



# 09TH

INTERNATIONAL  
SCIENTIFIC  
CONFERENCE

METHODOLOGY & ARCHAEOLOGY

Zagreb, 2<sup>nd</sup> – 3<sup>rd</sup> December 2021

## eBook of abstracts

<https://metarh.ffzg.unizg.hr/>

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### EDITOR

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Department of Archaeology, Faculty of Humanities and Social Sciences of the University of Zagreb  
and the Croatian Archaeological Society

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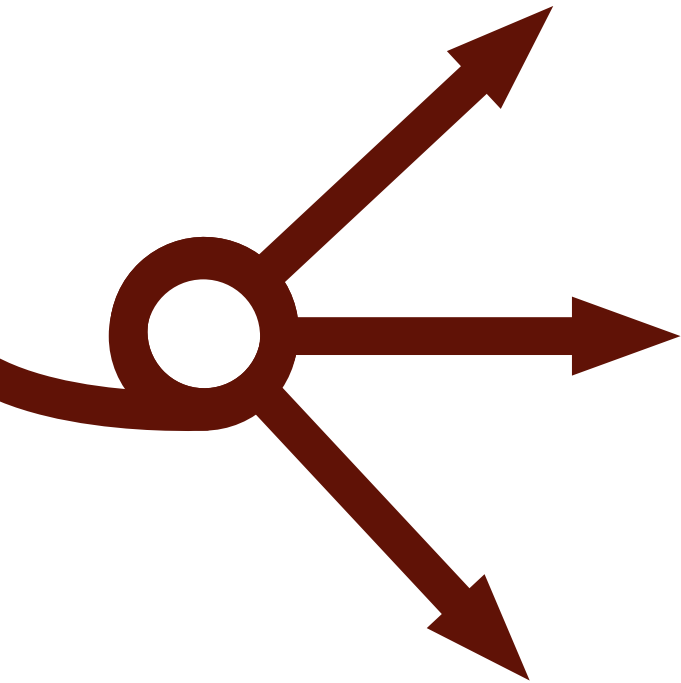
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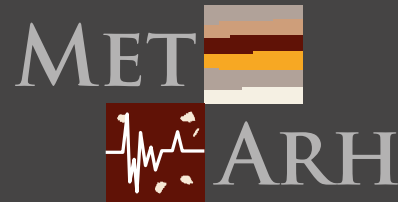


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The scientific conference *Methodology and Archaeometry* is being organised by the Department of Archaeology, Faculty of Humanities and Social Sciences since 2013. The goal of the conference is to entice interdisciplinarity, critical thinking, new insights and approaches as well as new theoretical frameworks in contemporary archaeological science.

Coverage of a wide spectrum of themes and scientific disciplines has resulted in papers and discussions that promote scientific issues in the fields of methodology, documentation and interpretation of archaeological data. The interdisciplinary character of the conference brings together archaeologists and researchers from other scientific disciplines with whom archaeologists collaborate closely; and who – through their work, projects and ideas – promote new insights about Interpretation of the human life in the past.

#### Section Methodology

Obtaining and collecting data is an essential part of the archaeological research process. How we collect and interpret data defines the validity of our interpretation. We use different techniques, approaches and tools which help us to reconstruct the past processes and to give more objective and comprehensive picture of the past. Contemporary interpretation tools alleviate and speed the data collection and also provide us with countless possibilities of interpretation, protection and presentation of archaeological sites and the landscapes encompassing them.

#### Section Archaeometry

Having in mind limited information we obtain from archaeological excavations and the classification of archaeological material, cooperation with other scientific disciplines becomes unnecessary, to obtain as much information as possible on the conditions and the way in which the humans lived in the past. Contemporary archaeology is a very heterogeneous discipline encompassing interest groups focussed on various periods, regions, theoretical frameworks and methodological techniques. Aside from the description of mechanical and physical features of a specific artefact or material, various archaeological analyses help us to direct our scientific focus to questions regarding the ways and features included in the social and cultural life of people who made, used, exchanged and discarded those objects. Cooperation with the natural sciences provides answers to many questions, but it also demands an additional level of caution when selecting adequate scientific analysis for a specific archaeological problem. It also demands a continuous cooperation of a specific expert and an archaeologist from sample collection to the final interpretation.

Due to the COVID-19 pandemic, this year's conference will be held on online platform for virtual events: <https://hopin.com/events/metarh-2021>

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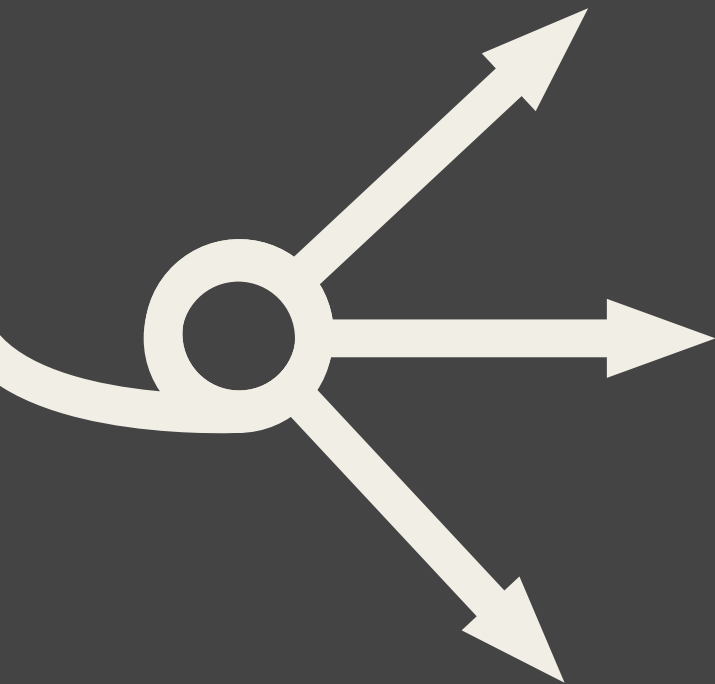
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**PROGRAMME**

**Thursday, 2<sup>nd</sup> of December****10:00 – 10:15****Conference opening****Ina Miloglav** – organizer, Department of Archaeology**Jacqueline Balen** – president of Croatian Archaeological Society**Nevena Škrbić Alempijević** – Vice-dean for research and international cooperation**Keynote lecture:****Chair: Ina Miloglav****10:15 – 10:45****Vedrana Glavaš****Cadaver dogs, archaeologist's best friends.****The use of dogs as bio-detectors in archaeological prospection****10:50 – 11:00****Break****Session 01****Chair: Miroslav Vuković****11:00 – 11:15****Andrej Janeš****Use of archaeological structural survey and the analysis of standing structures on mediaeval castles****11:20 – 11:35****Ivor Kranjec & Jelena Behaim****Macro and Micro Spatial Analysis in the Research of Early Medieval Istrian Bale Region****11:40 – 11:55****Igor Kulenović, Šime Vrkić & Sara Igljić****Historic Landscape Characterization – Let's Do That!****12:00 – 12:15****Neda Kulenović****Historic Landscape Characterisation –****Potential Improvements of the Method Using Geospatial Technologies**

12:20 – 12:35

Igor Medarić

Project MagIstra - magnetic mapping of archaeological structures in soils on flysch. Case studies from Slovenian Istria

12:40 – 13:00

Break

## Session 02

*Chair: Jacqueline Balen*

13:00 – 13:15

Jelena Anđelković Grašar & Bojana Plemić

Participation programmes for young people as an educational method in archaeology dissemination

13:20 – 13:35

Predrag Novaković

The Sorcerer's Apprentices: Teaching archaeological methods and techniques

13:40 – 13:55

Maja Kaleb & Ivan Vidulić

Underwater Archaeology Courses conducted by ICUA Zadar

14:00 – 14:45

Break

## Session 03

*Chair: Rajna Šošić Klindžić*

14:45 – 15:00

Dragana Rajković & Selena Vitezović

The Prehistoric site of Kotlina – methodology of excavation and preliminary results from seasons 2018–2021

15:05 – 15:20

Dolores Knežić

Alternative methods in handling heavy fraction - when do we need them?

15:25 – 15:40

Mario Novak & Dragana Rajković

The Late Neolithic human burials from Kotlina - Szuzai Hegy, Baranja: the first results of the anthropological analysis

15:45 – 16:00

Tina Bareša, Ivan Jerković, Željana Bašić & Ivana Kružić

The role of multi-slice computed tomography (MSCT) imaging in biological anthropology

16:05 – 16:20

Goran Tomac

Moooooving with the Herd - The analysis of domestic animal body size in the Neolithic and Copper Age of the eastern Croatia

16:25 – 16:40

Break

## Session 04: Poster presentations

*Chair: Nikola Vukosavljević*

16:40 – 16:45

Šime Vrkić, Sara Igljić & Igor Kulenović

Late Prehistoric Enclosures- an Elusive Type of Site

16:45 – 16:50

Pio Domines Peter

Survey methodology and challenges in an inaccessible Mediterranean (is)landscape with small surface visibility and dense vegetation - case study from island of Ist, Northern Dalmatia

16:50 – 16:55

Jugoslav Pendić, Vidan Dimić & Dragana Antonović

Application of photogrammetric method of 3D scanning within the shaft Object 1 at the Prljuša-Mali Šturac site

16:55 – 17:00

Katarina Gerometta & Rajna Šošić Klindžić

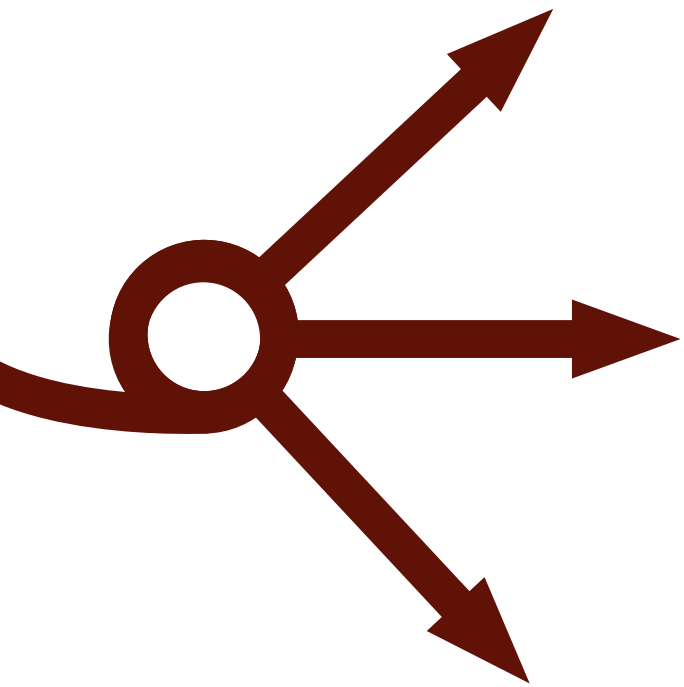
Archaeological micromorphology at the Late Neolithic site Gorjani

17:00 – 17:05

Katarina Šprem & Bernardo Marcuiš

Geochemical analysis of Istrian flint – first results and discussion

**Friday, 3<sup>rd</sup> of December****Session 05***Chair: Jasna Vuković***10:00 – 10:15****Tomislav Brenko, Tena Karavidović, Sibila Borojević Šoštarić & Tajana Sekelj Ivančan**  
Mineralogy and geochemistry of iron slags towards their provenance studies in Podravina region, NE Croatia**10:20 – 10:35****Ilaria Calgaro, Umberto Veronesi, Antonina Ermolaeva & Miljana Radivojević**  
Copper production and technology at Mid-Late Bronze Age Taldysai (central Kazakhstan): its place in the wider Eurasian metalmaking framework**10:40 – 10:55****Tena Karavidović & Tajana Sekelj Ivančan**  
Interpreting the archaeological record of iron production sites: a multi-method approach**11:00 – 11:15****Zorana Kovačević & Julia Fileš Kramberger**  
SEM in Archaeological Textile Research**11:20 – 11:35****Aleksandra Cetwińska, Ewa Wagner-Wysiecka, Katarzyna Kwiatkowska & Dariusz Manasterski**  
Origin versus style. An interdisciplinary study of amber ornaments from NE Poland**11:40 – 12:00****Break****Session 06***Chair: Ivana Ožanić Roguljić***12:00 – 12:15****Ana Fundurulić, Mafalda Costa, Fabrizio Michelangeli, Andrea Babbi, Cecilia Predan, Ana Manhita, Alessandra Celant, Cristina Barrocas Dias & Donatella Magri**  
Exploring Etruscan burial rituals: analysis and research potential of organic residues from funerary bronze vessels**12:20 – 12:35****Anđa Petrović, Cristina Lemorini & Stella Nunziante-Cesaro**  
Reference collection as key element of use-wear and residue analysis of chipped stone assemblages: study of Iron Gates region (Serbia)**12:40 – 12:55****Nikola Marković, Boban Tripković, Marko Porčić, Ana Tripković & Jasna Vuković**  
Preliminary X-Ray Fluorescence Analysis of Early Eneolithic Pottery: Šanac-Izba near Lipolist (Western Serbia)**13:00 – 13:15****Andreja Kudelić, Dinko Tresić Pavičić, Natali Neral, Mia Marijan & Ana Maričić**  
Research on Bronze Age pottery traditions – Conceptual approach**13:20 – 13:35****Aleksandra Cetwińska, Grzegorz Koczan, Maciej Sadło & Dariusz Manasterski**  
Potential of using reed arrow shafts hidden in their spine-force value**13:40 – 14:00****Break****Session 07***Chair: Jacqueline Balen***14:00 – 14:15****Ines Krajcar Bronić, Ivor Karavanić, Andreja Sironić, Nikola Vukosavljević, Marko Banda & Fred Smith**  
Radiocarbon dating of the Middle Paleolithic animal bones from two caves, Croatia**14:20 – 14:35****Miroslav Marić, Jelena Bulatović & Nemanja Marković**  
Regional Absolute Chronologies of the Late Neolithic in Serbia**14:40 – 14:55****Andreja Sironić, Žana Matulić Bilač, Barbara Španjol-Pandelo & Ines Krajcar Bronić**  
Dating wooden artefacts treated with resins**15:00 – 15:15****Dinko Tresić Pavičić, Željka Bedić & Filomena Sirovica**  
System for Recording and Analyzing Articulated Human Skeletal Remains**15:30****Closing**



*ABSTRACTS*

**Vedrana Glavaš**

Department of Archaeology, University of Zadar, Croatia

**Cadaver dogs, archaeologist's best friends.****The use of dogs as bio-detectors in archaeological prospection**

It is generally known that dogs can be used for a variety of purposes such as explosives, drugs, blood or disease detection, or that they can find missing persons. However, it is less known that dogs have abilities to detect graves from different periods. Human Remains Detection (HRD) or cadaver dogs are trained to detect and indicate the strongest concentrations of odor that is characteristic for human body at various stages of decomposition. Since the smell of human decomposing odor differs from odor of other decomposing mammals, properly trained dogs can locate positions of human burials.

Dogs trained in this way are mostly used to help solving criminal cold cases and they are usually employed by the police. However, research on the use of HRD dogs to detect and locate older historic or prehistoric burials was very limited. Since recent studies demonstrate that human decomposition smell can be very persistent, we have started testing the capabilities of dogs noses and developing the methodology of training and work in archaeology within the "Archaeological dog project".

This talk will present the methodology of work with HRD or cadaver dogs in archaeology and also the results of some research at archaeological sites from various periods.

The main goal of this talk is to present the general use and possibilities of Human remains detection dogs in locating burial sites from various periods and demonstrate how dogs can be used as bio-detectors in archaeology in the same manner as many other tools and techniques that are common in archaeology.

**Andrej Janeš**

Croatian Conservation Institute, Zagreb, Croatia

**Use of archaeological structural survey and the analysis of standing structures on mediaeval castles**

**A**rchaeological structural survey is a non-invasive procedure that determines the existence of structures and records the archaeological contents of buildings, or their parts visible above the ground. The archaeology of standing buildings is a method that involves arranging the observed stratigraphic units in a chronological sequence, applying the so-called Harris matrix (and linking the obtained results with other sources, primarily written, legal acts, graphic historical representations, and the results of archaeological research and archeometric analysis (samples of stone and mortar). Both methods were used in the research of remains of medieval castles. The paper will show the results of these analysis on two case studies: the Cesargrad Castle in Hrvatsko Zagorje and Grižane Castle in the Vinodol Valley. In the case of Cesargrad different construction, phases have been identified, showing a rich architectural history of the castle, ranging from the 13th to the 17th centuries. In the case of Grižane Castle, the data suggest that the visible traces date to only one phase of construction during the 15th century, contrary to the known historical data. With the application of the structural survey, the outer buildings and structures of the castle have been documented for the first time.

The use of these methods allows new insights in the architectural development of the buildings in question, give answers to specific research questions, especially in the field of late medieval and post-medieval archaeology, and enrich the data of individual buildings. The data can be used in later monuments protection programs, as the foundation for a better understanding of the buildings and the proper method of their preservation.

**Ivor Kranjec & Jelena Behaim**

Department of Art History, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia

**Macro and Micro Spatial Analysis in the Research of Early Medieval Istrian Bale Region**

**T**he results of archaeological research of the monastery complex of St Mary the Great near Bale have greatly contributed to our understanding of the Frankish expansion along the Istrian peninsula at the end of the 8th century. A quarter of a century of the research has been followed by the evolution of research and documentation methodology, which over the last two years has been more intensively focused on the development of a method for detailed spatial analysis of the microtopographic situation of the surrounding region. The IRCLAMA research team has focused on summarizing the results hitherto achieved and on planning the future research strategy, here presented on the example of wider Bale area.

The goal of this paper is to present the methodology that includes the use of contemporary documentation tools, as well as documentation and spatial analysis carried out at two levels - macro and micro - through the use of geographic information systems. From a macro perspective, it is possible to schematically define the initial impulse of the expansion in the form of infrastructure ramifications (roads, settlements, monasteries, churches, estates of the ruling elites etc.). Although the area of research (Bale region) is geographically limited, such a perspective permits us to reconstruct original points of interest, lines and areas which formed medieval spatial network. Redefinition of this (today lost) network is based on a comparative study of historical and contemporary cartographic material, as well as archaeological and historical sources.

At the second, the micro-level, the endpoint of the landscape is analysed, in this case, the remaining structures of the monastery complex. Here the goal is to revise and classify each individual element of the monument, together with its spatial and attribute data, in order to create a comprehensive database of early medieval architecture of southwestern Istria.

**Igor Kulenović, Šime Vrkić & Sara Igljić**

Department of Tourism and Communication Studies, University of Zadar, Croatia

**Historic Landscape Characterization – Let's Do That!**

**A**rchaeology has always been a spatial discipline even though it was not always aware of the fact. However, the so-called spatial turn has hit social sciences really hard across the disciplinary board. Archaeology, as usual, may have come late in the game but it did come nevertheless. Another thing archaeology has always been about is heritage.

That concept too became a highly debated issue, this time within the general confines of the linguistic turn. All this spinning and turning has raised a rather crucial issue: how can archaeology contribute to valorization and consequently protection of landscape (another highly debated concept). The awareness that landscape is a finite resource and that it has to be engaged with great caution is even codified in various legislation on a national and international level. Historic Landscape Characterization (HLC) was developed as a direct response to these issues and trends and it is high time for Croatian archaeology to catch that train. Our aim is to discuss some theoretical and practical issues regarding the notions of historicity, landscape, landscape protection and heritage. Finally, HLC as a formalized framework for identifying historic landscape formations will be discussed in the context of applying the method to a specific relief – the Dinaric Karst.

**Neda Kulenović**

Department of Geography, Geospatial Laboratory Analysis, University of Zadar, Croatia

**Historic Landscape Characterisation – Potential Improvements of the Method Using Geospatial Technologies**

**H**istoric landscape Characterisation – HLC is a method that identifies historic character types of the cultural landscape. The basic purpose of characterisations is the management of landscape as heritage. It is a part of the cultural resource management sector. HLC is also a part of applied archaeology since the method was conceptualised and deployed by archaeologists. The characterisation is executed in geographic information systems which were implemented in the method the moment GIS software packages became widely available. However, the characterisation is still carried out by manual vectorisation in a GIS. The basis of characterisation is morphological analysis.

The archaeologist as an interpreter has the main role in the process of characterisation. Hence, the quality of characterisation is interpreter dependent and as such extremely subjective. The development of new geospatial technology enables a fresh view on the application of new methods in HLC. The implementation of new methods may improve characterisation by making it more objective while simultaneously accelerating the process of characterisation. The improvement through the previously mentioned two aspects may be achieved through wider use of remote sensing methods, various landscape models, and, finally, the deployment of Geographic Object-Based Image Analysis.



**Igor Medarić**

Department of Archaeology, Faculty of Arts, University of Ljubljana, Slovenia

### **Project MagIstra – magnetic mapping of archaeological structures in soils on flysch. Case studies from Slovenian Istria**

**T**his presentation will deliver results of the ongoing research project MagIstra, which intends to assess the potential of the magnetic method in archaeology for soil sequences on flysch. Detailed evaluation of the effectiveness of this method for identification and determination of the type and physical properties of archaeological remains was carried out in Spring 2021, at typologically and chronologically different archaeological sites in the inner regions of Slovenian Istria. Even though often homogenous soil sequences on flysch can be favourable for recognizing archaeological remains for various geophysical methods, several technical and interpretative problems had to be addressed and checked for successful magnetic mapping.

The primary issue was recognizing and interpreting magnetic anomalies of commonly represented archaeological structures - architectural remains, composed of local rocks, with only a slight contrast between the soil's and their magnetic susceptibility. In order to tackle this challenge, dense and accurate measurements with a high-sensitive, optically pumped caesium magnetometer and selected measurements of magnetic susceptibility on individual natural and archaeological materials were taken. Afterwards, magnetic method results were analysed and compared with excavations and other geophysical method's results, such as electrical resistivity. Later on, these results were adapted to the specific natural features, archaeological structures and research objectives of particular sites. Based on the outcomes, a set of proven advanced quantitative processing procedures with transformations, as well as 2D and 3D magnetic modelling with all the challenges will be presented. Ultimately, the solutions ideally could serve as a basic methodology that would ensure the optimum survey efficiency and more effective problem solving of magnetic mapping in the specific environment for future research.

#### **Jelena Anđelković Grašar<sup>1</sup> & Bojana Plemić<sup>2</sup>**

<sup>1</sup> Institute of Archaeology, Belgrade, Serbia

<sup>2</sup> Academy of Applied Studies, Belgrade, Serbia

### **Participation programmes for young people as an educational method in archaeology dissemination**

**C**ommunity archaeology, as a part of Public archaeology, terminologically has existed since the 1970s, but still remains open to numerous definitions. Primarily, it is based on the need to include diverse subjects in the interpretation of the past, implying the mutual education of archaeological heritage professionals and the community itself. Despite the very different perceptions of this discipline, it is increasingly present in European archaeology, while the interaction of communities with heritage, either in museums or on sites, is considered an effective process for their integration. The focus of such an approach is particularly the younger population, targeted through schools and teachers, as an involvement priority.

Although we cannot talk about the systematic development of the Community archaeology domain in Serbia, there have been some lasting benefits achieved through participatory programmes for young people, which have been shown to be entirely acceptable methods of archaeological knowl-

edge dissemination. On this occasion, we will point out practices continuously conducted in the Viminacium archaeological park, through children's camps and workshops, the "Young Romans" programme or student tourism internships. Thanks to these, a network of intersectoral partners has been created and, together with the valuable experience gained by the participatory approach, has served as a basis for the special methodology development. Even though such examples are not numerous in the Serbian environment, they are paving the way for a new strategy considering the vertical mobility of archaeological knowledge in the formal education system, from the earliest school age to older students. In such a way, the creation of future professionals is enabled from the very foundations of the education system. Additionally, stable education effects a more responsible audience in relation to archaeological heritage and, ultimately, establishes a community that will actively coexist with it.

**Predrag Novaković**

Department of Archaeology, Faculty of Arts, University of Ljubljana, Slovenia

### **The Sorcerer's Apprentices: Teaching archaeological methods and techniques**

**I**f anything shows the interdisciplinary nature and practice of archaeology that it is its methodology. Compared to other social sciences and humanities, archaeology utilizes by far the largest arsenal of methods and techniques coming from other sciences' domains: natural sciences, engineering, social sciences, linguistics, art history, history, communication sciences, computing sciences etc. And there is also something that can be called the archaeological methods in sensu stricto: e.g. archaeological surveying, excavating, object's description, formal archaeological taxonomies etc., which are genuine archaeological combinations of various techniques. What joins this methodological apparatus in a coherent whole is an archaeological interpretation or, to put it better, the archaeological epistemology. Are we successful in doing this?

This paper aims not to discuss the methodological nature and perspectives of archaeology but rather how these methods are transferred to archaeology students. The empirical background is provided by a survey of 100 students from the universities of Ljubljana, Zagreb and Belgrade in November 2021. The survey aimed to reveal 'the methodological landscapes' in these three universities, how the learning of methods is perceived by students, shortcomings of the actual teaching and its future potentials and perspectives.

**Maja Kaleb & Ivan Vidulić**

International Centre for Underwater Archaeology in Zadar, Croatia

### **Underwater Archaeology Courses conducted by ICUA Zadar**

**T**he International Centre for Underwater Archaeology in Zadar (ICUA) is an independent public institution and is a UNESCO Category II centre, strongly promoting the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage.

Alongside research, protection, preservation, and dissemination of underwater cultural heritage on an international level, one of ICUA's main objectives has been organizing introductory and advanced underwater archaeology courses staged at ICUA every year following the UNESCO/ICUA program since 2011.

The basic course consists of theoretical and practical (hands-on) instructions in underwater documentation and archaeological excavation, whose main goal is to allow the participants to acquire the best possible knowledge of basic underwater archaeology research techniques. The advanced course is aimed at archaeologists who have diving experience and at least some basic experience of practical underwater archaeology and is designed to provide participants with advanced skills and training in underwater archaeology and basic project planning.

The programs are organized by the ICUA's Education and documentation department. The theoretical part of the course and the practical training is coordinated by ICUA staff and other guest lecturers. As the Centre is an official training partner of the "Nautical Archaeology Society", we also stage courses based on the "NAS" underwater archaeology syllabus. Alongside the mentioned courses, ICUA also organizes underwater photogrammetry courses and has successfully conducted underwater archaeology field schools abroad.

For practical diving activities, ICUA has eight sets of diving equipment, a scuba tank filling compressor, and an equipped motorboat. The students dispose of a comfortable dormitory for their accommodation on the Centre's premise, and a large, fully-equipped lecture hall and library for theoretical presentations, workshops, and education. The courses are organized with the financial support of the Ministry of culture and media of the Republic of Croatia.

**Dragana Rajković<sup>1</sup> & Selena Vitezović<sup>2</sup>**

<sup>1</sup>Archaeological Museum Osijek, Croatia

<sup>2</sup>Institute of Archaeology, Belgrade, Serbia

### **The Prehistoric site of Kotlina – methodology of excavation and preliminary results from seasons 2018–2021**

**T**he methodology of archaeological researches has undergone important improvements in the 21st century, in an attempt to increase both the quantity and quality of obtained data. In particular, systematic excavations went under significant changes; they are usually long-term, with predefined research questions, and comprise several stages. Although the actual excavations still comprise a large part of the work, equally important parts of research are also non-invasive field surveys with geo-physical methods, analyses of the surrounding environment, etc., as well as specialist analyses of diverse categories of archaeological findings.

This presentation will present the 4-year researches on the Neolithic site of Kotlina-Suzai Hegy, situated in Baranja in SE Croatia. Researches were carried out in several stages; after the geomagnetic survey, trenches were located following thus obtained data. Magnetic prospection was carried out of the entire surface, and showed a ring ditch system, with many archaeological structures (probably storage areas, dwelling houses, refuse pits, workshop, kilns). Until today, the area covering approximately 150 m<sup>2</sup> was excavated, revealing diverse archaeological structures: post holes (parts of habitation units), rubbish pits and graves. The portable archaeological finds were rich and diverse and consist of pottery sherds, animal bones, bone artefacts, chipped stone artefacts, polished and abrasive stone artefacts as well as one bead made from mollusc shell. Also, one very small fragment of copper was discovered. During the excavations also a large quantity of obsidian tools was recorded. The pits also contained large amounts of fragmented daub.

Portable archaeological finds and absolute dates show that the site can be attributed to the Late Neolithic/ Early Eneolithic Lengyel culture. Researches in Kotlina are therefore another confirmation that the Lengyel culture was widespread in this area in Croatia, and at the same time, they testify about the cultural diversity of this region in prehistoric times.

**Dolores Knežić**

Department of Archaeology, University of Zadar, Croatia

### **Alternative methods in handling heavy fraction – when do we need them?**

**A**rchaeobotanical analysis of seeds and fruits, known as carpological analysis, is most often performed by applying the flotation method to recover plant remains from sediment on the archaeological site. The main products of flotation are heavy fraction and light fraction which both contain organic remains. Light fraction includes mostly organic remains that were light enough to float above the water, while the heavy fraction encompasses all that is sunken in the sieve after flotation. In the heavy fraction, we usually find small archaeological artefacts, stones, bones as well as plant remains which need to be recovered and examined for archaeobotanical analysis. There are several ways of recovering plant remains from the heavy fraction which differ in efficiency, time and economy. Sugar reflation has proven to be the most acceptable method when there is a time constraint, many samples and a lot of carbonized macrofossils left in heavy fraction.

On the other hand, in the heavy fraction, we can find compact pieces of sediment that did not disperse during flotation due to certain reasons and they still contain plant material that needs to be collected. This can be done by soaking in water alone or by adding deflocculants depending on what type of soil we are working with. It is necessary to consider all crucial parameters prior to using any of the aforementioned methods. That includes the type of site, type of sediment, types of expected macrobotanical remains, research questions, the amount of material to be analyzed, time and other important factors to select the most suitable for our analysis.

**Mario Novak<sup>1</sup> & Dragana Rajković<sup>2</sup>**

<sup>1</sup>Institute for Anthropological Research, Zagreb, Croatia

<sup>2</sup>Archaeological Museum Osijek, Croatia

### **The Late Neolithic human burials from Kotlina – Suzai Hegy, Baranja: the first results of the anthropological analysis**

**D**uring the systematic archaeological excavation conducted from 2018 to 2021 at the site of Kotlina- Suzai Hegy, human burials with skeletal remains of four individuals were discovered. Portable archaeological finds and absolute dates show that the site can be attributed to the Lengyel culture.

The graves were laid in shallow pits, in the foetal position, only thirty centimetres below the surface, which contributed to their preservation. Conventional bioarchaeological analysis revealed the sex and age-at-death of the studied individuals as well their health status. Demographic profile of the studied individuals is quite unusual - Grave 1 contained the remains of a young female (18-20 years) while the other three graves contained the remains of subadults (G2 adolescent 11-13 years old, G4 young child 2-3 years old, G5 infant 6-9 months old). The samples from all four individuals were taken for the purposes of ancient DNA and stable isotopes analyses that will tell us more on the ancestry, kinship and diet of these individuals.

Graves show evidence of complex funerary practice; funerary equipment consisted of ceramic vessels, polished stone tools, and a bead from a mollusc shell. Grave goods and skeletal findings provide a great opportunity for osteological, palaeopathological and demographic investigations, and for the archaeological analysis of mortuary practices within the Late Neolithic community, as well as of the long-distance networks and exchange activity.



**Tina Bareša, Ivan Jerković, Željana Bašić & Ivana Kružić**

University Department of Forensic Sciences, University of Split, Croatia

### The role of multi-slice computed tomography (MSCT) imaging in biological anthropology

In forensic anthropology, MSCT images can be used for personal identification by comparing antemortem and postmortem data, but even in the lack of antemortem records, for biological profiling. In bioarchaeology, MSCT images can be used for creating osteobiography of an individual but can also give valuable data for population studies such as sex, age, ancestry, stature, disease, trauma, and traits on bones and teeth.

The greatest issue in forensic and biological anthropology is the unavailability of documented skeletal collections that could be utilized to develop population/time-period-specific standards for biological profiling. To overcome this issue, MSCT scans of patients are used for creating virtual skeletal collections with documented data.

In this paper, the authors will present activities of the installation research project "Forensic identification of human remains using MSCT imaging" and highlight the possibilities that new technologies can offer to forensic and biological anthropology. They will present the processes of creating a virtual skeletal collection, taking virtual skeletal measurements and non-metric scoring, and developing population-specific standards for sex and age estimation. Lastly, the authors will explain how data obtained from MSCT images of living individuals can be used to compare modern and ancient populations by evaluating migrations, population mixtures, secular changes, and population dynamics in general.

This paper is financed by the Croatian Science Foundation installation research project (UIP -2020-02) "Forensic identification of human remains using MSCT scans imaging".

**Goran Tomac**

Department of Archaeology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia

### Moooooving with the Herd - The analysis of domestic animal body size in the Neolithic and Copper Age of the eastern Croatia

The area of Slavonia in continental Croatia has relatively recently started to provide data in the field of archaeozoology, gradually complementing the picture of the prehistoric animal exploitation in the northern Balkan region. As part of the analysis of faunal remains from Neolithic and Copper Age sites (c. 6000 – 3000 cal. BC) in the eastern area of the interfluvium of the Sava, Drava and Danube rivers, one of the author's goals is to study the role domestic animals played in the local population's subsistence strategies. Since skeletal remains of cattle, domestic pig and sheep/goat are the most abundant in the analysed assemblages, they also yielded a sufficient quantity of measurable bones. The sites are located in the geographically confined area and this presentation aims to examine the potential diachronic differences in individual species' body size on a local level and compare the data with relevant biometric studies of animal bones from contemporary sites in the neighbouring areas. Given that the majority of the material analysed by the author belongs to cattle, the study of its genetic history in south-eastern Europe is planned in the future. Therefore, the results of this analysis may serve as a stepping stone in observation of the species' genetic changes in the wider region, which may have occurred relatively instantaneously, with the archaeologically documented cultural transitions.

**Tomislav Brenko<sup>1</sup>, Tena Karavidović<sup>2</sup>, Sibila Borojević Šoštarčić<sup>1</sup> & Tajana Sekelj Ivančan<sup>2</sup>**

<sup>1</sup> Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, Croatia

<sup>2</sup> Institute of Archaeology, Zagreb, Croatia

### Mineralogy and geochemistry of iron slags towards their provenance studies in Podravina region, NE Croatia

Archaeological excavation and field surveys in the Podravina region led to the discovery of numerous sites with traces of iron ore smelting and processing of the bloom that were dated to the Late Antique and Early Middle Ages. The discovered slag can be divided into two main categories: smelting slag (furnace bottom and tap slag) and primary smithing slag. The main focus of this study is 33 samples of tap slags and furnace bottom slags from archaeological sites Hlebine-Velike Hlebine, Virje-Sušine, and Virje-Volarski Breg and their provenance towards locally discovered bog iron ores using mineralogical and geochemical analyses. X-ray diffraction confirmed fayalite as the main mineral phase, with occurrences of other Fe minerals, such as wüstite and magnetite.

Geochemical analysis confirmed high Fe contents ranging between 52.30 and 66.46 wt. %, typical values for iron bloomery. Previous studies confirmed bog iron ore occurrences in the study area, both in archaeological as well as geological context. Therefore, provenance studies were carried using major, trace, and rare earth elements. Non-Reducible components ratios and principal component analysis revealed some differentiation between the samples from different archaeological sites, mostly due to aluminum contents. The geochemical signature of both bog iron ores and iron slags was constructed using 26 major, trace, and rare earth elements. Both ore and slag signatures are characterized by similar shapes, peaks, and patterns, implying a genetic connection between the bog iron ores and iron slags in the Podravina region.

**Ilaria Calgari<sup>1</sup>, Umberto Veronesi<sup>1</sup>, Antonina Ermolaeva<sup>2</sup> & Miljana Radivojević<sup>1</sup>**

<sup>1</sup> Institute of Archaeology (UCL), London, UK

<sup>2</sup> Institute of Archaeology named after A.Ch. Margulan, Almaty, Kazakhstan

### Copper production and technology at Mid-Late Bronze Age Taldysai (central Kazakhstan): its place in the wider Eurasian metalmaking framework

Second millennium BC Eurasian copper extractive metallurgy is widely assumed as large-scale and standardised, with its highest technological peak reached during the Mid-Late Bronze Age. Present-day Kazakhstan and Southern Urals host among the richest polymetallic ore deposits of Eurasia, massively exploited since the Early Bronze Age by the Steppe pastoralist communities. The metallurgical workshop of Taldysai in the steppes of central Kazakhstan was one of these production centres and represents the focus of this study. Extensive evidence of metalmaking has been unearthed at this site, including complex smelting furnaces, production debris, mining and beneficiation tools and finished metal artefacts.

Out of these, seven copper smelting slags were chemically and microstructurally analysed by Optical and Energy Dispersive Scanning Electron Microscope and provided a first insight into the multi-step metallurgical chaîne opératoire carried out onsite. Then, in order to test the estimated uniformity of Mid-Late Bronze Age copper extractive metallurgy, data collected from Taldysai were integrated with a comparative reference database of thirteen coeval metalmaking sites located between the Eastern Alps and Central China and analysed through multivariate statistics in form of principal component analysis (PCA) and ternary diagrams.



Overall, this study sheds light on the metallurgical process carried out at Taldysai and presents preliminary elements to fit in the wider second millennium BC narrative. Results highlight how specific choices dictated by local/regional-scale inventiveness, the exploitation of different mineral ores and the technological solutions adopted by Bronze Age metalsmiths determined variations in smelting steps, technological parameters and efficiency of copper production across Eurasia.

### **Tena Karavidović & Tajana Sekelj Ivančan**

Institute of Archaeology, Zagreb, Croatia

#### **Interpreting the archaeological record of iron production sites: a multi-method approach**

**I**ron production is a multi-step process that involves raw material exploitation (primarily ore and wood) and preparation (ore dressing and charcoal production), smelting, and primary and secondary smithing. Defining the traces of activities related to iron production on archaeological sites as well as reconstructing the past technological solutions is a complex process. It can involve the comparison of the results gained by different methods of archaeological research: i.e. chronological and spatial analysis of stratigraphic sequence and related artefacts; macroscopic, mineralogical, and chemical analysis of iron production waste; experimental testing of different phases of the production process; which result in various types of datasets.

Combining the results of the aforementioned methods, applied on archaeological remains from several sites with traces of bloomery and related activities and dated to Late Antiquity and Early Middle Ages (Velike Hlebine, Dedanovice, Volarski breg, and Sušine), allows the development of a methodological framework for interpreting the archaeological record of iron production sites.

### **Zorana Kovačević<sup>1</sup> & Julia Fileš Kramberger<sup>2</sup>**

<sup>1</sup> Department for Textile Chemistry and Ecology, Faculty of Textile Technology, University of Zagreb, Croatia

<sup>2</sup> Department of Archaeology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia

#### **SEM in Archaeological Textile Research**

**S**canning Electron Microscopy (SEM) is a very useful method for textile fibre identification and morphology analysis. It can be used in a broad range of diverse scientific research fields. Archaeological textile, as one of them, proved to be a specific challenge because of sample size, its age and state of preservation. However, like other analytical methods, the interpretation of results is closely related to the sample preparation for SEM investigation.

In this paper, work on several textile fragments from the Early Iron Age period will be presented. They were all found on fragments of iron horse gear, within the burial chamber in Tumulus 6 at the site of Kaptol-Gradac in the Požega valley, and dated to the Ha C1 period. The iron finds were previously consolidated for conservation purposes. During conservation, mineralized textile remains were discovered, which were photographed and analysed using nondestructive digital microscopy to determine the weave type and density, thread thickness and twist direction. Further on, in order to identify the fibres, samples were taken for SEM analysis. Above all, the goal was to analyse such samples in order to develop a new methodology for SEM analysis of archaeological textile in our further research.

### **Aleksandra Cetwińska<sup>1</sup>, Ewa Wagner-Wysiecka<sup>2</sup>, Katarzyna Kwiatkowska<sup>3</sup> & Dariusz Manasterski<sup>4</sup>**

<sup>1</sup> Antiquity of Southeastern Europe Research Centre University of Warsaw, Poland

<sup>2</sup> Faculty of Chemistry, Department of Chemistry and Technology of Functional Materials, Gdańsk University of Technology, Poland

<sup>3</sup> Polish Academy of Sciences Museum of the Earth in Warsaw, Poland

<sup>4</sup> Faculty of Archaeology University of Warsaw, Poland

#### **Origin versus style. An interdisciplinary study of amber ornaments from NE Poland**

**V**arious types of fossil resins can be found in the Baltic Sea, the most famous of which is succinite. It is the Baltic amber, which is still used for the production of amber items. It was used also in the late Neolithic period in north-eastern Poland when the presence of numerous amber workshops located around the Gdańsk Bay and the Żuławy Wiślane region has been recorded. Although amber seemed to be an easily accessible raw material in this area, so far only a few sites with such products have been discovered there. These include Ząbnie X and Supraśl 3, where some adornments with stylistic features never recorded in Poland before were discovered.

Due to the exotic nature of the artefacts, they were subjected to macro-, microscopic analysis and FTIR spectroscopy. The research showed not only the Western European provenance of the manufacturers but also revealed that they used local amber. Interestingly, apart from succinite, the presence of other resins - gedanite and gedano-succinite - was also detected. This is the first time such discovery was made.

### **Ana Fundurulić<sup>1</sup>, Mafalda Costa<sup>2</sup>, Fabrizio Michelangeli<sup>1</sup>, Andrea Babbi<sup>3</sup>, Cecilia Predan<sup>4</sup>, Ana Manhita<sup>2</sup>, Alessandra Celant<sup>1</sup>, Cristina Barrocas Dias<sup>2</sup> & Donatella Magri<sup>1</sup>**

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#### **Exploring Etruscan burial rituals: analysis and research potential of organic residues from funerary bronze vessels**

**E**truscan funerary rituals have been studied extensively, from an archaeological perspective, with conclusions being drawn based on depictions in tombs, objects and vessels, mortuary architecture and the layout of cemeteries. It is certain that rituals involved grave offerings and sometimes meaningful personal items as evidenced by the numerous vessels present within the tombs. Contents of the vessels, on the other hand, are not always preserved in an integral state and can be overlooked. To successfully reconstruct the meaning behind these objects and their role in the funerary ritual it is necessary to characterize substances often present only as residues.

Contents of three different bronze objects found in burials from the 8th and 7th centuries BC in Italy have been studied – a cauldron of the funerary bronze wagon from the Olmo Bello necropolis (Bisenzio), a miniature vase from the Casal del Fosso necropolis (Veii) and a cauldron from Fondo Artiano (Cumae). The chemical characterization of the organic fraction was carried out using a combination of two analytical techniques – ATR/FT-IR and PY-GC/MS – while the inorganic fraction was analysed by SEM-EDS and  $\mu$ -XRD. As a complementary method, the samples were also submitted to palynological analysis to get an insight into the surrounding environment and possible natural sources.



This research received funding under the Marie Skłodowska-Curie grant agreement N. 766311. The authors would also like to acknowledge the support of the ongoing projects: Cumae, Grave 'Artiaco 104': Performative Identity and Transcultural Attitude in the Middle-Tyrrhenian Region at the very End of the 8th c. BC; Bisenzio between the Bronze and the Archaic Age: a Capital Node Connecting Dynamic Networks in South Etruria; La necropoli di Casale del Fosso: nuovi dati alla luce di un riesame complessivo; Food and balms: combined botanical and chemical studies from funerary contexts.

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### Reference collection as key element of use-wear and residue analysis of chipped stone assemblages: study of Iron Gates region (Serbia)

The experimental procedure has been one of the fundamental methods in the use-wear and residue studies of the chipped stone assemblages for decades. This type of approach is considered to have an important role in the cognitive development of the functional analysis, more specifically in the educational component. The paper aims to examine the impact experiments have in the case of addressing specific research questions and hypotheses.

The closed eco-niche like Iron Gates revealed the economical and social aspects of its inhabitants during the Late Glacial and Early Holocene. Everyday tasks and activities are known in recent years, when the particular study, targeting the function of the chipped stone tools from Lepenski Vir, Padina and Vlasac, was conducted. The research which consisted of 51 experiments resulted in the first reference collection in the region, which included both formal and problem-oriented trials.

The idea of the study is to address the necessity and the wide application of the experimental approach represented by simple activities, connected to the broad chronological span, as cutting, scraping, engraving performed on the materials available in Late Mesolithic and Early Neolithic, as hide, bone, antler, or wood. Additionally, a number of problem-oriented experiments, as fish processing, or the use of tools after thermal stress were done to answer the particular research questions connected to the lifestyle of both local and incomer groups in the Transitional period.

**Nikola Marković<sup>1</sup>, Boban Tripković<sup>2</sup>, Marko Porčić<sup>2</sup>, Ana Tripković<sup>2</sup> & Jasna Vuković<sup>2</sup>**

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### Preliminary X-Ray Fluorescence Analysis of Early Eneolithic Pottery: Šanac-Izba near Lipolist (Western Serbia)

Šanac-Izba near Lipolist is an Early Eneolithic site located in western Serbia. It is a small site of only 40 m in extent surrounded by a wide ditch. The archaeological traces of several pits (pits 1-4) and one burnt building were revealed in 2013. The building and pit 4 can be generally dated to the Early Eneolithic, which correspond to the late 5th millennium BC of the regional chronology. The other pits were certainly dug later and filled up with redeposited cultural material

by natural processes. Pottery collected at the site represents a mix of cultural styles originating in the central Balkans and south Pannonian Basin. Diagnostic ceramic fragments were sampled preliminarily and analyzed to answer two research questions: 1) Is there a difference in the elemental composition of certain pottery types; 2) Can we observe a chemical and technological variability in the pottery belonging to different cultural traditions? The 41 powdered samples were taken from typologically defined pottery fragments, and the sample covers all features and many units. The elemental composition was obtained by the XRF instrumental method.

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### Research on Bronze Age pottery traditions – Conceptual approach

The tradition of studying archaeological ceramics in Croatia is deeply rooted in the culture-historical approach, especially when it comes to prehistoric pottery, which represents most of the archaeological record on prehistoric societies. However, turning the approach, by studying pottery throughout its lifecycle from raw material selection, different stages of production, to distribution and use, can provide valuable research contributions in a topic still not fully explored. Over the next five years, extended research on Bronze Age (2400-800 BC) pottery traditions on the territory of Croatia will be conducted. The paper will present the project concept and methodology approach. A prerequisite for the selection of archaeological material is a well-established stratigraphic and chronological context and in the initial phase, the ceramics will be classified with the focus on typology and style aiming at cultural and temporal determination. In addition, through a macroscopic examination of the pottery, an analysis of manufacturing techniques and vessel function will be carried out.

A large part of the research protocol will be focused on the analysis of archaeological ceramics and pottery raw materials using various analytical techniques (ceramic petrography, XRD, FTIR and geochemistry). All the information gathered will form a large set of data, that represent the basis on which the properties of production, distribution, and use through specific research questions, will be evaluated, and analysed. Therefore, the correlation of different interdisciplinary data sets, quantification methods, and digitalization of such data, currently presents the biggest challenge. In that sense, awareness of the advantages but also limitations of analytical methods and a well-formed theoretical framework, research questions, and hypotheses are key parameters of an optimal methodological approach.



**Aleksandra Cetwińska<sup>1</sup>, Grzegorz Koczan<sup>2</sup>, Maciej Sadło<sup>3</sup> & Dariusz Manasterski<sup>3</sup>**

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### Potential of using reed arrow shafts hidden in their spine-force value

**G**rooved stones are a common find in the archaeological record. These are small stone or clay artefacts varying in shape, quality, and decoration, with transverse grooves. These items are associated with at least sixty cultures ranging from the Mesolithic/Proto-Neolithic to the Bronze Age and occur over a vast territory which includes the Near East, northeastern and southern African coast, steppe, forest-steppe, and semi-desert regions of Eurasia from northeastern Europe and Moldavia to Mongolia. It is believed that they were used to straighten reed arrows. While the occurrence of such arrow shafts is confirmed in the literature, no studies have ever been conducted to verify the potential for their use. We present our experimental conclusions based on the preliminary measurement of reed spin values.

**Ines Krajcar Bronić<sup>1</sup>, Ivor Karavanić<sup>2</sup>, Andreja Sironić<sup>1</sup>, Nikola Vukosavljević<sup>2</sup>, Marko Banda<sup>2</sup> & Fred Smith<sup>3,4</sup>**

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### Radiocarbon dating of the Middle Paleolithic animal bones from two caves, Croatia

**T**he aim of the project „Last Neandertals at the Crossroads of Central Europe and the Mediterranean – NECEM“ (financed by Croatian Science Foundation, HRZZ-IP-2019-04-6649) is to gain new data on the adaptations of late Neandertals in today's Croatia by interdisciplinary methods. Radiocarbon dating method gives a chronological framework providing the samples are not older than about 50000 years.

A total of 16 bone samples from two caves, Vindija (Donja Voća, NW Croatia) and Mujina Pećina cave (Plano, near Kaštela, Dalmatia), were selected for radiocarbon AMS dating at the Ruđer Bošković Institute (RBI) laboratory. Collagen extraction yielded >1% of collagen for 10 samples. From six samples the collagen yield was lower than 0.5 % and those bones could have not been dated since the low yield (<1%) may produce an underestimated radiocarbon age. For comparison, 12 bone samples were sent to Oxford Radiocarbon Accelerator Unit (ORAU) for radiocarbon dating with an additional step of ultrafiltration (UF) to select collagen fraction having molecules larger than 30 kDa. Four of them could not have been dated due to low collagen yield (<1 ‰), five were dated in spite of low yield, and only three of them were successfully dated. The results of  $\delta^{13}C$  values of bone samples showed the same range in both RBI and ORAU laboratories, between -18.3 ‰ and -21.8 ‰, which are typical values for bone collagen. Radiocarbon conventional ages of these limited number of bone samples were comparable. Much more radiocarbon dating results of the old bones are necessary to obtain more reliable results.

The preliminary results presented here point to the possible obstacles in radiocarbon dating of late Middle Paleolithic samples: bones are not well preserved, yield of collagen is often low, and the age is close to the limit of the radiocarbon method.

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<sup>3</sup> Institute of Archaeology, Belgrade, Serbia

### Regional Absolute Chronologies of the Late Neolithic in Serbia

**I**n 2020, despite the ongoing Covid19 epidemic, a project "Regional Absolute Chronologies of the Late Neolithic in Serbia" started, aimed at detailed radiocarbon dating of the Late Neolithic phenomenon known as the "Vinča culture" in the traditional archaeological sense of the term. The project, combining radiocarbon dating technology and statistical seriation of ceramic assemblages from individual sites is an attempt to further narrow the chronological margins of the 800-1000 year long development that occupies large parts of the central Balkans and south edge of the Carpathian basin between the 54th and 45th century BC.

Using archival collections from regional museums across Serbia, the project established new chronological "beacons" that can be used to relate chronological information for surrounding sites to be excavated in future. A year into the project, here we present the first results from several sites in north and central Serbia and rate the current state of knowledge in the field and the region.

**Andreja Sironić<sup>1</sup>, Žana Matulić Bilač<sup>2</sup>, Barbara Španjol-Pandelo<sup>3</sup> & Ines Krajcar Bronić<sup>1</sup>**

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### Dating wooden artefacts treated with resins

**T**he wooden Romanesque Crucifix from Collection of Sacral Art in Poreč has been restored 1994-1999 in Conservation department of Split when the multidisciplinary research detected that original Christus triumphans has been transformed into Cristus dolorens in the early 18th century. Project Ars lignea: the Woodcarving Art Heritage of the North Adriatic from 1300 until 1600 (the University of Rijeka) involved the new possibility of radiocarbon dating of original wood (poplar). A sample was taken from the Christ's corpus.

The procedure of radiocarbon dating of wood, performed at the Zagreb Radiocarbon Laboratory, usually involves the so-called A-B-A or acid-base-acid chemical preclearing. The sample was inspected by microscope in order to remove larger foreign material, washed with ultrapure water and then subsequently treated by HCl, NaOH solution and again by HCl. This procedure removes carbonates and large organic molecules present in soil: fulvic and humic acids. However, it does not remove organic varnishes or other synthetic materials that might have been applied to the artefact. Since these coatings contain organic molecules, dating may lead to erroneous dates. When the coating is obvious, or there are indications that the artefact had been treated with synthetic coatings, a series of organic solvents is used for washing the sample before A-B-A procedure. The washing starts with a non-polar solvent, followed by a solvent with higher polarity and eventually ends with the most polar solvent, i.e. water.

Here we present a case of a wood sample taken from the Christus dolorens that did not seem to have been treated with coatings. However, its  $^{14}C$  activity and  $\delta^{13}C$  value proved it was treated with resins of fossil origin. In repeated measurements, it was proved that the procedure of solvent cleaning we use is efficient in removing the coating contaminates.

**Dinko Tresić Pavičić<sup>1</sup>, Željka Bedić<sup>2</sup> & Filomena Sirovica<sup>3</sup>**

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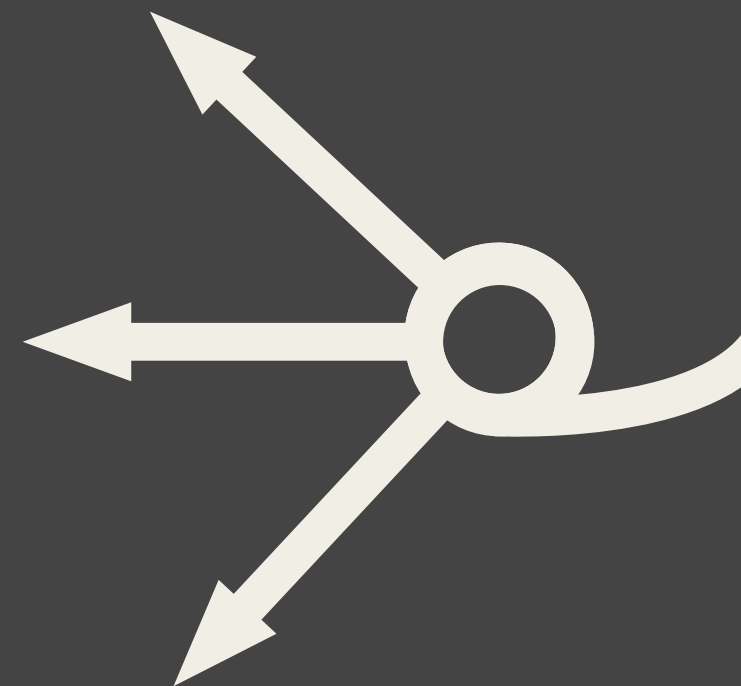
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<sup>3</sup> Archaeological Museum in Zagreb, Croatia

### **System for Recording and Analyzing Articulated Human Skeletal Remains**

**B**ioarchaeological analyses have the potential to generate a large amount of various data that require an efficient system of collection, storage, access and processing. In the scope of the Croatian Science Foundation project “milOrd: Development and Heritage of the Military Orders in Croatia” (IP-2019-04-5513), which is, among other things, focused on the analysis of large amounts of human osteological material found during archaeological excavations, a system for managing and processing of data collected by bioarchaeological analysis has been developed.

The authors will present an easy-to-use system for recording and analysing articulated human skeletal remains in a digital environment using predesigned forms and tables. The main goal of this procedure is to improve the current recording system, i.e. to enable simpler and faster access to recorded data through the use of relatively simple and well-known software, to speed up and simplify the bioarchaeological analysis, and to enable compatibility with other archaeological field data within the database.



Šime Vrkić, Sara Igljić & Igor Kulenović

Department of Tourism and Communication Studies, University of Zadar, Croatia

### Late Prehistoric Enclosures – an Elusive Type of Site

Main type of settlements in the prehistory of the Adriatic are hillforts and as such have been a focus of most prehistoric settlement research. Given their nature and their visible position in the landscape, they remain an emblem of prehistory. This is also evident in Northern Dalmatia, a predominantly karst relief. Several examples of different sites have been documented through various archaeological methods, such as analysis of areal and satellite imagery and field survey.

These sites are not positioned on hills and other strategic positions. Hence such sites remained unmentioned throughout earlier archaeological research. Furthermore, they have never been the focus of the local population as can be seen in their lack of toponyms inspired by archaeological remains. Here we will show different examples of said sites recorded in the aforementioned area from the period of late prehistory. They are positioned on flat ground or on gentle hill slopes and they lack defensive elements, such as ramparts. They also do not have rich cultural layers, even though there are surface finds. What can these examples show? Land use in later prehistory is not limited to hillforts and other strategic positions but is much wider in character.

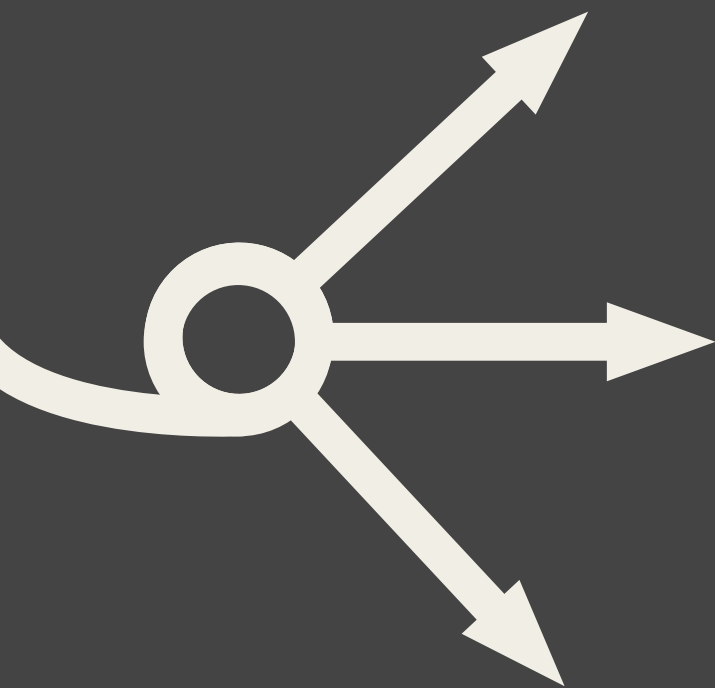
Pio Domines Peter

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### Survey methodology and challenges in an inaccessible Mediterranean (is)landscape with small surface visibility and dense vegetation – case study from island of Ist, Northern Dalmatia

Densely vegetated areas outside farming zones have long attracted attention in methodology as problematic environment targeted for survey research. The same problem appeared as a special challenge in a case of field survey on the small island of Ist, situated in an outer line of the northern Dalmatian archipelago. In 2020, as a part of a student project „Archaeological Landscape of Island of Ist Archaeo.IST“, during a systematic field survey on the island, which had not been previously archaeologically explored, a survey was conducted. The aim was to collect relevant data, which will contribute to understanding diachronic insights into the dynamics of human behavior, which are reflected in various traces of complex interaction between human and island-nature in way of shaping the cultural landscape. Long-lasting deagrarization has rapidly transformed the typical look of the island karst landscape to its today shape of uncultivated, heavily forested area with dense vegetation and inaccessible zones to *in situ* prospection.

Terrain conditions demand adjustment of traditional survey methodological settings, and the small surface of the island supported the implementation of a modified approach with emphasis on documenting formation processes, recording spatial distributions of surface material, studying visibility of archaeological record as well. This poster will present an established methodological framework, and the preliminary results of integrated into the GIS database, provide the bases for a further holistic study of various aspects of re(creating) island landscape through different periods of human activity in the past.







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#### Application of photogrammetric method of 3D scanning within the shaft Object 1 at the Prljuša-Mali Šturac site

Ten years of archaeological research on the Prljuša-Mali Šturac site have shown that on this steep slope of Mt. Rudnik is one of the largest and richest mining sites in Southeast Europe, where malachite was exploited in the period from the Eneolithic to the Bronze Age. Since 2013, the excavations have focused on surface mining open-pits on the central part of the slope (Shafts 4 and 6), while in 2014 the focus shifted to the top of the slope, and, as later research turned out, the imposing shaft Object 1. Over the course of campaigns, a number of interconnected galleries, hallways, entrances, burning marks, and marks of ore extraction were discovered, alongside over 500 hammerstones. As the works progressed, Object 1 became clearly defined, and plans for the arrangement and presentation of this part of the site were in development. In addition to site arrangement, the plans for the presentation included a 3D reconstruction of Object 1, and then the other shafts that are visible on the slope and whose research has not yet been conducted. The ultimate goal is a successive creation of a collection of 3D digitized prehistoric mining shafts of Prljuša - Mali Šturac that would have a research-presentation character.

The first step towards this goal was done in 2019, with the creation of technical documentation of Object 1 through 3D scanning, by terrestrial photogrammetry. During this process, a large number of convergent photographs of the research zone were collected, where all exposed areas, sheltered and covered sections were documented in multiple frames. The primary interest was to deliver complete reconstruction and so-called “ground zero” snap of the situation, for spatial plan development, conservation and presentation of mining structures. The final result of the 3D scan included the creation of a spatial plan of the whole and DMT (Digital Terrain Model) model, as well as a geometrically corrected orthophoto (True Orthophoto), a highly detailed 3D model of the whole, and an optimized view for sharing on online services. This poster presents the final products of this process. The authors believe that the existence of a reference collection of 3D digitized prehistoric mining shafts would be a welcome resource for the explorers, that would provide unique insight, from a new perspective, into the method of exploitation and formation of shafts, their maintenance, abandonment, and backfilling, together with the process of decay and collapsing.

### Katarina Gerometta<sup>1</sup> & Rajna Šošić Klindžić<sup>2</sup>

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#### Archaeological micromorphology at the Late Neolithic site Gorjani

Prehistoric settlements, especially when dealing with multilayer sites, make complex microstratigraphic sequences that have been formed from different processes and diverse materials. Particularly suitable method for studying and interpreting archaeological layers of complex origin is soil and sediments micromorphology. Preliminary analysis of seven thin sections from the Late Neolithic Sopot culture site of Gorjani-Kremenjača (Đakovo, Eastern Croatia) will be presented in the poster. Four soil samples were collected in sequence in the feature that was originally marked



in the field as a possible pit filling, but subsequent micromorphological analysis showed natural soil pedogenesis. Three samples indicate anthropogenic sediments connected to settlement activities, both inside houses and in open areas. Anthropogenic activities are indicated by the presence of ash, phytoliths, organic matter, bones, phosphates and fabric characteristics.

### Katarina Šprem<sup>1</sup> & Bernardo Marciuš<sup>2</sup>

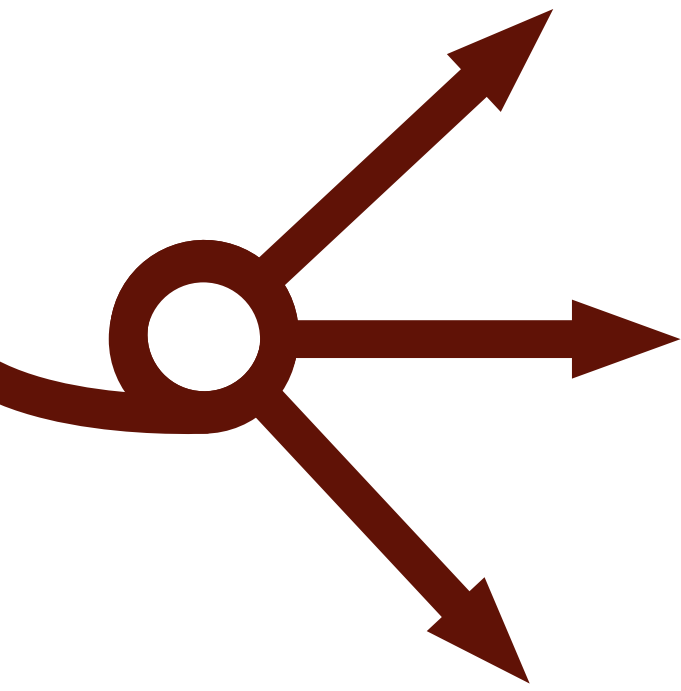
<sup>1</sup> Department of Archaeology, Faculty of Humanities, Juraj Dobrila University of Pula, Croatia

<sup>2</sup> Croatian Institute of Public Health, Zagreb, Croatia

#### Geochemical analysis of Istrian flint – first results and discussion

Geochemical characterization of flint is an analysis frequently used by archaeologists in their study of flint provenance in archaeological contexts. While flint deposits from northern Croatia were analyzed geochemically in the last several decades by geologists and archaeologists alike, there have not been any such analysis done on flint from the Istrian peninsula. There are several primary and secondary deposits of flint in the Istrian peninsula which were used frequently during prehistory. We decided to geochemically analyze two flints from archaeological contexts of the Neolithic site of Kargadur in southern Istria, as well as two flints from the deposits in southern Istria: one from the primary deposit on Vižula peninsula, and the other from the secondary deposit on Marlera peninsula, both within a four-kilometre distance from the Neolithic site, as the crow flies.

The four flint samples were analyzed using ICP-OES (Inductively coupled plasma optical emission spectrometry) and ICP-MS (Inductively coupled plasma mass spectrometry) analysis in Bureau Veritas Commodities Canada Ltd in Vancouver, Canada, which provided us with data on major oxides, major, minor, and trace elements. Even though we realize only four samples are not enough for a detailed study on the geochemical characterization of Istrian flint deposits, we nevertheless believe our data is a good starting point for other geochemical analyses. Moreover, data from geochemical analyses on four more samples from the Vižula and Marlera deposits using pXRF are forthcoming.



*PUBLICATIONS*

## PUBLICATIONS

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Papers from the 1<sup>st</sup> and 2<sup>nd</sup> conference *Methodology and Archaeometry* are published in the Journal *Opuscula Archaeologica* 39/40, Department of Archaeology, Faculty of Humanities and Social Sciences of the University of Zagreb, Zagreb, 2018.

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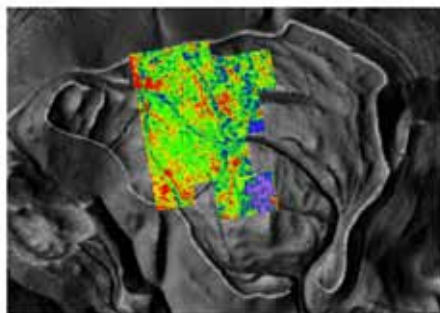
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Papers from the 3<sup>rd</sup> and 4<sup>th</sup> conference *Methodology and Archaeometry* are published in a book *Recent Developments in Archaeometry and Archaeological Methodology in Southeastern Europe*, Cambridge Scholars Publishing, Cambridge, 2020.

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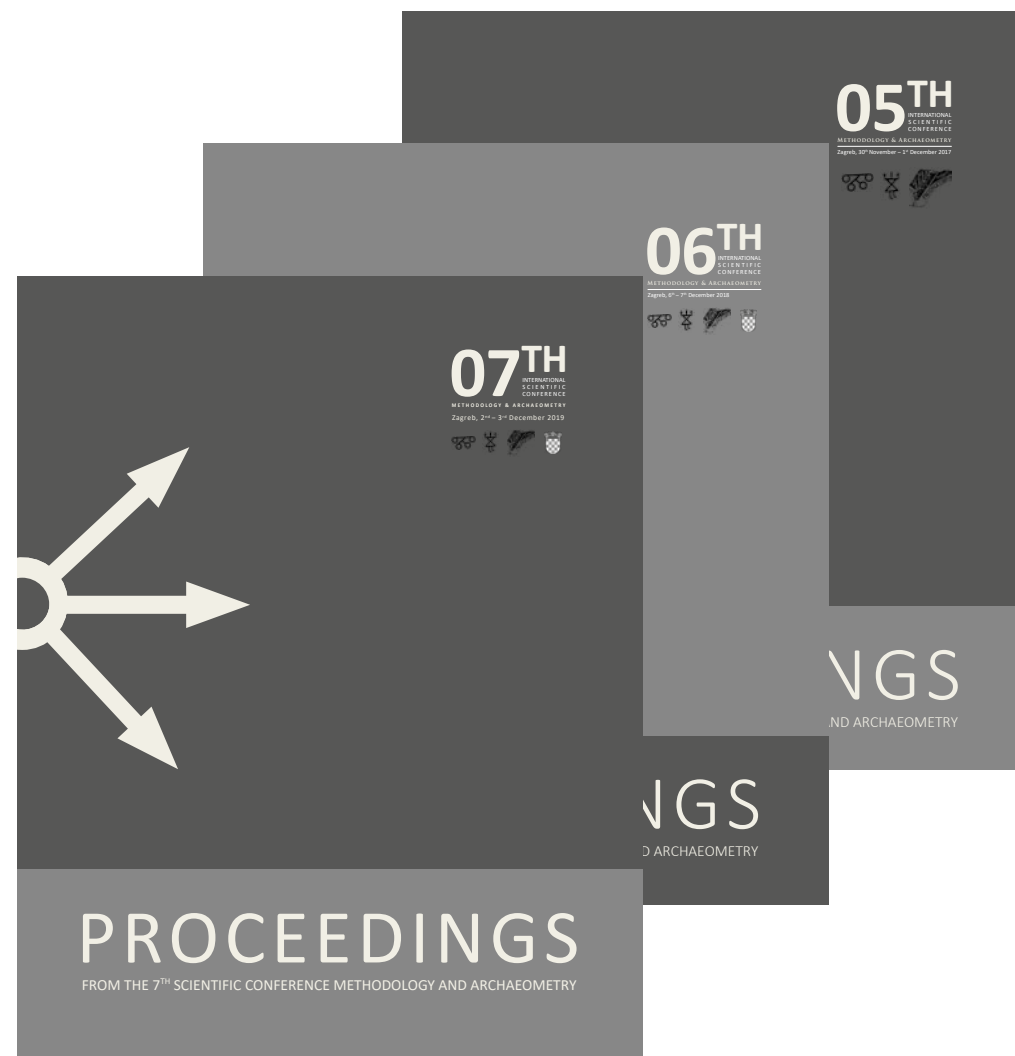
### Recent Developments in Archaeometry and Archaeological Methodology in South-Eastern Europe

*Edited by Ina Miloglav*

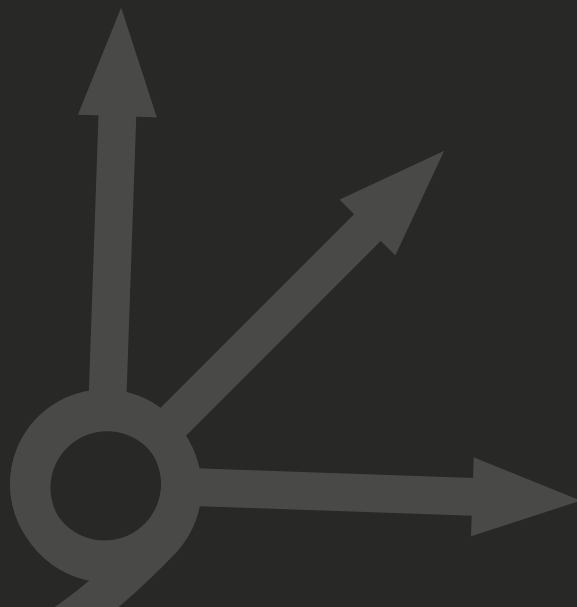
Since 2019 papers from the conference are published in the *Proceedings from the scientific conference Methodology and Archaeometry* on a platform for open access books from the Faculty of Humanities and Social Sciences of the University of Zagreb (FF Open Press).

Proceedings from the 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> conference are available on:

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