

UNIVERSITY COLLEGE LONDON  
INSTITUTE OF ARCHAEOLOGY

COUNCIL OF GORJ COUNTY  
through  
"ALEXANDRU ȘTEFULESCU"  
MUSEUM OF GORJ COUNTY  
(TÂRGU JIU)

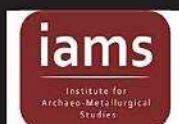
"VASILE PÂRVAN"  
INSTITUTE OF ARCHAEOLOGY  
(BUCHAREST)



# 4<sup>th</sup> BALKAN EARLY METALLURGY SYMPOSIUM



10<sup>th</sup> – 12<sup>th</sup> MAY 2015  
TÂRGU JIU, ROMANIA





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**ALEXANDRU ȘTEFULESCU  
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# **4<sup>th</sup> BALKAN EARLY METALLURGY SYMPOSIUM**

**10<sup>th</sup>-12<sup>th</sup> MAY 2015  
TÂRGU JIU, ROMANIA**

The Symposium is also supported by:

**FREEPORT - McMoRAN COPPER & GOLD  
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**INSTITUTE FOR ARCHAEO-METALLURGICAL  
STUDIES (LONDON)**

*Habitat, Environment and Natural  
Resources in the Lower Danube Area  
during the Pre- and Protohistory,  
PN-II-PT-PCCA Project, 339/2014*





4<sup>th</sup> BALKAN EARLY METALLURGY SYMPOSIUM (10<sup>th</sup>-12<sup>th</sup> MAY 2015, TÂRGU JIU, ROMANIA)

**Organising Committee**

**Miljana Radivojević**  
UCL Institute of Archaeology  
McDonald Institute for  
Archaeological Research  
University of Cambridge (UK)

**Thilo Rehren**  
UCL Qatar  
Hamad Bin Khalifa University  
(Doha, Qatar)

**Dumitru Hortopan**  
*Alexandru Ștefulescu* Museum of  
Gorj County (Tg. Jiu, Romania)

**Radu Băjenaru**  
*Vasile Pârvan* Institute of Archaeology  
(Bucharest, Romania)



**4<sup>th</sup> BALKAN EARLY METALLURGY SYMPOSIUM (10<sup>th</sup>-12<sup>th</sup> MAY 2015, TÂRGU JIU, ROMANIA)****Main Program****Sunday, 10<sup>th</sup> May****12.00 - 20.00**

*Alexandru Ștefulescu* Museum of Gorj County

- Arrival and Register

Hotel *Europa* and Hotel *Casa Vera*

- Accommodation

**20.00 - 22.00**

Hotel *Europa*

- Dinner

**Monday, 11<sup>th</sup> May****7.00 - 8.30**

Hotel *Europa* and Hotel *Casa Vera*

- Breakfast

**9.00 - 9.30**

*Alexandru Ștefulescu* Museum of Gorj County

- Official opening of the Symposium

**9.30 - 12.50**

*Alexandru Ștefulescu* Museum of Gorj County

- Presentation

**13.00 - 14.30**

Hotel *Europa*

- Lunch

**14.40 - 19.40**

*Alexandru Ștefulescu* Museum of Gorj County

- Presentation

**20.00 - 22.00**

Hotel *Europa*

- Dinner





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**Tuesday, 12<sup>th</sup> May**

**7.00 - 8.00**

Hotel *Europa* and Hotel *Casa Vera*

- Breakfast

**8.30 - 16.00**

Fieldtrips

- Copper mines from Baia de Aramă area

- Tismana Monastery (14th century AD)

- Memorial House of Constantin Brâncuși in Hobița

**16.00 - 21.30**

Village Museum Curtișoara

- Concluding discussions

- Festive Dinner

**Wednesday, 13<sup>th</sup> May**

**7.00 - 8.30**

Hotel *Europa* and Hotel *Casa Vera*

- Breakfast

**9.00 - Departure**





## List of Participants (in alphabetical order)

**Marko ALEKSIĆ** (Central Institute for Conservation, Belgrade, Serbia)

**Stefan ALEXANDROV** (National Institute of Archaeology with Museum, Bulgarian Academy of Sciences, Sofia, Bulgaria)

**Silvia AMICONE** (UCL Institute of Archaeology, London, UK)

**Dragana ANTONOVIĆ** (Institute of Archaeology, Serbian Academy of Sciences and Arts, Belgrade, Serbia)

**Radu BĂJENARU** (“Vasile Pârvan” Institute of Archaeology, Romanian Academy, Bucharest, Romania)

**Neculai BOLOHAN** (“Alexandru Ioan Cuza” University of Iași, Romania)

**Clive BONSALL** (University of Edinburgh, UK)

**Adina BORONEANȚ** (“Vasile Pârvan” Institute of Archaeology, Romanian Academy, Bucharest, Romania)

**Gheorghe CALOTOIU** (“Alexandru Ștefulescu” Museum of Gorj County, Târgu Jiu, Romania)

**Evgenij N. CHERNYKH** (Institute of Archaeology, Russian Academy of Sciences, Moscow, Russian Federation)

**Savo DERIKONJIĆ** (Homeland Museum of Priboj, Serbia)

**Vidan DIMIĆ** (Department of Archaeology, Faculty of Philosophy, Belgrade University, Belgrade, Serbia)

**Cristinel FÂNTÂNEANU** (National Museum of Union, Alba-Iulia, Romania)

**Florin GOGĂLTAN** (Institute of Archaeology and Art History, Romanian Academy, Cluj-Napoca Branch, Cluj-Napoca, Romania)

**Dumitru HORTOPAN** (“Alexandru Ștefulescu” Museum of Gorj County, Târgu Jiu, Romania)



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**Martin HRISTOV** (National Museum of History, Sofia, Bulgaria)

**Petar KALCHEV** (Regional Museum of History Stara Zagora, Bulgaria)

**Tim KERIG** (University of Cologne, Germany)

**Julka KUZMANOVIĆ-CVETKOVIĆ** (Toplica National Museum in Prokuplje, Toplica, Serbia)

**Verena LEUSCH** (Curt-Engelhorn-Zentrum Archäometrie, Mannheim, Germany / Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Eberhard Karls Universität, Tübingen, Germany)

**Jack LONGMAN** (Department of Geography, Northumbria University, Newcastle upon Tyne, UK)

**Florica MĂȚĂU** (Department of Sciences, ARHEOINVEST Platform of Interdisciplinary Research in Archaeology, "Alexandru Ioan Cuza" University of Iași, Romania)

**Philip MIHAYLOV** (Regional Museum of History Pernik, Bulgaria)

**Jugoslav PENDIĆ** (Department of Archaeology, Faculty of Philosophy, Belgrade University, Belgrade, Serbia)

**Anca-Diana POPESCU** ("Vasile Pârvan" Institute of Archaeology, Romanian Academy, Bucharest, Romania)

**Miljana RADIVOJEVIĆ** (UCL Institute of Archaeology, London, UK)

**Thilo REHREN** (UCL Qatar, partner of Hamad Bin Khalifa University, Doha, Qatar)

**Florin RIDICHE** (Museum of Oltenia, Craiova, Romania)

**Fabian SCHAPALS** (Deutsches Bergbau-Museum, Bochum, Germany)

**Anton V. SHIPILOV** (The National Museum of the Republic of Tatarstan, Kazan, Russian Federation)

**Vladimir SLAVCHEV** (Varna Regional Museum of History, Varna, Bulgaria)

**Cristian Eduard ȘTEFAN** ("Vasile Pârvan" Institute of Archaeology, Romanian Academy, Bucharest, Romania)

**Peter THOMAS** (Deutsches Bergbau-Museum, Bochum, Germany)





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**Meda TODERAȘ** (“Vasile Pârvan” Institute of Archaeology, Romanian Academy, Bucharest, Romania)

**Alexandra ȚÂRLEA** (Department of Ancient History, Archaeology and Art History, Faculty of History, University of Bucharest, Romania)

**Daniel VERES** (Institute of Speleology, Romanian Academy, Cluj-Napoca Branch, Cluj-Napoca, Romania)

**Alexandru VULPE** (“Vasile Pârvan” Institute of Archaeology, Romanian Academy, Bucharest, Romania)







## Detailed Program of Presentations

Alexandru Ștefulescu Museum of Gorj County

### Monday, 11<sup>th</sup> May

#### 9.00-9.30 – Official opening of the Symposium

- Dr. Dumitru Hortopan, Director of “Alexandru Ștefulescu” Museum of Gorj County
- Ing. Ion Călinoiu, President of Gorj County Council
- Acad. Alexandru Vulpe, Director of “Vasile Pârvan” Institute of Archaeology, Bucharest
- Prof. dr. Thilo Rehren, Director of University College London in Qatar

#### 9.30-12.50 – Presentations. Chairing session: Evhenij N. Chernykh

##### 9.30-9.50 – Veres D., Chauvel C., Atlas Z., Haliuc A., Longman J., Ersek V., Begy R., Gogâltan F., Onac B.

*Geochemical and isotopic records of anthropogenic impact and natural climate change in the Romanian Carpathians during the last 8000 years*

##### 9.50-10.10 – Mățău F., Ștumbea D.

*Tracking prehistoric copper resources from Eastern Romania by mineral prospecting mapping and geochemical analysis*

##### 10.10-10.30 – Antonović D., Vukadinović M., Dimić V.

*Prljuša - Mali Šturac. Eneolithic copper mine in Central Balkans*

##### 10.30-10.50 – Thomas P., Stöllner T., Schapals F., Derikonjić S., Radivojević M., Pendić J., Jablanović A., Kosczinski K., Neil N.

*Prehistoric Copper Ore Mining in Jarmovac, Priboj on Lim*

##### 10.50-11.10 – Aleksić M., Pendić J.

*Compared techniques for 3D documentation of ancient mining structures*

##### 11.10-11.30 – Coffee break





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**11.30-11.50 – Radivojević M.**

*How to cook your met(al): reconstructing the world's earliest metallurgy*

**11.50-12.10 – Kuzmanović-Cvetković J.**

*Archaeometallurgy and tourism*

**12.10-12.30 – Kalchev P.**

*Furnaces for copper ore from Stara Zagora region*

**12.30-12.50 – Bolohan N.**

*The Beginning of Metallurgy East of the Carpathians. Methodological Approaches*

**13.00-14.30 – Lunch**

**14.40-19.40 – Presentations. Chairing session: Alexandru Vulpe, Tim Kerig**

**14.40-15.00 – Chernykh E. N., Orlovskaya L. B.**

*Radiocarbon chronology of the Carpatho-Balkan metallurgical province*

**15.00-15.20 – Boroneanț A., Bonsall C.**

*Malachite processing in the First Temperate Neolithic: the evidence from Schela Cladovei, Romania*

**15.20-15.40 – Ștefan C.**

*Early Metallurgy North of Danube: A Necklace from a Boian-Vidra grave discovered at Glina-La Nuci*

**15.40-16.00 – Toderaș M.**

*Copper finds from the tell site Pietrele "Măgura Gorgana": typology, technology, use and raw material strategies*

**16.00-16.20 – Mihaylov P.**

*Known and unknown finds of early copper tools from the Upper Struma valley*

**16.20-16.40 – Shipilov A.**

*Copper artefacts from the Balkan-Carpathian metallurgical province in the funerary monuments of the Volga-Kama region*

**16.40-17.00 – Popescu A.-D.**

*Early Silver Artefacts in Southeastern Europe*

**17.00-17.20 – Coffee Break**



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Village Museum Curtișoara

**17.00-19.00 – Concluding discussions. Chairing session: Thilo Rehren**

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Based on this, the copper and copper alloys artefacts produced from native copper, oxide and sulphide ores will have a distinctive elemental composition, depending on the ore mineralogy and on the smelting processes involved. This approach was developed by the highly influential *Studien zu den Anfängen der Metallurgie* (SAM) project (Junghans et al., 1960, 1968, 1974) which investigated the trace elements in order to group elements by chemical variation. Later on, based on the chemical composition determined by "the Stuttgart school", D. Liversage (1994, 2000) analysed the spatial distribution patterns of the metal artefacts. This work was continued by linking the chemical and/or isotopic composition of copper and bronze artefacts with geological and geochemical ores analysis for different regions throughout Europe (Jovanović, 1971; Chernykh, 1978; Ambert, Barge-Mahieu, 1991; Ixer, Budd, 1998; Nierderschlag et al., 2003) and, recently, by taking into account the post-smelting processes (melting and casting, smithing, recycling and alloying) on the elemental signature of a certain bronze artefact (Bray, Pollard, 2012).

The chemical composition of some copper and copper-alloy artefacts from Eastern Romania were determined by the SAM project, and, more recently, by ARHEOMET (*Archaeometallurgical studies using nuclear analytical methods on Romanian museum gold, silver and bronze artefacts, 2005-2008*) and ROMARCHAEOMET (*Authentication and provenance studies on ancient gold, silver and bronze objects from Romanian museums using atomic and nuclear methods, 2008-2012*) projects.

In this study we intend to focus on the mineral mapping and geochemical analysis of the copper ores from Eastern Carpathians. Further, the geochemical fingerprint of the copper ores from this region can be compared with existing or future geochemical analysis of copper and copper-alloyed artefacts.

#### ***Prljuša - Mali Šturac. Eneolithic copper mine in Central Balkans***

**Dragana Antonović** (Institute of Archaeology, Serbian Academy of Sciences and Arts, Belgrade, Serbia)

**Momir Vukadinović** (Jaroslav Černi Institute for the Development of Water Resources, Belgrade, Serbia)

**Vidan Dimić** (Faculty of Philosophy, Belgrade University, Serbia)

The Eneolithic copper mine at Prljuša, just below the mountain peak Mali Šturac on Mt. Rudnik was discovered in 1980 and subsequently investigated to a smaller extent from 1981 to 1987. In 2010 the investigations at Prljuša were reactivated with the aim of defining how much and how long the mine had been exploited during prehistory. Pilot geophysical studies were followed by more extensive explorations in 2011 and 2012 (self-potential, electrical scanning and seismic profiling). The explorations covered a surface of 14 400 m<sup>2</sup>. These investigations identified underground channels in the middle part of the site connected with the earlier discovered entrance platforms named Shaft 4 and Shaft 6. The investigation with self-potential method detected numerous ore occurrences



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and potential prehistoric mining works in the lower part of the site. Survey of the locality led to the discovery of 15 more mining shafts spread in the upper part of the site.

After having obtained satisfactory results by geophysical investigations and field survey, archaeological excavation was undertaken in the zone of the Shaft 4 and the Shaft 6 in the middle part of the site, and in front of one mining shaft at the very top of the slope where is situated the site Prljuša. Excavation revealed open cast mine in zone of the Shaft 4 and 6 with several shallow vertical channels. A lot of grooved mining hammerstones were found in layers of debris that covered this mining zone. Investigation of the shaft at the top of the slope resulted with the discovery of broad mining channel covered with collapsed ceiling. In this shaft were discovered a certain number of mining hammerstones and pottery of Eneolithic Bubanj-Hum Ia culture.

Detailed surveying of the site resulted in discovery of around 1000 mining stone tools just on the surface. Except the hammerstones, which are the most numerous, few stone tools of different type have been found at the site Prljuša. One fragmented whetstone as well as few axes and anvils for crashing ore make an interesting segment of stone tool assemblage from Mali Šturac. Considerable amount of semi-finished objects without traces of use as well as tools made of rock originated from this locality confirmed that stone tools were often made on the mining site.

According to the great number of mining tools on the very surface of the site it is supposed that their number may be much bigger (at least 2000 in the layers of debris) what indicates the extensive mining activity at this site. Finding of Early Eneolithic pottery put this site in the group of the earliest copper mines in central Balkans whose exploitation could start even earlier, during the Vinča culture.

#### *Prehistoric Copper Ore Mining in Jarmovac, Priboj on Lim*

**Peter Thomas** (Deutsches Bergbau-Museum Bochum, Germany)

**Thomas Stöllner** (Ruhr-Universität Bochum, Germany / Deutsches Bergbau-Museum Bochum, Germany)

**Fabian Schapals** (Deutsches Bergbau-Museum Bochum, Germany)

**Savo Derikonjić** (Homeland Museum of Priboj, Serbia)

**Miljana Radivojević** (UCL Institute of Archaeology, London, UK)

**Jugoslav Pendić** (Department of Archaeology, Faculty of Philosophy, Belgrade University, Belgrade, Serbia)

**Aleksandar Jablanović** (Department of Archaeology, Faculty of Philosophy, Belgrade University, Belgrade, Serbia)

**Katja Kosczynski** (Ruhr-Universität Bochum, Germany)

**Nikolas Heil** (Ruhr-Universität Bochum, Germany)

In the year 2013 a joint team of Serbian and German archaeologists worked on the prehistoric mining site of Curak in the Jarmovac valley close to Priboj on Lim, southwest Serbia.

