6th International Conference on Mediaeval Archaeology
6. međunarodni zanstveni skup srednjovjekovne arheologije

USING LANDSCAPE IN THE MIDDLE AGES IN THE LIGHT OF INTERDISCIPLINARY RESEARCH

KORIŠTENJE KRAJOLIKA U SREDNJEM VIJEKU U SVJETLU INTERDISCIPLINARNIH ISTRAŽIVANJA

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Ulica Ljudevita Gaja 32

HR-10000 Zagreb

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PROGRAMME / PROGRAM Thursday, 6th June 2019	
08:45-09:00	Registration
09:00-09:10	Opening of the conference, welcome speech Katarina Botić, Institute of Archaeology, Zagreb
	Session 1 (Session Chair: Tena Karavidović)
09:10-09:30	**G. Mesterházy** Settlement pattern analysis with GIS methods in the vicinity of Polgár (NE Hungary)
09:35-09:55	**A. Magdič** Early medieval settlement patterns on the Drava Plain in north-eastern Slovenia
10:00-10:20	**P. Debnár** Human traces in the mountainous and forested areas of Kysuce region
10:25-10:45	coffee break
	Poster session S. M. Stanc, A. D. Stănică, D. Malaxa, A. Cabat, L. Bejenaru **Archaeological and archaeozoological Contribution to the Reconstruction of the medieval Environment: Settlement of Noviodunum (Romania)** M. Koller **Medieval settlement patterns on the boundary of the Middle and Upper Tisza Region** T. Törőcsik, S. Gulyás, D. Molnár, R. Tapody, B. P. Sümegi, G. Szilágyi, M. Molnár, G. Jakab, P. Sümegi, Z. Novák **Holocene paleoenvironmental evolution of a marshland from the southern part of the Danube-Tisza interfluve, S Hungary** I. Valent **A contribution to the topography of the iron smelting furnaces in Podravina – a case study of the Delovi – Grede/Poljane/Banovice archaeological zone**

Session 2 (Session Chair: Juraj Belaj)	
10:45-11:05	**E. Kononenko** The practice of substitution of shrines: Succession of the sacred topography of Constantinople / Istanbul
11:10-11:30	**U. Vojvodić** Transformacija prostora župe Ras u nahiju i osnivanje Novog Pazara
11:35-11:55	**A. Rimpf** Water supply infrastructure in Ottoman Ilok
12:00-12:45	lunch break refreshments offered by the organizer
Session 3 (Session Chair: Katarina Botić)	
12:45-13:05	**V. Peter Goss** Dvovjerje, dvokulturje i umjetnost „hrvatskog prostora“
13:10-13:30	**M. Procházka** Castle as Part of Bohemian Landscape
13:35-13:55	**D. Roksandić** Interdisciplinary approach to the study of late roman pottery
14:00-14:20	**S. Krznar, Ž. Bedić, M. Novak** Prilog rekonstrukciji prehrane u srednjovjekovnoj i ranonovovjekovnoj Podravini
14:25-14:40	coffee break
Session 4 (Session Chair: Siniša Krznar)	
14:40-15:00	**K. Botić, T. Sekelj Ivančan, M. Culiberg** Middle Ages forest and woodland cover in Drava region, archaeological perspective: Torčec, Virje and Hlebine case study
15:05-15:25	**T. Tkalčec, T. Sekelj Ivančan** Poplave i erozije tla na primjeru kasnosrednjovjekovnog naselja Buzadovec-Vojvodice (SZ Hrvatska)

15:30-15:50	**S. Gulyás, T. Törőcsik, B. P. Sümegi, P. Sümegi** Environmental history of a southern embayment of Lake Balaton from the Late Glacial to the Migration Age
15:55-16:15	**D. Hruševar, K. Bakrač, S. Miko, N. Ilijanić, O. Hasan, B. Mitić** Palaeoenvironmental changes on the broader area of Topusko during the Middle Ages
16:20-16:40	**S. Salajić** Virovitička utvrda i razvoj grada
16:45-17:00	general discussion
17:15	Closing Meeting Gathering and Coffee

ABSTRACTS / SAŽECI

Gábor Mesterházy
Várkapitányság Integrált Területfejlesztési Központ Nonprofit Zrt., Budapest, Hungary

Settlement pattern analysis with GIS methods in the vicinity of Polgár (NE Hungary)

Over the past decades least cost path calculations and archaeological predictive modelling became widely used in archaeological context to understand aspects of settlement patterns. In practice, settlement patterns were mostly concerned with settlements, meanwhile the route networks got lesser attention. The main goal of this paper is to handle the two elements of settlement patterns equally. The 350 km^2 study area is in the vicinity of Polgár (NE Hungary), where the floodplain of the Tisza river and elevated loess islands meet with the Hortobágy marshlands and elevation changes only 8 meters altogether.
As a work hypothesis it was presumed that during the floods and rainy season the road network should be different, as in dry season. Therefore first a dynamic flood and rainfall-runoff modelling was conducted to reconstruct the environmental context more thoroughly, then different cost surfaces were created to model dry and wet periods. Afterwards due to the rich archaeological heritage of the area it was also possible to study changes in road networks of Avar Period (7-10th century), Árpádian Age (11-13th century) and Late Mediaval period (14-16th century) in dry and in wet periods as well. Results of predictive modelling and geostatistical analysis were also important to identify changes in location of human occupations more comprehensively.
As a result of the integrated GIS based research method, changes in settlement patterns of Avar Period, Árpádian Age and Late Medieval Period became more understandable. A cyclical process is observable in the route networks; meanwhile distance among settlements is constantly growing. The occupation zones are shifting towards east, which can be partially explained with climatic data.

Andrej Magdič
Institute for the protection of cultural heritage of Slovenia, Regional office Maribor, Maribor, Slovenia

Early medieval settlement patterns on the Drava Plain in north-eastern Slovenia

The state organisation of the Roman Empire in today's north-eastern part of the Republic of Slovenia took a steep decline in the beginning of the 5th century. This can

be well observed in the city of Colonia Ulpia Traiana Poetovio, one of the Roman urban centres of Pannonia, as well as in the surrounding rural area in the Drava Plain. Although it is assumed that the region was not fully abandoned, there is no certain archaeological evidence of Roman settlement after that time period.

In the 7th century the examined area was settled by Slavs, arriving from the Pannonian Plane. In the Slovenian archaeology the beginning of Slavic settlement is understood as the onset of the Early Middle Ages. The early medieval settlement shows rural characteristics, with no urban formations, as known from the previous period. For the early medieval period self-sufficient farming was the prevailing economic principle. Therefore we can assume that careful choice considering the locations of newly established settlements was made, depending on the natural conditions in their economic hinterland. The inhabited landscape of the Drava Plain, with its surrounding hills, reflects diverse patterns of topographical features. They differ in slope degree and orientation, rock and soil bases, as well as in varying water regimes. All of them were conditioning the different eco-systems in the region, more or less suitable for diverse farming strategies.

The early medieval archaeological evidence was correlated with the landscape's natural features by the use of GIS tools. The result is an interpretation of the settlement patterns through the time span of the Early Middle Ages.

Peter Debnár
Institute of Archaeology of the Slovak Academy of Sciences, Nitra, Slovak Republic

Human traces in the mountainous and forested areas of Kysuce region

Region of Kysuce lies in the north-western part of Slovakia, on the borders of three states: Slovak, Czech and Polish republics. The region is mostly unsuitable for agriculture, and is not rich in mineral resources, with exception of sporadic appearance of iron ore. Kysuce region has high relief pattern and currently is mainly covered by manmade, mostly pine forests. Remains of the original forest cover are deciduous or mixed forests represented by beeches and fins. Main reason of settling the region in the past was connected with wood processing crafts. Deforested areas were then used for agriculture and pasture. Remains of these activities are still visible in the terrain and LIDAR data can be also used for their identification. Also, with the combination of data gathered in the terrain, it is possible to partially reconstruct a way in which the country was used and reconstruct the conditions in which these activities were made.

Evgenii Kononenko
The Head of Department of Asian and African Art, State Institute for Art Studies, Moscow, Russia

The practice of substitution of shrines: Succession of the sacred topography of Constantinople / Istanbul

The unique relief of the watershed of the Sea of Marmara and the Golden Horn and the water supply system inherited from the Roman city have determined not only the urban planning of Byzantine Constantinople, but also the features of its well-studied hierotopy. The location of aqueducts and streets was predetermined by the disposition of forums, temples, palaces, which led to the formation of a program of ceremonial and sacred spaces.
The Islamization of Constantinople after the Conquest demanded a change in the meaning of sacred topography and its new architectural content, but the Byzantine spatial paradigm itself was entirely inherited by the Turks. Ottoman patrons and architects conducted the practice of "substitution of shrines". The main factors of this process were: 1) the dominants of the relief which provided the best overview of the new memorials; 2) ready-made water supply system, necessary for the functioning of the Muslim complexes; 3) availability of building materials (primarily spolias); 4) the rhetorical significance of places, their veneration by the non-Muslim population. Due to these factors in the first decades after the fall of Byzantium the sultan's memorial complexes were built on the watershed line near the aqueduct of Valent or above old tanks. The "substitution of shrines" had not only rhetorical but also practical importance in facilitating the construction, supply and operation of Islamic centres.
Huge sultan's complexes formed a new image of Constantinople fixed on maps, engravings and landscapes painting. Moreover, in the minds of travellers Byzantine monuments disappeared faster than in the real buildings of the city: in medieval "panoramas of Constantinople" the still existed monuments were simply ignored and the landscape of Istanbul was filled exclusively with mosques.

Uglješa Vojvodić
Arheološki institut Beograd, Belgrade, Serbia

Transformacija prostora župe Ras u nahiju i osnivanje Novog Pazara

Uspostavljanje osmanske vlasti na prostoru srednjovekovnog Rasa i osnivanje Bosanskog pašaluka pratile su određene administrativne promene. Prostor srednjovekovne župe postepeno je menjao svoj dotadašnji izgled a taj proces započet je osnivanjem novog grada, Novog Pazara, u najplodnijem delu kotline, oko reke Raš-

ke. Grad je osnovan krajem šezdesetih godina 15. veka od strane Isa-bega Isakovića, najverovatnije na mestu starijeg, srednjovekovnog naselja, dok su okolna sela vrlo brzo spojena sa gradom i pretvorena u mahale. Bitnu ulogu novoosnovanog grada naslućivao je veoma brzo dobijen rang šehera, najverovatnije već pri osnivanju, dok se 1485. godine pominju vilajet i kadiluk Novi Pazar. Osnovan je kao administrativno središte nahije u kojem se nalazila vojna baza za dalja osvajanja ka severu ali i mnogo važniji trgovinski centar, koji se ubrzano razvija usled povoljnog geografskog položaja na raskršću čuvenog Dubrovačkog i Bosanskog puta. Zajedno sa osnivanjem i napredovanjem grada počinje postepeno gašenje tadašnjeg centralnog mesta trgovine, srednjovekovnog Trgovišta. Pored administrativnih promena i promene vlasti, dolazak osmanlija na ovaj prostor doneo je i novu kulturu. Novonastale okolnosti ostavile su trag i na religijskom planu, koji se uočava u resakralizaciji prostora tj. uspostavljanju novog poretka pretvaranjem postojećih crkava u džamije.

Andrea Rimpf
Ilok Town Museum, Ilok, Croatia

Water supply infrastructure in Ottoman Ilok

Water as a source of life is closely related to learning and practicing of Islam so, in the spirit of religion, the construction of water supply system, hammams, hamamdžik i.e. house bathrooms and fountains represent a contribution to the development of a settlement. In the area of Ilok the Ottomans are intensively building and reconstructing the route of the ancient Roman aqueduct, and building hammams and fountains in the town. The aim of the paper is to present the historical sources and archaeological excavations of the Ottoman water supply system and its importance to the town and its inhabitants.

Vladimir Peter Goss
Professor Emeritus, Sveučilište u Rijeci, Rijeka, Croatia

Dvovjerje, dvokulturje i umjetnost „hrvatskog prostora“

Prostor je vječni okvir ljudskog postojanja, natura, prirodna ekologija. Čovjek unosi u prostor svoj duh, kulturu, kulturnu ekologiju. Zajedno, natura i kultura čine opću ekologiju. Doseljenici se prilagođuju prostoru u koji ulaze. Odnosno, u nj unose neke od svojih značajki.
Hrvati su donijeli izvjesnu tradiciju kompatibilnu s onom predrimskog Ilirika i djelimično rimske provincijale. Ta se predpovijesna tradicija Hrvata polaka ali sigurno do-

kumentira. Pokrštenjem, Hrvati postaju braća u Kristu Romanima, no to pokrštenje dolazi primarno iz sfere Karolinga koja je isto tako kršćanska, kao i barbarska, iako s mjestimično solidnim premazom romanizacije. Čimbenik rimskog grada ne može se zaobići. „I u rudimentarnom obliku rimska Dalmacija ostaje repozitorij u kojem se zrcali i kontinuitet i propadanje antikne kulture..." (Katičić) . Situacija je u najmanju ruku kompleksna, no može se ipak svesti na dva bitna pola. Za područje prvenstveno jezika i književnih spomenika to je izvanredno pokazao u monumentalnim *Litterarum studia* Akademik Katičić, a kao opće načelo naglasio u svojoj genijalnoj knjizi, *Naša stara vjera*, kojoj dugujem mnoga od razmišljanja iznesena u ovom izlaganju.
Oslikavanjem naše stare vjere kao legitimnog paralelnog fenomena novoj, kao nečega što kao dvojevjerje (bilo živo, bilo latentno) postoji u duhovnosti slavenskih naroda do danas, otvara se mogućnost novih pogleda i na druge duhovne i kulturne fenomene, pa tako i na likovne umjetnosti. Umjetnost u hrvatskom prostoru, kao jedan od vidova takvog dvokulturja, formirala se u razdoblju prije romanike, od ca. 600. do 1100., i postoji kao konstanta u tom prostoru do danas. Razapeti između sela i grada, Istoka i Zapada, slavenstva i romanstva, tuđe i vlastite tradicije, određeni prostorom malih, odvojenih jedinica, stvaratelji hrvatskog kulturnog prostora formiraju izraz koji u svojim najboljim ostvarenjima izvanredno balansira između dva bitna suprostavljena pola, *urbsa* i *rusa*. Takva međuprožimanja događaju se diljem zapadne Europe, no lirika prostora i postojanja u prostoru je stvarni specifikum „hrvatske umjetnosti". Sjajni kasniji primjeri sinteza unutar hrvatskog prostora su Dubrovačka Republika 15. i 16. st., Zagorje 17. i. 18. st., te dijelovi Zagreba 19. i 20. st. Tu se ostvarju ideali Ebenezera Howarda s početka 20. st. o „trajnoj bračnoj vezi između grada i sela", što se može iščitati u hrvatskoj kulturi od doseljenja do danas.

Milan Procházka
Katedra archeologie ZČU v Plzni, Plzeň, Czech Republic

Castle as Part of Bohemian Landscape

Components of medieval landscape are not represented by merely isolated features, but elements of dynamic complexes which played their roles even after the demise of their major function. In order to reconstruct particular phases of landscape development, we are able to use various interdisciplinary methods thanks to which we gain knowledge about development, economics and natural environment of a castle and its surroundings. These findings also include knowledge of foundation, building development, demise and consecutive secondary use. The paper represents several sites within Bohemian landscape chosen for their representative character.

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

Interdisciplinary approach to the study of Late Roman pottery

Cibalae (today's town of Vinkovci) were situated in Slavonia region in the eastern part of Croatia, and it has been continuously inhabited for 8,000 years. The cultural layer, at places 6 to 8 m thick, contains all chronological periods and prehistoric cultures. One of the most interesting archaeological layers dates back to Late Roman period (4th to 6th century AD). According to historical sources during second Gepidic occupation of *Pannonia Secunda*, along with capital *Sirmium*, *Cibalae* was second most important stronghold, the most western one.

The aim of this study is to prove a continuity of pottery production at *Cibalae*, to examine the development of various types and shapes of vessels, and to observe changes in technology and typology of vessels dated at the end of 5th century. A special emphasis is put on those vessels, which have not been studied so far, nor typologically determined.

Besides typical Roman provincial pottery forms in Vinkovci, ceramic material that belongs to 5th and 6th century appears and can be linked to migrations of Germanic tribes in this area – the Gepids. Due to the insufficient exploration and interpretation of archaeological material, it is difficult to attribute ethnic elements to it, but one can discern a difference between a genuine local tradition and new elements among used pottery during 5th and 6th century in mentioned area. In this case, besides the typical archaeological methodology, we applied archaeometry to help determine whether new types of ceramics were produced in *Cibalae* or elsewhere.

Ceramic archaeometry encompassed both mineralogical-petrographic and chemical analyses. The purpose of analysing pottery and its additives is to determine the origin of the material used to produce pottery, i.e. to identify local and other workshops, transport methods and production intensity. Twelve pottery samples from five sites in the Vinkovci area have been analysed. The sherds were selected based on excavated typological groups of pottery, i.e. their fabrics and surface treatment. The analyses were used to identify characteristics of fired clay, i.e. its matrix, inclusions – tempers, slip, colour and glaze. The basic method was the optical analysis of petrographic thin sections using a polarizing microscope. It serves to explain in detail the transformations of each mineral and the temperature-induced emergence of new minerals, as well as to determine the conditions and temperatures reached in the kiln for each analysed sample, accompanied by explanations regarding the division into untouched fired clay, temper and grog, and the classification of wall cavities created during firing. Further analyses uncover not only the sequence of mineral phases (X-ray diffraction analysis - XRD), but also chemical differences in the composition of individual vessel types as well as pottery properties (Energy Dispersive X-Ray Fluorescence Spectroscopy – EDXRF). The results of the analysis showed

similarities between all 12 samples and that they were produced in the same workshop, the most important proof of which is the mineral and chemical composition of stamped and burnished pottery (Gepidic), which matches the composition of fine roman pottery traditionally produced in *Cibalae*. These analyses confirmed that new "germanic" pottery came from workshops in *Cibalae*, but also continuity of life in late antiquity and early Middle Ages in this area.

Siniša Krznar,[1] Željka Bedić,[2] Mario Novak[3]
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2 Anthropological Center, Croatian Academy of Sciences and Arts, Zagreb, Croatia
3 Institute of Anthropology, Zagreb, Croatia

Prilog rekonstrukciji prehrane u srednjovjekovnoj i ranonovovjekovnoj Podravini

Jedno od najvažnijih pitanja ljudske egzistencije je kako i gdje prikupiti dovoljno namirnica za kvalitetnu prehranu. I dok se danas, barem u razvijenijim zemljama, bez problema dolazi do dovoljne količine raznovrsnih namirnica visoke energetske vrijednosti, tijekom povijesti to često nije bio slučaj. Kako je proizvodnja hrane uvelike ovisila o okolišnim i vremenskim uvjetima, bilo je dovoljno da godina bude pretjerano kišna ili sušna da dođe do propasti ljetine te pojave gladi. U ovom radu pokušat će se na temelju povijesnih izvora, arheoloških i antropoloških istraživanja te analize stabilnih izotopa ugljika i dušika rekonstruirati prehrana ruralnog stanovništva srednjovjekovne i ranonovovjekovne Podravine.

Katarina Botić,[1] Tajana Sekelj Ivančan,[1] Metka Culiberg[2]
1 Institute of Archaeology, Zagreb, Croatia
2 Ljubljana, Slovenia

Middle Ages forest and woodland cover in Drava region, archaeological perspective: Torčec, Virje and Hlebine case study

During several years of archaeological research on sites around Torčec, Virje and Hlebine in Podravina (Drava region), as part of the project TransFER *Iron production along the Drava River in the Roman period and the Middle Ages: Creation and transfer of knowledge, technologies and goods* (IP-06-2016-5047) funded by the Croatian Science Foundation, a large number of samples of burnt wood was collected. Anthracological analyses of samples collected in medieval houses have shown that in the everyday life a large number of wood species have been used, not only for the construction of houses, but also for the heating and possibly making of furniture or smaller

items for everyday use.

There is a documented change in the use of wood species from the second half of the 6th century to the beginning of the 14th century in the example of several sites in the vicinity of Torčec, which was confirmed on the sites around Virje and in Hlebine. Although oak (*Quercus*) prevails in all periods, its use from the 10th century is reduced, when other types of wood appear. Some medieval settlements were located near the workshops for iron smelting, an activity that over time led to over clearing of oak forests and to the transformation of forest habitats. Thus, anthropogenic influences have allowed the spread of other species such as elm (*Ulmus*), maple (*Acer*), ash (*Fraxinus*), alder (*Populus*), willow (Salix), birch (Betula) and blackthorn (*Prunus spinosa*).

Tatjana Tkalčec,[1] Tajana Sekelj Ivančan[1]
1 Institute of Archaeology, Zagreb, Croatia

Poplave i erozije tla na primjeru kasnosrednjovjekovnog naselja Buzadovec-Vojvodice (SZ Hrvatska)

Arheološkim iskopavanjima provedenima tijekom 2011. i 2012. godine na nalazištu Buzadovec-Vojvodice kraj Križevaca (SZ Hrvatska) istraženo je srednjovjekovno naselje u kojem su prepoznate dvije faze zaposjedanja. Stariji horizont, komu pripada longitudinalna kuća većih dimenzija s pripadajućim tvorevinama smještenima u nizini toka rijeke Glogovnice, obuhvaća razdoblje od kraja 12. i 13. stoljeće kako je to pokazala tipološko-kronološka analiza keramičke građe, potvrđena i radiokarbonskim analizama. Arheološki zapis pokazuje da je kuća bila poplavljena i napuštena nakon toga vremena, možda početkom 14. ili tijekom prve polovine 14. stoljeće. Upravo u tom vremenu dobro su dokumentirane obilne padaline na području srednje Europe koje su posljedično izazvale i velike poplave, kakva je možda bila i uzrokom napuštanja naše kuće koja nakon toga više nije obnavljana.

Mlađi horizont ovog lokaliteta smješten je u nizini, no na nešto povišenijem dijelu terena. Veći broj otkrivenih ognjišta i peći te drugih arheoloških cjelina upućuje na neku gospodarsku djelatnost koja se ovdje odvijala tijekom 15. stoljeća. Veće poplave ili oborine su možda bile uzrokom i erozije tla na ovom dijelu nalazišta, koja se dogodila u nekom vremenu iza 15. stoljeća. Naime, čitav taj dio lokaliteta prekriven je debljim slojem/nanosom sterilne zemlje koji je uslijed specifičnih prirodnih uvjeta erodirao s uzvišenja iznad ovog nalazišta.

Arheološki lokalitet Buzadovec-Vojvodice dobar je primjer istraženog nalazišta na kojem je arheologija i primjena njenih metoda prepoznala određene prekretnice u životu naselja, uzrokovane najvjerojatnije poplavom i/ili erozijom tla nastalih uslijed nepovoljnih vremenskih uvjeta.

Sándor Gulyás[1], Tünde Törőcsik[1,2], Balázs Pál Sümegi[1,2], Pál Sümegi [1,2]
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Environmental history of a southern embayment of Lake Balaton from the Late Glacial to the Migration Age

^{14}C controlled detailed geoarcheological analysis of a sedimentary core sequence taken near Szólád along the southern shore of Lake Balaton enabled us to reconstruct the paleoenvironmental evolution of the vicinity of the site from the Late Glacial to the period of the Early Middle Ages (Migration Age). Late Glacial conditions in the area were characterized by the presence of a coniferous-birch forest-steppe complex and an oligotrophic lake having relatively deeper waters. This forest steppe was transformed into a mixed taiga harbouring deciduous elements like lime, oak, elm, ash as well as the heliophylic hazelnut towards the Pleistocene/Holocene transition and during the Early Holocene. This was the time when our oligotrophic lake was transformed into a mesotrophic lake harbouring extensive Chara vegetation. It was also the time when hydrological connections with the waterbody of the infant Lake Balaton were established as well. Coniferous elements disappeared during the Middle Holocene giving way to a hardwood forest with a dominance of oak, presence of lime, elm, ash, maple and hazelnut, the latter forming a rich sub-canopy. These conditions were preserved through the Neolithic and Copper Ages. Signs of human influences were also traced. The first significant paleoenvironmental change is dated to the Early Bronze Age. This hallmark the transition of our mesotrophic lake into an eutrophic lake. The oak dominated woodlands were gradually replaced by mixed deciduous woodlands harbouring beech and hornbeam besides oak. The strong presence of reed, bulrush and willow indicated the gradual paludification of the embayment. Numerous weed and cereal as well as walnut pollen grains indicate the emergence of strong agricultural and horticultural influences. Grape pollens were also detected during the Late Bronze Age, which was characteristic at other Transdanubian sites too. The Iron Age hallmarks a significant decline in the arboreal vegetation and an expansion of plant cultivation, horticulture as well as animal husbandry. In addition, our marshland gradually develops into a willow marsh towards the Late Iron Age. This transitional relatively open vegetation must have been present during the Imperial Age too indicating an increasing pressure on the landscape from a rising human population and elevated human activities. For the period of the Migration Age a restoration of woodlands can be postulated as a result of decreasing human activities and/or climatic change in the area. Research has been carried out within the framework of University of Szeged, Interdisciplinary Excellence Centre, Institute of Geography and Earth Sciences, Long Environmental Changes research Team. Support of the Ministry of Human Capacities, Hungary grant 20391-3/2018/FEKUSTRAT is acknowledged.

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Palaeoenvironmental changes on the broader area of Topusko during the Middle Ages

Results of the palynological analysis from the peat sediment cored on Blatuša mire during the year 2015 reflect the palaeoenvironmental changes within the confined areas of Topusko-Perna-Vrginmost, from which the first two mentioned toponyms were important centres of economic activity during the Middle Ages. Pollen diagrams were created and plotted by specialized PolPal software, giving us important information about vegetation transition - from more closed forest with domination of alder (*Alnus*), beech (*Fagus*) and oak (*Quercus*) to mosaic habitats in which beech and hornbeam (*Carpinus*) alternate with open land, grasslands and cultivated fields. Locally, at the very same time on the mire surface, the pollen diagrams point to a change in the hydrological regime. Due to the increase moisture condition, ferns (Polypodiales) and mosses (*Sphagnum*), which characterized the Early/High Middle Ages, were replaced by dominance of the sedges (Cyperaceae) in the Late Middle Ages. The high shares of non-arboreal pollen and the frequent occurrence of charcoal particles in sediment samples during the Early/High Middle Ages, as indirect indicators of anthropogenic pressure on habitats, are not supported by the findings of primary anthropogenic indicators. However, the frequent occurrence of the HdV-55 spores (Sordariaceae) probably reflects small intensity of agricultural activity, such as extensive livestock farming. Contrary, appearance of continuous curves of numerous secondary anthropogenic indicators in the Late Middle Ages, eg. cocklebur (*Xanthium spinosum*), goosefoot (Chenopodiaceae), plantains (*Plantago lanceolata*) pollen types correspond very well to the economic prosperity of Archdeaconry of Gora - construction of the Cistercian monastery in Topusko and the church of St. Nicholas on Petrova Gora (13th/14th century), and the privileges that Perna gained in the 13th century, which also increase level of agrarian production. The occurrence of primary anthropogenic indicator during this period, e.g. cereals pollen (Cerealia) indicates direct human influence on vegetation, which can be continuously traced from the Late Middle Ages until nowadays.

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Virovitička utvrda i razvoj grada

Srednjovjekovna nizinska utvrda u Virovitici je smještena u središtu grada. Danas je vidljiva samo u konfiguraciji terena. Grof Pejačević ju je porušio do temelja izgradivši na njezinom mjestu barokno-klasicistički dvorac. Neke dijelove utvrde je koristio i uklopio u perivoj oko dvorca. Zbog položaja i važnosti utvrda je diktirala razvoj grada i nametnula mu izgled grada na mostovima. Prestankom njezine uloge zatrpavaju se opkopi s vodom i ruše mostovi, te Virovitica poprima današnji izgled.

POSTER SESSION

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Archaeological and archaeozoological Contribution to the Reconstruction of the medieval Environment: Settlement of Noviodunum (Romania)

Noviodunum archaeological complex is located on the right bank of the Danube River, on a promontory near the most important ford of the river in northern Dobrogea, about 3 km east of the center of Isaccea town (Tulcea county), at the point Pontonul Vechi (the Old Pier) or Eski-Kale.

By its geographical position, the center of Noviodunum had an important strategic and economic role in the Roman, Byzantine and Medio-Byzantine Roman times, with the settlement ceasing here at the end of the 14th century and continuing on the territory of the current town Isaccea. The investment consisting of building the future headquarters of the Border Police (Isaccea sector) affected an area of 6000 square meters, from a land located in the protection area of the archaeological site 'Isaccea-Noviodunum fortress'.

Considering the large area to be archaeologically researched, it was chosen to divide it into 18 sections, oriented north-south and separated by stratigraphic witnesses with a width of 1 m. The length of the sections was between 54 m (S1) and 74 m (S17). The research was carried out in two stages. In the first stage, 161 complexes were discovered in the area covered by S1-S13, two of which were attributed to the Getic era, 25 to the Roman era, 113 to the Middle-Byzantine era (13th century) and 14 complexes represent arrangements of the First and Second World War; seven complexes did not contain archaeological materials. In the second stage of the preventive researches, in S14-S18, 110 complexes were identified and researched, 28 of them in the Roman era, 73 in the Middle-Byzantine era and one from the world wars period; eight complexes did not have archaeological materials.

Regarding the complexes of the Middle Byzantine period, they are represented by semi-detached dwellings, pits, poles and pottery ovens, inhumation tombs. The research from Isaccea-Noviodunum, the sector of the Land Border Police, has led to the identification of an area with an intense dwelling attributed to the Middle-Byzantine period, doubled by the marking of a new point on the map of the discoveries in the territory of the fortress.

A lot of faunal remains have been collected, coming from molluscs, fish, reptiles,

birds and mammals. Domestic mammal remains have the highest frequency and the identified species are: *Bos taurus, Ovis aries, Capra hircus, Sus domesticus, Equus caballus, Canis familiaris*. The identified wild mammals' species are: *Cervus elaphus, Sus scrofa, Capreolus capreolus, Bos primigenius, Lepus europaeus, Ursus arctos*.

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Medieval settlement patterns on the boundary of the Middle and Upper Tisza Region

Systematic field survey was executed in four micro regions of the Mezőség in Nyírség (North-eastern Hungary) in the spring and autumn of 2015. Tiszadob, Józsefháza, Tedej and Fejérszik micro regions were researched in all 17.9 km^2 area. 25.860 archaeological artefacts were collected in varied perceptual conditions. Medieval settlements were analysed in this presentation.

69 sites were researched totally in project, from which 40 were newly discovered. Settlements with different sizes and intensity belonged to different periods. Medieval ceramic was found in 39 sites, most dated to the Arpadian Age. Data of the surface survey were completed with archival documents.

Evolution of settlement network from the early Arpadian Age to the Late Middle Age could be reconstructed after the evaluation of finds based on size, intensity and location of settlements. Different geomorphological conditions of the four micro regions provided an opportunity to analyse environmental effect in settling relations. The regions were determined by floodplains, where the river Tisza played active role. Therefore the tracks of road network were greatly limited.

The environmental, archaeological and historical data analysed in joint framework were the basis of the changes of the mediaeval settlements network.

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Holocene paleoenvironmental evolution of a marshland from the southern part of the Danube-Tisza interfluve, S Hungary

This work presents the evolution of a Holocene marshland system from the southern part of the Danube-Tisza Interfluve. Based on multiproxy geochemical, sedimentological, paleoecological (mollusc, pollen) data the evolution of the system could have been outlined covering a timespan of ca. 13,000 years starting from 12,000 BC and lasting until 1300 AD. There is an upward stepwise increase in sediment accumulation implying potential human influences as driving force too. These are dated to the Copper, Bronze and Iron Ages. Highest accumulation rates are dated to the Early Middle Ages from the 11th century onwards in addition to the period of the Roman Age. Several climate induced changes could have been identified which as well are present in other Hungarian and Western European records too such as the 5b IRD event at ca 5800 BC, a humid phase around 1600 BC and a cool humid phase around the 6th century AD. Research has been carried out within the framework of University of Szeged, Interdisciplinary Excellence Centre, Institute of Geography and Earth Sciences, Long Environmental Changes Research Team. Support of the Ministry of Human Capacities, Hungary grant 20391-3/2018/FEKUSTRAT is acknowledged.

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A contribution to the topography of the iron smelting furnaces in Podravina – a case study of the Delovi – Grede/Poljane/Banovice archaeological zone

During the first two years of the TransFER research project "Iron production along the Drava River in the Roman period and Middle Ages: Creation and transfer of knowledge, technologies and goods", funded by the Croatian Science Foundation, over 80 archaeological sites with traces of smelting activities (pieces of smelting slag, blowers or furnace wall) were recognised on the territory of Podravina. The majority of sites is placed on lower Holocene Drava terraces that have an alluvial-swamp

substratum, next to a water source. These sites are most frequently grouped within a smaller archaeological zone within which one can define several positions on which smelting remains can be recognised. One of these areas is the Delovi-Grede/Poljane/Banovice archaeological zone, situated to the north of the village Delovi in Podravina.

The position of this plain zone is characterised by creeks Brzava and Bistra, their numerous meanders and several low sand mounts on which, or in the foot of which, archaeological positions Grede 1-7, Beljevine 1-2, Poljane 1-8 and Banovice 1-3 were recognised. The datation of the positions containing smelting remains (Grede 1, Poljane 1, 4-8, Banovice 1-3), based on the ceramic material collected during field surveys and one preventive excavation (Grede 1), can be dated to Late Iron Age (Poljane 4, 8), Roman Period (Poljane 4), Early Medieval Period (Poljane 1), High and Late Medieval Period (Grede 1, Banovice 1-3).

Additional examination of several pieces of slag from the 1982 preventive excavation of the site Delovi - Grede 1 revealed that the slag, which was found in abundance, was not created as a product of forging, as it was previously presumed, but in fact of smelting. The context in which the pieces were found was dated between 12th and early 14th century, but in fact, the ceramic material should be dated to late 15th/early 16th century. These information therefore indirectly prove the existence of a smelting workshop on the site within that period, which might have a secondary location on positions Banovice 1-3 situated approximately 1 km to the north, where smelting remains were discovered in the context of 13th-16th century.

Analysing the presented information, it is clear that the territory around Delovi has a long history of occupation which, during the period between Late Iron Age and Late Middle Ages, might have been collocated with the existence of bog iron ore in the soil which was continuously forming through centuries and thereby enabled the production of iron in Podravina.

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