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2018

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RADOVI ARHEOLOŠKOG ZAVODA  
PAPERS OF THE DEPARTMENT  
OF A R C H A E O L O G Y

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*Zrinka BULJEVIĆ*

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*Recenzija / Review*

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*Aleksandra BUGAR*

## ARCHAEOOMETRY IN THE SERVICE OF ARCHAEOLOGY – MEASURABLE CONTRIBUTION TO ARCHAEOLOGICAL INTERPRETATION

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*The possibilities of archaeometric analyses and their positive application in interpreting archaeological sites led to the realisation of the exhibition titled 'In the Service of Archaeology', displayed at the Zagreb City Museum in the year 2013. Displaying the archaeological find in the context of the results of interdisciplinary research was intended to acquaint the public with the powerful dynamics of the changes through which archaeology has passed during the past several decades, as well as to draw attention to the need to master contemporary methods and technologies that enable our understandings to become more comprehensive. This presentation is, among other things, author reflexion on the experience of working with numerous experts in archaeometry, as well as on the museological concept of the exhibition.*

*Key words: Exhibition, Zagreb City Museum, archaeology, archaeometry, museological concept, interpretation, interdisciplinarity*

### INTRODUCTION

Archaeological research and interpretation of researched sites is a challenging task entrusted to archaeologists. Numerous dilemmas and questions arise within this process. Some of them involve critical evaluation, for example: how to hold on to the thought that fieldwork research is destructive and that it requires a consistent methodology of research and accurate documenting of all segments of the explored site? How to interpret an archaeological site as precise, consistent and objective as possible within the post-fieldwork processing of the finds and the site? To what extent is this possible merely on the basis of information obtained from fieldwork research? Are various archaeometric analyses helpful in this process, and to what extent? The answer to the last question is definitely positive.

It is precisely these discussions on the possibilities of archaeometric analyses and their positive application in interpreting archaeological sites that led to the realisation of the exhibition titled 'In the Service



of Archaeology', displayed at the Zagreb City Museum from April until October 2013 (<http://www.mgz.hr/hr/izlozbe/u-sluzbi-arheologije,474.html>). It was co-created by Boris Mašić and the author of this article, both of whom are archaeologists with the Zagreb City Museum.

The scientific conference 'Methodology and Archaeometry – Current Situation and Guidelines', organised by the Department of Archaeology, Faculty of Humanities and Social Sciences in Zagreb, was held in November 2013, soon after the exhibition was closed, and it was only natural to present the exhibition, together with some of the concrete examples of archaeometric analyses, within the topic of Archaeometry. The exhibition term luckily coincided with the 'Regional Course on Dating of Cultural Heritage Using Nuclear Analytical Techniques' organised at the Ruđer Bošković Institute in May 2013 by the International Atomic Energy Agency (IAEA) and this very Institute (Krajcar Bronić 2013). In agreement with the Course Director Ines Krajcar Bronić, PhD, from the Institute, an expert-guided visit to the exhibition 'In the Service of Archaeology' was included in the official course programme.

At the scientific conference 'Methodology and Archaeometry – Current Situation and Guidelines', the author of this article presented the contents of the exhibition 'In the Service of Archaeology' through selected examples of archaeometric analyses carried out on the selected archaeological finds discovered on the sites explored by the archaeologists of the Zagreb City Museum in Zagreb and its surroundings. This article follows the same path; however, since the exhibition also featured the exhibition catalogue (Bugar & Mašić 2013), it will not go into the details of its (the exhibition's) contents, but will set out certain ideas and thoughts on the relationship of archaeology and archaeometry that might not have been pointed out that much at the exhibition. Working on this type of exhibition undoubtedly gives rise to certain critical observations. This presentation is, among other things, author's reflexion on the experience of working with numerous experts in archaeometry, as well as on the museological concept of the exhibition.

## A DIALOGUE BETWEEN ARCHAEOLOGY AND ARCHAEOOMETRY

When conceiving the exhibition "In the Service of Archaeology", many questions arose as to the way in which the issue of archaeological interpretation

should be discussed, i.e. what is used in archaeology in the specific process of research, classification and analysis of excavated finds. So, when developing the idea for this exhibition, it became essential to clearly define what archaeology and archaeometry are and what their purpose is. From the very beginning of archaeology many were concerned with issues of archaeological theory and methodology, and to a wider audience the definition is known, more or less. Perhaps the most illustrative and, from the museological point of view the least monotonous definition could be that that "Archaeology is partly the discovery of the treasures of the past, partly the meticulous work of the scientific analyst, partly the exercise of the creative imagination..." (Renfrew & Bahn 2008: 12). On the other hand the term archaeometry is less publically known and is rather unclear so it was essential to define it as a scientific discipline that consists of techniques and methods, especially those applied in natural sciences and used to analyse archaeological materials. It is important to emphasise that the development of archaeometry on one hand is inseparably connected to the requirements of archaeologists seeking answers to specific problems and on the other with general advances in science and technology (Summerhayes 2001: 100–105).

The main goal of the exhibition was to present to a wider audience, through the museological approach, an array of possibilities that archaeology offers in synergy with other sciences, particularly natural ones. Interdisciplinarity was emphasised as the key concept in modern archaeology, and in modern science in general. Geophysics, geodesy, geology, wood science, radiography, chemistry, botany, zoology, anthropology and, as separate topics, chronometry and forensics, were presented through the selected themes<sup>1</sup>. The visitors could, for example, see how micro-scanning LiDAR technology was used to help read the inscription on the milestone of Emperor Decius (who ruled from 249 to 251 AD), found on the Ježdovac site, or learn how the geological and paleontological analyses of the milestone found that the material used for the stone came from the slopes of Medvednica, in the area

<sup>1</sup> The concept of this Exhibition and its thematic units have also been presented in the Exhibition catalogue. Titles of the thematic units are actually the names of scientific disciplines - those used in archaeology to interpret finds. Each theme presents a brief history of the application of a certain scientific discipline within archaeology and an interpretation of selected archaeometric analyses on specific archaeological material revealed by Zagreb City Museum's research. Added with each thematic unit to the catalogue is a list of literature and scientific papers. In this way the catalogue is envisioned as a kind of manual or a reading list which should inspire further study of the topic.

of the suburban settlements of Zagreb. They could also learn the following: how geophysical measurements were used for the computer visualisation of the unexcavated finds on the Šepkovčica site; what method was used for determining the type of wood used for the coatings of the Roman period wells on the Okuje site, whose age was determined using the dendrochronological method; how chemical and archaeobotanical analyses provided us with information on the type of food eaten in the Zagreb area or what the environment in this area used to look like, or to learn about the early production of iron in shallow furnaces on the Okuje site during the Antiquity, gained through the analyses of slag with X-ray fluorescence (XRF) and inductively coupled plasma-atomic emission spectrometry (ICP-AES). Archaeozoological analyses gave us a large quantity of evidence on the flora in certain micro-locations, and indirectly on animal breeding and hunting, and anthropological analyses provided us with abundant data on the inhabitants of this area from the Roman period to the Modern Age...<sup>2</sup> There were many other examples that vividly depicted certain segments of the explored sites and contributed to their more comprehensive interpretation. Relatively numerous archaeometric analyses were carried out on the select specimens and finds provided a measurable contribution to archaeological interpretation, enabling us to get a complete picture of the life of the then inhabitants of today's Zagreb area.

Although having a secondary importance compared to the symposium topic, the concept and the way of presenting the exhibition were also demonstrated; they gave way to an imagined dialogue between Archaeology and Archaeometry<sup>3</sup>, which was to be achieved with the exhibition emblem: two schematised heads, skulls, facing each other (Fig. 1). Such display of skulls unambiguously suggested that they faced each other 'eye to eye', i.e. that their imaginary conversation was equal. The author's at-

titude was thus also given its visual symbol. And the head motif was not the result of the design concept alone; it was based on the concrete find, i.e. computer tomography of the skull of a woman whose grave had been found at the St. Mark's Square in Zagreb (Bugar & Mašić 2013: 67–70). But, there will be more talk about the so-called Ms NN later on.



Figure 1. Emblem of the exhibition 'In the Service of Archaeology' (Zagreb City Museum Archives / design by Iva Marochini)

## ARCHAEOLOGICAL RESULTS INTERPRETED AND PRESENTED

Choosing 'beautiful' items from the museum collection to be presented at exhibitions is easy. What is hard is to get someone interested in an unattractive item, such as a carbonised seed, a piece of wood, an animal bone, metallurgical waste, etc., and get them to see it in a new light, as an incredible source of information and a concrete segment of a story about a human being. It is only when presented together with archaeometric analyses and an archaeological interpretation that these items – musealia – will become interesting and important to a viewer, whether an expert or not. The exhibition authors extensively discussed the exhibition concept and came to the conclusion that texts, their contents and stories, questions and answers, were more important than the attractive exhibits for putting an emphasis on the idea. Namely, the majority of visitors gather information through text, but generally tend not to read it in full. There are a number of reasons for this, but it is generally accepted that written information should be given in a simple, clear, transparent and interesting manner. In this manner, even longer pieces of

<sup>2</sup> See Bugar & Mašić 2013, with the provided list of scientific research reports.

<sup>3</sup> The spatial and visual design of the exhibition was made by Adriana Čulek /Plan C and the visual identity and graphic design of the exhibition and promotional materials was made by Iva Marochini.

text can capture the reader's attention. However, the general (or rather one more common) point of view is that the text should cover and perform information in different ways, but that the primary focus of any exhibition are the exhibits (Dean 2005: 116). Therefore, the reactions to an approach used in the exhibition "In the Service of Archaeology" that one should read the text in order to understand the reason for displaying an item was, naturally, split. However, each exhibition is a learning experience and through exhibitions the museum-based mission of education can be achieved. This mission is implemented through interpretation recognised as a process of clarification, explanation and presentation performed in a way that piques curiosity and stimulates the desire to continue learning (Dean 2005: 6–7). It should be definitely pointed out that it was a great challenge to create an exhibition that would place archaeometry instead of archaeology in the spotlight, and in a way treat archaeological finds as a 'footnote' to archaeometric scientific analysis. The intention was to promote modern archaeological science and show how complex, rich in contents, interesting and open to accepting new technologies and methods of finding answers to ever-repeating questions it really is. And this depends precisely on the quality of interpretation. It was our intention, in a way, to express gratitude to all experts, particularly in the field of natural sciences, but also in the technical, biomedical and other interdisciplinary fields of research that archaeologists had for a long time been using, to a smaller or greater extent, as a necessary tool in the complex process of archaeological interpretation. Finally, our intention was also to show how long-lasting and demanding the process of excavating, recording, processing, identifying and ultimately interpreting the material really was.

Cooperation with the experts who had for years been carrying out scientific analyses of archaeological material, as well as with those who for the first time encountered these issues and developed experimental research methods on concrete cases, was both an inspiring and a challenging task for the archaeologists of the Zagreb City Museum. There was a terminology barrier that first needed to be overcome prior to posing the right questions. It was crucial to find out how to read the answers and search for additional clarifications after studying seemingly dry reports. Generally speaking, archaeologists, as the ultimate moderators of archaeological interpretation, must be aware of both the possibilities and constraints of archaeometric analyses, so that a commissioned analysis would eventually make sense and not be an end in itself. What we

must not lose in the process is the awareness of the fact that archaeological finds are material remnants of the way people lived in a certain period and place and that there has to be a logical explanation and motivation behind each trace. It is only after countless questions are answered and interpretations provided that a communication channel can get established between archaeologists and experts in the field of archaeometry. As a result, the archaeologists gain access to an ample amount of valuable information that they build into an archaeological interpretation.

It would take too long to list all expert associates that collaborated with the archaeologists of the Zagreb City Museum (the list includes 32 authors of scientific surveys, anthropologists, physicists, chemists, botanists, geophysicists, geologists, radiologists, dentists, zoologists, land surveyors, etc.).

Their names can be found in the publication details, as well as in the reference list within the catalogue of the exhibition 'In the Service of Archaeology'. We would like to point out here that a number of Croatian scientific and higher education institutions collaborated on the project: the Ruder Bošković Institute, Faculty of Science, Faculty of Veterinary Medicine, Faculty of Forestry, Faculty of Humanities and Social Sciences, School of Dental Medicine, Institute for Anthropological Research and Croatian Natural History Museum. Other contributors comprise the Department of archaeology of the Faculty of Arts in Ljubljana (Slovenia), Leibniz-Laboratory for Radiometric Dating and Isotope Research, Kiel (Germany), Romano-Germanic Central Museum, Mainz (Germany), Department of Physics and Earth Sciences, University of Parma (Italy), Research Unit of Paleoradiology and All. Sci., Trieste (Italy), Laboratory of Tree-Ring Research, University of Arizona and Cornell Tree-Ring Laboratory, Cornell University (USA)<sup>4</sup>.

Presentation of excavated finds is one of highly important responsibilities of a chief archaeologist. This usually involves expert reports on the fieldwork results, expert and scientific papers and, if we are lucky enough, monographs providing a comprehensive overview of an archaeological site. Although there are exceptions to the rule, all of the above-referenced documents are generally intended for a small group of experts. A selection of analysed and interpreted archaeological artefacts is presented also through permanent museum displays, but the results of various archaeological research works are more often presented through

<sup>4</sup> See Impressum in Bugar & Mašić 2013: 74-75.

temporary exhibitions. Considering the role and mission of museums within contemporary society, an exhibition is the most basic and common form of museum communication. It is a unique and special way of presentation or a form of interpretation: it simultaneously send a message to more people and expose authentic exhibits which visitors can more easily identify with and appreciate at a personal pace and level (Ambrose & Paine 2012: 141). An exhibition is also a kind of act of creation, presentation and interpretation of certain phenomena and the knowledge around them (Maroević 2003: 13). As a rule, they address a wider audience and should not be intended for a narrow circle of professionals and experts in the field. It is therefore necessary to take into account, as early as in the phase of drawing up an exhibition script, different levels of presentation intended for different visitor profiles of different age and successfully balance between oversimplifying and over-complicating the script. This balance is not easily achieved.

## INTERDISCIPLINARITY – A KEY TO COMPREHENSIVE INTERPRETATION

‘Ms NN’, the final theme of the exhibition, described in the catalogue under the chapter Forensic Aspect of Archaeology (Bugar & Mašić 2013: 67–70) best summarises our attempts to view archaeometry in a larger context, i.e. in the service of archaeology, thus allowing for creative cooperation of different expert fields. Forensic science is difficult to define precisely, but broadly speaking it is the “application of scientific techniques and principles to provide evidence to legal or related investigations and determinations” (Tilstone et al. 2006: 1–2). The term forensic archaeology, on the other hand, can be defined as a “form of archaeology in which the data is examined and interpreted within a legal context, usually with the aim of assisting criminal investigations” (Shaw & Jameson 1999: 242). Both archaeologists and police officials seek to understand the nature, origin and sequence of certain events in the past. The final objective is different, but the philosophy is very similar. (Hunter et al. 2003: 11). The keyword in these cases is interdisciplinarity. This view of the research process is very popular in a variety of media, so it is little wonder that there is a great deal of interest into any attempt to ‘reconstruct the past’ within the context of a museum. And this is how the exhibition in Zagreb tries to bring an interesting archaeological finding closer to public: it refers to the grave of a woman from the 13<sup>th</sup> Century, named

Ms NN (e.g., Jane Doe), found and investigated on St. Mark’s Square in Zagreb (Grave 33). While the catalogue contains an extensive description of the said grave, this article refers to it only as an example of how in ideal conditions an almost forensic approach to analysing archaeological finds contributes to a more meaningful archaeological interpretation. Namely, four archaeometric analyses were carried out on the bone remains, which is a rather exceptional case in terms of usual practice. One might ask why this particular find was chosen among many others to ‘receive special treatment’. It can be best explained by pointing to a set of events that were recounted even after the site excavations had already ended. The grave might easily have remained undiscovered: during the rescue activities in 2005, mainly focused on the area in front of the southern wall of the St. Mark’s church, it was decided that the stone stairs in front of the south portal would not be moved since the project of reconstructing the pedestrian zone envisaged that they would remain in situ. The following year, due to certain technical and construction requirements, the stairs were moved regardless. In that phase, as was the case the year before, some thirty graves from the Middle Ages had already been found in shallow burial pits, just below the asphalt and recent thin filling layers, in a rather poor condition (Mašić & Bugar 2006: 183; Bugar & Mašić 2008: 172–173). The stairs were removed on the last day of works and, even though it seemed that it would not take long to investigate this narrow surface, everybody was surprised when a grave was discovered right below the stairs. What is more, it was the deepest burial pit discovered on the site so far, meaning that the bone remains were exceptionally well preserved. So it is no wonder that the high level of cautiousness required when investigating the remains, data recording, photographing, land surveying, and sketching until late night hours created great excitement. The cemetery as a whole represents an important archaeological find proving that the area around the parish church of St. Mark had served as a burial place even before the today’s St. Mark’s church was built, i.e. in the period before the Mongol attack in 1242. The two graves (Grave 14 and Grave 21) covered by the foundation wall of the west front of the church also pointed to this fact, which was further confirmed by the radiocarbon dating of Grave 14 to the end of the 11<sup>th</sup> Century, i.e. to the 12<sup>th</sup> Century (Bugar & Mašić 2008: 175–176). It goes without saying that the most fundamental archaeometric techniques available to archaeologists are dating techniques, and the two most important

techniques that have revolutionised archaeology are dendrochronology and radiocarbon dating (Summerhayes 2001: 102). A bone specimen from Grave 33 (of the so-called Ms NN), due to its position near the south portal of the church, below the stairs, was also radiocarbon dated and the result confirmed that it belonged to an older phase of the cemetery, before the mid-13<sup>th</sup> Century (Grootes 2007; Bugar & Mašić 2008: 176). As was the case with all the bone remains within the cemetery, a bio-anthropological analysis was carried out on the bones from Grave 33, as well. Since the remains were well-preserved, the anthropological analysis was more extensive than those performed on the major part of other remains, revealing a large quantity of information on the “life recorded in the bones” of this woman, who died between 25 and 30 years of age (Hincak 2008). The study of human skeletal remains from archaeological sites can

ing the very heart of the City of Zagreb, whose history and everyday life is presented to the public by the Zagreb City Museum, one of their central themes. This is why the best-preserved skeleton from Grave 33, a deceased woman named Ms NN, was chosen to be the final theme of the exhibition. The intention was to present to the visitors an Upper Town inhabitant from the 13<sup>th</sup> Century, and what she looked like – for this reason her face was digitally reconstructed (Cavalli 2013). It was the first facial reconstruction in Croatia! (Fig. 2). A forensic reconstruction uses a computer to “add” soft tissue to the facial bones of a corpse. The use of computer programmes today is a process identical to the process of manual facial reconstruction but performed on a computer screen: it is a form of “virtual sculpturing” based on 3D data obtained by laser scanning or computerised tomography of the skull of a corpse (Polić et al. 2012: 31, 33). The

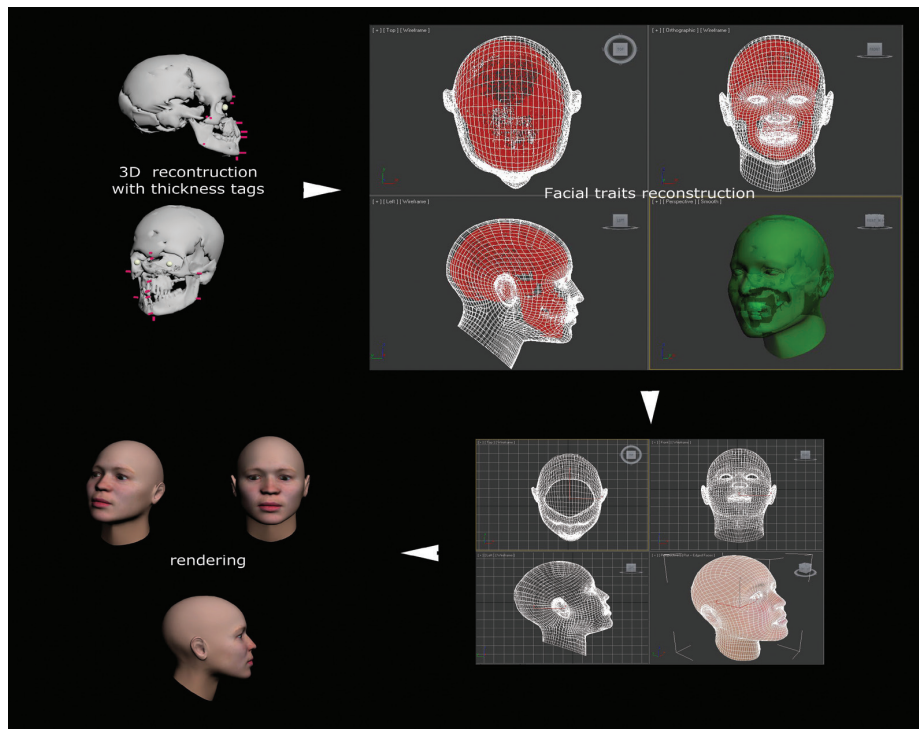


Figure 2. Phases of the computer-aided facial reconstruction of the skull from Grave 33 (Zagreb City Museum Archives / made by Fabio Cavalli)

provide answers to many questions, for example about historical population lifestyle, diseases, nutrition, trauma, activity patterns, population characteristics etc. (Rajić Šikanjić 2005: 763). Further analyses of the cemetery and the preparatory phase of the exhibition were focused on the desire to make the site of the St. Mark's Square, situated at the very heart of the Upper Town and symbolis-

intention was also to find out, through advanced chemical analysis of stable isotopes in bone collagen, additional information about diet of Ms NN and the surroundings in which she had grown up and lived (Iacumin 2013). Additionally, isotopic analyses can reveal a wealth of data on long-term food consumption and this method relies on identifying the chemical tracers in bodies that are left

by different food stuffs put more simply - put more simply, "we are what we eat" (Renfrew & Bahn 2008: 313). So, teeth tell the story of a childhood and bones contain the stories of last 10 to 20 years of our lives. The museological approach to presenting this find focused on telling a compelling story about the so-called Ms NN, and interdisciplinarity was a key to comprehensive interpretation<sup>5</sup>. The story of Ms NN was based on true facts, and creative bits were added just to make it more personal and poetic, in order for the visitor to be able to identify with a real person who lived on the Grič Hill more than 700 years ago and get to know her 'up close and personal'. We believe this illustrates that archaeometric analyses are not only an interesting addition, but also an indispensable part of archaeological interpretation. Here we cite only the first few sentences of the text contained in the exhibition catalogue as a good example, we believe, of how to get a wider audience interested in an archaeological find by addressing them on a more personal level: "Ms NN was buried on Grič Hill, as King Bela IV in the Golden Bull of 1242 called the Zagreb Upper Town of today. Ms NN did not see the king himself, or the Mongols from whom the king was fleeing that year, for she died between 1224 and 1239, aged between 25 and 30..... Had she not died then, who knows what evil might have met her during the tumultuous period of the Mongol devastation. If she had lived just fifteen years more, she would have witnessed the building of today's Church of St Mark, where, just a few metres from the southern portal, her mortal remains were found....."

## CONCLUSION

We are witnessing that our heritage is becoming increasingly endangered due to the public's lack of understanding, which perceives the preservation efforts as unnecessary expenditure in a time of severe crisis. However, this lack of understanding should and must be changed through efficient and comprehensible communication. Even though it may sound unrealistic, we need to raise awareness about the importance of the entire cultural heritage and about the fact that none of its fragments should be considered less important or unimportant. This attitude should serve as a basis for every individual to identify themselves with the world they live in. Archaeologists can contribute to this change through fresh, creative, educational, interesting and high-quality presentation or at least give their best to achieve this, and exhibitions can be ideal for this purpose.

In archaeological interpretation, it is often the tiniest and the most unattractive find that represents an abundant source of information. Archaeologists analyse the data obtained by applying archaeological methods in various ways; by choosing adequate specimens suitable for archaeometric analyses, they do their best to build upon the knowledge they have acquired. Not only are archaeometric analyses a welcome help, but also a necessary tool for the proper interpretation of finds. The archaeologist, as a moderator, integrates them into the final interpretation, which is thus based on the archaeological data obtained through the application of the archaeological methodology and on the data from other scientific disciplines, obtained from the natural, technical, medical and other interdisciplinary fields of research. Archaeometry gives a measurable contribution to archaeological interpretation and to the deepening of the knowledge about our past.

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## BIBLIOGRAPHY

- Ambrose & Paine 2012 T. Ambrose & C. Paine, *Museum basics*, London & New York, 2012.
- Bugar & Mašić 2008 A. Bugar & B. Mašić, "Srednjovjekovno groblje na Trgu sv. Marka u Zagrebu", in: Mitja Guštin (ed.), *Srednji vek – arheološke raziskave med Jadranskim morjem in Panonsko nižino*, Ljubljana, 2008, 171–177.
- Bugar & Mašić 2013a A. Bugar & B. Mašić, *U službi arheologije* (katalog izložbe / exhibition catalogue), Zagreb, 2013.
- Bugar & Mašić 2013b A. Bugar & B. Mašić, "Gospoda NN iz 13. stoljeća", *Zagreb moj grad*, 7, 44 (2013), Zagreb, 2013, 86–87.
- Cavalli 2013 F. Cavalli, *Facial Reconstruction of the skull from grave 33, St. Mark Square, Zagreb, Croatia* (unpublished report, Zagreb City Museum Archives), Trieste, 2013.
- Dean 2005 D. Dean, *Museum Exhibition: Theory and Practice*, London & New York, 2005.
- Grootes 2007 P. M. Grootes, *Results of Radiocarbon Dating of Samples: KIA 33240 – 32242, 33175 – 33177 from St. Mark Square, Zagreb* (unpublished report, Zagreb City Museum Archives), Kiel, 2007.
- Hincak 2008 Z. Hincak, *Izvjeste: Antropološka analiza skeletnih ostataka s nalazišta Trg. Sv. Marka, Zagreb 2005/2006*. (unpublished report, Zagreb City Museum Archives), Zagreb, 2008.
- Hunter, Roberts & Martin 2003 J. Hunter, C. Roberts & M. Anthony, *Studies in Crime: An Introduction to Forensic Archaeology*, London & New York, 2003.
- Iacumin 2013. P. Iacumin, *The Isotop Analysis of Human Bone Remains from Archaeological Sites St. Mark Square in Zagreb, Croatia and Šepkovića near Zagreb, Croatia*. (unpublished report, Zagreb City Museum Archives), Parma, 2013.
- Krajcar Bronić 2013 I. Krajcar Bronić (ed.), *Collection of Lecture – IAEA Regional Training Course on Dating of Cultural Heritage Artefacts Using Nuclear Analytical Techniques*, Zagreb, 2013.
- Maroević 2003 I. Maroević, "Muzejska izložba – muzeološki izazov", *Informatica Museologica*, 34, (3-4) 2003, Zagreb, 2003, 13-18.
- Mašić & Bugar 2006 B. Mašić & A. Bugar, "Lokalitet Zagreb – Trg sv. Marka", *Hrvatski arheološki godišnjak*, 3, 2006, 182 – 184.
- Polić, Petaros, Cuculić & Bosnar 2012 Lj. Polić, A. Petaros, D. Cuculić & A. Bosnar, "Forenzička facijalna rekonstrukcija – između umjetnosti i znanosti", *Medicina Fluminensis*, 48, no. 1, Rijeka, 2012, 30 – 40.
- Rajić Šikanjić 2005 P. Rajić Šikanjić, "Bioarchaeological Research in Croatia – A Historical Review", *Collegium Antropologicum*, 29, no. 2, Zagreb, 2005, 763 – 768.
- Renfrew & Bahn 2008 C. Renfrew & P. Bahn, *Archaeology: Theories, Methods and Practice*, London, 2008.
- Shaw & Jameson 1999 I. Shaw & R. Jameson (eds.), *A Dictionary of Archaeology*, Cornwall, 1999.
- Summerhayes 2001 G. Summerhayes, "Archaeometry", in: T. Murray (ed.), *Encyclopedia of Archaeology. History and Discoveries*, Santa Barbara, 2001, 100 – 105.
- Tilstone, Savage & Clark 2006 W. J. Tilstone, K.A. Savage & L.A. Clark, *Forensic Science: An Encyclopedia of History, Methods and Techniques*, Santa Barbara, 2006.

## ELECTRONIC SOURCES:

<http://www.mgz.hr/hr/izlozbe/u-sluzbi-arheologije,474.html> (posjet / accesed: 31 July 2015).

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