxism, nationalism, empiricism and culture history (Bejko 1998: 195-201). Bejko mentions that perhaps the only debate which emerged within the Albanian community of archaeologists was associated with a few claims of Bep Jubani who, in 1969, suggested notable differences between the northern and southern burial rites of the late prehistoric communities of Albania (i.e. southern Illyria) (Jubani 1969a; Bejko 1998; 2000). The statement created a furor within the community of archaeologists and, according to Bejko, it provoked even the reaction of Enver Hoxha himself, in order to avoid any future "discrepancies", Hoxha accorded the "right" to Albanian archaeologists to call 'Greek' and 'Roman' anything that was not Illyrian (Hoxha 1969: 74-78, 80-81).

It needs to be stressed however, that this clear relationship between nationalistic agendas and the culture-historical tradition comes as a response to a similar trajectory in research of the southern Balkans. This fashion in discipline had been a modus operandi in other European countries like Germany, Italy and France even in the pre-WW2 period and continued more vigorously in large parts of Europe after the WW2 in Poland, Czech, Slovak or Slavic archaeology (Trigger 2006: 248-61). These kinds of politically-charged conclusions not only compromise the overall research mentality but also the possibility of engaging in critical thinking and even incorporating alternative research frameworks. Consequently, in combination with culture-historical tradition, such an approach has hindered research, rather than fostering it.

The analysis of material culture mostly focused on pottery and metal objects, has become one of the crucial tasks in the study of the late prehistory of Albania, the western Balkans, and southeast Europe in general. By approaching such issues, however, through a highly generalist agenda, problematic and often ill-defined conclusions have resulted, which lacked systematic strategy in the analysis of the material record. Pottery research undertaken by the Albanian scholars has occurred in largely isolated circumstances. A 'labor of love', often pursued without much fanfare, and certainly far from the gaze of international academic centers. Consequently, the bulk of the available data is usually confined to the ritual contexts normally encountered in cemeteries, tumulus burials in particular (Prendi 1956; 1957; 1959; Budina 1969; 1971a; 1971b; Ceka 1974; Bodinaku 1981; 1982; 2002; Korkuti 1981; Jubani 1982; 1983; 1995; Aliu 1984; 1994; 1995; 1996; 2004; 2012; Andrea 1985; 1990; 1997; 2010; Bela 1990; Bela and Përzhita 1990; Kurti 1999; Koka 2012), as well as a few shaft cemeteries (Aliu 1994; Andrea 1981; Braka 1987). However, potential sources of data are also present in other contexts, including settlements (e.g., caves or open-air sites) (Prendi 1966; Korkuti 1971; Belli and Starova 1983; Hoxha 1987; Ylli 1988; Andrea 1990; 1996; Prendi et al. 1996; Prendi and Bunguri 2008).

Quantitatively, the work on pottery is well represented in the publication of numerous articles in the *Archaeological Bulletin* (1968-1975), *Studia Albanica*, which largely focused on the so-called "Albanological science"

(1964), and in the journal *Iliria*, which, since 1971, has become the flagship archaeological journal in the country. Studies in *Iliria* were often presented in a standardized format: the presentation is limited to a few pages that focus, in a somewhat uniform fashion, on descriptive commentaries of material findings based on a regional comparative framework. Monographs are a more recent phenomenon (Andrea 1985; Kurti 1999; Aliu 2004, 2012; Koka 2012). Though they are much larger texts, their content follows the standardized model found in *Iliria*.

This general perspective becomes even more evident in the cases when the focus is limited to a particular subject matter. Specifically for material culture, theoretical considerations are not part of the research agenda. The lack of constructive and coherent theoretical underpinnings is apparent. Pottery is essentially considered a key material component that integrates a chain of potentially crucial issues including ethnogenesis, cultural identity, and continuity. Formulations comprising a given hypothesis are uniformly synthesized and thus rather arbitrarily aligned with the predetermined conclusions of the research. The effects of these very limited "pick-and-choose" and "mine" versus "yours" strategies remained widely applied.

There is also a consistent trend of particularization of research agenda; in other words, a discrete focus is given to issues of chronology and even individual qualitative attributes of the archaeological data. The assumption is that the particularistic focus will potentially explain problems previously formulated in the hypothesis, leaving ethnogenesis, cultural identity, and continuity as the main concepts of reasoning. Particularistic treatments are commonly undertaken in a fashion that gives preference to the most salient or most easily observed, attributes. For instance, out of the entire repertoire of the Iron Age pottery, the majority of research and analyses are strictly focused on matt-painted pottery, a derivative of the so-called Devollian Ware. Its fabric is, generally, described as light-fine, highly-fired, and usually mixed with very fine particles of sand and micas. Such identification was initially used by Frano Prendi in his study of the long-term settlement in Maliq in southeastern Albania (Prendi 1966: 255-271).

Prendi showed an exceptional enthusiasm for matt-painted pottery. His discussion is somewhat evasive when he argues that the matt-painted repertoire forms the most distinctive group of the Iron Age pottery in southern Albania (in the Devoll Valley). In the case of Maliq, Prendi offered a somewhat simplistic theory related to the painting technique – the existence of two techniques for decoration painting: one before, and the other after firing. His distinction was based solely on a simple macroscopic test – by scratching a vessel surface by hand and seeing, whether the decoration remained in place. Prendi's determinations focus solely on the firing technique, with little emphasis given to the archaeological sequence. He considers both pre- and post-fired decoration as a qualitative attribute which demonstrates advancement in pottery painting and technology through time. Thus, the post-fired version, its paint being more easily erased, Prendi, somewhat dubiously assigned to an earlier period (Late Bronze Age, which corresponds to layers IIId2 and d3 at Maliq, dating to the 13th–12th century BC). According to him, the pottery with decoration painted before firing is of the Early Iron Age date (11th–8th century BC) and continues through the so-called period of the Developed Iron Age (8th–7th BC) (Prendi 1978: 13).

The same kind of particularistic views are consistently stressed by other scholars in research at several Iron Age sites in southern Albania. So, from entire pottery assemblages, only the Devollian ware and matt-painted pottery continued to comprise a significant part of the pottery assemblage and research agendas (Korkuti 1969; Andrea 1985; Bodinaku 1989; 1990). Such a particularizing agenda has left many obscurities regarding the pottery dating to the Bronze and Iron Ages in southern Illyria and northern Epirus/Albania. Not much attention has been paid to various other features that are abundantly present in the late prehistory such as: coarse ware, dark fine ware, incised decoration, the similarities between the incised and matt-painted motifs, the varieties of the plastic applications and vertical and diagonal ribbing, finger impressions, vessel forms, and so on. It is likely that even in the case of matt-painted decoration, most of the above cited authors have rushed to conclusions without conducting a systematic quantitative and qualitative assessment of the data collected at various sites. Comprehensive accounts of a typology of motifs, regional distribution, and quantitative occurrence, relation to fabric and vessel forms are lacking.

The entire discourse unanimously considered the matt-painted pottery, as a local tradition, deeply rooted in the Devoll Valley. Based on this, it is claimed that a cultural identity 'organically' arose in this region in the Iron Age (pots = peoples), and have gradually spread over neighboring areas in Macedonia and northwest Greece (Prendi 1974: 121). Upon closer inspection, matt-painted pottery was linked together with the related issue of the so-called "migration waves" on the eve of the Iron Age and served as a crucial material for the arguments of the emergence of new comers and their continuity. Decoration especially was understood as an innovative element in the pottery and the main indicator of new movements and/or occupations in the southern Balkans.

Already few decades prior to the excavations at Maliq, Walter Heurtley, working in the settlement of Boubousti in north-central Greece (western Thessaly), had come across a similar ware decorated with matt-painted motifs. This ware was dated to the transitional period from the Late Bronze to Early Iron Age (1300–900 BC), and Heurtley hastened to link this new pattern with Dorian migrations (Heurtley 1927: 91-94, 169-79).

Soon, two different agendas came to the fore: 1) strong belief in migration theory. The principal advocates were German scholars seeking, to confirm the emergence and spread of the Aryan race in the Balkans in the Late Bronze Age (Heurtley 1926; Hochstetter 1982; 1984); and 2) observations that presence of matt-painted pottery in the Middle Helladic period in the areas of Lianokladhi points to gradual, penetration to Thessaly and Boiotia (Wace and Maurice 1912; Buck 1964). Ioulia Vokotopoulou subsequently confirmed this observation by admitting that, in the cemetery of Vitsa Zagoriou (northwestern Greece), the matt-painted motifs did not appear until the Late Bronze Age (Vokotopoulou 1986: 364-66). According to her, this material rooted in the Greek lands that subsequently spread toward Epirus, western Macedonia and Albania. The nationalistic tendency about the leading role of the Greeks in the areas of the southern Balkans was thus promoted, whether intentionally or unintentionally.

The question of origins has only recently been considered in alternative terms. The phenomenon of matt-painted pottery, as Barbara Horejs defines it, rather than being a migration product of people, either from Anatolia, southern Greece or central Europe, is the result of long-term contacts along a south-north direction (Horejs 2007). Though approached through traditional avenues, her views eschew political and nationalistic agendas. Thomas Tartaron seems to offer so far the most plausible account on the presence of matt-painted pottery in western Macedonia and southeastern Albania. Together with Horejs, Tartaron agrees that this category of material was nothing but the result of constant communications among the Late Bronze and Iron Age communities in the wider regional context region. Furthermore, he emphasizes the geographic configuration as a crucial feature, putting special focus on the routes along the river valleys (Tartaron 2004: 85-87).

Though cultural-historians, mentioned above, never called into question the migration theory, the discourse became controversial when the origins and directions of these putative waves of migration and their representations in the material culture (especially matt-painted pottery) were considered.

Nevertheless, the potential offered by the research of pottery with regard to social aspects, its role in everyday life, the modes of production, transmission in time and space, and especially its reflection in the economic development, have not been comprehensively considered. In many ways, the issue of matt-painted pottery has become something of a scholarly trap in which one can get easily lost in the various narratives. To this day it remains an approach that perceives archaeological data as an element of ownership developed within sharply delineated boundaries framed within an “ours” versus “yours” mentality. It is interesting how such scholarly narratives, rather than accomplishing their stated academic mission, revert to traditional concepts, legends and clichés that have been very popular among different ethnic groups living in the Balkans.

While conducting my research in Albania, I have came across a television documentary entitled “*Whose is this Song?*”, the production of a Bulgarian director named Adela Peeva (Peeva 2003). The plot was interesting: a well-known folk song that Peeva assumed to be Bulgarian turned out to be equally popular in several countries around the Balkans, including Greece, Albania, Serbia, and Bosnia and Herzegovina, and even beyond the Balkans, in Turkey. Moreover, in each country, apart from the distinct lyrics, the song had a similar melodic rhythm. Intrigued by this diversity, Peeva undertook a journey in each of the above countries attempting to explore the roots and possibly the identity of the song. I was familiar with the Albanian version of the song and had taken for granted its Albanian origin; after all, the song had always been part of family celebrations in many parts of my country. In Peeva’s exploration, I was expecting the “contest” to favor an Albanian origin. The problem, however, was that others from all over the Balkans had expressed even stronger feelings that the song was ‘theirs’. In her journey through Turkey, Crete, Albania, Serbia, Bosnia, and finally in her native Bulgaria, Peeva came across various versions of the song but also encountered a uniquely similar reaction among different ethnic groups when she asked the question: Whose is this song? To a person, every musician, singer, music expert, composer and local people emphatically claimed the song as belonging to either their country or culture. In the case of two countries—Turkey and Albania—mu-

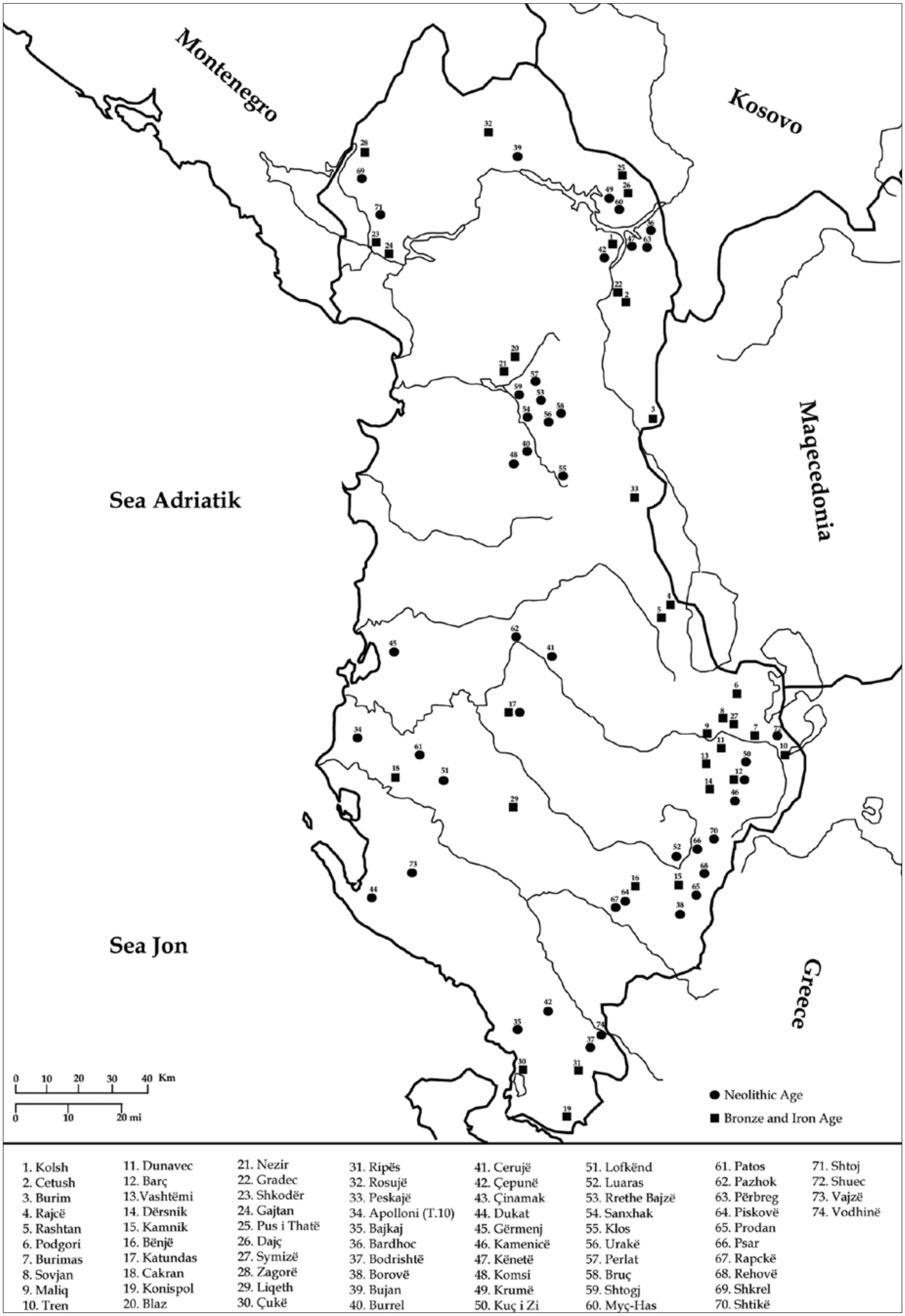

FIGURE 1.
Map showing prehistoric sites

Site	Surface area m²	Quantitative Data				Research method (excavations)	Publication status
		Pottery	Tools	Rituals	Others		
Bënjë	102 m²					-I-	Not published
Blaz	13 m²					-I-	-I-
Burim	17 m²					-I-	-I-
Burimas	225 m²					-I-	-I-
Dërsnik	325 m²					-I-	-I-
Gradec	300 m²					-I-	-I-
Cakran	428 m²		75	51	2	-I-	Brief reports
Cetush	350 m²	Classification based on fabric	--	--	--	-I-	-I-
Dunavec	300 m²	--	184	70	--	-I-	-I-
Barç	64 m²	1430	9	4		-I-	-I-
Kamnik	150 m²	22	64	10	10	-I-	-I-
Katundas	40 m²	--	--	--		-I-	-I-
Kolsh	275 m²		97	21	4	-I-	-I-
Konispol	19.36 m²	--	--	--	--	-I-	-I-
Podgorie	100 m²	--	--	--	--	-I-	-I-
Rajcë	265 m²	Classification based on fabric	30	6	--	-I-	-I-
Rashtan	18 m²	--	30			-I-	-I-
Topojan	428 m²	14.997	86	14	1	-I-	-I-
Vashtëmi Phase II	225 m² 64 m²	---	39			-I-	-I-
Total	3.708.36						

TABLE 1. Explorations in Neolithic sites.

sic specialists offered even more elaborative accounts of the authenticity, indeed ethnicity of the song as, in each respective case, Turkish or Albanian. Elsewhere, Peeva even witnessed fighting among the Roma (Gypsy) communities of southern Serbia who claimed the song even more emphatically as theirs. In the end, she returned to Bulgaria empty-handed, unable to give the song an agreed-upon identity. What she uncovered, however, was more important: an "ours" vs. "yours" mentality throughout the different Balkan nations. The documentary serves as a striking example of the lack of cohesiveness and a dualist attitude toward the "other", in spite of the fact that these communities have constantly interacted with one another and, above all, experienced many centuries of living under the same rulers, whether the Romans, Byzantines or Ottomans.

A similar attitude is noted in cases of archaeological data that was rarely considered as a record of the past and one not necessarily associated with the present. Moreover, as with the song, the first reaction towards the archaeological record was precisely a similar claim of 'ownership', one squarely located in the sharply defined ethnic and religious vicissitudes of the Balkans.

Research strategy in data collection and site exploration

Systematic explorations of prehistoric sites begun relatively late. Frano Prendi and Adem Bunguri when speaking about the historic development of Albanian archaeology distinguish three main phases: (1) archaeology between the two World Wars (1918-1939), (2) archaeology during the Communist regime (1948-1990) and (3) archaeology in post-Communism (1991 and onward) (Prendi and Bunguri 2014: 16). So far, it was during the second period when the largest quantity of data has been collected. And it was during this phase when the discipline of archaeology was shaped also in institutional and organizational terms. Systematic excavations were the main way of data collection. Other kinds of explorations, including test pits or regional surveys, entered the research agenda only after 1991. By taking into account the very fact that excavation in itself represents a destructive technique which leaves not many possibilities for further investigations in the field, I analyze, below in the text, to what extent the size of excavated areas of prehistoric sites in Albania highlighted the understanding of past, and what is the potential for further examinations of data already collected, archived and stored. First, I deal with the excavations of the Neolithic sites, then with settlements and cemeteries dated to the Bronze and Iron Ages, and finally, I am focusing on the implications of the surface surveys in the research strategies in Albania (Figure 1).

Neolithic sites

The Neolithic Age caught the attention of Albanian scholars at an early stage. Excavations took place on at least in 19 settlements: Podgorie, Barç (Lera 1983; 1987), Bënjë, Blaz, Burim, Burimas, Dërsnik, Gradec (Korkuti and Prendi 1992; Korkuti 1995; Prendi and Bunguri 2014), Cakran (Korkuti and Andrea 1974), Cetush (Korkuti and Bunguri 1996), Dunavec (Korkuti 1974), Kamnik (Prendi and Aliu 1971), Kolsh, Katundas, (Korkuti 1983a; 1995), Konispol (Korkuti et. al. 1996), Rashtan, Rajcë, (Gjipali 1995; 1997), Topojan (Bunguri 1993), Vashtëmi (Korkuti 1983b). From the data so far collected in publication reports, the area explored is roughly *3,708* m² (Table 1). At least 13 out of 19 settlements have an explored area greater than 100 m² or 3473 m² combined. In spite of systematic excavations, not much attention was given to the examination and assessment of the site extension. Excavations are broadly led by the very intuitive decisions of the archaeologists without employing a concrete strategy on site and data sampling. In many cases, they were directed using rather intuitive methods and can be considered as 'informal sampling' according to the C. Ortons classification of sampling strategies (Orton 2000: 2-4).

As Table 1 shows, six settlements lack publications what presents significant impediment for further analysis. In the published reports of other sites, qualitative descriptions on material culture and stratigraphic sequence serve as a key reference for analysis and interpretations. Moreover, special attention is given to artefacts in on the good state of preservation and at least from the publications, the presentation and analysis of the quantitative profile of the data is poorly treated. Catalogues on material culture often offer narrative terms and lack comprehensive accounts on individual artefacts at least on macroscopic attributes. Most commonly, the interpretations focused on regional and cross-regional comparisons and offered some narratives on preferable cultural connections. However, this is generally treated and leaves no gap at all for any understanding to what extent and intensity these contacts developed.

Some interesting dynamic is noted in those few excavations that have been carried out after 1990, joint Albanian-American excavations in the cave of Konispol in the early 1990s (Korkuti et. al. 1996), and, a few years later, of the open settlement of Vashtëmi (Allen and Gjipali 2013). The site areas explored were 19.36 m² and 64 m², respectively. No complete publications are yet available and in the preliminary reports, not much is said about the sampling strategy (e.g. sampling trenches, limits of the sites). Though the excavated areas are distinctively smaller than any site explored prior the 1990, the research protocol addressed some new questions, including the observation of transition from the Mesolithic to Neolithic by looking at plant remains, climatic data or by radiocarbon absolute dating (AMS C14) (Korkuti et. al. 1996: 220; Hansen 1999; Russell 2000; Ellwood et. al. 2000). In addition to this, the explorations of the Vashtëmi settlement was part of a more comprehensive project aimed at a re-evaluation of other Neolithic sites in the region including those of Podgorie, Progër, Pogradec and Rajcë. Allen and Gjipali reported to have collected samples in each settlement in order to establish subsequent steps of the research program (Allen and Gjipali 2013: 107-109). So far, the analysis of the environmental data have yielded interesting results regarding the economic profile of the Vashtëmi community, together with the earliest absolute radiocarbon C14 AMS date of an Early Neolithic settlement in Albania (cal. 6.400 BC) (Allen and Gjipali 2013: 109-117).

Settlements of the Bronze and Iron Age

The Bronze and Iron Ages represent some salient characteristics, especially regarding the settlement patterns. In the stratigraphic sequence, the Late Bronze and Early Iron Age artefacts are often found in similar layers and as a consequence not easy to distinguish from one another. Several Bronze Age settlements have also yielded earlier evidence from Late Neolithic and Copper Ages: Maliq (Prendi 1966), Tren (Korkuti 1971), Sovjan (Prendi et.al. 1996), and Nezir (Andrea 1989; 1990). However there are 14 settlements situated in the Late Bronze and Early Iron Age transition: Dajç (Bela 1987), Gajtan (Rebani 1966), Liqeth (Ylli 1988), Maliq (Prendi 1966; Andrea 2006; Prendi and Bunguri 2008; 2014), Nezir (Andrea 1989; 1990), Peskajë (Bunguri 1994), Pus i Thatë (Bela 1992), Rosujë (Ceka and Jubani 1971), Ripës (Budina 1971a), Symizë (Lera 1992), Sovjan (Prendi et al. 1996; Lera et al. 2008a; 2008b) Shkodër (Hoxha 1987), Tren (Korkuti 1971) and Zagorë (Andrea 1996). In total, the excavated areas measure *4.336 m²* (Table 2). Only in two cases, Pus i Thatë and Shkodër the excavated areas are smaller than 100 m².

More extensive excavations were conducted at Maliq and Tren, 1000 m² and 780 m², respectively. Maliq however, represents the quite typical case in Albanian archaeology. The 1000 m² were uncovered during 11 field campaigns (1961-1966; 1973-1974 and 1988-1990) (Prendi and Bunguri 2014: 18-19). Since the results were not published it makes it difficult not only to understand the reasoning behind such extensive research strategy but also to get a grasp of a sequence of this multilayer settlement. Even more, because the conventional chronology of the Bronze and Iron Ages strongly relies on data collected at Maliq (Prendi 1974: 1978). Some recent studies, again, focus only on conclusive remarks regarding the type of settlement and the characteristics of material culture (Prendi and Bunguri 2008; 2014). However, brief analyses of the organic evidence offer some insights on the transformation of the environment during the Early Iron Age and the potential causes for the abandonment of site (Fuache et. al. 2001). Unfortunately, in spite of more than 1000 m² large excavations at Maliq, crucial questions remained unanswered. The cave settlement of Tren is the case of another extensive excavations that offers very little. The preliminary excavation report published in 1971 is the main reference for 700 m² of the explored area (Korkuti 1971). Recent field campaign (2015) revealed a striking fact about Tren, that in Room 1, inside the cave, there are no intact contexts at all. From the most recent field season, it became obvious that Korkuti completely emptied this area during his first campaign (Agolli 2017).

On the other hand, Sovjan could become the case of the successful excavation-publication process in the near future. However, until now, only some interesting insights derived from pottery analysis regarding the transition from the Bronze to the Iron Age, and new data on absolute chronology (Gori and Krapf 2015; Lera et.al. 2008a; 2008b). Other sites like Dajç, Liqeth, Peskajë, Pusi i Thatë, Rosujë, Ripës and Symizë are just partly explored and only very descriptive and general remarks are published in reports, making any further assessment based on the published evidence a highly complicated enterprise.

Cemeteries of Bronze and Iron Age

The sites which provided principal evidences for social and cultural aspects of the late prehistoric communities are the burial mounds. It needs to be stressed, that most of our understanding of the late prehistory is largely based on finds and data collected from the tumuli which in majority date from the Late Bronze and Early Iron Ages. So far, 156 tumuli have been excavated in total (Bejko 2014: 518). Publications, however, offer evidence only for 129 tumuli and three shaft cemeteries. The total area of the excavated tumuli is approximately 30,300 m² (Table 3)[1]. In many cases, these were rescue excavations that would commence after some notification of the local people. Rescue campaign were conducted exploring only the area subject of damage. There are however cases when experienced archaeologists expanded their research beyond simple rescue interventions. For instance, Skënder Aliu in Kolonjë region reports three rescue interventions on heavily damaged tumuli of Shtikë, Psar and Prodan, as well as systematic research of tumuli of Luaras and Rehovë, and shaft cemetery of Borovë. Bep Jubani in his rescue excavations of the tumuli in Kukës region, which are only partly published, still offers some invaluable insights. Due to the

1 Tumulus 10 in the necropolis of Apollonia (Amore 2010), Bajkaj (Budina 1971b), Tumuli 1 and 2 in Barç (Andrea 1985), two tumuli in Bardhoc (Hoti 1982), Bodrishtë (Prendi 1959), six tumuli in Bujan (Andrea 1995), seven tumuli in Burrel (Kurti 1978; 1983; 1987; 1999), Cerujë (Andrea 1997), Çepunë (Budina 1969), four tumuli Çinamak (Jubani 1969b), two tumuli in Dukat (Ceka 1974; Bodinaku 2002), Kamenicë (Bejko forthcoming), six tumuli in Kënetë (Hoti 1982; 1986; Jubani 1983), Komsi (Kurti 1999), eight tumuli in Krumë (Jubani 1982), tumuli 1 and 2 of Kuç i Zi (Andrea 1985), Lofkënd (Papadopoulos et. al. 2007; 2014), Luaras (Aliu 2004), the tumuli in Mat region (Islami 2013), nine tumuli in Myç-Has (Bela 1990), Patos (Korkuti 1981), four tumuli in Pazhok (Bodinaku 1982), Përbreg (Përzhita and Belaj 1987), Piskovë (Bodinaku 1981), Prodan, Psar (Aliu 1984; 1995), Rapckë (Bodinaku 1981), Rehovë (Aliu 2012), ten tumuli in Shkrel (Jubani 1995), Shtikë (Aliu 1996), 11 tumuli in Shtoj (Koka 2012), Shuec (Andrea 2010), four in Vajzë (Prendi 1957), Vodhinë (Prendi 1956). The shaft cemeteries include: Borovë (Aliu 1994), Gërmenj (Andrea 1981), Katundas (Braka 1987).

Site	Surface area m²	Quantitative data			Research method (excavation)	Publication status
		Pottery	Tools	Others		
Dajç	270 m²	?			Systematic	Article Report
Gajtan	--	23			-I-	-I-
Liqeth	107 m²	13			-I-	-I-
Maliq	1000 m²	149?			-I-	-I-
Nezir	80 m²	38	13	2	-I-	-I-
Peskajë	114 m²				-I-	-I-
Pus i Thatë	84 m²				-I-	-I-
Rosujë	675 m²				-I-	-I-
Ripës	300 m²				-I-	-I-
Symizë	370 m²	25			-I-	-I-
Sovjan	350 m²				-I-	-I-
Shkodër	80 m²	650			-I-	-I-
Tren	700 m²	43			-I-	-I-
Zagorë	206 m²	26	9		-I-	-I-
Total	4.336 m²					

TABLE 2. Explorations in Bronze and Iron Age settlements.

construction of the Fierza power plant the research, today would not be possible. Zhaneta Andrea was able to research tumuli of Barç and Kuç i Zi and publish a considerable amount of evidence which would otherwise perish. The only case where the excavation of a tumulus was followed by a systematic assessment of the surrounding area is that of Lofkënd.

Publications published prior to the 1990's in the journal Illyria or as monographs were almost exclusively focused on material culture. However, in contrast with settlements, quantitative data about material culture, tombs and burial rites is better presented and accompanied with descriptions and spatial distribution of individual tombs. Lorenc Bejko sees this as a great desire of the Albanian archaeologists to reconstruct, through tumuli, important aspects of the socio-cultural image of the late prehistoric communities. Bejko also stressed that several issues which burial data could effectively address, including demography, gender, pathology or diet, have not gained any attention in these relatively massive explorations. Some other aspects, e.g. geographic setting of burials, their density or any kind of study of relationships between tumuli and people in the surrounding environment are not mentioned at all (Bejko 2014: 517-525).

With the explorations of the last two decades of the tumuli of Kamenicë, Tumululs 10 at the necropolis in Apollonia new winds started to blow. For the first time, each tumulus was explored having a comprehensive formal strategy of data collection and a standardized format of documentation. In Kamenicë, after assessing the burial size, one area was left unexcavated for later assessments and possibly the application of more advanced methodologies (Bejko forthcoming). The tumulus 10 of Apollonia and that of Lofkënd which have been published raised emerging issues on bio-archaeology, including the health profile of the buried individuals, gender and age, diet, DNA analysis, human impact on the environment, as well as the analysis of the faunal and floral evidence (Bejko et. al. 2006; Damiata et. al. 2008; Amore 2010; Schepartz 2010; Papadopoulos et. al. 2014; Martson 2014; Schepartz 2014).

The surface surveys

In Albania, the surface survey was extensively applied after 1991. Several regions, including Butrint, Mallakastër (Korkuti et. al. 1998; Davis and Korkuti 2004), Shala valley (Galaty et.al. 2013), Korça basin (Bejko forthcoming) and Lofkënd (Aprile 2014), have been subject of systematic surveys. This emerging methodology opened several new queries regarding the settlement patterns, the density of human presence in time and space, consideration of environment and so on. However, here again, the poor state of publications remains

<table>
<tr><th colspan="2" rowspan="2">Tumuli</th><th rowspan="2">Surface area</th><th rowspan="2">Tombs</th><th colspan="2">Finds</th><th rowspan="2">Research strategy</th><th rowspan="2">Publication</th></tr>
<tr><th>Pottery</th><th>Others</th></tr>
<tr><td colspan="2">Apolloni (T. 10)</td><td>636 m^2</td><td>77</td><td>11</td><td>14</td><td>Systematic</td><td>Monography</td></tr>
<tr><td colspan="2">Bajkaj</td><td>314 m^2</td><td>45</td><td>12</td><td>3</td><td>Partial</td><td>Paper/Report</td></tr>
<tr><td colspan="2">Barç 1</td><td>1383 m^2</td><td>181</td><td>86</td><td>112</td><td>Systematic</td><td>Monography</td></tr>
<tr><td colspan="2">Barç 2</td><td>694 m^2</td><td>22</td><td>13</td><td>24</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Bardhoc (#2)</td><td>312.16 m^2</td><td>34</td><td>7</td><td>47</td><td>-I-</td><td>Paper/Report</td></tr>
<tr><td colspan="2">Bodrishtë</td><td>153.86 m^2</td><td>6</td><td>1</td><td>--</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Borovë</td><td>250 m^2</td><td>49</td><td>40</td><td>282</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Bujan (#6)</td><td>0.282 m^2</td><td></td><td>9</td><td>4</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Burrel (#7)</td><td>902.6 m^2</td><td>154</td><td>54</td><td>184</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Cerujë</td><td>226.8 m^2</td><td>6</td><td>3</td><td></td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Çepunë</td><td>380 m^2</td><td>63</td><td>4</td><td></td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Çinamak (#4)</td><td>175.84m^2</td><td>64</td><td>15</td><td>14</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Dukat (#2)</td><td>314 m^2</td><td>75</td><td>22</td><td>57</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Gërmenj</td><td>?</td><td>37</td><td>13</td><td>9</td><td>Partial</td><td>-I-</td></tr>
<tr><td colspan="2">Kamenicë</td><td>1295.2 m^2</td><td>405</td><td>2362</td><td>801</td><td>Systematic</td><td>Not published</td></tr>
<tr><td colspan="2">Katundas</td><td>115 m^2</td><td>12</td><td>7</td><td>9</td><td>-I-</td><td>Paper/Report</td></tr>
<tr><td colspan="2">Kënetë (#6)</td><td>1514.9 m^2</td><td>82</td><td>36</td><td>92</td><td>Rescue</td><td>-I-</td></tr>
<tr><td colspan="2">Komsi</td><td>314 m^2</td><td>7</td><td>5</td><td>--</td><td>Partial</td><td>-I-</td></tr>
<tr><td colspan="2">Krumë (#8)</td><td>1086.2 m^2</td><td>30</td><td>15</td><td>25</td><td>Rescue</td><td>-I-</td></tr>
<tr><td colspan="2">Kuç i Zi 1</td><td>754.3 m^2</td><td>126</td><td>28</td><td>176</td><td>-I-</td><td>Monography</td></tr>
<tr><td colspan="2">Kuç i Zi 2</td><td>176.6 m^2</td><td>18</td><td>16</td><td>69</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Lofkënd</td><td>251.2 m^2</td><td>100</td><td>20</td><td>92??</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Luaras</td><td>706.5 m^2</td><td>203</td><td>112</td><td>181</td><td>-I-</td><td>-I-</td></tr>
<tr><td rowspan="7">Mat</td><td>Rrethe B #13</td><td>3527 m^2</td><td>212</td><td>50</td><td>-I-</td><td>-I-</td><td>-I-</td></tr>
<tr><td>Sanxhak #5</td><td>1372 m^2</td><td>38</td><td>12</td><td>-I-</td><td>-I-</td><td>-I-</td></tr>
<tr><td>Klos #1</td><td>254.3 m^2</td><td>22</td><td>8</td><td>-I-</td><td>-I-</td><td>-I-</td></tr>
<tr><td>Urakë #2</td><td>929 m^2</td><td>18</td><td>8</td><td>-I-</td><td>-I-</td><td>-I-</td></tr>
<tr><td>Perlat #8</td><td>631 m^2</td><td>31</td><td>31</td><td>-I-</td><td>-I-</td><td>-I-</td></tr>
<tr><td>Bruç #2</td><td>694 m^2</td><td>9</td><td>--</td><td>-I-</td><td>-I-</td><td>-I-</td></tr>
<tr><td>Shtogj #2</td><td>628 m^2</td><td>42</td><td>58</td><td>-I-</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Myç-Has (#9)</td><td>60.28 m2</td><td>37</td><td>49</td><td>126</td><td>-I-</td><td>Paper/Report</td></tr>
<tr><td colspan="2">Patos</td><td>153.8 m^2</td><td>62</td><td>25</td><td>61</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Pazhok (#4)</td><td>967.1 m^2</td><td>52</td><td>15</td><td>59</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Përbreg</td><td>--</td><td>--</td><td>4</td><td>--</td><td>Partial</td><td>-I-</td></tr>
<tr><td colspan="2">Piskovë</td><td>706.5 m^2</td><td>116</td><td>15</td><td>--</td><td>Systematic</td><td>Not published</td></tr>
<tr><td colspan="2">Prodan</td><td>?</td><td>74</td><td>37</td><td>40</td><td>Rescue</td><td>Paper/report</td></tr>
<tr><td colspan="2">Psar</td><td>314 m^2</td><td>11</td><td>17</td><td>45</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Rapckë</td><td>--</td><td>--</td><td>5</td><td>--</td><td>Systematic</td><td>-I-</td></tr>
<tr><td colspan="2">Rehovë</td><td>1766.25 m^2</td><td>119</td><td>156</td><td>324</td><td>-I-</td><td>Monography</td></tr>
<tr><td colspan="2">Shkrel #10</td><td>1965 m^2</td><td>10?</td><td>5</td><td></td><td>-I-</td><td>Paper/report</td></tr>
<tr><td colspan="2">Shtikë</td><td>23.55 m^2</td><td>12</td><td>13</td><td>26</td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Shtoj #11</td><td>2175 m^2</td><td>66</td><td>61</td><td></td><td>-I-</td><td>Monography</td></tr>
<tr><td colspan="2">Shuec</td><td>827.39 m^2</td><td>68</td><td>23</td><td>71</td><td>Partial</td><td>Paper/report</td></tr>
<tr><td colspan="2">Vajzë #4</td><td>1360 m^2</td><td>57</td><td>7</td><td>49</td><td>Systematic</td><td>-I-</td></tr>
<tr><td colspan="2">Vodhinë</td><td>226.8 m^2</td><td>18</td><td>10</td><td></td><td>-I-</td><td>-I-</td></tr>
<tr><td colspan="2">Total</td><td>30310.612 m^2</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

TABLE 3. Explorations in Bronze and Iron Age Cemeteries.

an obstacle for a better understanding of the results of the above endeavors, as well as further analysis. To this day, the Lofkënd tumulus and Shala valley are the only research projects published systematically. The Shala valley project importantly contributed to issues in synchronic and diachronic perspective, by analyzing the settlement density, spatial distribution of finds, environmental context and the ethno-history of the region (Galaty et. al. 2013). On the other hand, the systematic survey of the surroundings of the tumulus of Lofkënd even though did not produce solid data for a potential inhabited area of settlement contemporary to the tumulus, it yielded interesting insights regarding the diachronic development of the region around the tumulus (Aprile 2014).

In addition, in terms of research strategy and methodology, there is a need to point out to some problems that could condition further any kind of research and analysis. *First and foremost*, the research strategy is not oriented towards addressing or answering proper questions. Most generally, any author who carries out excavations vaguely justifies them either as rescue interventions (most frequently in the cases of burial mounds) or as efforts to enlarge the knowledge of a given period. Recent research projects (including those of Lofkënd, Tumulus 10 of Apollonia necropolis, Shala valley) that rely heavily in an inter-disciplinary agenda do make an exception. These projects have shifted the focus towards a coherent strategy that addresses proper queries at the inception of research. *Second*, though large excavations are very frequent, not much attention is given to finding their full spatial extension. In most cases, archaeologists are more willing to enlarge the excavation area, and claiming and enjoying the authorship rights, rather than analyzing thoroughly that amount of data that is already collected. It is sad to say that discussion in Albanian archaeology is dealing more with issues of 'ownership' of data, rather than vivid discussions imposed from the queries that the exploration of this amount of data and space would have yielded. *Third,* publications remain at a very poor state. For example, six important Neolithic settlements are still not published and for others only brief reports are available. Muzafer Korkuti did publish a conclusive summary on the Neolithic sites in German including some previously unpublished evidence (Korkuti 1995), but this is far from enough. Even in cases of new research campaigns taking place after 1990, lack of publishing became a serious impediment for further research. Projects like those of Konispol cave, Sovjan, Vashtëmi, Kallamas, and that of Kamenicë tumulus, which all applied several new methods and innovative research protocols, are still presented very partially and incomplete. *Fourth,* the documentation and preservation of artefacts is still a crucial issue. The excavation protocol is very simplified and at most times not even standardized. This makes the assessment of data highly complicated. Typical record are still personal logs or diaries which usually contain remarks and comments on the execution of work, and results. Photographs and drawings are done more professionally, however efforts to associate altogether artefacts with their belonging stratigraphic sequence, photographs and drawings is a very complicated enterprise. To put it more ironically, in many cases it would be easier to repeat the excavation and collect new data, rather than attempt analysis of finds and data from older excavations. *Fifth*, from the recent research of tumuli, some positive outcomes could be seen, both in documentation and publication. In a number of new publications, data is correctly and accurately presented, enabling so the possibilities for further assessments, fruitful discussion on new research venues on cultural contacts and networks, socio-economic organization, cultural differences etc. (Bejko 1993; 1994; 2000; Kurti 2006; Aliu and Bejko 2009; Agolli 2009; 2014; Pevnick and Agolli 2014).

Culture Heritage Law and valorization of prehistoric heritage in Albania

Needless to say, beyond strict academic objectives, archaeological research also provides a crucial corpus of evidence for care and protection. For prehistory, lacking written records and accounts on persons, places and events, the evidences testify more about long-term dynamics, and crucial cultural processes and their material consequences of human groups in the past. In this section, I discuss the ramifications of the Culture Heritage Law and focus on how prehistoric sites and material culture are managed and presented in the context of the law.

A new law on Culture Heritage was adopted in 2003 and amended in 2006, 2008, and 2009. Currently, the Ministry of Culture has just passed through Parliament a new law which will supposedly remedy the issues previous law had not covered properly (http://www.kultura.gov.al/files/userfiles/LIGJ_9048_Per_Trashegimine_Kulturore_i_ndryshuar.pdf) (2018).

In the case of academic (i.e. research-oriented) archaeological field research, regarding the permits, the law does not address properly two main issues, it does not require explicit spatial limiting of the individual field project (e.g. excavation), and it does not give any importance to the assessment of the archaeological potential in the area object of research. The National Council of Archaeology, under the authority of the Ministry of Culture that issues permits, requires more detail description of the proposed projects only in cases of potential property issues, or when the site integrity may be endangered. In all other cases, limitations and penalties are provisioned only in the cases of violation of permission requirements.[2] The law has also transferred the rights of the storage of finds and documentation to the Agency of Archaeology Service (Agjensia e Shërbimit Arkeologjik); a National entity under the authority of the Ministry of Culture.

Conservation and preservation of archaeological sites after completion of fieldwork have been addressed since the beginning of the 21st century (Stanley-Price 2003: 269-83). Taking into account the Venice charter (Article 15), Stanley-Price argues that the duty of the site conservation and preservation is to be attached to the permit of every archaeologist that approaches a site for research objectives (2003: 269).

Turning to the case of Albania, some matters must be discussed in this respect. During the Communist government, the preservation of sites or any architectural feature was not included in the research agenda. The images of palaffites found in a lake at Maliq became the representative case of the prehistory of Albania, widely published and displayed in museums, and yet, the preservation of this site was never brought to the discussion. In fact, after completing the individual excavation campaigns, the remains were, in the best case scenario, backfilled.

Attention to site preservation and promotion modestly increased after 1990. Lorenc Bejko, director of the excavations of Kamenicë tumulus, after completing his excavations agreed on the expropriation of land, kept intact the architectural structures of tombs, and successfully lobbied for changing the status of tumulus into a monument of culture of the first category. The tumulus was inaugurated in 2007 as an open air museum presenting replicas of artefacts. The museum also presented a general overview on the research of tumuli in Albania. This enterprise has proven highly positive in both domains, promotion and preservation. A different situation was with the tumulus of Lofkënd. Given the lack of any architectural features, after completing the excavations the tumulus was reconstructed to its original shape and dimensions. This also proved to be an effective strategy which to this day preserved at best the integrity of the monument (Papadopoulos et. al. 2014: 561-568).

On the other hand, several excavation campaigns in Sovjan revealed some architectural remains, but they were only backfilled without any further management strategy (http://www.sovjan-archeologie.net/sovjan/presentation/synthese.html).

Some serious problems are noticed also when speaking of preservation and management of artefacts. Two institutions in Albania, the National and Archaeological museums (both in Tirana) have served as the main centers for displaying the most aesthetically attractive artifacts. Among Albanian prehistorians, it was common to hear expressions of pride that artefacts which they had discovered, were displayed in these two most visited venues. However, there are two problems which must be considered here. *First of all*, the displays solely rely on the aesthetic features of objects while context and chronology were only briefly presented. Also, the recent discoveries and interpretations have not made it yet to any museum displays (Agolli 2016: 53-60). *Second*, the very fact that most of the explorations has not yet been published created a serious impediment to any kind of promotion of artifacts. Not to mention the poor conditions of storages, especially outside Tirana.

The preservation and conservation of archaeological sites is far from being resolved. The adoption of the Culture Heritage Law triggered significant improvements in monitoring and the quality assurance in archaeological projects, but, it seems that conservation, preservation and site valorization rather remained a matter of choice of the archaeologist, and not formalized as responsibility stated in the permit. The issues with the preservation and display of artifact are also highly problematic. Collections in the museums are displayed in an in an old fashioned way, while the conditions of storage remain very questionable.

2 Personal communication with Dr. Elio Hobdari, member of the National Council of Archaeology.

Conclusions

Back in 1964, Lewis Binford addressed some crucial matters regarding the archaeological research design (1964: 425-441) arguing that we are wondering what are we digging for, we all agree that we do that in order to recover facts for the elucidation of the past. In doing this, we are to be highly careful about collecting the totality of data as our main access to past behavior (1964: 426-430). To what extent these ideas are followed in Albanian archaeology? The conceptualization and reasoning behind research agendas have been heavily influenced by political instrumentalisation and nationalistic perceptions of the past. Not only in Albania, in the Balkans, in general, it was frequently about connecting the dots of past and present, and ignoring a simple fact that prehistory as a time-space phenomenon, and context, did not convey the political borders and cultural divisions we have inherited today. In the last two decades, several joint research projects have much improved the reasoning driving the research, and freed it of a great deal of political or nationalistic agenda. However, we cannot expect that such approaches will come from joint projects only.

Always when achievements in Albanian prehistoric archaeology are mentioned, the quantity of researched sites and data collected are referred to as a matter of success. However, the high disproportion between the total area explored and the knowledge obtained has not been quite discussed, and not even the fact that excavation in itself is a destructive technique which prevents any chance of repetition. For many decades the Albanian archaeology was developed through extensive excavations, lack of proper research agendas and publications and preservation strategies. The joint international projects, taking place after 1990, had considerable impact, especially in terms of new research questions and methods of data collection and artefact assessment. The cases of Konispol, Sovjan, Kamenicë, Vashtëmi, and Lofkënd illustrate this at best. The surface surveys have been quite effective in widening the focus of research on the regional scale and in obtaining interesting results in a diachronic perspective. The regional projects in Mallakastër, Shala valley, Sovjan, Lofkënd, Butrint, Korçë represent seminal and positive efforts in the application of a non-destructive methodology and digital recording. Unfortunately, comprehensive publications are today only available for Lofkënd and Shala valley. However, from these two cases alone, one can easily imagine the amount of knowledge which can be obtained if every kind of data is collected and analyzed cautiously.

The Culture Heritage Law in Albania is definitely a step forward regarding many previous issues associated with research permissions and treatment of the archaeological heritage. However, the relevant public institutions and the National Council of Archaeology still do not address sampling strategy as a crucial matter in research projects. Also, no formal requirements are anticipated for publication or artefacts preservation. Though the preservation and promotion strategies in the cases of tumuli of Lofkënd and Kamenicë have resulted very positive, they were successful because of the personal engagement and choices of researchers and not because of the systemic norms.

Almost eight decades of prehistoric research in Albania have yielded interesting results. The knowledge of distant past has gradually increased, but this has occurred at a considerably high cost especially if is considered the disproportion between the expansive site explorations and the knowledge and research queries they have produced. Future efforts in the field of prehistory must put a strong emphasis on such matters and indeed give to the discipline a formal scientific and legal setting.

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Identifying a Relict Cultural Landscape. The Lower Danube Limes in Bulgaria

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The Danube Limes is a relict cultural landscape, part of the Frontiers of the Roman Empire. It consists of three main material elements: defensive structures, infrastructure and landscape. What binds together these elements and turn them into a cultural landscape are the relationships between them. The principal challenge when studying such kind of cultural landscapes is their identification within the contemporary landscape as many of their elements are invisible or destroyed, the original character of the surroundings is altered and, as a result, many of the original relationships are hard to detect.

To face this challenge this paper proposes a methodology for analysis of the territory, designed to guide the process of identification of the cultural landscape Lower Danube Limes in Bulgaria in view of its protection as a cultural heritage site. Each fortified location is evaluated according to a set of criteria regarding the present state of the site and its surroundings in comparison with their past state, in view of their authenticity and integrity. The methodology facilitates the detection of: preserved valuable elements of both archaeological sites and landscape; relationships that each site has with other locations or with the landscape; risk factors affecting the property.

The result of the analysis may serve as a basis for the designation of protected areas and other measures for the protection of the cultural landscape.

The Lower Danube Limes in Bulgaria as a part of the Frontiers of the Roman Empire

The Lower Danube Limes in Bulgaria is part of the Frontiers of the Roman Empire and more precisely of the frontier which goes along the Danube from its spring to its delta on the Black Sea. This is one of the most long-lasting defensive lines that stably retain its function and geographical position through the ages – from the beginning of the 1st c. – as part of the Roman Empire, up to the 7th c. – already as part of the Eastern Roman Empire – Byzantium. The Bulgarian section of the Danube has a length of about 471 km and there are around 80 known fortified sites belonging to the Lower Danube limes situated around it.

The frontiers of the Roman Empire are one of the main instruments for the security of the empire, designed not only to demarcate but also to protect its territory. They secure the empire from invasions, protect the territory and population from attacks and raidings by small groups, provide control of the flow of people and access to imperial territory (Breeze 2011: 194-212). This is accomplished through the symbiosis between humans – represented by the Roman army, and the environment in which the army operates – including built facilities (artificial barriers, forts and minor military posts, roads) and natural resources.

Nowadays the former frontiers of the Roman Empire lie on the territory of a number of countries in Europe, North Africa and the Middle East[1]. However, their common past as part of one integral system led to the idea of the formation of a single trans-border cultural heritage site of world significance (UNESCO FRE 2008: 153; Fejérdy and Jilek 2011: 20). The first section, which has been inscribed individually on the World Heritage List, is the Hadrian's Wall in 1987. In 2005 as World Heritage was declared also the Upper Raetian Limes in Germany and in 2008 – the Antonine's wall; they are now united as one transnational serial property "Frontiers of the Roman Empire" (FRE) (Fig. 1).

The final objective is the association of all the remaining parts of the FRE in Europe and elsewhere.In Europe, the remaining sections of the frontiers are these in the present-day Netherlands and Upper Germany, the whole Danube limes, which concerns Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Bulgaria and Romania and the Dacian frontier in Romania. Up to now, most of the above-mentioned states (except for Romania) have included their sections in their respective national tentative lists for cultural heritage. (UNESCO FRE TL 2016; UNESCO FRE WHS Slovakia).[2]

According to the present day definition[3] of the FRE WHS, the Frontiers of the Roman Empire as cultural heritage site are defined as **relict cultural landscape**: "The remains include the lines of the linear frontier, natural elements such as the sea, rivers and deserts, and networks of military features such as roads on, behind and beyond the frontier. These encompass both visible and buried archaeology. Together the inscribed remains and those to be nominated in the future form an extensive relict cultural landscape which displays the unifying character of the Roman Empire, through its common culture, but also its distinctive responses to local geography and political and economic conditions. Each component part is a substantial reflection of the way resources were deployed in a particular part of the Empire." (SOUV 2012; similar in FRE SNS 2004: 1-2; UNESCO FRE 2008: 449).

1 UK, The Netherlands, Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Bulgaria, Romania, Turkey, Syria, Jordan, Israel, Iraq, Egypt, Libya, Tunisia, Algeria, and Morocco (SOUV 2012: 1)

2 In the meanwhile, after the submission of this paper, Romania also added their sites to their tentative list in 2018.

3 Included within the Statement Of Outstanding Universal Value For The Frontiers Of The Roman Empire And Its Component Parts and within the summary nomination statement of the FRE.

The Lower Danube Limes as a cultural landscape. Problems

The Danube Limes as every Roman frontier is a system composed of three main material elements: landscape, different types of fortifications and defensive structures, and infrastructure (Fig. 2).

- The landscape – the natural surroundings are the original primary context in which all the man-made structures are integrated. The demarcation line of the frontier, in this case, is the river Danube itself.

- The characteristics of this pre-existent natural background – the Danube riverbank – define the locations of the **primary fortification structures**: the earliest and strategically most important points for the defence or for the further expansion – fords on the Danube, the mouths of its major tributaries as their valleys lead deep into the territory, in other words, the places where the naturally defined routes pass across the border.

- The word Limes has been used initially in the sense of **military road**, and only later was adopted for the fortified frontier itself (Elton 1996: 70-1; Torbatov 2004: 77; Breeze 2011: 6). The infrastructure has always been a priority for the Romans, so simultaneously with the establishment of the primary fortification structures, starts the construction of the main military road (in this case the Danube Limes road) that connects them and facilitates the mobility of the imperial army troops and the exchange of goods.

- As the main road is the spine of the economical and cultural exchange and is indispensable for the operation of the frontier's defence its safety and functioning has been secured further with the construction of **secondary defensive structures**. These fill the gaps between the primary fortifications; they are often situated at naturally protected locations that allow the surveillance of the surroundings.

The characteristics and topography of the territory determine generally the location, typology and nature of the Romans military structures. On the other hand, the presence of a series of functionally bound man-made

FIGURE 1. The Frontiers of the Roman Empire and "Frontiers of the Roman Empire" World Heritage Site (Base map original author: Frontiers of the Roman Empire Culture 2000 project (2005-2008); WHS layer and legend by Silva Sabkova)

FIGURE 2. The symbiosis between cultural heritage and natural environment forming the relict cultural landscape Lower Danube Limes in Bulgaria

elements, subject to an overall strategic plan, gives the territory itself a new aspect. This combination of natural and anthropic elements belonging to the past forms the relict cultural landscape (Fig. 3).

One of the serious issues regarding a relict cultural landscape like the Danube Limes in Bulgaria, is that its features are not quite obvious; the system has ceased to function many centuries ago, its elements have been degraded by a number of factors and many of them are not even visible anymore, there is no prominent artificial barrier that may tie together the whole system, the original environment has been altered. Therefore, the question what has to be considered as subject of protection does not really have an obvious answer.

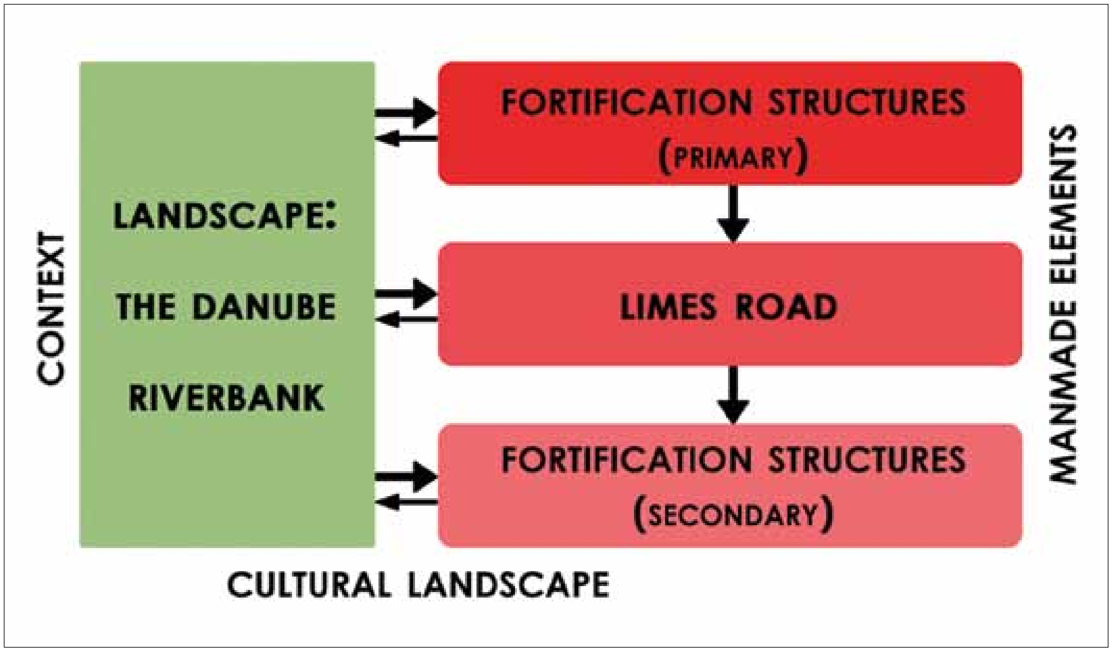

FIGURE 3. The Danube Limes and the relations between its elements as a cultural landscape

Presently, the very limited number of legally protected sites belonging to the Danube Limes in Bulgaria[4] makes it obvious that there is still a lack of comprehension about the concept of cultural landscape. The sites that benefit from legal protection are mainly those having visible remains. Those are protected only as individual sites and neither their fundamental characteristic to make part of a larger system, nor the question about their context has ever been taken into consideration. This limited selection of sites cannot represent and make the Danube Limes understandable as a system that involves landscape and artefacts alike.

This paper aims to raise the awareness towards all the less prominent elements of the cultural landscape of the Lower Danube Limes in Bulgaria that however contribute to its integrity and authenticity.

Integrity and authenticity of the Lower Danube Limes

Integrity and authenticity of a World Heritage Site such as the "Frontiers of the Roman Empire" is the sum of the degree of integrity and authenticity of all the various elements that compose it – man-made or natural, regardless of their size. Therefore in order to express the Outstanding Universal Value of the Lower Danube Limes in Bulgaria, the authenticity and integrity ought to be demonstrated at system level though demonstration of preserved integrity and authenticity in as many individual sites as possible and integrity and authenticity of the relationships site to site, site to landscape, site to system.

The authenticity and integrity of a site do not end with its material remains. The surroundings of each site and the territory between the sites should also be analysed in view of their authenticity and integrity. Obviously, the environment along the Danube river bank is much altered due to natural or anthropic factors and it is often unauthentic. However, each individual case should be analyzed in order to determine to what extent the relationship between site and environment is altered or compromised; sometimes the altered ground cover does not necessarily change the relationship between the site and its surroundings. Preserved features or elements revealing an authentic aspect of the historic character of the landscape, relevant to the archaeological sites should also be traced. The integrity and authenticity at system level include also visual integrity.

The inclusion of the maximum amount of elements and relationships as part of the subject of protection would contribute to the better preservation and enhancement of the integrity and authenticity of the Danube Limes. It will also increase the possibility to make more understandable the structure and the unity of the frontier as a system, rather than a sum of individual fortified sites. It would add another layer of perception to those sites and will enrich the experience of the interested public.

Preliminary researches and database.

To get started understanding what should be included in the subject of protection in the case of the Lower Danube Limes in Bulgaria it is necessary to collect as much relevant information as possible. It will be later used to plan and design the instruments of protection. The main archaeological sites that form the backbone of the cultural landscape Lower Danube Limes in Bulgaria (all known fortified locations, despite their size) should be used to form the backbone of a specifically designed GIS-based database. The present paper aims to outline the contents of such database that should be prepared in near future.

A site from the Lower Danube Limes will be used to illustrate the graphic visualisation of the contents of the proposed database and the analysis that follows. This is *Colonia Ulpia Oescus* (Gigen, Pleven, Bulgaria) (Fig. 4).

The first step is to collect basic descriptive information about each fortified location on which the analysis and evaluation of the valuable elements and relationships will be later based. The sources that should be used to compile this initial basic database include reports from archaeological excavations, aerial recognition, remote-sensing and of course most importantly – field surveys and observations. It should also be implemented with other kinds of existing GIS-based databases that are useful for the understanding and management of the cultural landscape, such as land use, land cover, cadastre, natural protected areas, territorial building plans, etc.

Naturally, the level of detail that should be visualised depends on the scale. In view of the preparation of the nomination of the Bulgarian section as part of FRE WHS, it is practical to adopt the standard scales for such documentation. The contents of the standard mapping materials for the nomination are predominantly descriptive and schematic in nature, and contain information about

4 The Bulgarian section of the Danube limes has been submitted on 01 April 2016. It includes 27 fortifications, one stone quarry, and 5 road fragments with or without pavement. This means that more than the half of the known sites has been discarded from the selection for inclusion in the tentative list of Republic of Bulgaria. The sites selected for inclusion are however the best examples of sufficiently studied and provenly existing sites, usually with visible remains. This approach focusing on the best examples of sites may be practical, but it is certainly not very sensitive towards the preservation of the integrity and the authenticity of the cultural landscape, which requires inclusion of as many sites as possible, those invisible as well.

FIGURE 4. *Ulpia Oescus: Decumanus*, shops and bath-house (personal archive, 2016).

the location of the fortifications and the artificial barriers (if any), towers and other structures represented by their area on a real scale, distinguishing them according to their visibility (visible, invisible, supposed, destroyed). It contains the outline of the proposed WHS and the buffer zone as well as the boundaries of legal protection under the national law (if available). The standard scales are 1: 50000/25000 and 1: 5000 (Jones and Thiel 2008: 99-100, Fejérdy and Jilek 2011: 13-15).

While the scales are adopted, the contents however of the GIS-based database designed specifically for the study and management of the Lower Danube Limes in Bulgaria and respectively of the maps that may be produced from, should be much extended and should include data from the preliminary research, needed for the designation of boundaries of the potential WHS and buffer zone. There are multiple levels of information that have to be available on both scales. The geographic background should be able to switch between satellite imagery, topographic maps and geo-referenced historical aerial footage. Data from other GIS services should be incorporated, such as data about the land cover and land use, protected areas, cadastre.

The scale 1:50000/25000 is used for the representation and analysis of larger sections; includes all the sites and their vaster surroundings. It includes representation of the areas (known or provisory) of all primary and secondary sites true to the scale. The distinction between visible and invisible sites should be made. This scale should be used for analysis of valuable relationships at the system level: visual relationships between the primary sites, between primary sites and secondary sites, relationships between the sites and the landscape, historic and current road connections.

The basic scale for the analysis is 1:5000. At this scale, the focus is on the individual sites and their immediate surroundings. It contains information about the actual remains at each site, contains a plan of the site (according to archaeological research or aerial recognition); current land use; boundaries of heritage and natural protection; tourist infrastructure. A distinction should be made between visible and invisible elements within each site. This scale should be used for analysis of valuable or problematic elements and relationships within the site itself and its surroundings.

The boundaries of each location should be described with geographical coordinates and the polygon describing each site should be associated with a number of attributes. These polygons should cover the actual physical boundaries of the sites established by destructive or non-destructive research methods. It should be noted that in certain cases where the sites have legal boundaries of protection already assigned they may not coincide with the real physical boundaries. Both should be included in the database. The attribute table for the polygons describing the main sites should contain the categories listed in Table 1, with the possibility to choose one or more respective predefined values or in some cases to add some free text. These options then may be used to sort, filter and visualize the sites according to the objectives of the analysis of the territory of the cultural landscape (Fig. 5).

Category	Values	Sub values	Free text	Visualization
Visibility (of the remains)	Visible (presence of any visible structures)		(optional)	On a smaller the scale, sites with visible structures should be distinguished graphically by those that don't have visible structures. On a larger scale, all visible and invisible but known remains should be represented on the cartographic overlay with the possibility to distinguish between them.
	Invisible (absence of structures visible above ground)	Presence of surface scattered materials	(optional)	
		Absence or impossibility to detect surface scattered materials	(optional)	
	Destroyed (there must be evidence that the site has been completely destroyed)		(optional)	
Chronology[5] (of the visible / known / presumed archaeological remains)	pre-Roman		If possible, it is recommendable to include provisory dates of establishment and final destruction of the fortifications.	Each period should be distinguished by colour.
	Roman	Principate		
		Late Antiquity		
	Medieval			
Typology (of the site)	Legionary camp		-	The various type of sites should be distinguishable graphically from one another
	Auxiliary fort	Infantry	-	
		Cavalry	-	
	Fortified city / settlement	Colonia	-	
		Municipium	-	
		Other settlement	-	
	Watch tower		-	
The character of the present **environment**	Agricultural areas	Arable land	-	This information may be obtained from already existing data bases such as Corine Land Cover Europe 2012. Each type of environment should be visualised according to a standardised colour scheme.
		Orchards	-	
		Vineyards	-	
	Urban (Artificial surfaces)	Continuous	-	
		Discontinuous	-	
		Low storey	-	
		High storey	-	
		Industrial	-	
	Natural (Forests and semi-natural areas, wetlands)	Forest	-	
		Natural grassland	-	
		Wet areas	-	
	Water Bodies		-	

Category	Values	Sub values	Free text	Visualization
Cultural heritage protection	Archaeological reserve	-	Protection regimes: free text according to the act of declaration	If boundaries are available they should be described with coordinates and visualized graphically on the cartographic overlay
	World significance	-		
	National significance	-		
	Local significance	-		
	Serial Property	-		
Natural protection	Yes		Protection regimes: free text according to the act of declaration	Their boundaries may be integrated from already existing GIS-based databases such as: Protected Areas in Bulgaria: Available at: http://eea.government.bg/flexviewers/pr-areas/index.html?
	No			
Excavations and surveys	Yes	-	What has been researched Bibliography	
	No	-		
Conservation / Restoration	Yes	-	What has been done References	
	No	-		
Accessibility	Yes	-	(optional)	Data about road accesses, public transport may be imported from existing GIS databases
	No	-		
Socialization	Yes	-	(optional)	Visit routes, services and facilities, parking lots should be included graphically
	No	-		
Maintenance	Yes	-	(optional)	
	No	-		

TABLE 1. The layout of the attribute table for the Danube Limes sites.

The system should provide the possibility to make references between main and secondary sites associated with the main site. Those sites should all be listed within a secondary but similar database and should be described with similar attributes.

"Typology of the site" this time should include: civilian settlements, suburban estates, industrial and mining complexes, cemeteries, sacred sites, ports and possibly others.

The Danube limes road should be regarded as a special category.

5 Naturally all Danube Limes sites are Roman by definition, but in some cases there is continuity and the remains from other periods happen to be more prominent.

Identifying the relict cultural landscape Lower Danube Limes in Bulgaria.

The actual recognition of the elements and relationships that partake in the cultural landscape and the evaluation of their level of integrity and authenticity should be then based on one hand on analysis of the information included in the database, that concern mostly the current state of the sites and the system, but on the other – it should involve knowledge about the history of the transformations occurred in each site, in the landscape, in the infrastructure, in the structure of the system on a territorial level, etc..

What is of uttermost importance is to consider the state of the environment in the past, during the functioning of the Lower Danube Limes. Despite its distance in time, it is still possible to have at least a general idea about the land cover and the state of the major elements of the environment such as relief and water bodies.

The study of the natural component of the cultural landscape – the environment and the complex transformation processes that concern it, require an interdisciplinary approach, based on the conclusions from existing researches from different fields: geography, geomorphology, botany, archaeology, history and others, combined with information coming from other sources: classical sources, historical maps, materials from archives and field observations. The exploration of the present and past transformations of the natural environment and building up hypotheses about what it may have been in Roman times provided background information needed for the detection of certain valuable elements and relationships having direct relativity to the structure and organization of the man-made elements of the system. Even if they are still present in the territory today, they often could not be associated so easily with the Danube Limes cultural landscape at their present state. When possible, this data should be also implemented into the GIS-based database in order to facilitate its use during the analysis.

For example, having an idea about what the authentic environment of the Danube Limes may have been, allows identification of preserved historic elements of the landscape in close relation to the fortified locations – old riverbeds, the character of the vegetation, wetlands and others. These elements are often directly related or determinative for the choice of the particular location as suitable for fortification in Roman times. Therefore these elements should be treated as part of the cultural landscape and should be included in the system for preservation and management alongside the man-made structures. In other cases, even though the character of the landscape has been completely changed, it has been established that the present situation has something in common with the historic one, for example – lack or presence of development or/and high vegetation in certain areas around the site. It means that the visual

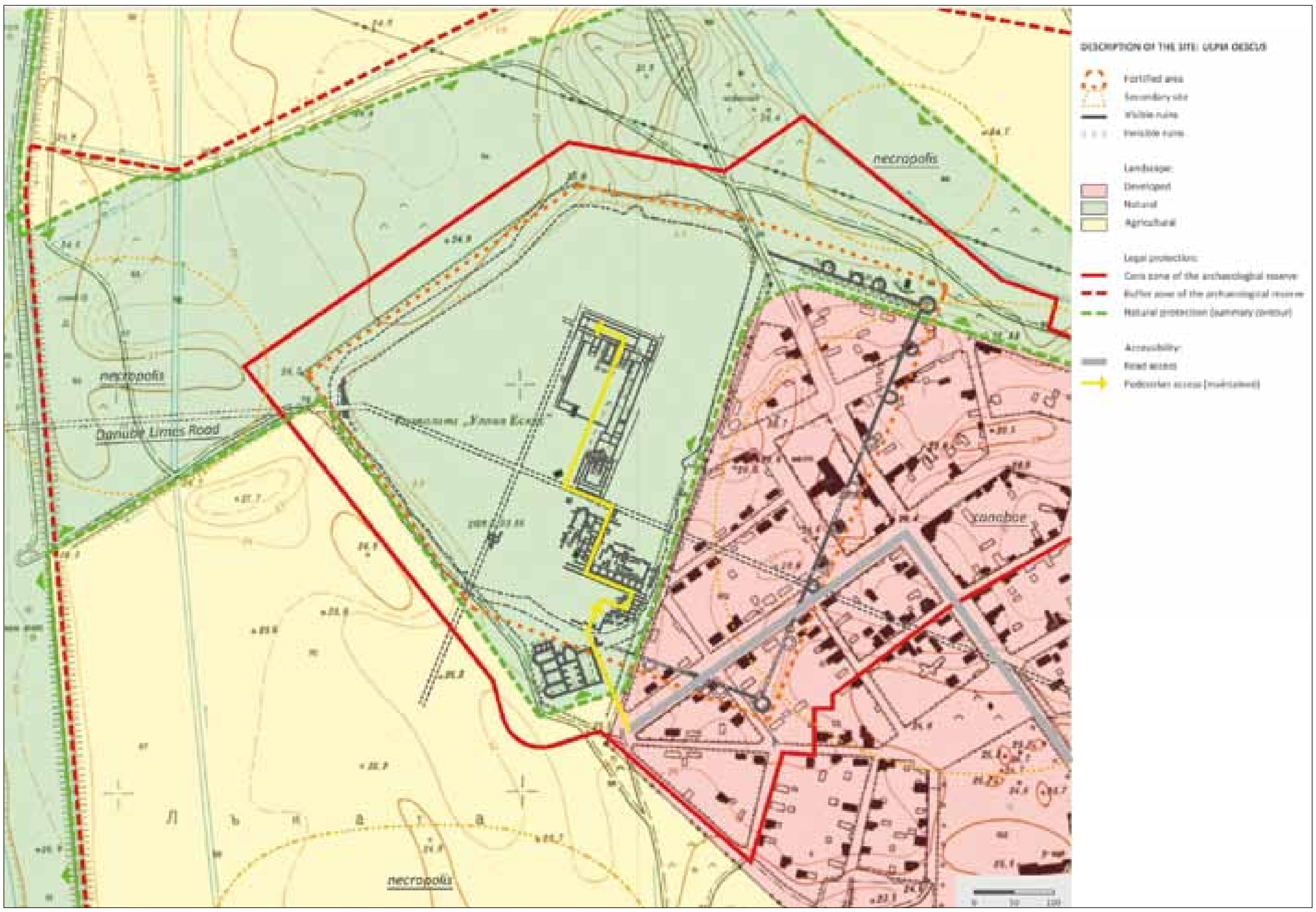

Figure 5. Description of Ulpia Oescus. Plan according to existing research (after St. Daskalova in Ivanov T. and Ivanov R. 1998: 57, fig. 24), placed on topographic map K-3-36-(40) (1979).

relationship between the site and its environment in the respective direction is similar to the authentic one and it is worth preserving it.

The man-made component of the Danube Limes includes a variety of artificial elements that make part of the cultural landscape. Following the definitions for what can be included in the "Frontiers of the Roman Empire" WHS, in may be summarized that the backbone of the man-made component of the cultural landscape includes all kinds of fortifications belonging to the Limes and secondary sites associated directly with them, preserved segments of the Limes road. The cultural landscape, however, expands even further and includes also other man-made elements and features (other complementary sites, the route of the road, sites from other epochs that are situationally related to the Limes), that could eventually make part of the buffer zone of the potential WHS.

To identify all these various groups of elements within the contemporary landscape is a major challenge. Despite many of them are completely invisible, and others are even entirely destroyed, they still have their role for the integrity and the authenticity of the cultural landscape. The placement of the identified sites in the context of the hypothetically reconstructed environment, considering also the chronological span of their existence, their continuity with pre-existent and successor sites is another task needed in order to identify further aspects of the cultural landscape that need to be preserved. The comparison of the historic and contemporary state of the territory could make evident many situational, visual, infrastructural and chronological relationships between the various elements of the cultural landscape. Therefore, the conditions which allowed preservation of these relationships should be maintained or in some cases improved, in order to keep and enhance the existing bonds within the cultural landscape.

The following methodology for analysis of the territory was designed to guide the process of identification of all the above mentioned valuable elements and relationships that make part of the cultural landscape of the Lower Danube Limes in Bulgaria. It is recommended that each fortified location is evaluated according to a series of criteria that describe all possible valuable characteristics that may be available for an individual site (Table 2; Fig. 6). The sum of the results from the analysis performed for every fortified location belonging to the Danube Limes forms the subject of protection. The subject of protection includes material elements that may be man-made or natural, visible or invisible and non-material features: situational, visual, infrastructural and chronological relationships. The analysis of the territory gives the outlines of active risk factors as well whose elimination or at least limitation is essential for the preservation of the cultural landscape.

Valuable material elements of the site itself and its landscape settings	Such are all visible remains, known and presumed underground structures, that make part of the defence system of the site and its internal constitution; all visible or underground structures belonging to the secondary sites in the vicinity of the main site; landscape elements testifying to a previous condition of the environment, related to the ancient fortified site or to associated secondary sites.	(1) Visible remains. (2) Preserved remains below the ground.[6] (3) Preserved historical landscape features. (4) Readability of the fortified area within the surroundings.
Spatial and visual relationships between sites in the system of Lower Danube Limes, between the main site and secondary sites, between site and landscape	These are visual connections or direct links between the sites (primary and secondary); visual connections or direct links with elements of the landscape: rivers, water bodies, landforms; free visibility corridors within the surrounding area.	(5) Relation between the site, the Danube River and the opposite bank. (6) Relation to important elements of the landscape. (7) Relation between the site and its surrounding territory. (8) Visual connection with another Danube limes sites. (9) Relation to Roman roads. (10) Relation to secondary sites.
Chronological relations between elements of the system	These are specific relations of continuity between elements associated with the system that evolved in different time periods.	(11) Topographical continuity in the same site (presence of cultural layers of different origin) (12) Functional continuity between two sites (for example when one site succeeds another on a different location)

TABLE 2. Criteria for evaluation of the fortified locations on the Danube Limes.

FIGURE 6. *Ulpia Oescus*. Analysis: Valuable elements and relationships. Negative factors.

Factors affecting negatively the valuable elements and relationships

The analysis should end with a summary of key issues and active risk factors threatening the integrity and authenticity of the sites themselves and the system of the Danube Limes in Bulgaria in general (Table 3). Such negative factors may compromise the possibility to maintain the characteristics of the heritage needed in order to become part of the world cultural heritage "Frontiers of the Roman Empire." The classification of risk factors is partially adopted by the guidelines for the preparation of management plans (Ringbeck 2008: 35-38).[7] Some specific issues relevant to the sites belonging to the Lower Danube Limes in Bulgaria are included, as well as issues regarding the sites as elements of a cultural landscape. Factors whose detrimental effect terminated in a past moment and whose effect can be considered irreversible are not included (for example the alteration of the environment due to the drainage of the Danubian lowlands).

6 The present analysis includes information about potential underground remains coming from written sources and interpretation of historic aerial photos. The knowledge about the underground remains could increase substantially if modern non-destructive methods are applied on the territory: contemporary aerial photography, geophysical surveys, airborne laser scanning (LiDAR) (see Sommer 2008a: 70-3). In urban areas, a useful tool for documentation and management and prognostication of underground remains may be the archaeological cadastre, that include mapping of archaeological evidence (positive results), mapping of all disturbances of the archaeological heritage (negative results), overlay of existing older maps and plans and evidence of written sources (Sommer 2008b: 119-20).

7 "Tourism pressure" and "Overpopulation" are risk factors that are not characteristic for the Danube limes sites. They are not established as major tourist attractions and only few of them are situated within populated zones.

Factors affecting the physical integrity of the site	The negative effects are due to natural factors (common or having emergency character) or of human impacts (associated with the modern development of the territory or having illegal nature).	(1) Environmental influences: (1^1) Climatic effects, (1^2) Groundwater, (1^3) Natural vegetation; etc. (2) Natural disasters: (2^1) Landslides; (2^2) Flooding; (2^3) Fire; etc. (3) Development pressure: (3^1) Agriculture; (3^2) Construction; (3^3) Mining; (3^4) Forestry; etc. (4) Malevolent human actions: (4^1) Treasure hunting; (4^2) Vandalism; etc.
Factors disturbing the perception of the site/system	These factors disturb mostly the visual integrity of individual sites or the system as a whole and also the connection between the sites and their immediate context. In most cases they can be considered as derivatives from the "Development pressure", but due to the nature of the cultural landscape of WHS Frontiers of the Roman Empire, a more detailed analysis is required.	(5) Factors disturbing the perception of the site (presence of objects alien to the archaeological site which ruin its aspect) (6) Factors disturbing the relationship between the site and its surrounding territory (7) Factors disturbing the perception of the system (visual integrity)
Factors disturbing the authenticity of the site		(8) Disrespect to the concept of authenticity (projects for conservation/restoration)

TABLE 3. Factors affecting negatively the valuable elements and relationships.

The model for the analysis of sites of Lower Danube Limes in Bulgaria here proposed can be considered as guidelines for the study of the current situation of these sites. This is a preliminary phase for the planning of protective measures that must ensure the protection of both the individual sites but also of the entire cultural landscape. The most comprehensive identification of valuable elements and relationships and their inclusion in the "Subject of protection" would contribute to the more effective preservation of the Outstanding Universal Value of the Lower Danube Limes in Bulgaria.

Conclusions

The proposed methodology for analysis of the sites and territory aims to include a vast variety of evaluation criteria applicable to Danube limes sites, different in respect to their history, present situation and future prospective. The analysis performed that way manages to reveal many valuable aspects of the cultural landscape that should be protected, enhanced, interpreted and presented to the public. The methodology puts stress not only on the material components of the cultural landscape – the actual archaeological remains and historical elements of the landscape but also on a variety of spatial, visual and chronological relationships present on the territory. All of them together form the subject of protection.

The analysis outlines also problems and risk factors that currently threaten the heritage, but that may possibly be reversed through positive landscape management. The results of the analysis form the basis for the design of suitable instruments for the conservation, management and socialization of the cultural landscape "Lower Danube Limes in Bulgaria".

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Visibility of Archaeological Record on the Surface

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When using archaeological surface survey method, be it for purposes of archaeological landscape research or archaeological resource evaluation, understanding visibility of archaeological record on the surface and factors affecting it is of crucial importance. Surface visibility must always be considered on multiple levels and five of these can readily be defined: (1) Visibility determined by geomorphic, pedogenic and other post-depositional formation processes. (2) Visibility determined by the nature of the archaeological record. (3) Visibility determined by techniques and strategies of the survey method. (4) Visibility determined by surface and other environmental conditions during the survey. (5) Visibility determined by the human factor.

Without considering these levels and using methodological procedures designed to control their effects on survey accuracy, any analysis and interpretation of survey results is at risk of being seriously erroneous and invalid. Furthermore, we should always bear in mind that surface survey is only capable of detecting disturbed and exposed archaeological record in the landscape. We are thus always dealing with incomplete distributions which primarily speak about landscape taphonomy and its effects on preservation, visibility and integrity of archaeological record in the landscape.

Introduction

Archaeological surface survey is one of the principal methods of archaeological prospection and research on a regional level, but despite the long development of this method its capabilities and limitations are still often not well understood, especially its effectiveness as a discovery method (see for e.g. Ammerman 1981: 81-82; Wandsnider and Camilli 1992; Burger et al. 2004; Burger et al. 2008: 216-218, 228). This is a problem in any archaeological landscape and settlement research but it comes to the forefront especially when the survey is used as a tool for evaluating the presence of archaeological resources before large-scale development projects. In such cases survey results may be the basis for decision making about the presence or absence of archaeological resources, needs for their protection and management, needs for excavation and in this case also for determining the size, time and cost of excavations (see Hey and Lacey 2001; Hey 2006; Medlycott 2017). In such cases, it is crucial that survey procedures are precise, reliable and accurate and that decisions based on their results are valid (see Banning et al. 2017: 468). But standard survey procedures generally do not allow for a realistic evaluation of the precision, reliability and accuracy of survey results or simply addressing the key question of »How much did we miss?« (Wandsnider and Camilli 1992; Burger et al. 2004). In tackling this problem, it is crucial to take into account the visibility of archaeological record on the surface and all variables affecting the discovery and recovery rate of the cultural material.

Multiple levels determining visibility

Visibility is generally accepted as an important aspect of archaeological surveys, which must be considered in the analysis and interpretation of survey results. In most surveys, however, dealing with visibility is mostly limited to documenting the amount of exposed ground surface or amount of vegetation cover in the field during survey and then using this information in the analysis to correct the raw data (e.g. Cherry et al. 1991: 27-28; Gaffney et al. 1991: 61; Terrenato 1996: 223; Terrenato 2000: 60, 66). However, the problem of visibility is much more complex and should be considered both in survey design and in the analysis of survey results on multiple levels:

(1) Visibility determined by geomorphic, pedogenic and other post-depositional formation processes.

(2) Visibility determined by the nature of the archaeological record.

(3) Visibility determined by techniques and strategies of the survey method.

(4) Visibility determined by surface and other environmental conditions during the survey.

(5) Visibility determined by the human factor.

Within each of these levels, a multitude of factors operate to influence surface visibility and detectability of archaeological record on the surface and consequently survey precision, reliability and accuracy by introducing biases into survey results. In the following text, each of these levels is defined and briefly explored by using information from a selection of relevant literature dealing with factors operating on the levels as they are defined in this paper[1]. For each level, an example of a study demonstrating the importance of some of these factors is presented as well as some methodological solutions, proposed so far by different authors, for dealing with problems these levels present for survey archaeology.

1 The five levels have already been briefly defined and touched upon in Gruškovnjak 2017a. In the present paper considerations on some of these levels have been expanded, especially in the case of the 1st and 5th level.

1st level determining visibility: geomorphic, pedogenic and other post-depositional processes

On the first level visibility is determined by post-depositional formation processes affecting visibility, preservation, and integrity of the archaeological record. After cultural materials leave the systemic context, in which they were used, through different ways of deposition they enter the archaeological record and are affected by post-depositional processes. These include natural and anthropogenic processes that burry or expose them, move or transport them as well as degrade or destroy them (Fig. 1) (Schiffer 1972; Schiffer 1973: 25-30, 53, 63-65; Schiffer 1983: 677; Sullivan 1978; Foley 1981: fig. 6.5; Butzer 1982: 98-122; Barton et al. 2002: 155-156, 166-167; Burger et al. 2008: 205-211; Ozán 2017).

Among the key factors to consider regarding surface visibility and use of surface survey as a discovery, method are geomorphic and pedogenic processes which burry or expose the land surface and alter the soil profile. As no land surface is stable in the long run three basic scenarios must always be considered. First, erosion may slowly or rapidly remove material, lowering the surface through time[2]. If the soil or sediment contains coarse fragments, natural or archaeological, the surface may eventually become enriched with them as a lag concentrate or carpetolith. Second, the surface can receive additions of mineral material which may be slow, steady or intermittent, as well as rapid and catastrophic. Slow additions of sediment aggrade the surface, eventually causing the soil profile to thicken. These processes, in soil science known as cumulization[3] and developmental upbuilding[4], are caused by eolian, hydrologic or human-induced additions of mineral particles to the soil surface. These often occur on alluvial surfaces, e.g. floodplains, in sediment receiving areas, e.g. colluvium or slopewash at the base of slopes or in micro-topographical lows, but it may also occur in the uplands. Catastrophic additions, as with floods or mass movements, may rapidly and deeply bury the surface, isolating it completely and causing retardant upbuilding[5] (Johnson 1993: 76, figs. 8-10; Schaetzl and Anderson 2005: 169, 172, 456-460, 532-534, 543). Third, the processes of burial and erosion are always accompanied by a force vector which may move and transport

2 Soil profile characterized by lack of pronounced horizons (Peacock and Fant 2002: 97).

3 Soil profile characterized by an overthickened A horizon (Schaetzl and Anderson 2005: 458-459).

4 Soil profile characterized by an overthickened B horizon (Schaetzl and Anderson 2005: 458).

5 Soil profile characterized by relict A and B horizons or paleosol and a newly forming soil on top of the younger sediment (Schaetzl and Anderson 2005: 459).

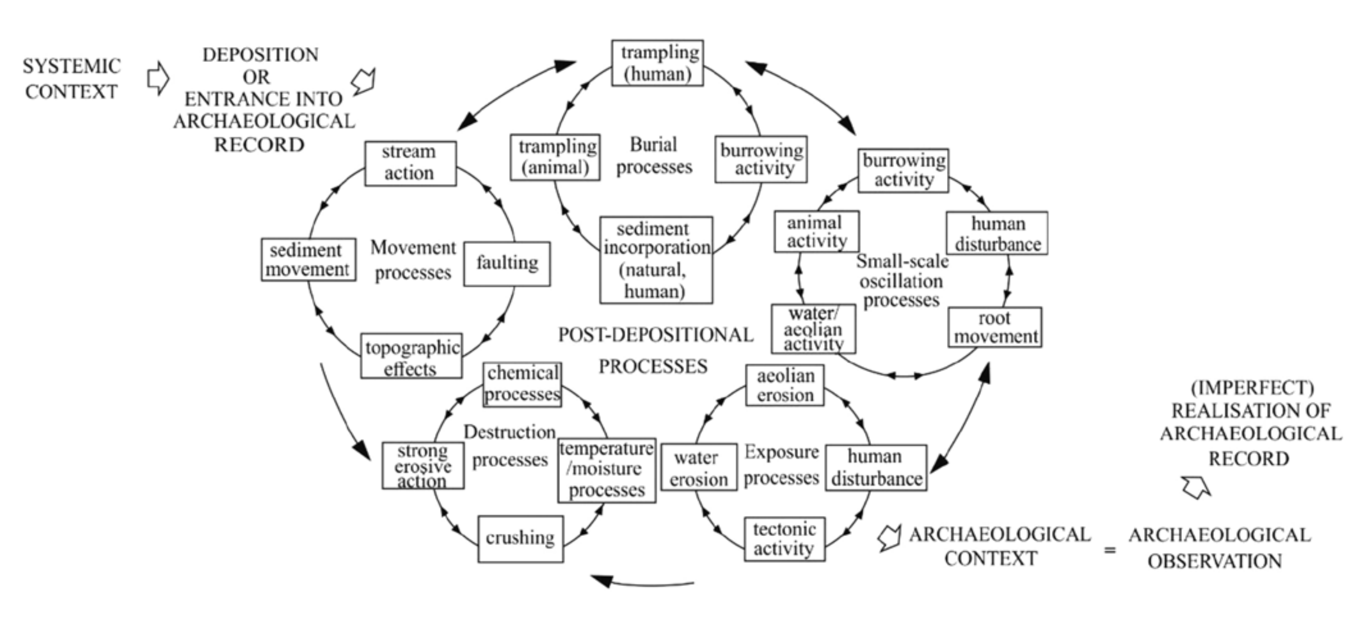


FIGURE 1. Scheme of post-depositional natural and cultural formation processes (Source: altered after Foley 1981b: fig. 6.5; also see Gruškovnjak 2017a: fig. 4).

surface materials. That is why soil scientists often realize that the process of burial alone simultaneously erodes the upper soil horizons, often leaving only B horizon as the only proof of soil surface existence prior to burial (Foley 1981: 170; Butzer 1982: 100; Schaetzl and Anderson 2005: 50). Thus, on a buried or exposed land surfaces, movement and transport of archaeological artefacts on the surface must be taken into account, as well as their incorporation into and movement with the burying or eroding sediment (e.g. Barton et al. 2002: 169-170). In any landscape we are surveying we must, therefore, be aware of what kind of geomorphological surfaces we are dealing with and what kind of debris flux, involving erosional and depositional processes, operated on them through the evolution of the landscape, especially during the Pleistocene and Holocene, up to the present day. Geomorphic surfaces can be erosional, constructive (aggrading) or a combination of both (see Schaetzl and Anderson 2005: 467, 471; also see Johnson 1993: 76; Van Nest 2002: 57, fig. 2).

Pedoturbation is another crucial, but rarely considered, factor affecting surface visibility as well as the nature of the stratified subsurface archaeological record. It is a ubiquitous and continuous process synonymous with soil mixing. From an archaeological perspective, pedoturbation is very important because it can result in burial of archaeological artefacts and architectural features even without the additions of mineral matter, as well as in sorting, mixing and moving of the larger size fractions of soil or sediment, like gravel, stone, and crucially archaeological artefacts[6]. Bioturbation, i.e. pedoturbation by soil fauna (faunalturbation) and plants (floralturbation), can, for example, cause surface aggradation and thus burial of archaeological record through surface mounding of fine soil fractions by animals. It can also cause a downward movement of coarse fragments via loosening and within-horizon jostling and undermining (by root growth and decay, and animal burrowing). This eventually causes settling of the coarse fraction at the maximum depth of burrowing and formation of so-called stone-lines and artefact-lines, or layers, overlain by a biomantle, i.e. a layer of material sorted and brought to the surface by animals[7]. With enough time elapsed the entire artefact size range archaeologists typically recover and study will be concentrated into a subsurface stone layer, only the smallest debris remaining mixed in the upper fine textured biomantle. Besides rendering archaeological record invisible on the surface through

6 For pedoturbation processes that can move coarse fragments and representative sources on the topic see Schaetzl and Anderson 2005: tab. 10.2.

7 In such a case the principle of stratigraphic superposition does not apply as the stone line and biomantle are synchronous. Also a false impression of paleo land surface is created in this way, and in some cases the amount of displacement can be sufficient to alter stratigraphic relationships and may potentially cause significant errors in dating of archaeological features. However, if not enough time has elapsed for artefacts of different periods to reach the maximum depth of bioturbation, the relative stratigraphic relationships are preserved (Atkinson 1957: 222-224, 226; Johnson 1989: 383; Balek 2002: 46-48; Van Nest 2002: 77; Schaetzl and Anderson 2005: 242).

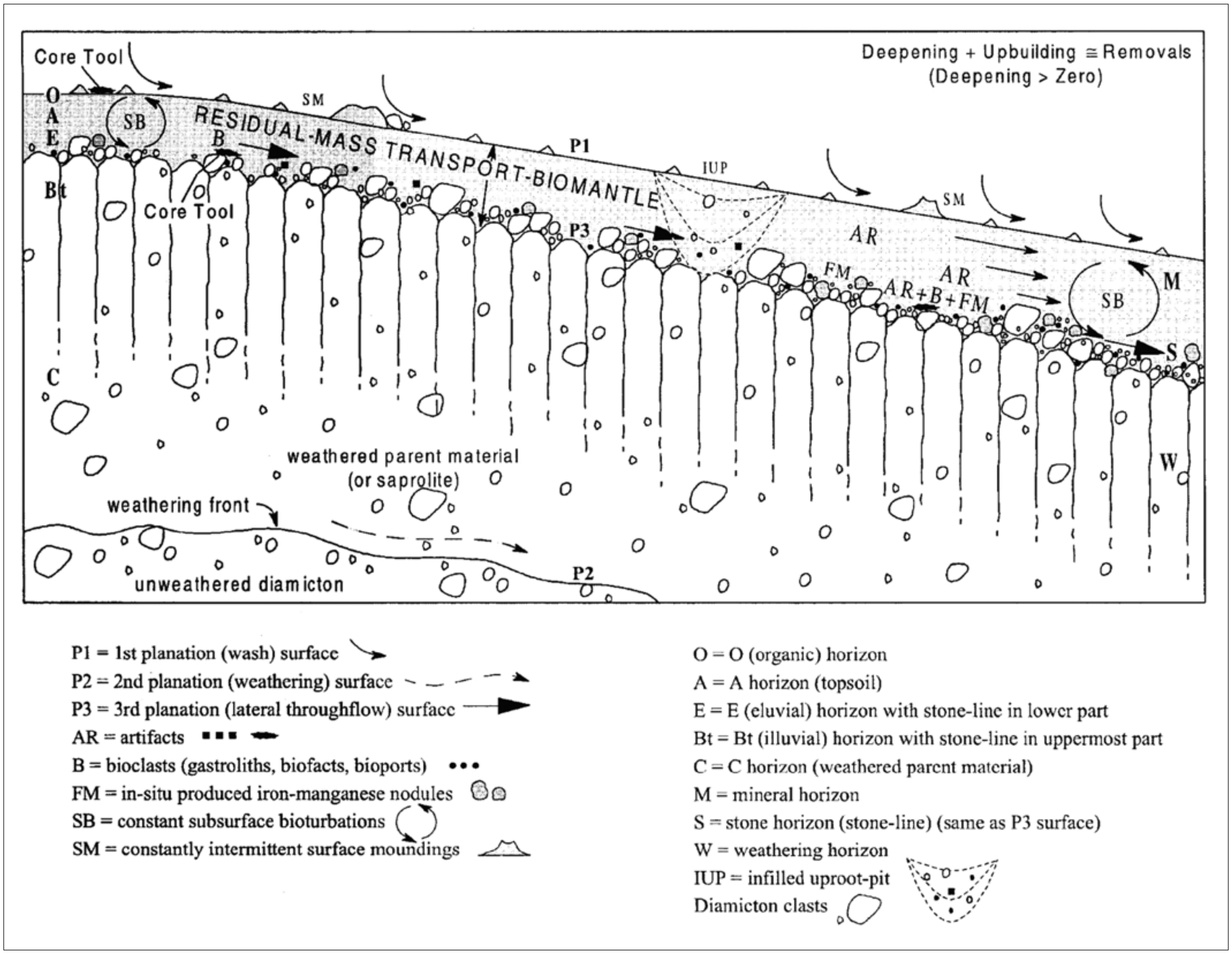


FIGURE 2. A Schematic example of dynamic denudation in landscapes underlain by stony diamicton or other sedimentary rock that contains relatively weathering-resistant clasts. The scheme portrays how small-scale slope processes operate on drift landscapes in the midcontinental United States and Europe. The legend identifies the symbols and processes. Only the major processes of the model are showcased, with a focus on the biomantle, which extends from the surface to the base of the stone-line. Material is removed as solutional and particulate matter from the soil-landscape system via P1, P2, and P3 planation surfaces. Due to bioturbation and gravity, artefacts, manuports, and bioclasts deposited on the surface gradually sink to the top of the stone-line (P3 surface). The biomantle then slowly migrates downslope (migration rates depend on slope angle, intensity and duration of bioturbation, climate, etc.). Ferricrete and other metallic bodies may form in place and/or become incorporated into the stone-line from below as the landscape slowly downwastes. Soil deepening (D) is an active process in the figure (i.e, D > zero), and both deepening and upbuilding (U) approximate removals (R) in the soil thickness (T) relationship: T = f(D + U – R). Consequently, the denudating P1, P2, and P3 planation surfaces gradually move downward as the landscape slowly downwastes (Source: Johnson 2002: 22, 24, fig. 2).

burial, the faunal activity may also seriously affect the reliability of surface-collection data by causing a disproportionate amount of small-sized artefacts (artefact size dependent on animal size) to be present on the surface, while large-sized artefacts are buried. Similar sites with differential amounts of faunal activity and different animal species involved in it may thus display very different contents in their surface assemblages. Also, because the biomantle slowly moves downslope (rates of mass transport vary spatially and temporally with local conditions), it is both sedentary in the short term and transported in the long term. In addition the stone-line often acts as a lateral aquifer or lateral subsurface throughflow zone on sloping surfaces and is thus subjected to aquaturbation, which mainly affects the fine soil fraction, but may potentially cause movement, abrasion, degradation etc. of artefacts in the stone-line (Atkinson 1957; Erlandson 1984; Bocek 1986; Johnson 1989; Johnson 1993: 72, 74-76; Balek 2002; Johnson 2002; Peacock and Fant 2002; Van Nest 2002: 57, 59, 62-63, 77-79, figs. 2-4; Schaetzl and Anderson 2005: 239-255, 543-546, tab.10.1-2; Araujo 2013; Ozán 2017: 2-4).

Other forms of bioturbation can also bring larger clasts, including archaeological artefacts, to the surface. Tree uprooting, for example, is a major cause for this and as the fine materials are washed away, coarse fragments can become concentrated as a surface lag. Tree uprooting can move particles in any direction, bringing buried materials up as well as introducing surface materials to lower levels of the soil while soil horizons are disrupted and mixed together. Repeated uprooting results in so-called "natural ploughing" or "tree ploughing" and through long periods of time this localised and spatially discontinuous process may affect very large portions of the landscape, often creating the so-called cradle-and-knoll or pit-and-mound micro-topography. Deep burrowers may also bring deeply buried materials into the near-surface environment, and larger burrowers such as rodents may cause considerable lateral movements of artefacts. Larger clasts can also be brought to the surface and sorted via cryoturbation (freeze–thaw processes) and argilliturbation (Bocek 1986; Johnson 1993: 74; Balek 2002: 42-48; Johnson 2002: 8-9; Peacock and Fant 2002: 91–92; Van Nest 2002: 57; Schaetzl and Anderson 2005: 243-244, 259-262, 501; Pawlik 2013).

Thus, it must be realized that biomechanical processes of soil formation are inherent to all soils and that archaeological contexts, be it in the bottomlands or uplands, have been universally altered by biomechanical processes. Case-by-case assessments of the formation processes affecting sites are required to discern which patterns can be attributed to human activities and witch to other processes, though this task is inescapably complicated by equifinality (Van Nest 2002: 78; Burger et al. 2008: 205; Ozán 2017: 12-13).

The above-mentioned processes are only a part of the dynamic denudation model (Fig. 2) developed by Donald Johnson (1993; 2002)[8], which must be considered in any archaeological landscape survey, analysis and interpretation. As summarized by Johnson (1993: 76-77): "Dynamic denudation theory provides a rational explanation for the evolution of tropical, subtropical and temperate landscapes with three-tiered soils that may or may not bear stone-lines. The dynamic processes and conditions are driven by gravity, water and biotic agents. The framework is a synthesis of tripleplanation, soil evolution, biomantle, soil thickness, etchplanation, and mass transport theory fused with /…/ A, E, B, C soil horizon designations, and hydrological principles of lateral throughflow. /…/. It explains soil-slope systems with or without stone-lines in a variety of landscapes underlain by variable rock types, including those that are saprolitized. Dynamic denudation principles should have wide applications in archaeology, ecology, forestry, geomorphology, mineral exploration, and pedology."

A case study of archaeological record's surface visibility considering dynamic denudation principles is provided in western Illinois, U.S.A., by J. Van Nest (2002). Among archaeologists working in this area the prevailing view has been that before a late prehistoric establishment of bison into the region, Illinois prairies were mostly uninhabited. Seemingly confirming this view was the scarcity of surface archaeological materials away from the river valleys. Surface surveys of upland terrain in the region discovered only ribbon-like distributions of sites on the slope shoulders and upper backslopes along headwater valleys. For a long time, it has been presumed that during the Holocene the uplands underwent massive hillslope erosion, causing nearly all archaeological materials to became lag deposits, which are now incorporated into historic plough zones and are thus all visible on the surface. However, Van Nest observed that erosion in western Illinois uplands is spatially restricted and that no massive hillslope erosion occurred during the Holocene. Large areas of this landscape retain soil profiles with biomantles and buried archaeological remains. She examined the interaction of biomantle–stone zone formation, soil creep on a hillslope transect (catena) and processes related to vegetation type (forest vs. prairie) (Fig. 3). At the hilltops where soil loss by creep is effectively zero, large artefacts have been readily buried by soil fauna to depths below the plough zone. On the contrary, backslope positions are so steep that the rate of soil creep exceeds the rate of artefact burial by soil fauna and thus they remain at the surface. At intermediate slope steepness positions on slope shoulders, burial by soil fauna is rapid enough for the artefacts to start sinking, but erosion is also rapid enough to allow only shallow burial. Thus, artefacts are protected from surface disturbances but may be incorporated into the historic plough zone. At the bases of slopes, artefacts may be buried by sediment washed from upslope, or by alluvium (Fig. 3A). Besides the position on the hillslope transect, vegetation also proved to be an important factor in soil development and artefact burial. Tree ploughing in forests can overwhelm the downward movement of artefacts by soil fauna and in addition, the organic-rich layer with soil fauna activity of many forest soils is so thin that it is now entirely incorporated into historic plough zones. Contrary, in prairie soils the organic-rich A horizons extend to considerable depths and artefacts become buried in biomantles below the depth of ploughing (Fig. 3B). There is probably also a link between prehistoric Indian

8 For historical background and comments see Schaetzl and Anderson 2005: 324-338, 537-546.

vegetation burning practices and the position of the forest-prairie boundary on upper slopes, and consequently the distribution of surface and buried habitation scatters in this landscape. The process of burial by soil fauna has been documented for Archaic period sites (>3500 B.P.), while not enough time has elapsed for Woodland period (<2500 B.P.) artefacts to become buried to sub-plough zone depths. Thus, the once prevailing assumption that upper slopes along valleys are an eroded, degraded landscape where all cultural remains occur at the surface, in the plough zone, or occasionally in pits reaching below the plough zone is now obsolete. The biomantle–stone zone hypothesis now predicts that almost all pre-Woodland sites occurring across the upland prairie regions will be buried and consequently not detectable by surface surveys (Van Nest 2002: 79-83, figs. 8-9; Schaetzl and Anderson 2005: 254).

This case study clearly demonstrates that consideration of pedogenic and geomorphic processes along a catena is crucial for decision making about which prospection method is appropriate for a particular surface while any analysis and interpretation of survey results as well as settlement and land use patterns, which does not consider these, cannot be regarded as valid (see e.g. Bettis and Mandel 2002: 141-142, 149-152; Peacock and Fant 2002: 92, 95; Burger et al. 2008: 205-211; Banning et al. 2017: 469; Ozán 2017). For example, the surface survey will be pointless in a deeply buried landscape where the subsurface survey is called for instead, and no surface finds in such a case do not mean that there is no subsurface archaeological record present in the area (see e.g. Brookes et al. 1982; Stafford and Creasman 2002). Only archaeological record affected by exposure or disturbance processes might be expected to be visible on the surface, while buried sites will not be. Finds might also be dispersed or even drastically moved by post-depositional processes and the location of finds in a colluvium, for example, may be far removed from the location of their primary deposition and incorrectly interpreted if colluviation process is not identified (e.g. Foley 1981: 166-174; Butzer 1982: 98, 100-117; Ebert et al. 1987: 165-166; Burger et al. 2008: 221-227).

Often overlooked, however, is that the patterning of these natural processes, which affect the visibility, preservation and integrity of the archaeological record, are of a very local nature. They are controlled by local microtopography and other small-scale factors and are thus often of an even smaller scale than might be assumed to fall within the boundaries of culturally-caused clusters of artefacts, or sites. Consequently the existing regional scale maps and data on these processes in any given area are usually too general and not precise enough for archaeological purposes which is why all survey projects should incorporate localized small-scale soil geomorphological[9] mapping and other geoarchaeological methods into the initial (and if necessary subsequent) phases of their survey design (Ebert et al. 1987: 173; Stafford and Creasman 2002: 120-121; Johnson 2002: 11; Schaetzl and Anderson 2005: 501-506; Ozán 2017: 2, 7, 12, 13).

In the context of burial an exposure processes it must be mentioned that globally speaking in temperate zones, most of the surfaces are generally affected by constant aggradation and consequently most of the archaeological record is buried, thus displaying very low artefact densities and poor visibility on the surface, while in arid zones most of it is exposed, thus displaying much higher artefact densities (lag concentrate) and better visibility on the surface (Bintliff and Snodgrass 1988: 508-512, fig. 2). That is why the surface survey in temperate zones is almost exclusively applied to ploughed surfaces, where subsurface materials are potentially being brought to the surface. Mechanical ploughing as a form of pedoturbation or anthropoturbation can be considered as a large-scale formation process unique to modern surfaces. Though more severe its effects are similar as in the case of many other natural and anthropogenic pedoturbation processes. Also similar are factors affecting it, but their effects are drastically increased. When studying archaeological record in the plough-zone we must consider at least (1) lateral displacement and its effect on spatial patterning; (2) vertical displacement or the circulation of finds in the plough-zone and the functioning of the surface as a sampling process determining the relation between the whole population of finds in the plough-zone and artefacts brought to the surface; (3) changes in state of preservation of various classes of material in specific conditions; (4) duration, direction and depth of ploughing as well as ploughing equipment; and (5) local characteristics of soil, relief and post-depositional burial of the archaeological record. (see Lewarch 1979; Jermann 1981; Lewarch and O'Brien 1981a: 308; Lewarch and O'Brien 1981b; Ammerman 1985: 34-35; Odell and Cowan 1987; Reynolds 1988; Boismier 1989; Yorston et al. 1990; Dunell and Simek 1995; Schaetzl and Anderson 2005: 292-293). Various experimental studies have shown that what we see on the ploughed surface is only the tip of the iceberg and a random one at that (Ammerman 1985: 37, 39).

9 Soil geomorphology can be defined as the study of soils and their use in evaluating landform evolution, age and stability, surface processes and past climates. It can also be more broadly defined as the study of the origin, distribution end evolution of soils, landscapes and surficial deposits and the processes that create and alter them (Schaetzl and Anderson 2005: 465).

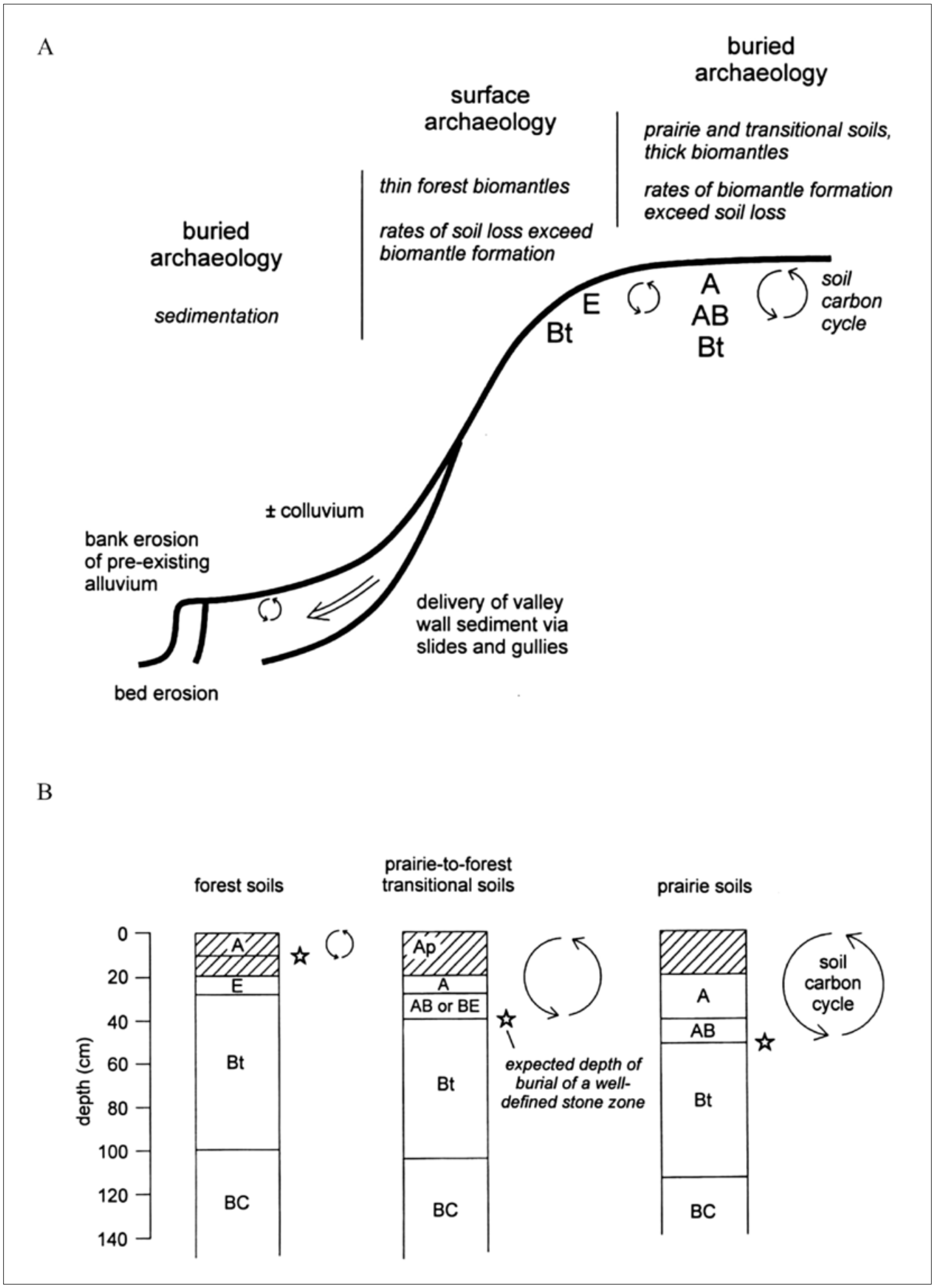


FIGURE 3. (A) A slope transect model showing where buried and surface-exposed archaeological remains are expected in the western Illinois uplands. (B) Influence of soil type on the expected depth of stone-lines in fully formed faunalmantles of western Illinois (Source: Van Nest 2002: figs. 8-9).

2nd level determining visibility: nature of the archaeological record

On the second level, visibility is determined by the nature of the archaeological record itself. Among key factors here, are obtrusiveness, clustering and density of artefacts (Schiffer et al. 1978; Wandsnider and Camilli 1992; Banning et al. 2017: 472-473).

Obtrusiveness of artefacts is conditioned especially by their size, shape and colour as well as by the relationship of these properties to the natural material of the soil surface. More the archaeological material differs from the natural background noise of the soil matrix more obtrusive it is. This means that the effect of artefact properties is specific to specific circumstances and must always be evaluated in light of local conditions. Generally as the size of the artefact increases so too does its obtrusiveness, but there are variations in this relation conditioned by local circumstances. For example, if pebble stones of intermediate size class are predominating, intermediately sized artefacts might be less obtrusive than small sized artefacts. Also, the more the artefact's shape differs from the shapes of the natural material in the background, more obtrusive it will be and so in some circumstances small unnaturally shaped artefacts will be more obtrusive than larger more naturally shaped artefacts. Similarly, in soils of different colours and in the presence of natural stones of different colours differently coloured artefacts will contrast the natural background differently and will thus have different obtrusiveness. Thus, in different natural backgrounds artefacts of different sizes, shapes and colours will have different levels of obtrusiveness. That is why the natural matrix and any changes or variations in it during the survey should be described in detail in order to evaluate the effect of artefact obtrusiveness and biases it incorporates into survey results (Wandsnider and Camilli 1992: 174, 176, 177-179; see also Banning et al. 2006: 726, 732; Banning et al. 2010).

Artefact clustering and density also affect the recovery rate during the survey. More clustered than isolated artefacts will be discovered and the higher the density of the cluster the higher percentage of artefacts present in it will be discovered. The interaction between clustering, density and obtrusiveness is very important but it is not simple and straightforward. Obtrusiveness will especially affect the differential artefact recovery at low densities while its effect at higher densities will be lower. In this case, the size of the artefacts plays the most important role for large artefacts are quite consistently recovered at high as well as low densities while small artefacts are mostly recovered in cases of higher densities (Wandsnider and Camilli 1992: 174, 180-182).

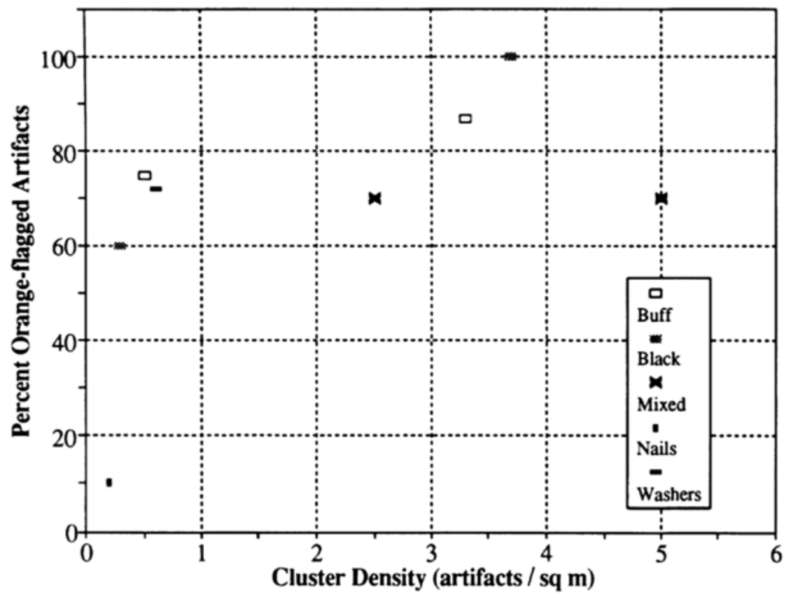
Besides the effects post-depositional processes (1st level determining visibility) have on artefact surface density, artefact density is also conditioned with the duration of the past occupation or activity, the intensity of activities involving discard behaviour, focus of such activities to a specific location and integration of durable cultural materials into these activities, such as stone and pottery, while discovery of other types of activities is severely limited. Similar factors also apply to periods for we are more likely to discover remains of periods characterised by locally concentrated long-lasting activities or occupation, higher population densities and production of durable cultural materials, which are more resistant to destruction. Regarding preservation, time or progressive degradation and destruction of materials also plays a role, as well as types of soil, which have different effects on the degradation and destruction of cultural materials. However, visibility is also conditioned by the resolution of our dating or relative archaeological visibility, meaning that periods with highly diagnostic material will have higher visibility in surface assemblages than periods with less diagnostic material, and if finds from a particular period are not recognised it will stay invisible even though present in the collected material (see Hope-Simpson 1984: 116; Bintliff and Snodgrass 1985: 138; Gallant 1986: 415; Schofield 1989: 460-462, 466-468; Barker 1996: 167; Bintliff 2000: 205-206, 212-213; Banning 2002: 226; Novaković 2003: 145; Hey 2006; Vermeulen and Mlekuž 2012: 209).

For dealing with problems of artefact obtrusiveness, clustering and density, incorporation of seeding experiments into survey design has been proposed as a way to enable the evaluation of biases incorporated into survey results by these properties of the archaeological record (Wandsnider and Camilli 1992: 183, 185). Such an experiment would be done on a smaller plot or plots of the survey area, representative of the local conditions, by seeding a known quantity of non-archaeological artefacts and mapping their distribution in order to control the most relevant attributes such as colour, shape and size of artefacts as well as different degrees of their clustering and density. These experimental plots would be surveyed using the same procedure as throughout the survey area and the results would provide a quantitative measure for evaluating the effects of these characteristics on the recovery of archaeological artefacts in the specific circumstances of the survey area and with the specific procedure used in the survey project (e.g. Wandsnider and Camilli 1992: 173-176; also see Banning et al. 2017: 475-476).

An example is provided by the Seedskadee (Green River, Wyoming, U.S.A.) seeding experiment, presented by L. Wandsnoder and E. L. Camilli (1992), in which an intensive (5 m transect interval) distributional survey technique was used. With the distributional technique, discovery is done in two phases, first systematically by the discovery crew, and then unsystematically by the encoding crew. Regarding shape and colour of seeded artefacts (washer and nails of black and buff colour) more "unnaturaly" shaped washers (71%) were recovered and slightly lower number of larger but less unnaturally shaped (stick-like) nails (61%), while more black artefacts (70%), which were more contrasted with the soil surface, were recovered than buff artefacts (62%). Regarding isolated vs. clustered seeded artefacts the discovery crew recovered 10% of all isolated and 69% of all clustered artefacts, while the encoding crew recovered additional 6% of all isolated and 12% of all clustered artefacts. In total,

FIGURE 4. Seedskadee seeding experiment results.
(A) Frequency and percentage of recovered seeded artefacts by characteristics.
(B) Percentage of orange-flagged (recovered by discovery crew) artefacts vs. cluster density.
"Buff" – clusters with buff washers and nails;
"Black" – black washers and nails;
"Mixed" – buff and black washers and nails;
"Nails" – buff and black nails;
"Washers" – buff and black washers
(Source: Wandsnider and Camilli 1992: tab. 1, fig. 2).

A



B

Seeded artifacts		*Recovery* — *Discovery crew* No.	%	*Encoding crew* No.	%	*Total* No.	%
Isolated							
Buff							
Nails	12	0	0	0	0	0	0
Washers	12	1	8	1	8	2	17
Black							
Nails	12	2	17	0	0	2	17
Washers	13	2	15	2	15	4	31
Total	49	5	10	3	6	8	16
Clustered							
Buff							
Nails	44	29	66	3	7	32	73
Washers	35	29	83	1	3	30	86
Black							
Nails	27	15	56	8	30	23	85
Washers	48	34	71	7	15	41	85
Total	154	107	69	19	12	126	82
Grand total	203	112	55	22	11	134	66

dramatically more clustered (82%) than isolated (16%) artefacts were recovered, with the inspection of 20–40% of the ground surface (5 m transect intervals and inspection of 1–2 m transect strips) (Fig. 4A). Also, as the cluster density increased, so did the percentage of total seeded artefacts discovered in the cluster (Fig. 4B). Furthermore, of all the isolated seeded artefacts discovered (systematically and unsystematically) the discovery crew recovered 62.5% and the encoding crew 37.5% as opposed to clustered artefacts, the majority of which were recovered by the discovery crew (85%) as compared with the encoding crew (15%) (Fig. 4A). This observation has important implications especially regarding the discovery rate of clustered and unclustered surface distributions by standard survey procedures with only one (systematic) discovery phase (Wandsnider and Camilli 1992: 174, fig. 2, tab. 1).

Because of two discovery phases, the distributional survey technique also allows some evaluation of recovery rates in the case of archaeological distributions, where total quantity and distributional pattern of the sampling universe are not known (Wandsnider and Camilli 1992:

176). With standard survey procedures, where discovery is done only in one phase, this is not possible and only seeding experiments incorporated into survey design would allow evaluation of artefact obtrusiveness, clustering and density. In the case of standard surveys with transects in 15 m intervals, a lot of the same high-density clusters might be discovered as with the more intensive distributional survey. However, because only 6–13% of the ground surface is inspected, presuming that only 1–2 m away from the transect lines are inspected, this allows for only 6–13% of surface artefacts to be recovered. But because of the biases incorporated by all levels determining visibility only part of these 6–13% will be discovered and the fraction will be different for different areas, different types of artefacts, different collectors etc. This means that the fraction of the sample remains unknown and that such techniques themselves support the apparent "sitedness" of archaeological record or the perception that archaeological record mainly consists of rare high-density distributions or sites and just a few isolated artefacts. From this point of view, such a survey procedure is neither an off-site survey, neither a full/total-coverage survey. The population of isolated phenomena is at least 8–17 times greater than discovered by such surveys, but these are already problems related to the 3rd level determining visibility discussed below. Also, observations that very low-density archaeological distributions are comprised mostly of larger artefacts may reflect discovery bias owing to effects of interaction between differential artefact obtrusiveness, clustering and density, rather than differential use and discard. Furthermore, the results of such seeding experiments clearly show that even very intensive surveys fail to provide accurate and reliable results, especially in low-density areas, pointing to the dangerous business of interpreting survey results, especially with the help of quantitative analyses, when measures to quantitatively evaluate the effects of discovery biases are not incorporated into survey design (Ibid.: 182-185).

Until now, we have only considered those properties of the nature of the archaeological record, connected with artefacts, for these represent the basic units of observation in the surface survey. Artefacts alone, however, cannot be a sufficient criterion for discovering the presence and for determining characteristics of the archaeological record, considering that it constitutes of (1) artefacts, (2) features, (3) anthropogenic soil horizons, (4) organic materials, and (5) chemical and geophysical anomalies. In different types of sites or remains, these constituents are present in different ratios (McManamon 1984: 226-228). With the surface survey, we are detecting only artefacts and rarely features, and therefore, by detecting only one or rarely two types of constituents, the surface survey is an inherently biased discovery method. That is why the use of multiple survey methods, each detecting a different kind of archaeological remains or constituents of archaeological record are called for, at least if our intention is to discover various types of archaeological remains in the landscape and not only large high-density distributions of artefacts. It is not possible to blindly rely on the presuppositions that high densities of surface artefacts correspond to high densities of subsurface artefacts and features as well as areas of most intensive past human activities. Many studies show that surface distributions do not or only partly reflect subsurface distributions, that important sites with large number of features may contain very low numbers of subsurface artefacts and even less surface artefacts, as well as that many sites manifest themselves on the surface with lower densities than off-site distributions and therefore cannot be quantitatively recognized (Shott 1987: 361-362; Schofield 1989; Bankoff et al. 1989: 70-72; Bintliff 1996: 252; Bintliff 2000: 206-209, 212; Fentress 2000: 48-49; Hey and Lacey 2001; Medlycott 2017).

3rd level determining visibility: techniques and strategies of the survey method

Visibility is also determined by the techniques and strategies of the survey method. Here term method is understood as the basic method such as surface survey, subsurface survey, geophysical survey etc., while the technique determines the basic procedures used such as systematic fieldwalking or surface collection (e.g. Cherry et al. 1991), distributional survey (e.g. Ebert et al. 1987), point-sampling (e.g. van de Velde 2001), probability survey (e.g. Plog 1976) etc. in the case of surface survey method. Strategy refers to survey intensity and the shape, size and spatial layout of the survey grid and/or collection units used (e.g. transects, quadrats), or in the case of probability survey to a simple random, stratified random, systematic or stratified systematic unaligned sampling strategy used[10].

Generally, the more intensive the survey and slower the pace, more surface material will be discovered (e.g. Wandsnider and Camilli 1992: 177, 183, fig. 3; Banning et al. 2006; 2010; 2011; but see below). For example,

10 This distinction between method, technique and strategy is adopted after Elco Rensink's presentation of the *Best Practices Prospectie* project at the *Finds in the Landscape. New Perspectives and Results from Archaeological Surveys. / Funde in der Landschaft. Neue Perspektiven und Ergebnisse archäologischer Prospektion* international conference, held on June 12th–13th at the Fritz Thyssen Stiftung in Cologne, Germany. Results of the project achieved so far are accessible at *www.archeologieinnederland.nl* (see Gruškovnjak 2017b).

when using transects recovery will be primarily determined by transect intervals, which will determine the size of phaenomena the survey is capable of discovering. Phaenomena smaller than the transect interval will thus be discovered only due to coincidence (e.g. Cherry et al. 1991: 18-20). The capability of different shapes and sizes of aggregate units and their layout to discover sites according to their size and artefact density can be calculated by mathematical formulas based on search theory or recovery theory (e.g. Miller 1989; Sundstorm 1993). However, these must generally presume that if the aggregate unit intersects the area of a certain phenomenon it will be discovered, though the reality is not as simple. The chance of discovery is also determined by all other factors of all of the five levels determining visibility and all of these cannot be taken into account in such calculations, which is why they are only capable of evaluating the effectiveness of discovery in ideal circumstances. Besides, such calculations are mostly limited to evaluation of discovery capability for discrete distributions, i.e. sites, and not off-site distributions.

Because of the great variability in the surface visibility of archaeological record in the landscape, each survey area should be stratified into zones according to visibility (Banning et al. 2006: 740; Banning et al. 2017: 469). That is according to visibility as determined by the first and fourth level, as well as second level in case its properties are already known to a certain degree. For each zone, method, technique and strategy of a survey that will perform best in the given conditions should be determined[11], while most surveys use a standardized procedure throughout the survey area despite the differences in visibility. This difference is related to two different approaches to survey which are connected with the problem of data comparability, views on which differ among survey archaeologists. The core of this problem is in the question whether survey results of a certain area are comparable if the same standardized procedure was used throughout, or are they comparable if the same chance of discovery was assured by using different procedures according to different visibility conditions? Here, the latter approach is being emphasised.

Furthermore, the capability of addressing the question "What did we miss?" is generally absent in most surveys and therefore their effectiveness cannot be realistically evaluated (Burger et al. 2004: 411). For tackling with this problem to a certain degree, the proposition of using control seeding experiments has already been mentioned, while intensive resurveys of certain control areas through property-based investigations would be yet another or additional option which would allow for comparison of recovery rates with the standard procedure used in the survey project. Regarding the definition of a property-based approach, we may follow Burger et al. (2004) who differentiate archaeological surface survey procedures according to their numerous goals. Discovery-based surveys identify geographical aspects of the surface record by locating and describing clusters of artefacts, while property-based approach focuses on evaluating the accuracy of technique and strategy used as well as on formational aspects of the regional record. A property-based approach will, therefore, be especially valuable in cases of geomorphologically active and topographically diverse landscapes (Ibid.: 410; also see Banning et al. 2017: 474-476).

An example of such a property-based investigation is provided by Burger et al. (2004) with the experiments performed in the Oglala National Grassland (Nebraska, U.S.A.), where the multi-scale Modified-Whittaker sampling plot[12] (Figs. 5-6) borrowed from plant ecology was used and surveyed at different intensities. The main technique used was a distributional survey in 70 cm intervals, followed by a resurvey of smaller control areas with crawl survey (the fieldworkers inspected the surface by crawling on their knees shoulder by shoulder). In 14 experiments done in this way it was discovered that the crawling survey recovered from 170% to 1000%, or on average 350 %, more artefacts than the walking survey in 70 cm intervals, which was in itself already absurdly intensive if compared to more standard survey procedures done in 10–15 m intervals. These re-

11 This is a point also emphasised in the *Best Practices Prospectie* project (see f.n. 10).

12 Modified-Whittaker multiscale sampling plot (Fig. 5) has been developed for plant species surveys in landscape ecology and is devised in a way to enable data collection at spatial scales of 1, 10, 100 and 1000 m^2. Former plant species survey procedures, which were very similar to archaeological systematic surface surveys using transects, were not able to accurately represent rare plant species, while dominant plant species were being overrepresented, much like archaeological surveys overrepresent high density artefact distributions and fail to detect a large proportion of low density distributions and isolated materials. Comparative studies showed that Modified-Whittalker plot outperformed traditional plant sampling designs by documenting more plant species, capturing more rare and exotic species, and more accurately representing the relative abundances of species in the surveyed community, making it also a potentially powerful tool for archaeological survey investigations. Furthermore, Modified-Whittaker strategy allows a methodological control which enables the investigation of the influence different sizes of spatial units have on patterns and processes we are able to observe, as well as how survey intensity affects data gathering and spatial patterns. Furthermore the spatial arrangement of 1 m^2 frames in this strategy reduces the degree of avtocorrelation among samples, which can be substantial when transects are used (Burger et al. 2004: 411-413, 421; Burger and Todd 2006: 237-243, 251; Burger et al. 2008: 219-221; also see Stohlgren et al. 1995; 1997; 1998; Barnett and Stohlgren 2003).

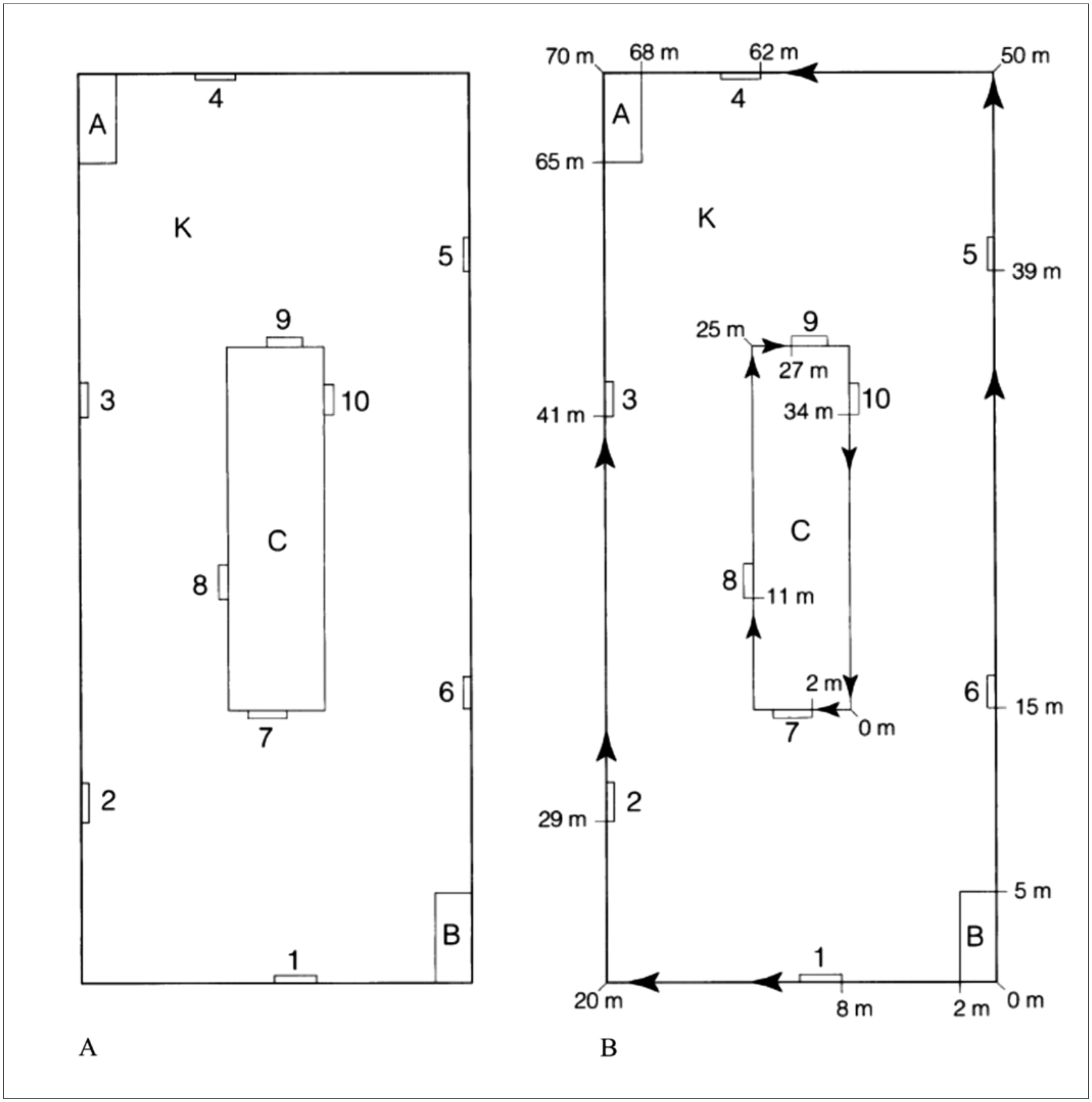


FIGURE 5. The Modified-Whittaker multi-scale sampling plot. (A) The layout of the 20 x 50 m plot. The numbered plots (1 to 10) are 0.5 x 2 m, the A and B plots are 2 x 5 m, and the C plot is 5 x 20 m. (B) Plot layout with guides for arranging subplots. The location of each subplot is indicated as a distance in meters from the anchor corner, marked by a 0 m in the lower right corners of the K plot and subplot C (Source: Burger et al. 2004: fig. 3).

sults have drastic implications about the recovery rate of such surveys and also prove the already mentioned point that without such additional property-based techniques or experiments incorporated into survey design the fraction of the sample acquired cannot be determined and interpretations of survey results based on quantitative analysis may be invalid. Furthermore, in these experiments, the results of both survey intensities were compared with test excavations of the upper 10 cm of the taphonomically active topsoil, results of which have worrying implications about the relationship of surface and subsurface archaeological record. The sample of the crawling survey was capable of predicting 72% of artefact variance in the topsoil, while the very intensive distributional survey was able to predict only 24%. This means that the surface visibility of the properties of the subsurface record or in other words the capability to predict its properties on the basis of surface distributions is very poor even at great intensities let alone when using standard intensity levels of 10–15 m intervals. But nonetheless, such surveys are usually expected to detect the presence and predict the properties of much more deeply buried subsurface record, which is obviously very problematic, especially in case of development projects (Burger et al. 2004: 414-420; Burger and Todd 2006: 242-243; Burger et al. 2008: 221).

As demonstrated in the case study above, the expectation that surface distributions can be used to predict the properties of subsurface archaeological record can be problematic or unrealistic. Similarly, the expectations that patterns observed in the surface record reflect past behaviour also seem unwarranted because surface distributions primarily reflect post-depositional formation

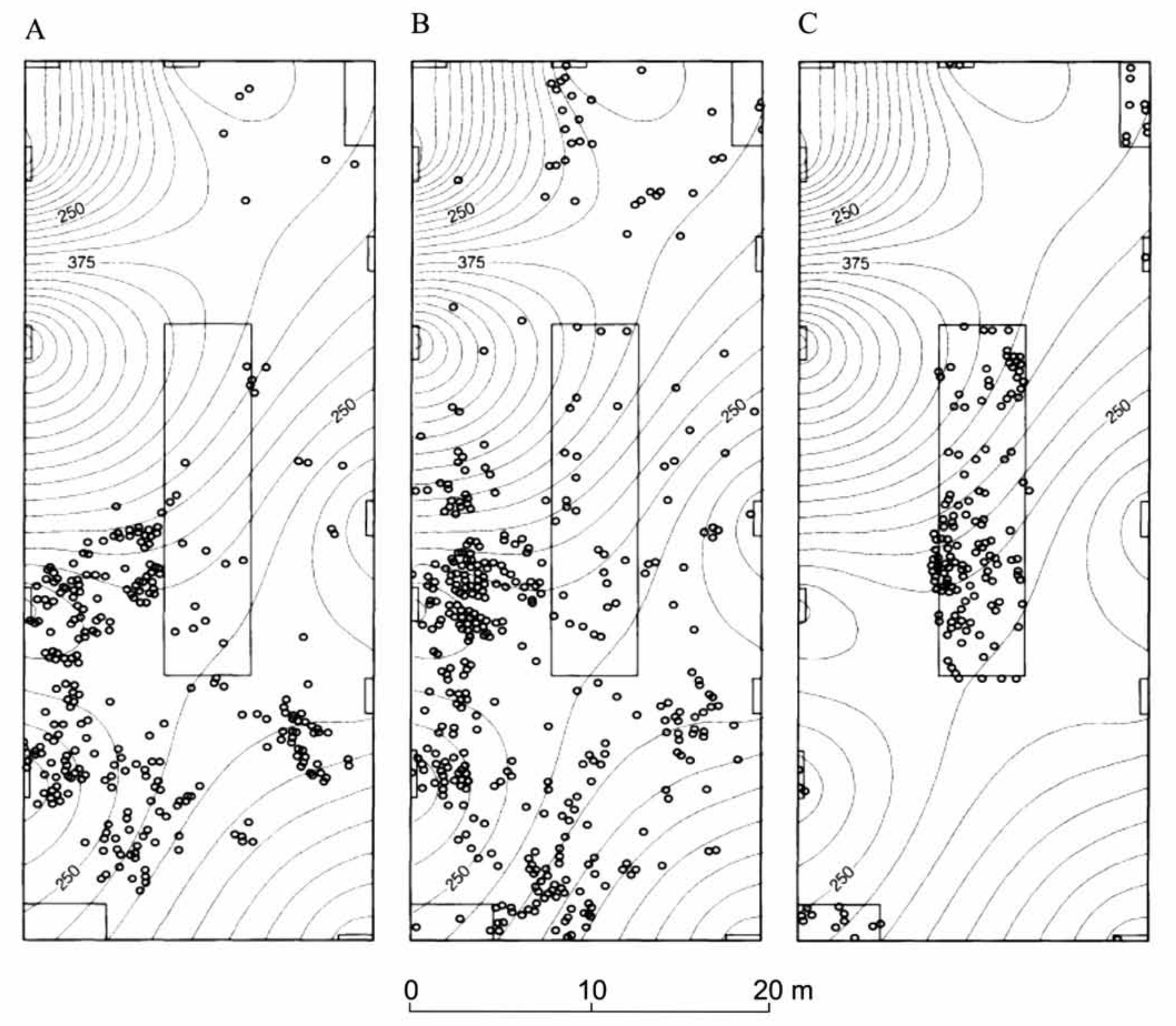


FIGURE 6. An example of how the surface record changes with observer intensity. Results of an experiment with Modified-Whittaker sampling strategy on plot NRT in the Oglala National Grassland. (A) Artifacts discovered by the discovery group during a systematic walking survey in 70 cm intervals. (B) Artifacts later discovered by the coding group, highlighting existing clusters rather than identifying new ones. (C) Crawl survey in the subplots delineated by smaller rectangles transformed the areas with relatively diffuse scatters into dense clusters. The contours are based on chipped stone recovered in the subsurface subplots 1 to 10 (see Fig. 4); the interval is 25 flakes (after Burger et al. 2004: 417, fig. 6).

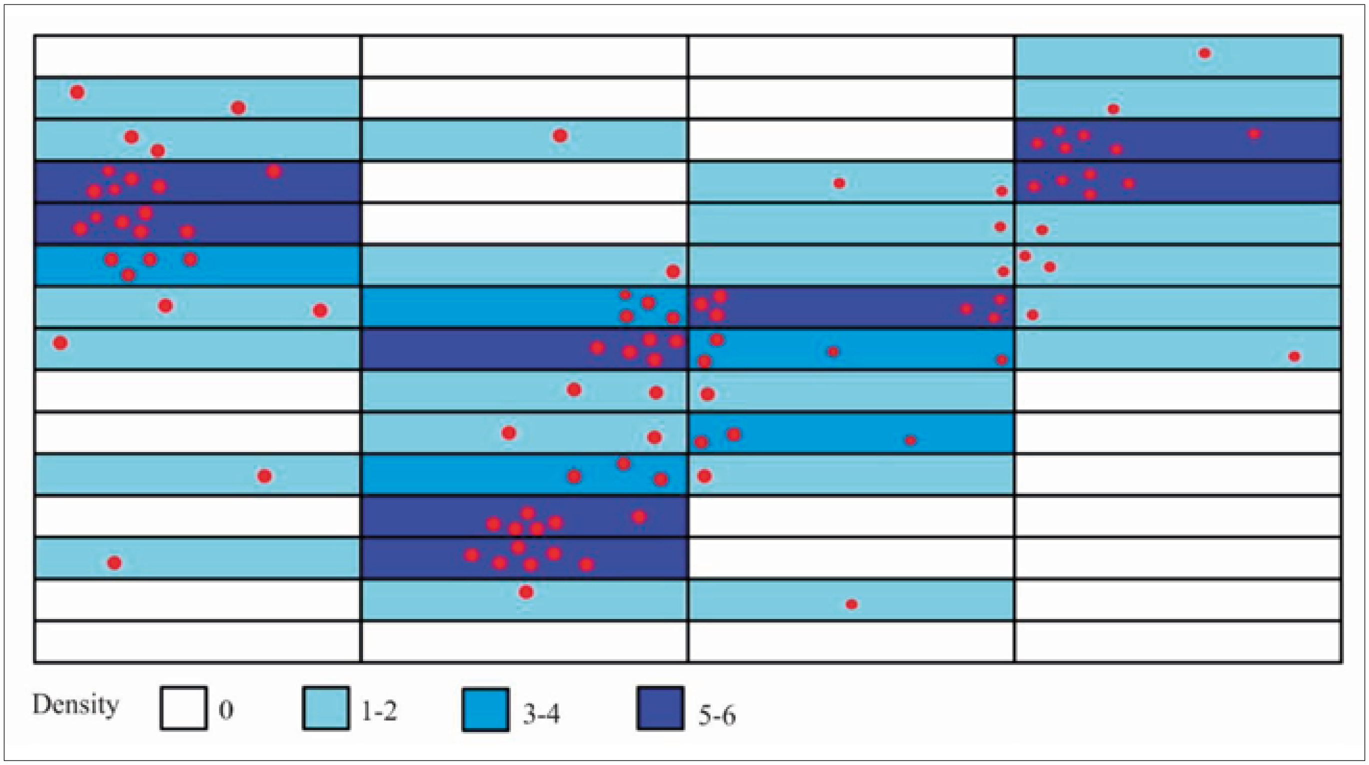


FIGURE 7. Example of a hypothetical smearing effect which occurs when using aggregate units, in this case, transects. Properties of the real distributional pattern and artefact clusters (red dots) are concealed in this aggregate unit density map.

processes or taphonomy of the landscape (see Burger et al. 2008: 203-211). But setting these interpretative problems aside an important methodological question is whether standard survey procedures even allow for documentation and recognition of realistic patterns in surface distributions? Because standard procedures use aggregate units smearing effect occurs, disguising spatial patterns and associations in the distributions we record (Fig. 7). Also by using aggregate units, which can be of different shapes and sizes, we are faced with the Modifiable Areal Unit Problem or MAUP, which is connected with the question to what degree our choice of areal units conditions the results of the analysis. This problem arises because we use arbitrary areal units for documenting a continuous space and thus obtain arbitrary spatial patterns (Harris 2006: 48). Data are ascribed to areal units, which are arbitrary and modifiable and have no natural meaning in the continuous space. However, if the units are arbitrary and modifiable than so are the results of the spatial analysis, which are heavily dependent on the shape and size of units used. Different ways of spatial data aggregation lead to an almost infinite number of possible spatial units, and patterns that result from this may vary widely and are thus an artefact of modifiable areal units and not of the archaeological phenomena themselves (Ibid.: 49). Modifiable areal units are the main cause of variability in spatial data interpretations because the choices of units and data aggregation process condition the patterns we may recognise. Different ways of data aggregation give different results but without any systematic trends. With the changing of areal units we arrive to different statistical results and generally the bigger the unit the greater the correlation between two variables. Thus, bigger areal units cause greater stability in the results and mask important spatial variations, which could be discerned if smaller units were used (Fig. 8) (Ibid.: 46, 49-50).

Incapability of discerning between spatial associations of data aggregated into units and real associations of unmodifiable individual data is endemic to all kinds if analyses based on spatial data aggregated into units. Thus, techniques of data collection which are not dependent on the frame and which allow joining and disjoining of data in different ways are called for (Harris 2006: 50-51). In the case of the surface survey, the only solution to this problem seems to be the use of point provenience instead of data aggregation. With the rapid development of GPS technology, it is now possible to do this in an efficient way and many survey archaeologists have recently called for the need of point provenience or artefact accurate survey (see Wessel and Wohlfarth 2008: 15-18, 42-43; García-Sánches 2013; García-Sánches and Cineros 2013: 297-299; García-Sánches and Ezquerro 2014; Trachet et al. 2017; de Neef et al. 2017: 285, 296; Gruškovnjak 2017b), which allows for recognition of real distributional patterns and spatial associations. However, such high resolution surveys may bring forth the problem of surface coverage because more work hours are needed to accomplish it, and despite the high data resolution and their representativeness within a small area, such an area may be too small to be representative and useful from the regional point of view (e.g. Bintliff 2000: 205; Fentress 2000: 44, 50-51). By lowering the intensity of the survey, the speed of discovering new data is increased, but their resolution is decreased (Burger and Todd 2006: 247-248, fig. 15-5). This is caused by the interaction of two main aspects of visibility, determined by survey strategy or two reasons why different survey strategies do not discover cultural material: (1) sacrifice of space or coverage – smaller the coverage less material will be discovered; (2) sacrifice of intensity – lower the intensity, less material will be discovered. This is an insurmountable problem because both sacrifices are inevitable and unacceptable at the same time. Regarding this, the difficult question is: "What is a better way not to discover artefacts, by not looking in enough places or by not looking closely enough?" The need for archaeological resource management and protection on the regional level, the fact that archaeologists will never know where all cultural material in the landscape is located as well as restrictions of time and resources probably call for continued use of conventional survey procedures. However, at least one phase of survey design should include control experimental surveys at different scales and intensities, which would then allow a quantitative understanding of these methodological sacrifices and a better understanding of the regional surface record (Burger et al. 2004: 420). As an ideal frame for such property-based investigations, the already mentioned Modified-Whittaker sampling strategy (Fig. 5) has been proposed, while other options are also worth exploring[13].

13 Another strategy for property-based investigation that could also be borrowed from landscape ecology surveys, is the North Carolina Vegetation Survey (NCVS) nested plot (Peet et al. 1998). At least one comparative study (Goslee 2006) shows that it performs just as well as the Modified-Whittaker plot, but in comparison, it might be easier to set up and modify according to field circumstances. Jet another option for property-based investigations could be the use of point-sampling (Van de Velde 2001), combined with a standard survey procedure using transects or quadrats. With point sampling areas of around 2 square meters spaced in regular intervals are thoroughly cleaned and inspected which insures the discovery and collection of all artefacts present on the surface and enables comparisons with the results of standard procedure. This possibility for using point-sampling has been proposed by Jitte Wagner at the *Finds in the Landscape. New Perspectives and Results from Archaeological Surveys. / Funde in der Landschaft. Neue Perspektiven und Ergebnisse archäologischer Prospektion* international conference, held on June 12th–13th at the Fritz Thyssen Stiftung in Cologne, Germany. There he presented point sampling as a subsampling technique performed in 10 m intervals as it was used in the case of Tappino Valley Survey (2013–2017), results of which have not jet been published (see Gruškovnjak 2017b; also see the comment on point sampling technique by Burger et al. 2004: 420-421)

4th level determining visibility: surface and other environmental conditions during the survey

The fourth level that determines visibility is connected with surface conditions, accessibility and other environmental conditions during the time of the survey. Some surfaces are not accessible due to strong vegetation, difficult terrain, buildings or due to owners who prevent access and such areas cannot be surveyed. Because of such factors, total coverage of survey area is almost never possible and consequently, we are always dealing with surface samples or incomplete distributions (Schiffer et al. 1978: 8-10; Terrenato 1996: 223-224). The effectiveness of the survey is affected by different environmental conditions such as lighting conditions, weather conditions, flora and fauna etc. (e.g. Chapman 1989: 57; Barker 1996: 167). Among generally measured aspects of surface visibility is the assessment of surface exposure in relation to groundcover, usually measured with 1 to 10, 10 being 100% of the surface is exposed (see Bintliff 1985: 210; Gallant 1986: 406; Cherry et al. 1991: 27–28; Gaffney et al. 1991: 61; Terrenato 1996: 223; Terrenato 2000: 60, 66). However, a variety of other factors also

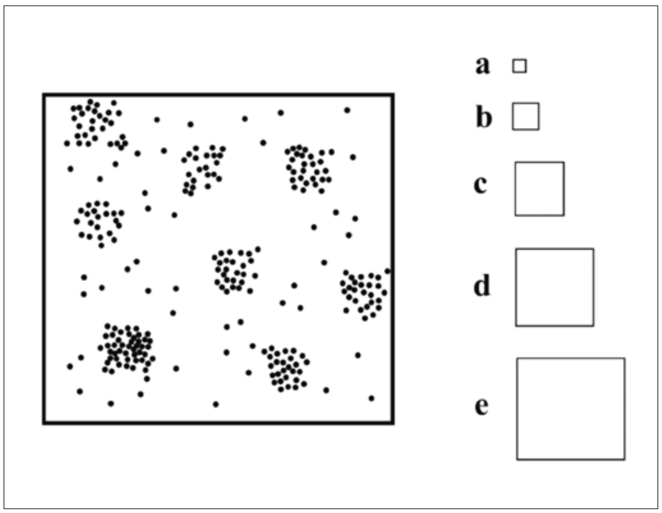


FIGURE 8. Example of a hypothetical distribution pattern showing the differences that can result from using different sample unit sizes. Sampling with smaller quadrats (a and b) would suggest slight clustering, with intermediate quadrats (c) strong clustering, and with large quadrats (d and e) regularity (Source: Plog 1976: fig. 5.3).

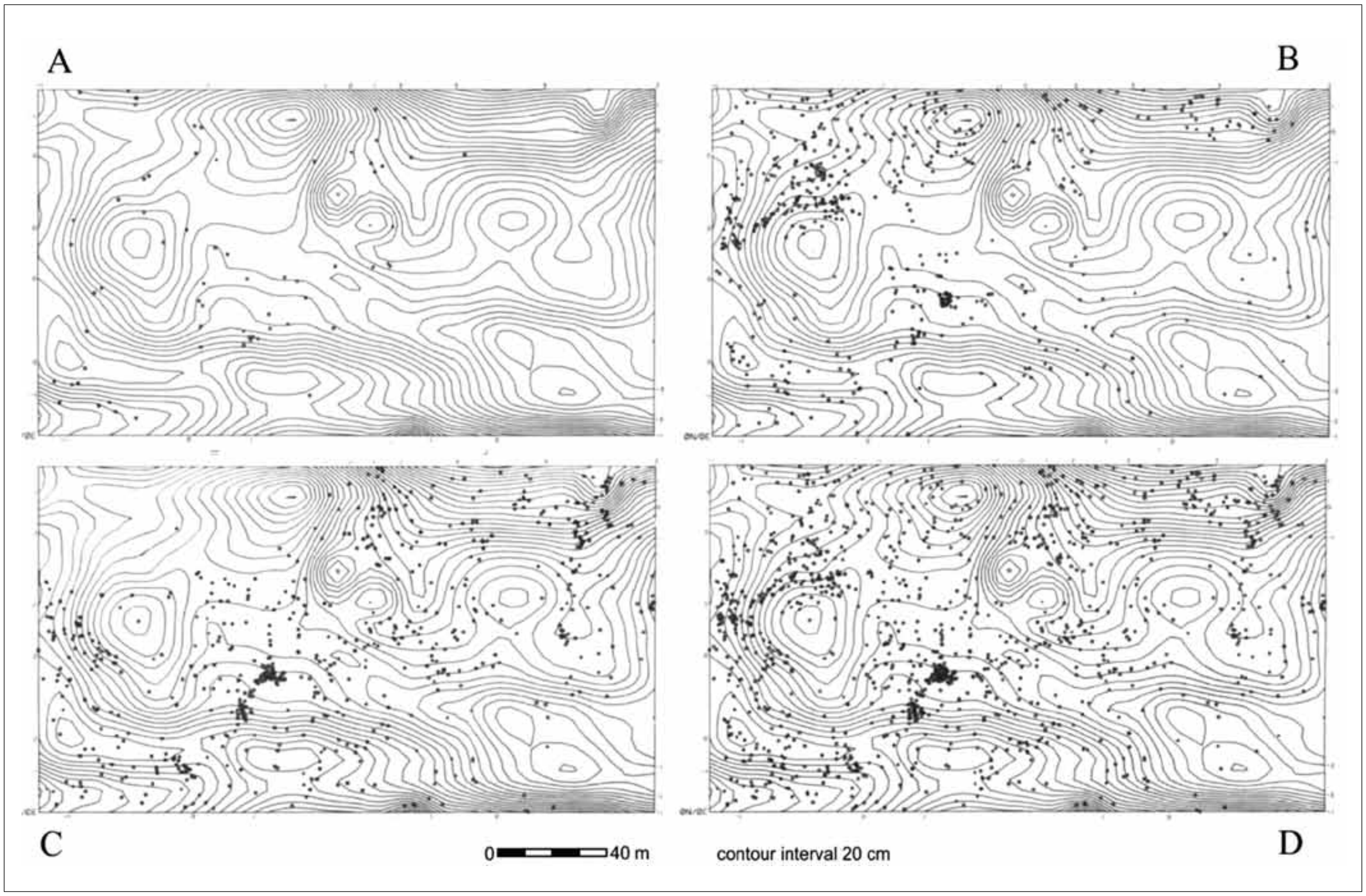


FIGURE 9. Comparison of consecutive collection phases (a) on an unmodified surface, (b) on a ploughed surface, (c) on a disked surface and (d) a representation of joined results of all three phases of the surface collection. Each of collection phases was done after rain (Source: Jermann 1981: Fig. 3.5-8).

affect visibility which is why simple correction formulae (see Bankoff and Winter 1982: 152; Bintliff 1985: 210; Bintliff 2000: 204; Bankoff et al. 1989: 65, tab. 1; Gaffney et al. 1991: 64; Terrenato 2000: 66-69) cannot rectify all the biases that differential visibility conditions incorporate into survey results (see e.g. Banning et al. 2006: 739-740). These other factors for example include phase in the cultivation cycle and plant rotation, type of soil, colour and composition of the soil matrix, type of vegetation, relief, type of surface treatment (ploughing, disking), rain before survey etc. (see Hirth 1978: 126, 130; Jermann 1981: 79-82, 88; Gallant 1986: 406; Bankoff et al. 1989: 65, 69, tab. 1; Barton et al. 2002: 164; Banning et al. 2017: 473). The main problem in the assessment of visibility, however, is that it is very hard or impossible to formalize and realistically quantify the effects of the interaction of all such factors on surface visibility. Furthermore, gathering data on these factors is usually done by using aggregate units, and consequently subjected to the Modifiable Aerial Unit Problem (see above).

An example of the effects of surface treatment (ploughing and disking) as well as differences in soil types and micro-relief, is provided by a survey performed on a site 45-SA-17b in SW Washington, U.S.A., presented by V. Jermann (1981). There one is able to see a comparison between three consecutive phases of surface survey, first on an unmodified surface, then on a ploughed surface and last on a disked surface (Fig. 9). The differences in recovery rate between these phases were drastic: unmodified surface yielded 80 artefacts, ploughed surface yielded 600 artefacts, and disked surface yielded 750 artefacts. In addition, each consecutive phase recovered more artefacts of smaller sizes and lower weights than the previous phase. Because of the effects that ploughing and disking have on surface visibility, it has been suggested on several occasions that every surface should be prepared by ploughing and disking before the survey, though this is only acceptable in case of already cultivated or otherwise disturbed surfaces. Besides the differences in the number, size and weight of artefacts, there were also differences in spatial distributions between the three collection phases on the undulating surface of the surveyed field. Artefacts recovered in the first phase were generally confined to the central and lower slopes of major hillocks, which also correspond to parts of the survey area exhibiting sandier soils. This spatial pattern is probably connected with the effects of long-term exposure and eolian action on these dune-like hillocks, while in the parts exhibiting more silty or clayey soils the precipitation caused "puddling" which subsequently obscured the surface, and colluvial sediments accumulating between hillocks buried any artefactual remains. The difference between sandy and silty soils was particularly evident in the post-ploughing and post-disking collections. The northeast portion of the area is characterised by much sandier soils, and post-ploughing recovery rates were considerably higher in these sandier soils. Silty soils require much more intensive mechanical preparation to render optimal exposures as evident in the post-disking collection, which yielded a much higher number of artefacts on siltier surfaces than previous phases (Ibid.: 73-79, 83-88).

5th level determining visibility: the human factor

The fifth level determining visibility is the human factor or fieldworkers themselves for in the end it depends on them what will actually be noticed and collected in the field. Survey is done with "sentient instruments" capable of learning, boredom, exhaustion and so on, so the accuracy of measurements or effectiveness of recovery may vary according to their experiences, skills, motivation, interest, talent, visual focus, mood, health, fitness etc. (e.g. Schiffer et al. 1978: 14; Wandsnider and Camilli 1992: 185; Barker 1996: 167; Banning 2002: 65; Hawkins et al. 2003: 1504; Banning et al. 2017: 472, 484).

One of the greatest problems concerning human factor here is that in the presence of a mixture of different types and/or colours of artefacts our attention and visual perception becomes unequally distributed and biased towards and/or against some of the types and/or colours of artefacts (Banning et al. 2011: 3454). The most problematic, even in the case of experienced workers, is the visual focus on ceramic artefacts, while recovery of stone artefacts is extremely low. To ensure the discovery of stone artefacts besides the ordinary field team a specialist for stone artefacts would be needed to inspect the surface only for this type of finds. In Boeotia Survey, for example, experimentations with a lithic specialist collecting only stone artefacts resulted in 1 tool per hectare discovered by the specialists, while the average for the rest of the fieldwalking team was zero (Bintliff 2000: 207).

Other ways to control and evaluate inter-observer bias have also been proposed. Control seeding experiments and resurveys, especially with property-based investigations, mentioned above in the context of second and third levels determining visibility, are already two procedures which can prove invaluable in evaluating inter-observer biases (see Banning 2002: 214; Hawkins et al. 2003: 1504; Banning et al. 2017: 474-476). Also, some basic steps which allow for the evaluation of inter-observer bias must be followed in any survey design. An essential first step is to track the work of different collectors by recording specific units they survey. If fieldworkers follow a consistent pattern of examining alternating transects, the evaluation of inter-observer biases is more effective, because the principle of autocorrelation can be used to advantage during the analysis. Evaluation is also made easier when transects are spaced at close intervals. It is also important for crews to mix fieldworkers of different experience and skill levels. In addition, crews and fieldworkers should be allocated in such a way to enable easy distinguishing of their respective abilities from spatial variation. For example, allocating each crew and/or fieldworker to equal numbers of survey units in each stratum of the survey area stratified according to different visibility conditions (according to 1st, 4th and possibly 2nd level) simplifies evaluation. Monitoring and documenting health, mood etc. of crew members can also prove valuable when comparing results of different survey areas. Training the crew members is obviously also essential. All fieldworkers should be familiar with the kinds of materials, site characteristics, subsurface feature characteristics, visibility conditions etc. that might be expected in the survey area, as well as trained to scan the surface in the same and consistent way. Motivating crew members is also an important factor as most highly motivated people will report most material. Motivation could possibly be stimulated by increasing continuity between fieldwork and analysis as well as involving staff in the publication of results (Banning 2002: 66; Hawkins et al. 2003: 1506, 1507-1508, 1510-1511).

Determining detection functions of each surveyor has also been proposed by Hawkins et al. (2003) and Banning et al. (2006; 2011; 2017) as a way to allow for the analysis of inter-observer biases in survey results. This is done by testing surveyors' abilities to detect different types of artefacts under different controlled but realistic field conditions, in both cases such as are anticipated in the specific survey area (Fig. 10). For this purposes, 20 m wide and 100 m long experimental plots are set up on calibration fields characterized by environmental conditions present in the survey area. The plots are overlain with a 2 m grid and longitudinally divided into two halves with a clearly visible rope. A known number of artefacts, simulating characteristics of archaeological materials anticipated in the survey area, is seeded throughout the plot in such a way that each long column in the grid would have the same number of artefacts of each type in a randomized position along the column. Crew members are then asked to walk along the central line without leaving it and record the positions of the finds they spot on a sheet with a corresponding grid. Such an experimental design might seem similar to the already mentioned control seeding experiments incorporated into survey design, however, in this instance, the experiment is performed differently and not as part of the field collection and also serves somewhat different purposes. It enables the determination of detection functions for each crew member in relation to different characteristics of artefacts and environmental conditions. Simply put, it shows to what distance laterally from the transect line crew members are able to spot a satisfying fraction of different types of artefacts in different field conditions. Such data can be invaluable when deciding on survey design, specifically optimal transect intervals which will ensure the same level of detectability in different visibility conditions of the stratified survey area. Furthermore, through the use of exhaustion maps[14] in the analysis of survey results this data will allow for a realistic evaluation of inter-observer biases in the recorded artefact types and densities, which might otherwise be severely limited or impossible. Thus, with the use of such experiments one is able to adjust the survey strategy (intensity or sweep width) and evaluate inter-observer biases according to capabilities of any specific field crew in any specific survey area. Preferably such experiments would be performed repeatedly over the course of a survey project in order to control for maturation and history and produce "average" results (Hawkins et al. 2003: 1509; Banning et al. 2006: 728-730, 737-741; Banning et al. 2011; Banning et al. 2017: 478-481).

14 Exhaustion maps of surveyed areas allow us to determine whether density variations in the distribution maps might be due to thoroughness of survey rather than real variations in the evidence present in the field. On such a map, each survey unit or collection unit shows the average detection rate of the crew members who worked there as an estimate of unit's exhaustion or thoroughness of survey. Units with high detection rate have a lower probability of overlooked evidence, while units with low detection rate have a higher probability of overlooked evidence and might be far from exhausted. Plotting artefact or site distributions on exhaustion maps shows how much the distributions may depend on the degree of exhaustion. It can also provide direction for decision making about which areas need to be rechecked in the subsequent phases of the survey or in future survey projects (Hawkins et al. 2003: 1509, fig. 6; Banning et al. 2017: 482-483, fig. 6; also see Banning 2002: 220-223).

Conclusions

All the levels determining the visibility of archaeological record on the surface are in complex interactions and it is very hard to formalize their effects and realistically account for them let alone correct all the biases they incorporate into survey results. Nonetheless, we should strive towards accounting for them as precisely as possible by incorporating additional methodological procedures into survey designs. These should include initial geomorphological and pedological mapping followed by stratification of the survey area according to properties of the 1st, 4th and possibly 2nd level determining visibility and modifying the survey design according to these properties and experimentally determined crew member detection functions. Very precise descriptions of the soil matrix, micro-topography and other environmental variables need to be documented during fieldwork. Also, phases with control seeding experiments and/or property-based investigations incorporated into survey design may be the only way to allow for a realistic evaluation of precision, reliability and accuracy of survey results. And as the surface survey is an inherently biased discovery method multiple survey methods detecting different types of constituents of archaeological record are called for.

We should also realize what it is we are primarily discovering with the surface survey. The surface survey is not a discovery method, which would show the presence or absence of archaeological resources in the survey area. Instead, this method is geared towards discovering only disturbed and exposed archaeological record. From this point of view, this method primarily allows us to study post-depositional disturbance processes in the landscape or landscape taphonomy (see Burger et al. 2008) and its effects on the archaeological record. Thus, the surface survey can never be expected to reveal a complete distribution of archaeological remains still preserved in the landscape, let alone a complete distribution that once existed in that landscape.

In addition, we should be aware of the difference between the totality of archaeological record and the archaeological record as it is realised through our investigation methods during which loss of information or imperfect realisation of the archaeological record is inevitable. This is because the accuracy, reliability and precision of our methods are conditioned by a multitude of factors, archaeological record itself being only one of them.

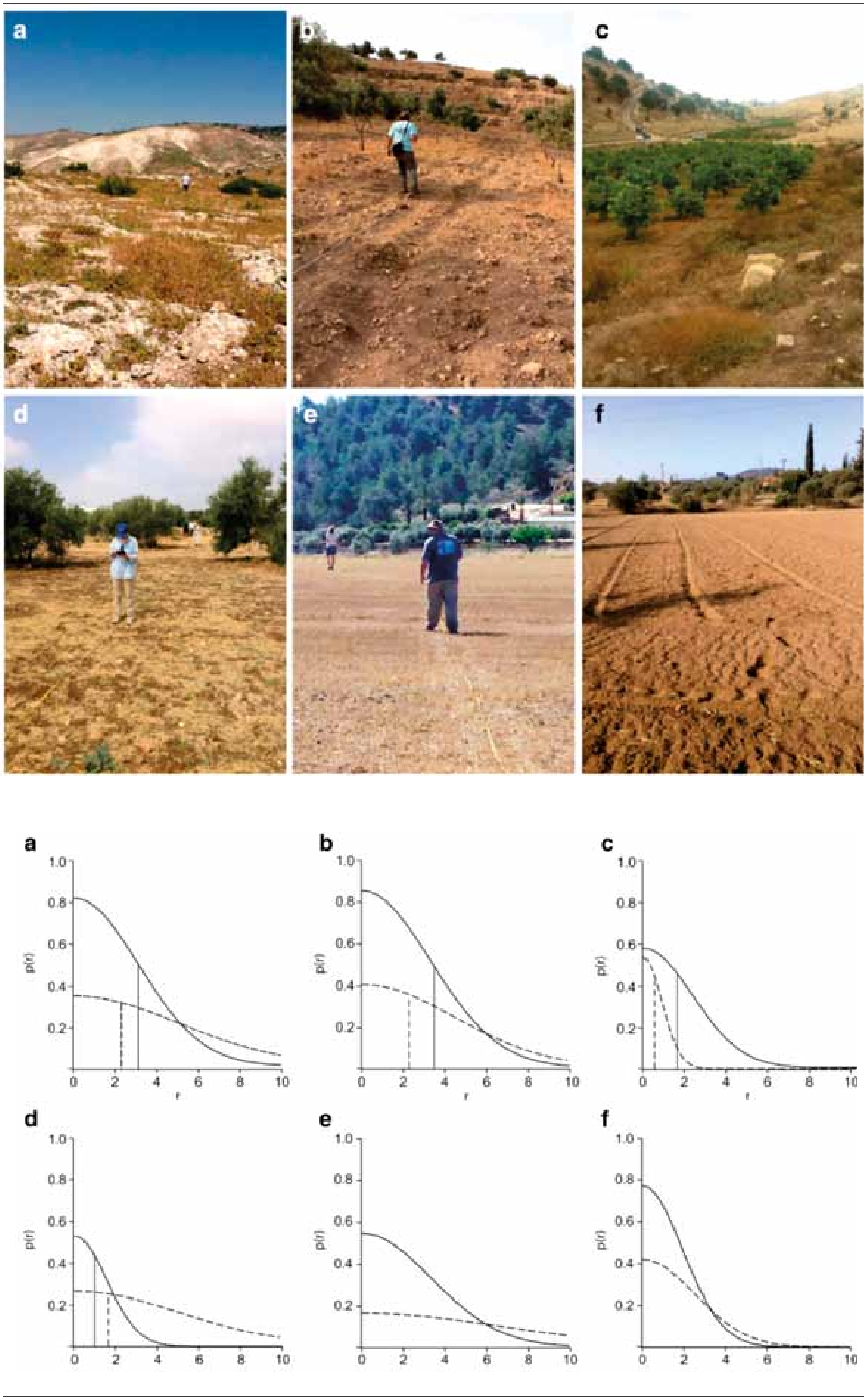


FIGURE 10. An example of assessing crew detection functions on calibration fields in Jordan and Cyprus. In the upper part are views of the plots:
a) pasture,
b) olive grove,
c) guava orchard,
d) mixed field, all in Jordan,
e) stubble field, and
f) ploughed a field in Cyprus.
Below are detection functions for all lithics (solid curve) and all pottery (dashed curve) along with half the corresponding sweep widths (vertical lines) at the corresponding calibration sites. p(r) is detection probability at range r and r is a range in meters (Source: Banning et al. 2017: fig. 3-4).

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Archaeological Record in Karst Landscape: The Travels of Materialities

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The paper explores the materiality of the landscape in a very specific Dinaric karst setting. A karst environment is specific in the sense that it is characterized by materialities and relational properties rather different than other geomorphological contexts. The materiality of karst and what it implies is often overlooked in archaeology. Hence, the constitution of the archaeological record in karst is treated as a disembodied set of highly generalized and reductive processes.

The most prominent feature of karst as an archaeological environment is the lack of a sub – surface context and almost complete dominance of surface structures. Surface structures enable direct interaction with past landscapes which thus always already participate in the constitution of landscape as synchronous elements in a taphonomic process. Thus, the emergence of the karst landscape involves properties of various materialities which constantly interact with each other only to produce new contexts for new dynamics.

The interwoven properties of various materialities include both human and non–human actors and actants. The elements in the taphonomic processes were identified and studied as to how various materialities interact through their properties to constitute new assemblages. The case studies selected to demonstrate these issues are considerably different in terms of materialities they entail.

Introduction

Dinaric karst is an emblematic form of the landscape for a larger part of Croatia and southeastern Europe. The distinctiveness of karst as an environment is reflected in the specificity of archaeological remains and in the practice of conducting archaeological research. Although the tradition of archaeological research in Croatia is long (especially in coastal areas) the archaeological remains were not discussed in relation to their specificities and idiosyncrasies. The topography of archaeological sites presented a satisfactory level of data acquisition and analysis within the context of the dominant culture–historical paradigm. The perspective introduced by the landscape archaeology demands a more holistic approach to archaeological remains which would consider the landscape transformations in the context of the immediate materiality of this particular archaeological environment – the karst. Issues discussed in this paper are the result of a field survey conducted since 2016 on southeastern Velebit and karst plain – typical Dinaric karst areas. The research may have begun as a field survey project with proclaimed aims and expected results appropriate for such an endeavor. However, during the course of actually conducting the survey, it became obvious that the survey is, in fact, a context for reflection on and reconceptualization of standard archaeological operative concepts. The focus of the paper is primarily the ‘’nature’’ of the archaeological record in a karst landscape defined as an archaeological environment. Karst areas are particularly appropriate to demonstrate that the constitution of the archaeological record is contingent upon the material properties of a particular environment and not universal laws external to the dynamics in a particular landscape.

Karst as an Archaeological Environment

The creation of archaeological knowledge in Croatia has a long–standing tradition indeed. Traditional, culture–historical paradigm was instrumental in creating that knowledge. The practice of this discursive formation is reflected in the detailed knowledge on sites topography and characteristic forms of material culture. These forms of knowledge are self–sufficient since this type of information is simultaneously data and an end result of scholarly enquiry culminating in the definition of archaeological cultures (Kulenović 2013). Issues such as the modes of visibility and preservation of sites, their spatial distribution, the representativeness of data etc. are simply beyond the horizon of what counts as knowledge in archaeology in Croatia. Karst areas are not an exception here and the same reduction of vast complexities to mere essentialized identities was and still is the current state of affairs in archaeological scholarship in Croatia.

Neothermal Dalmatia Project (NDP) (Chapman et al. 1996) offered a significant change of perspective. The project was, until recently, mostly ignored in Croatian archaeology. Nevertheless, it constitutes an important shift in archaeological reasoning and an important departure point for further research in this area. The NDP provided one of the first glimpses of processual thought in Croatian archaeology. Rather than an emanation of essentialized, bounded entities, the material culture is constituted as an indicator of social complexity levels as well as a basis for analyzing relations between land use and settlement patterns. The foundation of this research was a sampled field survey. Consequently, the research area was categorized and analyzed according to multiple criteria. The karst areas i.e. the area of limestone ridges of Ravni Kotari in Zadar hinterland was designated as the ''*zone of preservation*''. The features were preserved in this zone because their material characteristics rendered them unaffected by all forms of cultivation (Chapman et al. 1987: 136). Accordingly, the research area discussed in this paper fits the profile of a ''*zone of preservation*'' category although the geological characteristics of the respective areas are somewhat different.

The categories ''*zone of preservation/destruction*'' are defined in relation to the kind and the intensity of agriculture as the most prominent transformation factor in plough zone areas (Taylor 1971, cited in Chapman et al. 1987: 136). These categories are rather inappropriate for the research area and karst in general because the long–term subsistence strategies throughout history in these areas were pastoralism/nomadic pastoralism. The fact of the matter is that cultivation, as a primary transformation factor is practically non–existent in karst areas. Such activities are concentrated exclusively on smaller areas of dolines and poljes. Therefore, it appears ill–advised to characterize areas according to transformation factors which are not operating in that particular area. Having this in mind, the initial categorization of types of archaeological remains, according to the modes of visibility and preservation, was first carried out within the NDP. Three categories of archaeological sites were defined: *monuments or standing monuments*, *findspots* and *single finds* (Chapman et al. 1987; 1996). The designation of archaeological record in karst as the monument is reminiscent of the oldest notions of archaeological sites as ''*discrete and obvious*'' (*monument model*, Banning 2002: 13) and we might add isolated, singular and romanticized. We may also note that the suggested categories are not defined using a common criterion. The monuments are as real as possible while findspots and single finds reflect some other reality than their own. The notion of a monument does not appear to meet the standards of what constitutes an analytical concept, at least not according to standards espoused in archaeology from the days of processual archaeology onwards. Rather, it is a purely designative concept where it is assumed that mere naming or typological categorization fully exhausts the purpose of scholarship. The designation of archaeological remains as monuments renders the landscape under study ahistorical and static in nature and reduces it to a ''*timeless Mediterranean landscape*'' (Barker 2005: 47, Fig. 3.1). To be fair, the term monument may have a ''practical'' etymology since a large number of sites in karst, a vast majority even, is visible as or predominantly as surface features. Nevertheless, the implication of such categorization (Chapman et al. 1987; 1996) is that practically all archaeological sites in karst fall under the rubric of a monument which is hardly a discerning classification. The classification was probably informed by the situation in temperate areas since the preservation of sites in the ''*monument form*'' is an exception in such areas rather than the rule. Furthermore, karst is an archaeological environment all of its own and what appear to be the rules may not apply, generalized as they are on the basis of other areas. Therefore, rather than viewing karst as a backdrop to monuments which happen to populate the area, it appears that we would do better to view karst with the full appreciation of its individuality and particularity.

The preservation and the mode of visibility of sites in karst areas is primarily contingent upon the very materiality of such landscapes. Simply put, this refers to the way of life in the landscape, the use of landscape and natural and geological processes which form the landscape as a network of mutually interacting processes. For starters, we must unequivocally declare that the karst landscape is ''built'' from limestone. Archaeological record in such an environment is commonly not expressed in the form of relations between surface and sub–surface record and represented by finds, as may be the case in the majority of areas where the practices of field survey were developed. The basic constitutive element of a karst landscape is limestone rock rather than any form of soil. Therefore, it appears pointless to define karst in negative terms, as a landscape lacking a certain quality simply because the default for all things survey was defined in areas with different characteristics. To bring the point home, the *differentia specifica* of karst landscapes is extremely low soil coverage. Areas which contain soil in karst landscapes are places of extremely concentrated activities and they present an exception rather than the rule. Therefore, the soil is comparatively inconsequential for material relations in the karst landscape and archaeology.

The basic forms of practices in karst are adding and subtracting or removing the stone. A crucial practice in karst landscape is a clearance of arable portions of land and as a direct result of this practice boundary walls and various clearance features are being built. Limestone rock is the very fabric of karst and as such the structures built of stone are very durable. Past practices are materialized in stone. Therefore, the materiality of the landscape has an active role in the preservation and destruction of archaeological features. As such, archaeological features in karst are preserved and visible mostly as surface structures made of stone. Consequently, past material practices have become a permanent presence in landscape topography and its surface.

Since archaeological features in karst are preserved and visible mostly as surface structures, the researchers are always in direct contact with them. Therefore, the archaeological record is detected and documented in its immediate materiality. The contact or interaction between the researcher and the researched is not mediated through the relationship of subsurface and surface context. The problematics of field surveying in karst, as well as methodological, epistemological and ontological implications of such research, require a distinct elaboration and formulation. These features, characteristics and the implications of the archaeological record in karst have further enabled the rethinking of the common notions such as the nature of the archaeological record, the constitution of the landscape and research in general.

On the Archaeological Record

The practice of archaeology was constituted by various concepts which simultaneously determined different research methods. Several crucial notions were instrumental in constituting the modern archaeological reasoning. Perhaps the most important departure point was the introduction of systems theory in archaeology. This repositioned the scale of archaeological research from a single site to regional level and enabled the development of landscape archaeology as a separate discipline with a distinctive categorical apparatus (Novaković 2003: 135-138), which still figures as a dominant paradigm in the practice of archaeological survey today.

Notions such as Binford's definition of archaeological record as the static reflection of dynamic system and the assumption that the spatial distribution of archaeological finds reflects activities in the past (Binford 1981: 197-199; 1983: 19; followed up by Schiffer 1972; 1975) have expanded the perspectives of the archaeological research and generated new discussions and development of new disciplines in archaeology. Operative concepts in landscape archaeology are directly contingent upon these initial assumptions. The site formation process is perhaps the most important among them. The significance of this concept for field survey methodology in particular, cannot be overstated. Schiffer (1972; 1975; 1983; 1996) based the concept of formation process on the differentiation between and the constitution of a systemic (dynamic) and archaeological (static) context. These contexts are affected by transformation processes, namely, non–cultural and cultural transforms (*Ibidem*).

The archaeological context understood as static is at the very core of archaeology and embodied in the practice of archaeology through research strategies and methods. The positioning of the archeological context in the realm of the static, as opposed to systemic or dynamic, constitutes the binary opposition based on the Cartesian worldview of dichotomies between subject – object, mind and body. The archaeological context is positioned in the realm of the body, the object, the material, the passive. By positioning the archaeological record in the realm of the object, it is constituted as an entity or a set of entities functioning according to logical rules, mechanisms and laws. Such a nomothetic approach suggests that it is not only possible but necessary to define and apply the appropriate methodological procedures in order to discover and define the underlying processes in the constitution of the archaeological record. (Thomas 2001: 165-167; 2004: 55-77).

The Cartesian logic is followed by further fragmentation into independent, separate and opposed categories of cultural and non–cultural formulated as constitutive formation mechanisms. These mechanisms are formulated as cultural and non–cultural formation and transformation processes. The cultural transformation process is defined as the process of deposition or creation, whereas the non–cultural as the process of post–depositional modification and destruction. The essentialization of the archaeological record is embodied in the depositional mode which stands in opposition with the post–depositional process of external forces of non–cultural transformations. Constituted as an object, the archaeological record is always already reconstituted as an object by the application of the methods based on law–like principles of assumed regularities. The examples of such reasoning include the discussion of identifying the transformation processes which created the surface finds distribution patterns as well as their relationship with the subsurface patterns, the reconstruction of their relationship, the methodology of data collection, sampling strategies etc.

The conceptualization of archaeological record as a string of mechanistic processes is rooted in a system of values embodied in a desire for boundedness, originality and preservation.[1] Defining and identifying the transformation processes is predicated upon the belief and desire for the existence of a ''golden age'' of originality, a state we must strive to recapture and, in a sense, turn the proverbial clock around.

The dual ontology represents the very essence of the Cartesian perspective and is reflected in the representational mode (Thrift 1996). The representational mode[2] is based on the notion of separateness and it is manifested in the projections of the subject on the categories of object. Cartesian dual ontology can be substituted for a relational ontology defined within the Actor Network Theory (Latour 1993) and further elaborated within the notion of hybridity (Whatmore 1999). The concept of hybridity is particularly relevant for the approach proposed in this paper. The implications of such an approach would be that archaeological record is a material process, irreducible to any one nod in that process. Therefore, a consecutive succession of transforming events eroding the original to oblivion should be substituted for a more nuanced approach where various affordances of material actors and actants affect a constant flow of materialities in an on–going process of change (*Ibidem*).

Therefore, rather than a set of superimposed cultural and non–cultural mechanical processes which are at work on the static archaeological record, as suggested by the Cartesian perspective, the constitution of the archaeological record is a process involving the very material properties of actors and actants in a relational field. Various actors and actants are mutually constitutive through continuous material engagement of their capacities, a state Sarah Whatmore defined and elaborated as hybridity (Whatmore 1999). The concept of a hybrid is not only characterized by relational modality but also by a post–humanistic perspective of the decentralized subject and agency. Relational ontology is based on the active relationship of human and non–human or agents and actants. The affordances of actors are their agencies and agency, on the other hand, is their interconnecting link. The interaction of actor properties, rather than their fixed material characteristics, constitutes the hybrid capacity. Agency is thus posited as decentralized because everyone and everything has it. Hybrid is never static but is always in the state of becoming through interactions of actor's agencies (*Ibidem*). Naturally, the concept of hybridity is not some sort of a replacement for mechanical processes but rather a radical reconceptualization of the archaeological record. The Cartesian dual ontology posits the archaeological record as static, cultural or *naturalistic* (in a sense Lucas used the term, 2001: 151-152). The concept of hybridity (Whatmore 1999) suggests that all actors and actants involved in a relational field act through their capacities or material affordances. This constant flow of mutually constituting affordances and affects is what constitutes the archaeological record. Everything is always already moving, changing and on their way to become something different. The ideas of originality and preservation are simply redundant because there never was the original record (systemic or otherwise) to begin with: only a constant flow of various materialities affecting each other to produce new conditions for new flows in an ever ongoing non–directional process.

Archaeological Record in Karst

This section will present examples of archaeological sites in karst which were discovered and documented during field survey: a path and deposits on structures generated thorough field clearance activities. Each of these examples represents common features in karst: paths are, by far, the most common archaeological feature and clearance activities are one of the most common practices in

1 The underlying assumptions are demonstrated in the epic Pompeii premise discussion (Binford 1981; Schiffer 1985).

2 Lucas (2001: 149) describes Binford's concepts of static and dynamic as a representational model.

FIGURE 1. The path on slopes of Zrmanja canyon (photo: author).

karst agriculture. Furthermore, the examples presented here illustrate the dynamic interaction of cultural and non–cultural, human and non–human.

The path described in the following section is a vivid example of various materialities at work in a karst environment (Fig. 1.). The feature interpreted as a path is placed on the slopes of the Zrmanja canyon (Fig. 2.). The structure is formed as a negative by clearing and extracting the limestone bedrock, thus creating a flat and uneven linear surface 2.5 m wide. The environment at this particular place is characterized by exposed rock surface, complete lack of soil and well–developed karst surface features such as deep grikes. The vegetation cover is extremely scanty and almost completely limited to the structure. Soil coverage displays similar characteristics as the vegetation cover. It is exclusively concentrated on the structure surface. A rather large quantity of surface finds was recovered scattered at the slopes below the path. The finds featured only fragments of pottery which were distributed in small concentrations. Based on the technological characteristics, the finds can be roughly dated to Early Modern Period. Although some sections of the structure could not be identified, the direction and topography suggest that the path connected two particular points in the landscape: a well placed in a gully and a multiperiod hillfort site Šibenik.

The practice of field survey and subsequent interpretations commonly include questions concerning the proper order of transformation factors affecting changes in the landscape (for instance: Gaffney et al. 1991). Actually, our entire investigative mindset is predicated upon the drive to neatly dissect the causative relations in the taphonomic process (Schiffer 1972; 1975; 1983; 1996). Naturally, the underlying assumption is that history progresses from some original state to the present.

The problem we are faced with includes not only the history of events leading to the present but rather the present is as much part of the history as is the past. Therefore, the structure as it is visible to us today is a result of various material agencies with different temporal regimes rather than the linear sequence of superimposing events. A common place to start a taphonomic narrative would be the building of the path. However, from the land point of view, the path is not the beginning of anything. It is merely a chance occurrence enabling the accumulation of soil and the growth of vegetation – two factors facilitating the archaeological detection. Therefore, a good place to start instead might be the soil. The soil is a rare commodity indeed in karst landscapes and it never would have formed at this particular place if it were not for the other agencies at work. The paths are made for walking or rather the movement of humans and animals. However, paths are also flat surfaces (unlike the rest of the surrounding area) and such surfaces tend to accumulate the organic material carried by the wind or produced by humans and animals. The removal of the limestone bedrock and the subsequent construction of the path has altered the micromorphology and microtopography of Zrmanja canyon slopes creating a straight, cut, regular and linear flat surface. This newly created surface possesses different characteristics in the deposition regime when compared to the surrounding areas of canyon slopes and surface features such as deep grikes. The created surface has become an integral part of the landscape and an actant engaging the relational properties of humans, animals, plants and wind. Coupled with the affordances of other actors and actants, a new context was created. When archaeologists came along, a new relational layer was added constituting this particular situation as archaeological record.

The common understanding of the archaeological record is rooted in the representational model of the dynamic and the archaeological context. These contexts are changed through the work of individual events formulated as cultural and non–cultural transforms (Schiffer 1972; 1975; 1983; 1996). The example of the path demonstrates that the dichotomies such as static and dynamic, cultural and non–cultural simplify and reduce the complexities of landscape formation. The processes occurring in the landscape are treated as a sequence of singular events rather than synchronous interactions (Thomas 2001). The social practice has transformed the canyon slope by forming a flat surface. However, the

FIGURE 2. The path on slopes of Zrmanja canyon – marked by arrows and the local setting (made by the author, base map: geoportal. dgu.hr).

built feature is not simply a backdrop for other developments to take place but rather it has become a new context for a relational network between living and non–living agents. The spatial constraints of social and natural processes involving the feature are one and the same. Although the spatiality of the feature is constraining, it is by no means a defining factor. Rather, all the elements in the relational field are mutually constitutive.

The dynamic character of archaeological record may be illustrated with another example documented during the field survey. Different types of finds dated to the Roman period (tegulae, amphorae, stone blocks, mortar fragments etc.) were documented as scattered deposits on clearance features such as boundary walls and clearance cairns (Figs. 3-4). The finds represent the actual remains of a Roman villa. This type of deposit is specific for sites dated to the Roman period in karst areas. Such deposits are restricted to dolines and poljes as only arable areas. This type of site/deposit is rather rare in the study area. Their presence appears to be limited to Rovanjska, an area featuring a small cove in the Velebitski kanal.

Archaeological deposits on clearance features were presented as the latest and hitherto undiscovered transformation factor (Gaffney et al. 1991). This transformation has affected a complete dislocation of finds from their original context. The transformation factor operates on at least two levels: spatially and at the level of finds size. The researchers (*Ibidem*) defined a sequence of events, leading from the original or systemic context of the Roman villa to its disassembling by a cultural transformation factor. This particular factor refers to local agriculturalists who affect the archaeological record through their work. Several problems can be identified with this reasoning. The first is an unproblematic and rather arbitrary privileging of archaeological remains as if they somehow present a default everything else derives from. As discussed earlier, this reasoning is embedded in Cartesian thought where archaeological record displays a teleological trajectory from the state of completeness to the state of decay.

A perspective which conceptualizes the archaeological record as a static entity, affected and determined by external forces fails to appreciate other potential of such material–spatial expression. The deposits on clearance features may be viewed as a material expression constituted through repetitive practice rather than a transformation factor which indirectly reflects the archaeological record. The problematics presented by the deposits on clearance features is not reducible to land use patterns such as the preferential land use classes in the Roman period, the land division in Medieval and Early Modern period negating the Roman pattern or designating this landscape as a palimpsest.

The practice of land clearance is one of the basic long–term repetitive practices in karst which is materialized in stone. Arable land along the cove represent the material–spatial traits mobilized in the Roman world. Subsequently, the remains of the Villa at the edge of the cove slopes became an integral part of the feature and simultaneously a context for activities such as removal, separation and assembling all the while creating arable land and land division drystone walls. Parts of the Villa are actants much in the same way as the natural rock. Together they represent forms of material which in this particular socio–material context is appropriate for removal and deposition on clearance features. This is the context where the Villa is disassembled into smaller fractions and arranged into new assemblages and takes its place in the present. The life of the Villa in the present is quite literal since it takes an active part in creating land division drystone walls and constituting the social relations in the community.

FIGURE 3. Deposits of tegulae and amphorae fragments on a stone cairn in Rovanjska (photo: author).

The archaeological record from this example can be understood as the result of material practices which are always already in the state of movement and ever emerging. These processes cannot be accounted for by the binary and opposed categories of systemic or the archaeological, cultural or non–cultural. Rather, the ar-

FIGURE 4. Spatial distribution of finds on clearance features in Rovanjska (made by the author, base map: geoportal.dgu.hr).

chaeological record is created by relations of affordances, properties or capacities of human and non–human actors and social practice. These notions could affect our understandings of how landscapes are formed considering the transformative nature of social practices intertwined with material and/or non–human. This example may represent a context for understanding the landscape as a relational field which is always, in Binford's (1981) terms, in a systemic context.

Conclusion

The research and interpretations presented in this paper are an attempt to highlight the materiality of the landscape by performing the research, rather than elaborate various notions and categories exclusively in discourse while being sensitive to the rhythms and processes of various material agencies acting in a karst environment. Archaeological research in Croatia displays a long tradition. Culture–historical paradigm determined the focus of research where karst was not discussed as a separate area of research. In that sense, the focus was on defining cultural groups and references to space/landscape were reduced to anthropogeographic interpretations. More recent international research projects (Chapman et al. 1996) were focused on practicing archaeology as a universal set of rules and laws which ultimately reflects a positivistic Cartesian view. Namely, this is reflected in the conceptualization of archaeological landscapes and archaeological remains in karst as a measure of the temperate areas for which the methodology and concepts were developed in the first place.

Rather than pursuing the practice of defining karst as a measure of others, this paper suggests an approach to archaeology in karst which is more attuned to the intricacies of a particular area. The purpose of the conducted field survey was, naturally, to collect archaeological data but more importantly to understand karst in its materiality – what actually constitutes karst as an archaeological environment. Čučković (2012: 269) claims that karst is not suitable for a systematic archaeological survey. This claim is not really wrong. It only treats karst in negative terms which ultimately means that karst does not meet the standards defined for completely different environments. Archaeological remains in karst are commonly represented by surface structures. Therefore, the methods which are focused on establishing the relationship between the surface and the subsurface context are simply not appropriate for a landscape where such relations are not featured in any way. Therefore, the task before us is to develop research approaches which will be in a position to fully appreciate the particularities and complexities of karst as an environment.

Archaeological survey as a discipline is dominated by a specific form of processual thinking where the essentialized archaeological record is determined by external forces, namely cultural and non–cultural transforms. This brand of reasoning assumes the existence of an original state (systemic context) which subsequently collapsed into various states of disrepair such as archaeological context or refuse. The underlying assumption is that the original context was destroyed by a linear sequence of superimposed events. This approach fails to appreciate the material affordances of all actors and actants in a relational field. The archaeological record is neither destroyed nor does it follow a linear, teleological path. Rather, the constitution of the archaeological record involves the engagement of various material capacities.

Karst appears to be a particularly suitable context for contemplating issues such as materiality and the constitution of the archaeological record. Moreover, it appears to positively resist positivistic reasoning by virtue of its very materiality. The landscape which is built almost exclusively of surface structures and durable materials represent a context for establishing a direct relationship with the ''object of study''. The ''object'' is absolutely unmediated through the approximated relations of surface and subsurface contexts. The examples presented in this paper demonstrate the inseparable and intertwined nature of the cultural and natural where the affordances of the material, including both living and non–living entities, facilitate the constitution of an ever–emerging landscape.

The notions elaborated in this paper could affect our understanding of how landscapes are formed considering the transformative nature of social practices intertwined with material and or non–human.

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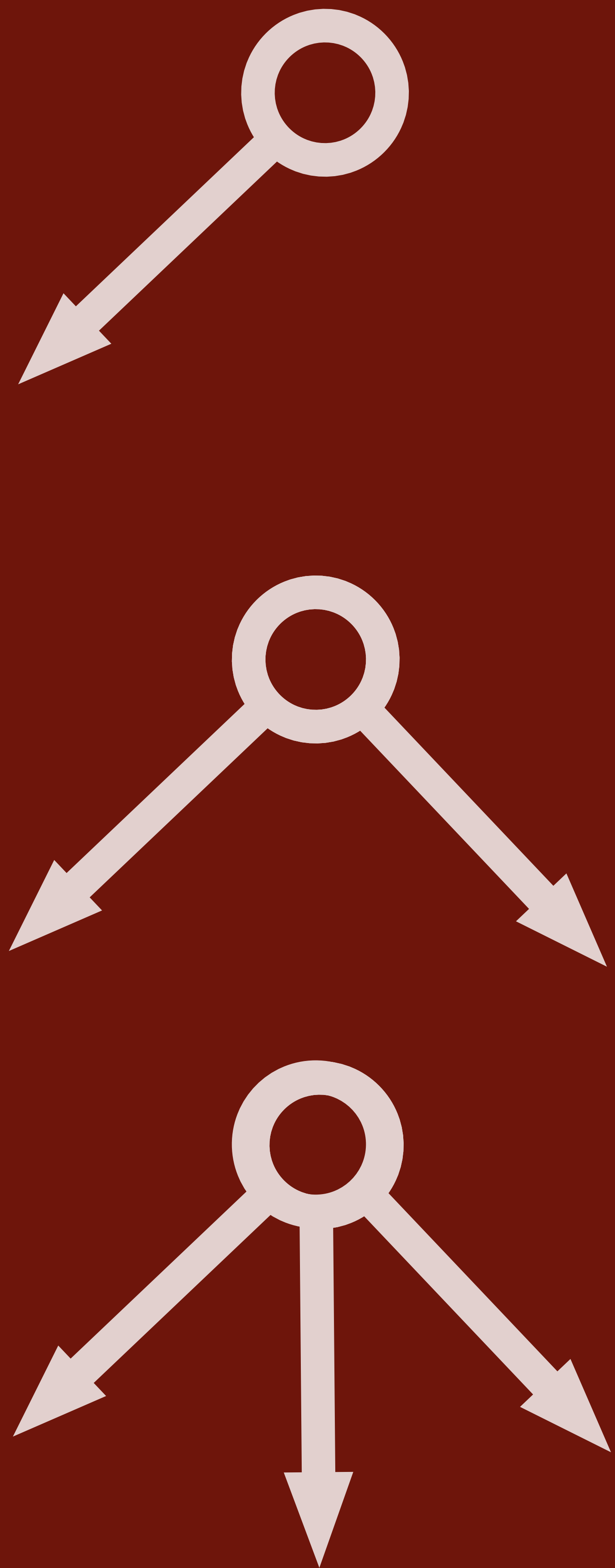

Technological Changes in the Neolithic Pottery Production of the South Iberian Peninsula: the Transition from the Middle to the Late Neolithic in Los Castillejos (Montefrío, Granada)

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In this paper, we present the analytical results of the vessels from Los Castillejos (Montefrío, Granada), attributed to the Middle and Late Neolithic periods (5000-4900 BC and 4200-3600 BC, respectively). The analytical corpus used in this study comes from techniques related to Earth Sciences (stereomicroscopy using a binocular microscope and X-ray diffraction). The results obtained have allowed us to differentiate the moments of the occupation of the site; the periods are separated by more than 700 years and present a marked difference in the ceramic production that allows us to identify a cultural change between the Middle and Late Neolithic.

Introduction

Archaeometry has been consolidated as an efficient approach in the study of archaeological material during the last decades. The use of analytical techniques applied to archaeological materials has allowed us to access a new dimension of knowledge that transcends the description of the object, giving it a full meaning and a unique role in the cultural characterization of the human groups that made and included it in daily activities, whatever their material nature might be, including these objects within the economic, social or ritual fields within the archeological construction (Shepard 1971; Howard 1982; Rice 1984; Steponatis 1984; Gibson and Woods 1997; Banning 2000; Spataro 2006; Peacock 2012; Klein and Philpotts 2013; Orton and Hughes 2013; Quinn 2013).

One of the research paths developed under the broad framework of analytical methodology has been devoted to the characterization of the manufacturing processes of artifacts, placing the producers themselves at the center of the production sequence. This allows us to relate the cultural context in which they are immersed as

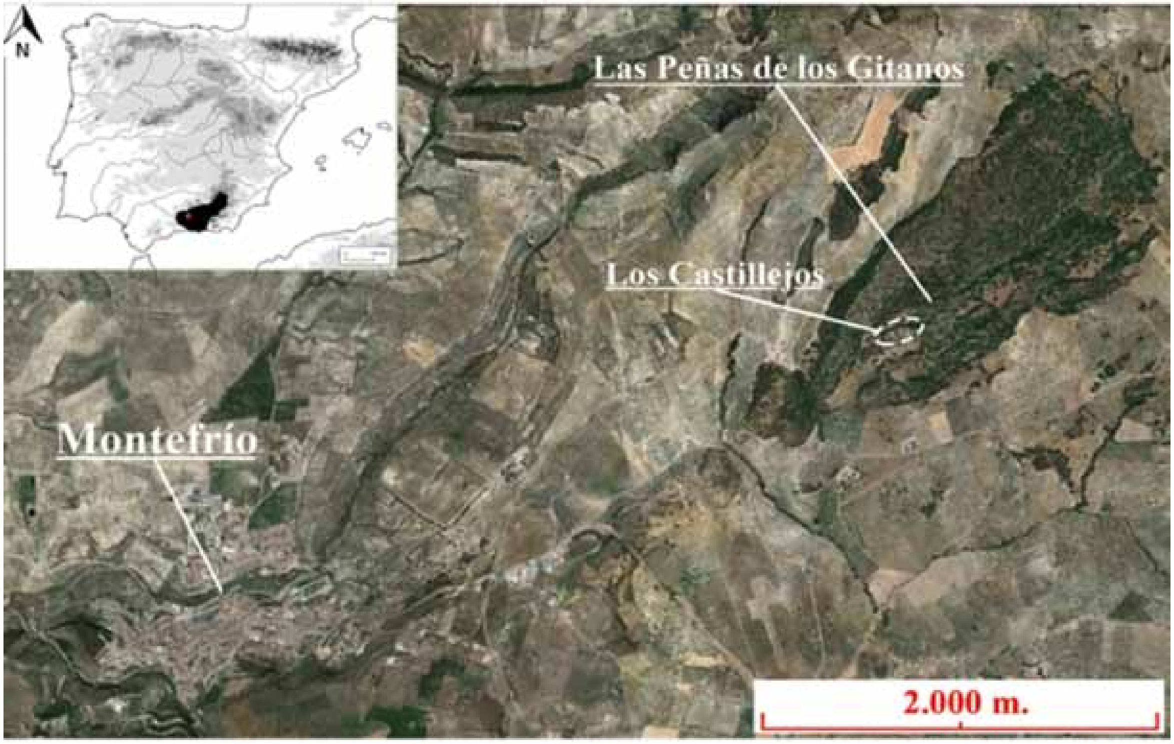

FIGURE 1. Geographic location of Los Castillejos (Montefrío, Granada).

creators and beneficiaries of the object, with the result of the final product and its integration in the cultural system to which they belong.

Therefore, archaeometry has been the key through which we have been able to overcome the description of the material evidence, leading towards a more complex explanation, where the object does not dissociate from the subject, relating both to a specific activity within a concrete cultural system, not lacking in complexity, and its internal and external link at the social level (Albero 2011; Druc et al. 2013; García Roselló and Calvo 2013).

On the other hand, it must be borne in mind that artifacts recovered during archaeological interventions which have been carried out using an adequate excavation methodology can be located at a specific time and in a specific space according to their stratigraphic location. If we add this information to detailed analytical techniques, we can define more precisely the cultural context in which they were created, which inevitably leads to a better understanding of its aesthetic-functional value within the society that produced the object.

Based on this epistemological framework, in the present work we will analyze ceramic assemblages from the site of Los Castillejos (Montefrío, Granada), chrono-culturally framed between the Middle and the Recent Neolithic, a moment of transition in which a change in the cultural system is evident, which has been clearly evidenced in the technological characteristics of the ceramics under study.

Los Castillejos (Montefrío, Granada)

The settlement of Los Castillejos is located in the area known as Las Peñas de Los Gitanos (Fig. 1), 5 km east of the town of Montefrío in the province of Granada (Cámara et al. 2016).

This archaeological site is located geographically between the region of Los Montes and El Poniente Granadino, both framed in the System of the Subbética, formed by mountain ranges connected to each other by natural passages and fluvial courses, suitable for human occupation.

The singularity of this site is that it is an open-air, being the only one described in this region. The low agricultural potential of the site location has led to the unaltered preservation of the Neolithic sequence in the largest open-air village of the Iberian Peninsula (Cámara et al. 2016).

This non-alteration of the stratigraphic sequence has allowed the documentation of the chronological sequence, dated by means of radiocarbon dating of short life elements obtained during the development of the excavation campaigns carried in 1991-1994 (Ramos Cordero et al. 1997; Cámara et al. 2016). The result was a chronological framework composed of 23 dates analyzed in the Laboratory of the University of Uppsala, in the Beta Analytic Laboratory in Miami and in Laboratorium voor Algemene Naturkunde, Rijksuniversiteit of Groningen (Table 1). Of the first seven samples, six were sent to Beta Analytic and one to the Groningen laboratory. Of those sent to the first laboratory, three were analyzed by AMS and two were subjected to a double analysis, both by AMS and by conventional dating, showing significant differences in the results (Molina and Cámara 2004; Cámara et al. 2005). The stratigraphy was divided into 30 phases and sub-phases from the levels corresponding to the Ancient Advanced Neolithic to the Final Copper Age. The new data allowed to contextualize in more detail the issue regarding the transition between the Ancient and the Middle Neolithic and the beginning of the Recent Neolithic (Cámara et al. 2005; 2016; Molina et al. 2017); we will focus this study on the last transition/phases. In this chronostratigraphic context, the existence of a temporary hiatus is detected, characterized on a material level by evidence of sedentary lifestyle and consolidation of agricultural practices materialized in the proliferation of silos as storage structures and the emergence of new constructive strategies, changes that take place in parallel to changes in the ceramic production which will be discussed in this paper.

Objectives and Methodology

The general objective of this research is to technologically characterize the ceramics from the phases prior to the hiatus (11a and 11b between 5210-4940 cal BC) and the subsequent ones (12 and 13 between 4240-3970 cal BC), in order to determine the technical changes. Sec-

PERIOD	PHASE	N. Sample	N. Lab.	DATE B.P.	DATE B.C.	1σ cal BC	2σ cal BC
EARLY NEOLITHIC	1	MF614049	Ua36215	6310±45	4360±45	5325-5220	5470-5200
	2	MF613836	Ua36213	6120±40	4170±40	5210-4980	5210-4950
	3	MF613868	Ua36214	6260±45	4310±45	5310-5210	5330-5060
		MF612645	B135663	6120±40	4170±40	5210-4980	5210-4950
	5	MF612051	Ua36211	5400±45	3450±45	4335-4230	4350-4060
	6	MF613442	Ua36212	6240±45	4290±45	5310-5070	5320-5050
MIDDLE NEOLITHIC	7	MF613428	B135664	6470±150	4520±150	5610-5300	5700-5050
			B145302	6250±80	4300±80	5320-5070	5380-4990
		MF611678	Ua36210	6100±45	4150±45	5200-4940	5210-4900
	9	MF610760	Ua36209	6090±40	4140±40	5190-4940	5210-4850
	10a	MF610377	Ua36208	6120±40	4170±40	5210-4980	5210-4950
	11b	MF64868	Ua36203	6115±40	4165±40	5210-4960	5210-4940
LATE NEOLITHIC	13	MF68020	Ua36206	5265±45	3315±45	4230-3990	4240-3970
	14	MF68370	Ua36207	4795±40	2845±40	3640-3520	3660-3380
FINAL NEOLITHIC	15	MF64337	Ua36202	4980±35	3130±35	3790-3705	3930-3650
EARLY COPPER AGE	16b	MF66158	B135665	4480±40	2530±40	3340-3090	3350-3020
	17	MF64013	Ua36201	4450±35	2500±35	3330-3020	3340-2930
LATE COPPER AGE	20	MF62206	Ua36200	3990±40	2040±40	2570-2470	2620-2340
		MF61451	B135666	3770±70	1820±70	2300-2040	2460-2020
	21	MF65634	Ua36204	3925±30	1975±30	2480-2340	2490-2290
	22	MF66883	B135667	3910±40	1960±40	2470-2340	2550-2230
		MF61331	B135668	3640±120	1690±120	2200-1780	2450-1650
			B145303	3960±50	2010±50	2570-2340	2580-2290
FINAL COPPER AGE	23b	MF662	GRN7287	3840±35	1890±35	2400-2200	2460-2200
		MF66791	Ua36205	3720±35	1770±35	2200-2030	2280-2020

TABLE 1. Dates of C14 from Los Castillejos (Montefrío, Granada) (Cámara et al. 2016; Gámiz. 2018).

ond, we will address the possible causes that gave rise to these changes, among which we must define those of functional origin (economic and social basis) and those of cultural origin (social and ritual/symbolic).

The ceramic selected for this study are 899 fragments of which 509 were analyzed by stereomicroscopy and 36 by X-ray diffraction. A Leica M80 binocular stereomicroscope with magnifications up to 60x, with an EC3 high definition camera (0.5x objective), was used for the analysis. The stereomicroscope is located in the Antonio Arribas Palau Archeometry Laboratory of the University of Granada. The analyzed fragments were cut in order to have a clean section of the interior of the ceramics; after, we describe two areas of the section, following a descriptive routine based on several works already published (Gámiz et al. 2013; Druc and Chavez 2014; Gámiz 2018). The areas of description and the variables observed were: a) surface of the fragment, with a description of the surface treatment, decorative techniques, technological marks, systemic and post-depositional alterations, as well as the color of the external and internal surfaces; b) description of the internal section of the fragment which takes into account the compactness of the paste, the color of the matrix, nature, size, distribution, orientation and proportion of the non-plastic.

The optical observation was complemented by X-ray diffraction, performed by powdering the sample (10μ) and analyzing it in a BRUKER D8 ADVANCE diffractometer with Cu radiation (sealed tube) and LINXEYE detector under a measurement parameter of 2" per scanning step, in an increment of 0.00393766 with limit of 2 theta at start in 3 and stop in 70.0108, at a power of 40 Kw and 40 mA. The resulting diffractograms were read using the Software XPowder 12 v.00.27, and the DifData database and PDF2. By XRD we were able to identify and quantify the minerals present in the sediments used in the ceramic production.

The application of these analytical techniques brings us closer to the characterization of the different stages of manufacture. We will talk about the production sequence, a concept that is inspired by the, though not always correctly used, *chaîne opératoire.* We understand the process of making an object by studying its production sequence, which, through its characterization, allows us to suggest its functionality, without addressing other aspects such as its life and disuse (Rye 1994). In this way, we determine the ceramic production sequence on the basis of the following phases: raw material collection, clay treatment, modeling, surface treatment, drying and firing.

Discussion

The study of the ceramics from phases 11a and 11b (between 5210-4940 Cal BC) (Table 1), during the last moments of the Middle Neolithic, show us a series of technological features that are the result of the continuity of a pottery tradition, which has remained virtually unchanged since the Early Advanced Neolithic (Gámiz 2018). These collection areas were defined by comparison of the XRD results obtained from the ceramics that have been studied and the results obtained from soil samples. Thus, we observe how there is a predilection for those areas where the sediments are characterized by a high content of quartz, with a particle size below 2 mm and with an estimated saturation above 20%. The high sphericity and the variability of the minerals place the sediment extraction in detrital areas and with a high degree of erosion, being the fluvial beds the most feasible areas for the collection of sediments. Three water courses are present next to the settlement. This data, together with the verification of the results obtained by XRD among the sediment samples taken from the surrounding environment, the mineralogical characterization offered by the Geological Survey of Spain (IGME) in the cartography of Alcalá la Real and Montefrío (IGME 1985), and the XRD results of the analyzed ceramics, allows us to affirm that the origin of the material used in the manufacture of the ceramics is local (Gámiz 2018), with the exception of the pigments used for engobes, such as those used in the characteristic Almagra ceramics, which do not pose a series of new issues. The first reason is due to the detection of mercury in these pigments by means of Scanning Electron Microscope (SEM), an element that is directly related to cinnabar. Still to be confirmed through a study in progress, the origin of this mineral is found far from the area under study, in very localized deposits in the southern areas of the Peninsula, such as the outcrops of Cástaras and Tímor (Granada), Bayeque and Tíjola (Almería) and the larger quantity in Almadén (Ciudad Real) (AA.VV. 1986; Hunt and Hurtado 2009; Tsantini et al. 2018). This would indicate an exchange of raw material over long distances.

In the preparation phase of the raw material, we distinguish several actions. The first one, the alteration of the sediment by means of manual purification, where the non-plastic inclusions that may hinder the mixing of the clay are extracted, such as coarse clasts and elements of plant origin such as small branches or stems. After this action, we detect the opposite process, that is, the adhesion of non-plastic inclusions that are added as temper to subtract clay plasticity (Fanlo and Pérez 2011; Clop 2012, Cubas 2012). The addition of temper was a fre-

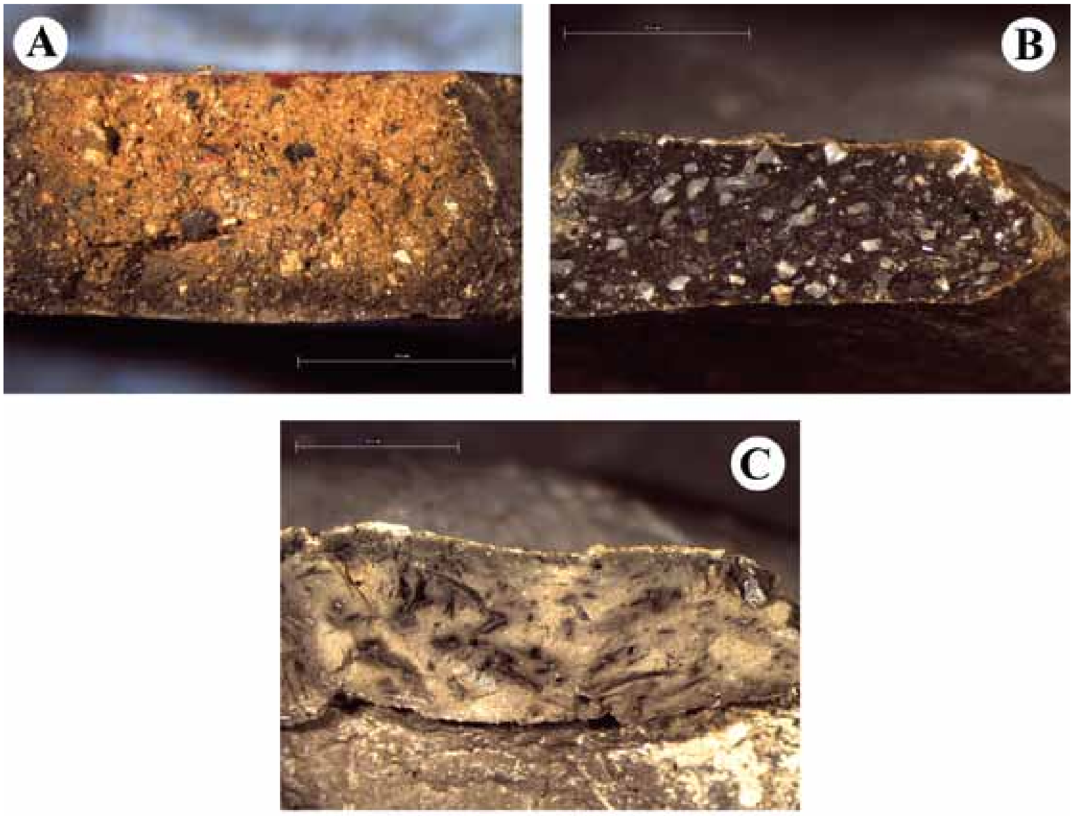

FIGURE 2. Ceramics of the Middle Neolithic of Los Castillejos with different types of temper: A) chamotte, B) mineral, C) vegetal. (Scales: 5 mm).

quent action that isalso identified during Early Neolithic in other geographical areas such as Valencia or Cataluña (Clop 2012), and materializes in the detection of chamotte in ceramic paste, systematizing the practice of adding crushed ore since the last moments of the Middle Neolithic onwards (Fig. 2).

Among the studied ceramic, we observed the presence of minerals with a high degree of angularity, with very similar sizes (between 1 and 2 mm) and in a high proportion between grains considered to be of the same mineral type. These observations contrast with those ceramics with very rounded grains and with greater mineral diversity, characteristic of sediments collected from or near rivers as has been previously explained. Through XRD we were able to verify that the calcite or quartz levels exceed in most cases those of other mineral phases, a phenomenon that coincides in those ceramics with the granulometric characteristics to which we refer (Fig. 3).

The presence of these minerals gives the final product a greater mechanical and thermal resistance, in addition to subtracting plasticity from the clay in order to facilitate its modeling, the drying of the piece and to reduce firing failures during the same (García Roselló and Calvo 2006). On the other hand, the existence of ceramic pastes with a high content of pores and grooves suggests the addition of plant matter acting as a temper, especially for the production of ceramics related to the conservation of food and provisions, since these pores generate a cool environment inside the container (Ortega et al. 2005). Finally, this phase of production will conclude with the kneading of the paste. The greater or lesser dedication to kneading, the concentration and size of the temper and the volume of water contained, are characteristics that will determine the compaction of the paste (Rice 1987; Rye 1994; Gibson and Woods 1997; Orton and Hughes 2013). The compaction will affect other phases of the production sequence such as drying since ceramics with optimal compacting paste avoid the appearance of cracks and defects in the surfaces of the vessels, which in turn elevates the possibilities of success during firing. On the other hand, these ceramics are likely to contain excess water, which causes a sudden contraction of the walls during drying and firing, resulting in vessels with structural defects or failed firing. The end of the Middle Neolithic culminates in a consistent trend with a domain over ceramics with a high degree of compaction, as we have been able to see in the Ancient Neolithic as well, with which we can confirm the survival of techniques in ceramic manufacturing, and what we interpret as continuation within the ceramic production tradition. However, there is a minority of fragments that show poor

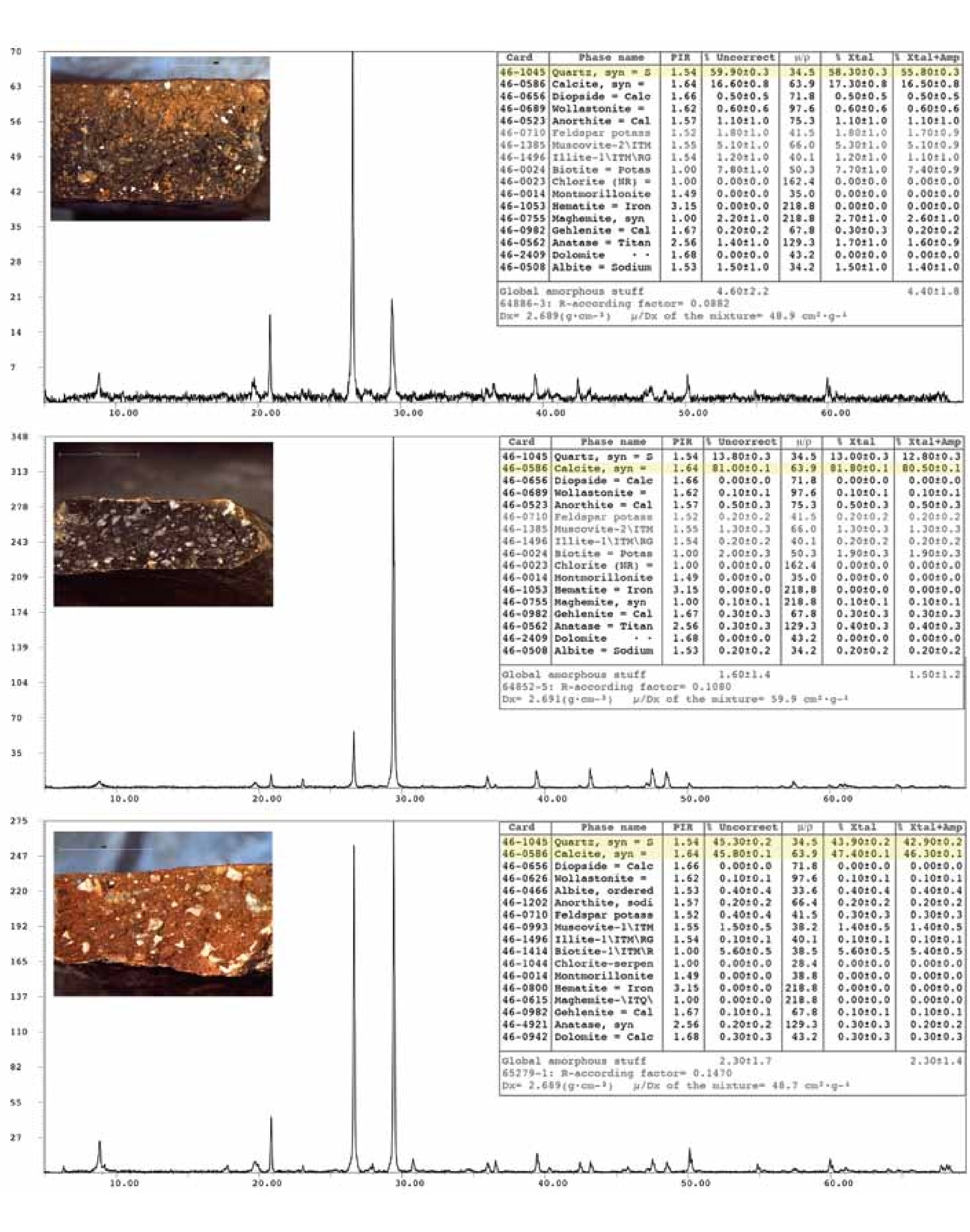

FIGURE 3. Ceramic diffractograms from the Middle Neolithic of Los Castillejos (Montefrío, Granada). Above: sample with high quartz content, Center: sample with high calcite content, Below: sample with equality between calcite and quartz.

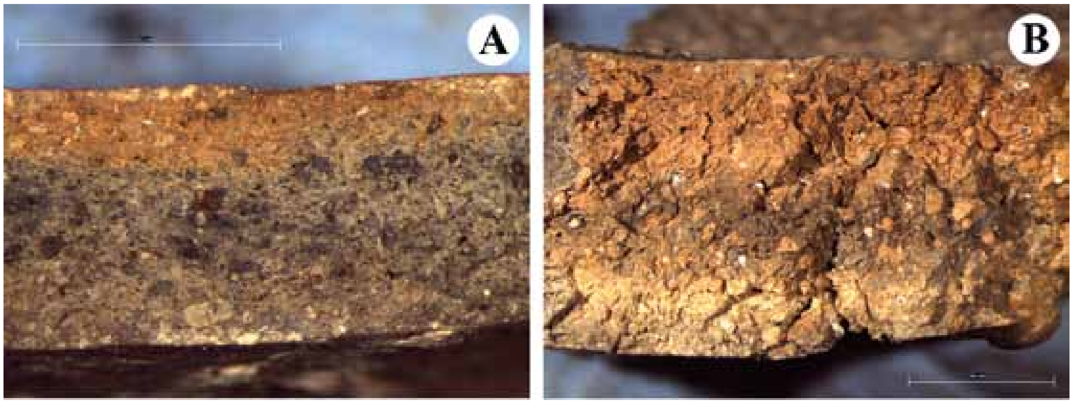

FIGURE 4. Ceramic sections from the Middle Neolithic of Los Castillejos (Montefrío, Granada): A) compact ceramic and B) not very compact ceramic. (Scales: 5 mm).

compaction (Fig. 4), the result of loose or insufficient kneading work. These types of productions are related either to circumstantial elaborations or to learning processes (Bagwell 2001; Kamp 2010).

Regading the modeling techniques, traces that clearly indicate the techniques used were not detected. However, after elaborating the typology corresponding to the ceramics object of study (Gámiz 2018), we deduce that techniques such as hollowing, mold and overlap of rolls or plates, also defined as *rollos de columbí* (coils), must have been used. Therefore, we attribute the technique of hollowing to small containers such as bowls, and the use of the molds for the base, which are completed with the superposition of rolls or coils, a technique which is easier to detect in composite forms of two bodies or in the elevation of ceramic necks.

On the other hand, in the surface treatments we distinguish two features: on the one hand the exterior treatment in itself, and on the other the decoration. Decoration will be an aspect that we will ignore in this work since the entity of the description deserves a separate study. Focusing therefore on the surface treatment, smoothing and burnishing were identified. In the first case, it is only intended to achieve a regularization of the surface, achieved presumably without the use of tools simply by hand. On the other hand, burnishing becomes the most used technique, since greater uniformity than in the previous case is achieved, in addition to providing the piece with a greater aesthetic degree and conferring impermeability and non-stick property to the pot. This technique requires the use of tools or intermediaries with a rough surface that allows the polishing of the surfaces, such as stone or animal skins.

The drying phase, in most cases, can be determined optimal. This inference is obtained through the study of the pastes, which present a uniformity without striations which indicates an absence of estimable quantities of water before firing. From this description are excluded those ceramics to the learning process that have been previously mentioned.

Finally, different traces identified in the studied fragments allow us to determine that firing action was carried out without the use of any kind of structure and therefore temperature control and firing time. The evidence of this are the chromatic variability of the fragments as well as the irregularity of these colors in different areas or shards belonging to the same ceramic. In the same way, if we compare the sections of the different fragments we can observe how some of them indicate firing in an oxidizing atmosphere and others in a reducing atmosphere. The most common colour among the studied fragments are dark core sections with beige or reddish edges. This variability is related to the position of the ceramic inside the fire and its greater or lesser proximity to the source of heat. With these characteristics, we deduce that the combustion that the combustion was carried out using holes dug in the earth where the ceramics would have been placed along with the fuel. It was possible to establish an approximation of the firing temperatures by XRD. The presence of calcite in many fragments, together with the appearance of gehlenite (Fig. 5) allows us to determine a fiering temperature between 500 and 800 ºC (Capel et al. 1979: Ortega et al. 2005).

Levels 12 and 13 belong to what we call Late Neolithic (4240-3970 Cal BC). This new period takes place after a long and widely documented temporal hiatus of more than 700 years in Los Castillejos (Cámara et al. 2016; Molina et al. 2017) (Table 1). Among the ceramic objects that belong to this phase, a series of changes that break with the pottery tradition described for phases 11a and 11b have been documented. On the one hand, we will highlight the irruption of new forms that were not present in the previous period, as is the case of casseroles

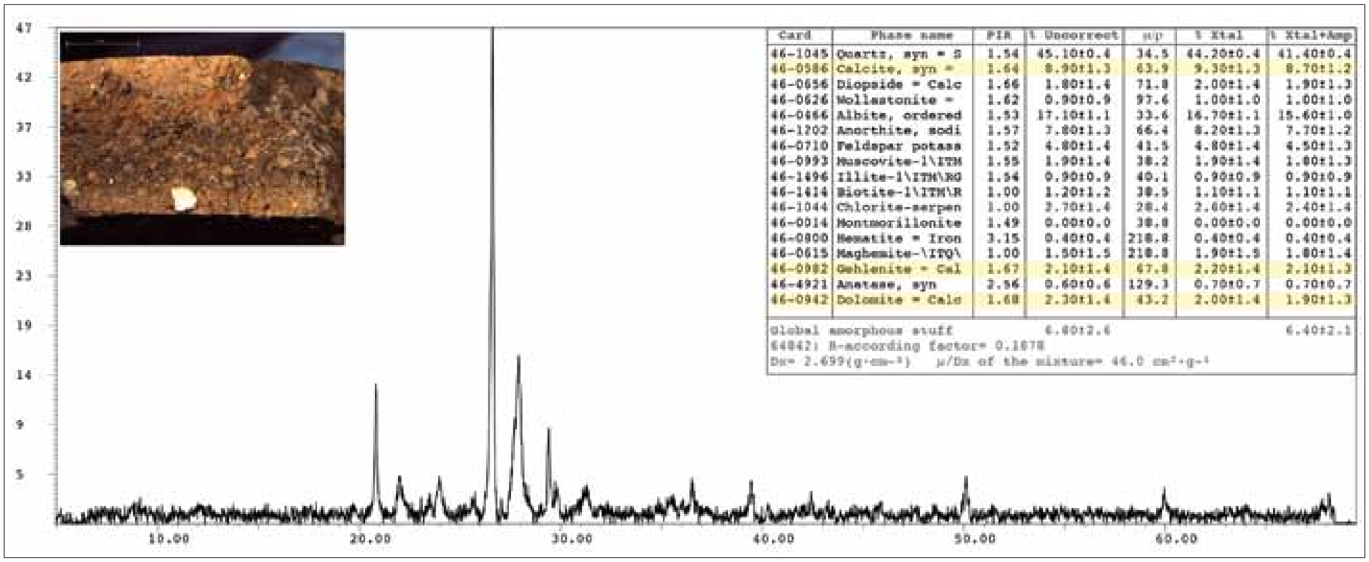

FIGURE 5. Diffractogram of fragment belonging to the Middle Neolithic phase of Los Castillejos (Montefrío, Granada) showing the presence of calcium carbonate in low proportions and gehlenite.

(Fig. 6). The fragments and forms associated with these new types at a quantitative level are far above the other types of the forms; but it is also that, at a qualitative level, they present characteristics radically different from previous productions. The main technological change lies within the systematic addition of temper mineral to the ceramic paste, mainly calcium carbonate (calcite and dolomite) (Fig. 7). The properties of these minerals, previously mentioned (refractory and flux), predispose new productions wih functions related to food preparation and consumption.

The analyzed fragments show an absolute predominance of ceramics with a high degree of compaction. This evidence is a consequence of two factors: on the one hand, the high presence of temper, which increases the chances of success during the drying and firing stages; on the other hand, the high compaction denotes a continuous work in the kneading of the clay, now associating all the ceramic production to expert hands.

Regarding the modeling techniques, the techniques identified for the previous period will be repeated, with the exception that the most common method would now be the use of molds for the base and then raising the ceramic by using coils, mainly for elaboration of the pots, composed of two bodies, which is also the most common ceramic production during this phase. Ceramic decoration during this period is practically nonexistent and in the case of the casseroles is absent. However, burnishing is conferred as the external treatment technique par excellence. This fact will be related again with the budgeted functionality of these forms, since the characteristics of burnishing makes the ceramic suitable for the processing and consumption of food.

Finally, in the drying and firing phases, there are no differences with regards to the previous period. The features identified in the ceramic productions during this phase are the same as there are no identifiable changes from the point of view of innovation for these stages of the production sequence.

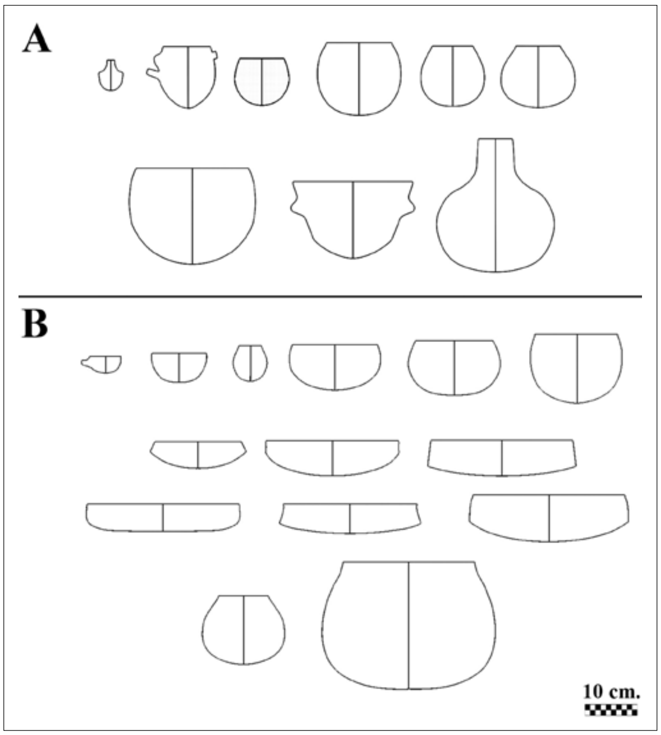

FIGURE 6. Ceramic types of Los Castillejos (Montefrío, Granada): A) Middle Neolithic, B) Late Neolithic.

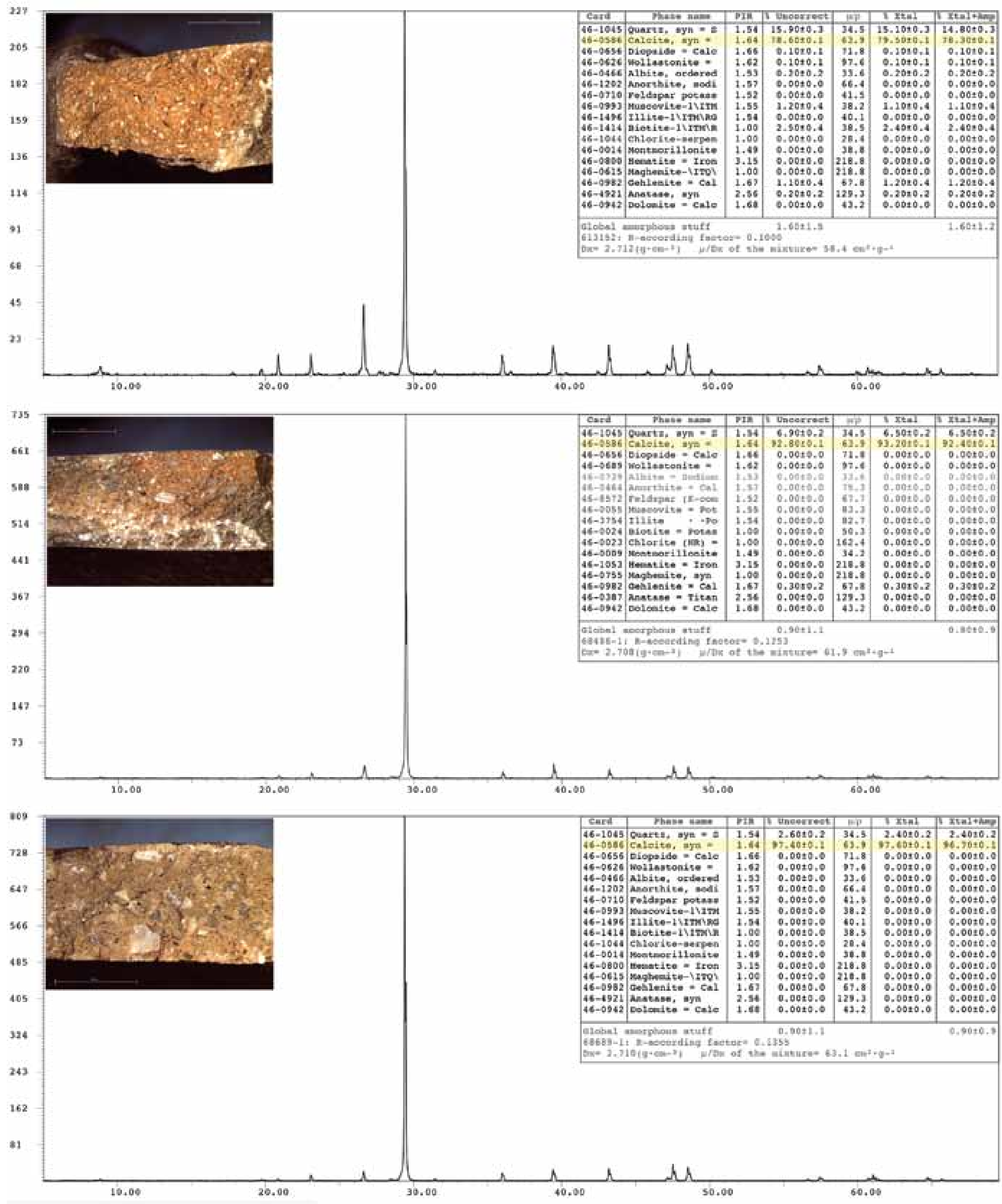

FIGURE 7. Ceramics difractograms of the Late Neolithic of Los Castillejos (Montefrío, Granada) showing the high content of calcite added as temper.

Conclusions

The data obtained from the study presented here show us a change in the pottery production between the phases prior to the temporary hiatus and the one carried out after it. The changes referenced in this work concern the typology and the technological characterization of ceramic production.

On these bases, we can affirm that pottery tradition between one period and the other change substantially due to the fact that these changes take place during a chronological hiatus of more than 700, and thus these must have been originated by different human groups, with a different cultural system, also evidenced by deeper economic and social changes, which we describe below.

Regarding the economic aspects, it has been possible to verify through carpological characterization studies (Rovira 2007; Cámara et al. 2016) that cereal production suffers a considerable increase. This increases in agricultural production are also related to the proliferation of silo-type structures and the increase in volumes of ceramic forms related to storage such as pots or jars (Gámiz 2018). In the same way, animal husbandry also intensifies, specializing in the stockbreeding of cattle, sheep/ goats, bovine and porcine (Riquelme 1996; Camera et al. 2016).

The result of this increase in agricultural exploitation linked with a specialization in the breeding and cultivation of certain species, which leads, in consequence, to a demographic increase evidenced in the urban modifications documented in the settlement during the beginning of the Late Neolithic (4200-3600 BC). The material evidence of this situation is materialized in the proliferation of silos, the increase in size and complexity of the habitat structures and an expansion of the occupation area of the Los Castillejos (Cámara et al. 2016).

The presence of a hiatus in the chronostratigraphic sequence of more than 700 years (Molina et al. 2017), makes us think that during this phase the settlement is uninhabited for reasons still unknown. However, the documentation from levels 12 and 13 of evidence corresponding to a human group with fully defined cultural characteristics and different from those identified in the levels 11a and 11b, allow us to affirm that the enclave is reoccupied. In this sense, we will relate the settlement of Los Castillejos during the Late Neolithic (4200-3600 BC) with a phenomenon regarding population movement from the lower Guadalquivir documented in settlements near the settlement case of this study, such as those identified in Cordoba´s countryside (Nocete 1989) or the Polideportivo de Martos (Jaén) (Lizcano et al. 1997; Cámara et al. 2008). The new configuration of the economic base, the changes in the social structure and the changes in the belief system, have served to consider this Neolith phase as the genesis of the factors that will configure the defining characteristics of the Chalcolithic, where the first clear evidence of a social structure based on access and differential control of the modes of production and economic surplus will be documented.

Final Note

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