

# Integrating Genetic, Archaeological, and Historical Perspectives on Eastern Central Europe, 400–900 AD

## Brief Description of the ERC Synergy Grant – HistoGenes 856453<sup>1</sup>

Walter Pohl, Johannes Krause, Tivadar Vida, Patrick Geary

Institute for Medieval Research, Austrian Academy of Sciences, A-1020 Wien,  
Hollandstrasse 11-13, Austria; [Walter.Pohl@oeaw.ac.at](mailto:Walter.Pohl@oeaw.ac.at)

Max Planck Institute for the Science of Human History, D-7745 Jena,  
Kahlaische Str. 10, Germany; [krause@shh.mpg.de](mailto:krause@shh.mpg.de)

Institut of Archaeological Sciences, Faculty of Humanities, Eötvös Loránd University,  
H-1088 Budapest, Múzeum krt. 4/B., Hungary; [vida.tivadar@btk.elte.hu](mailto:vida.tivadar@btk.elte.hu)

School of Historical Studies, Institute for Advanced Study, USA-8540 Princeton NJ,  
1 Einstein Drive, United States; [geary@ias.edu](mailto:geary@ias.edu)

Received 02 November 2020 | Accepted 09 December 2020 | Published online 30 April 2021

**Abstract.** Few parts of Europe witnessed so many population shifts in a few centuries as the Carpathian Basin in 400–900 CE. In this macro-region along the middle Danube, Pannonians, Romans, Goths, Gepids, Longobards, Avars, Bulgars, Slavs, Franks and many others came and went. This is an intriguing test case for the relationship between ethnic identities constructed in texts, cultural habitus attested in the archaeological record, and genetic profiles that can now be analysed through ancient DNA. What was the impact of migrations and mobility on the population of the East-Central-Europe? Was the late antique population replaced, did it mix with the newcomers, or did its descendants only adopt new cultural styles? To what degree did biological distinctions correspond to the cultural boundaries and/or ethnonyms in the texts? If pursued with methodological caution, this case study will have implications beyond the field. HistoGenes will analyse c. 6,000 samples from graves with cutting edge scientific methods, and contextualize the interpretation of these data in their archaeological and historical setting. The rapid progress of aDNA analysis and of bio-informatics now make such an enterprise viable. However, the methods of historical interpretation have not kept pace. HistoGenes will, for the first time, unite historians, archaeologists, geneticist, anthropologists, and specialists in bio-informatics, isotope analysis and other scientific methods. A wide range of particular historical questions will be addressed from an interdisciplinary perspective, and fundamental theoretical and methodological issues can be explored. HistoGenes will not only advance our knowledge about a key period in European history, but also establish new standards for the historical interpretation of genetic data. The six-year HistoGenes Synergy Grant was launched on May 1, 2020.

1 This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n° 856453 ERC-2019-SyG).

**Keywords:** ancient DNA, isotopes, Late Antique-Early Medieval population, Carpathian Basin, HistoGenes

## History and genetics: a new approach

Scientific methods in archaeology, and in particular paleogenetics, have made spectacular progress in recent years. Whole genome sequencing, SNP capture, principal component analysis, advanced computer modelling, and more now provide a toolbox for obtaining data from ancient DNA (aDNA) that is robust and fine-tuned enough to allow for the identification of distinct genetic clusters, even in historical periods in which the European population already shared most of its genetic heritage.<sup>2</sup> These methods have also gradually become more affordable, although they still require investments that are only viable through large grants. Several highly ambitious projects are being drafted, and the competition for access to samples has begun. When using scientific methods to clarify the population history of Europe for periods in which extensive written evidence is available, however, we encounter a fundamental problem. As yet, we lack a proven method for integrating genetic, archaeological, and historical evidence into a coherent picture of the past. This is what HistoGenes strives to achieve through a broadly conceived pilot project conducted by an experienced team from all involved disciplines.

In fact, the problem is not simply the lack of an adequate method: it is the prevalence of an insufficient approach. Many genetic studies simply identify the clusters that emerge from their data on historical peoples. This is a good way to create maximum media attention, especially when it also allows the creation of a direct link to modern nations: finding an Anglo-Saxon, Hungarian, or Viking “we” in bones that are over 1000 years old caters to the longing to uncover “who we really are.”<sup>3</sup> However, this is problematic for several reasons. It tends to direct funds for costly genetic research toward projects producing facile equivalencies that can be trumpeted and that are designed to appeal to the general public. Worse, it can be misused to affirm neo-nationalistic or even racial ideologies. Moreover, this approach rests on nineteenth-century paradigms, which do not represent the current state of historical and archaeological research. It is possible that ethnic designations in the texts correspond to some extent with a shared language and distinctive culture and can be traced to a common origin through joint migration. However, historical and archaeological research since the 1960s has yielded considerable evidence of the frequent re-composition of ethnic groups; thus, in most cases, a high degree of admixture

---

2 Schiffels et al., “Iron Age”; Furholt, “Massive Migrations?”; Eisenmann, “Reconciling Material Cultures.”

3 Comaroff and Comaroff, *Ethnicity, Inc.*; Jobling, Rasteiro, and Wetton, “In the Blood.”

can be hypothesized.<sup>4</sup> Whichever position one takes in the ongoing debates on whether and when archaeological groups can be linked with historical peoples, the methodological principle should be clear: historical, archaeological, and biological evidence are not simply natural expressions of a fixed group identity. None can be taken as a proxy for the other. Their equivalence cannot be taken for granted but needs to be demonstrated in each case.

Admittedly, this makes the interpretation of genetic and archaeological finds more complicated. It cannot be tackled by geneticists alone, as has been a frequent practice in the field. This has had the unfortunate consequence that many historians and archaeologists have dismissed results of genetic studies because of their obviously faulty conclusions.<sup>5</sup> If a recent, high-level study of admixture dates a putative population movement to “the end of the first millennium CE, a time known as the European Migration Period, or *Völkerwanderung*,”<sup>6</sup> almost half a millennium later than historians would, then there is a problem in communication between the disciplines. Therefore, the interpretation of genetic data should be performed by interdisciplinary teams working together throughout the process: from the design of the project and formulation of the research questions to the joint monitoring of the work flow and finally the interpretation and integration of the data into a historical narrative. This requires researchers (especially the historians) to move out of their comfort zone. Our project seeks to achieve this.

### The historical problem

HistoGenes addresses one of the formative periods in European history: between c. 400 and c. 900 CE, medieval Europe emerged after the dissolution of the Western Roman Empire in a process that involved migrations and demographic change and the rise of post-Roman Christian kingdoms in the West and non-Roman “barbarian” societies in the East.<sup>7</sup> For centuries, the frontier of the Roman Empire, extending along the Rhine and Danube rivers, had divided the continent into a Roman South and a “barbarian” North. Now, a Latin and Christian West was separated from a largely “pagan” East, which only gradually came to be Christianized and integrated among the medieval societies that had emerged in much of the continent. The area where these fault-lines crossed was perhaps most affected by these changes: the Carpathian

---

4 Geary, “Barbarians and Ethnicity”; Geary, *Myth of Nations*; Pohl, “Introduction: Strategies of Identification”; Wolfram, *Das Römerreich*.

5 Brather, “New Questions”; Pohl, “Transformation of the Roman World”; Feuchter, “Migrationen.”

6 Busby et al., “Role of Recent Admixture.”

7 Brown, *Rise of Western Christendom*; Smith, *Europe after Rome*; Halsall, *Barbarian Migrations*; Heather, *Empires and Barbarians*; Wickham, *Inheritance of Rome*.

Basin, the macro-region along the Middle Danube, roughly between Vienna and Belgrade. In this period, it was a node in the population history of Europe: new groups arrived from the north and east and continued their migration or expansion towards the south and west.<sup>8</sup> It was situated between the core areas of the Roman world and the broad and thinly populated regions in which, in the Romans' perception, "barbarians" lived. Many former provinces of the Roman Empire experienced fundamental political changes but only a gradual social and cultural transformation. In the Carpathian Basin, the break with classical civilization was almost complete, although contact remained with areas of continuing Romanness to the south and west.

Several very different social models coexisted or replaced each other in the area. These included first the complex society of the Christian Roman Empire. The second model was composed of the "barbarian" military elites who were more or less ready to be integrated into privileged positions in these late Roman societies. The post-Roman rural populations under "barbarian" rule made up the third. A fourth was composed of steppe warriors who built their often short-lived realms on tributes and plunder from the Roman heartlands and relied on local farmers for subsistence. The fifth model was that of decentralized Slavic groups who had no need of Roman infrastructure and built regional political units only over the course of centuries. The final model was that of the Christian empire of the Franks. What is particular about the Carpathian Basin is that for much of the period, unlike most neighboring regions, it was dominated by steppe empires following a Central Eurasian model.<sup>9</sup>

### **A model area for study: the Carpathian Basin in the fifth to ninth centuries**

The period and the area chosen for the present project allow us to test and monitor the various disciplinary approaches particularly well. The Carpathian Basin—that is, modern Hungary and the surrounding areas along the Middle Danube, roughly between Vienna and Belgrade—was a hub for population movements during the centuries after the dissolution of the Western Roman Empire.<sup>10</sup> In Roman times, it was divided by the Danube limes between the Roman province of Pannonia, with its network of cities and roads, and a northern/eastern half settled by Sarmatians. In the former province of Pannonia, the traces of the "Roman" population gradually disappeared during the sixth and seventh centuries, and archaeological and historical

8 Bóna, *Anbruch des Mittelalters*; Pohl, *Völkerwanderung*; Wolfram, *Das Römerreich*.

9 Golden, *Central Asia*; Bemmman and Schmauder, *Complexity of Interaction*.

10 Bóna, *Anbruch des Mittelalters*; Wolfram, *Das Römerreich*; Curta, *Making of the Slavs*; Bemmman and Schmauder, *Kulturwandel in Mitteleuropa*; Steinacher, *Rom und die Barbaren*.

sources provide only a blurred picture of their fate.<sup>11</sup> What became of the Roman provincial population? In the course of the fifth and sixth centuries, Huns, Goths, Gepids, Heruls, Sciri, Suebians, Longobards, Bulgars, Avars, Slavs and Byzantine captives came, settled, and in part left again.<sup>12</sup> The written sources distinguish these groups by ethnic names but provide only vague information about their numbers, composition, and impact on the long-term population history of the country. In 567, the Avars, a group of at least partial Central Asian origin, conquered the entire Carpathian Basin and established a steppe empire ruled by a khagan, which facilitated the expansion of the Slavs over most of Eastern Europe.<sup>13</sup> This empire existed for over 200 years, and was only overcome by the Frankish armies of Charlemagne around 800. In the ninth century, Franks dominated a largely Slavic population, before the Hungarians arrived in c. 900.

Many of these groups observed burial customs that included inhumation and the leaving of grave goods, both practices that can provide extraordinarily useful information for researchers of population history and social and cultural developments. From the Avar period alone, over 70,000 graves have been excavated.<sup>14</sup> As a result, we know much about the cultural profiles of the period. However, there is more potential in this rich body of evidence. There are two main issues that can be addressed in the proposed interdisciplinary research. One is the grassroot-level social structures as reflected in the cemeteries of small communities. How did the way of life in Roman provinces such as Pannonia change when the Roman order disintegrated? A pilot project on the Longobard migration to Italy<sup>15</sup> in 568 provides material for comparing the development of “barbarian” settlements in Pannonia and Italy before and after 568.<sup>16</sup> The (debated) “Transformation of the Roman World” had many faces.<sup>17</sup> The issue of basic social structures can be addressed by a combination of archaeological assessments of cemetery structure, genetic data on kinship relations, C- and N-isotope analyses of richer and poorer diets, anthropological evidence of labor or combat (provided by skeletal remains), and written information about local communities.

The second issue is the origin and composition of the inhabitants of the Carpathian Basin during the frequent changes in rule, which encompasses the extent

---

11 Bierbrauer, “Keszthely-Kultur”; Vida, “Local or Foreign Romans?”; Vida, “Conflict and Coexistence.”

12 Pohl, “Gepiden”; Vida, “Many Identities of the Barbarians”; Vida, “Conflict and Coexistence.”

13 Bemann and Schmauder, “Kulturwandel in Mitteleuropa”; Pohl, *Avars*.

14 Daim, “Avars and Avar Archaeology”; Bálint, “Avars, Byzantium and Italy.”

15 Amorim et al., “Understanding.”

16 Koncz, “568.”

17 Wickham, *Framing the Early Middle Ages*; Halsall, *Barbarian Migrations*.

and impact of migrations, the homogeneity or hybridity of the ethnic groups mentioned in the texts, and the degree of correspondence between cultural and genetic groups. Examination of this issue requires a critical assessment of the relationships between broader genetic clusters, SR-isotope analysis, the archaeological record of long-distance cultural similarities and differences, and textual evidence about ethnic groups, migrations, and mobility. Was this essentially a population continuum dominated by changing elites who came and went? Or are we witnessing a succession of different populations, as the written sources seem to suggest? Byzantine texts claim that “to disappear like the Avars” even became proverbial—was this because the Avars were exterminated after their defeat, or did many of them simply change their identity and become Slavs? Genetic and other forms of bio-archaeological analysis can provide extensive data that will push forward discussions about population history and the impact of migrations.<sup>18</sup> These data will not per se resolve many of the unanswered research questions specified below. However, if HistoGenes succeeds in integrating these data with the archaeological and historical evidence in a differentiated way, this would constitute a breakthrough in the field.

### **Project design and general goals**

HistoGenes will use the extraordinary archaeological evidence in the Carpathian Basin to create a more profound picture of the changes in population, social structure, and culture during the period. It will employ cutting-edge methods of scientific archaeology, bio-informatics, and population genetics to arrive at a new level of knowledge about the population history of Eastern Central Europe. Samples will be drawn both from the core area of the Carpathian Basin (Hungary and the adjacent lowlands) and from the neighboring regions of Austria, Germany, Croatia, Czech Republic, Slovakia, Romania, Serbia, Slovenia, and northern Italy for comparison. The team will collect c. 6,000 samples for genetic, isotope, 14C, and anthropological analysis. Core cemeteries will be comprehensively analyzed rather than sampled. This will be done in an integrated workflow involving four groups of investigators who will seek further innovation in the processing of the samples and in the modelling of the data. These data will provide an unparalleled open-access resource for further studies of European genomic history in historical periods. The selection of the samples, the monitoring of the process, and the interpretation of the data will be conducted by the four groups, which comprise historians, archaeologists, population geneticists, and bio-informaticians, all working in close cooperation to arrive at a well-balanced historical interpretation of the data. The goal is to find a common language between the disciplines.

---

18 Samida and Feuchter, “Why Archaeologists”; Eisenmann, “Reconciling Material Cultures”; Geary, *Herausforderungen und Gefahren der Integration*.

In particular, we will assess the value and limitations of written evidence in assessing the uses of ethnonyms and the fundamental categories of ethnicity, identity, community, and migration for interpreting the archaeological and scientific data. This will be accompanied by reflections on the methodology of using bio-archaeological data and “classical” archaeological evidence to arrive at historical conclusions. Thus, we seek to establish a best-practice model for the interpretation of biological data in history and counteract the return of biological determinism and the emergence of old and new nationalist narratives in Central and Eastern Europe. We will disseminate the results to the scholarly community in high-level scientific, archaeological, and historical journals and monographs, in databases, and in online resources and apprise the general public through a major exhibition and the use of digital humanities tools.

The main applicant for the project is the Austrian Academy of Sciences, which is coordinating the historical and anthropological research under the leadership of Walter Pohl (Institute for Medieval Research, Vienna). Genetic testing is being performed by the Max Planck Institute for the Science of Human History, Jena) under the direction of Johannes Krause. At the Institute for Advanced Study in Princeton, Patrick Geary directs the complex biohistorical analyses, and Krishna Veermah of Stony Brook University is conducting the bioinformatics evaluations. In Budapest, the archaeological evaluations are being coordinated by Tivadar Vida in the Institute for Archaeological Sciences at the Eötvös Loránd University, while the sampling, the preparation of the samples, and some genetic tests are being carried out in the Laboratory of Archeogenetics in the Institute of Archeology at the Research Centre for the Humanities from Eötvös Loránd Research Network by Balázs Gusztáv Mende and Anna Szécsényi-Nagy. The regional research groups are led by senior researchers: Tina Milavec (University of Ljubljana, Department of Archaeology), Vujadin Ivanišević (Institute of Archaeology, Belgrade), Falko Daim (University of Vienna, Institute of Prehistoric and Historical Archaeology, University of Vienna), Lumír Polaček (Institute of Archaeology, Czech Academy of Sciences, Brno), Matej Ruttkay (Institute of Archaeology, Slovak Academy of Sciences, Nitra), and Szilárd Sándor Gál (Mureş County Museum, Târgu Mureş).

## Research questions

The project will address the following major issues in the history of the transition from the Roman to the post-Roman world in the region.<sup>19</sup> The first is the dissolution of the Roman system and the fate of the “Roman” provincials and their Christian culture.<sup>20</sup>

---

19 Pohl, “Introduction: Strategies of Identification.”

20 Pohl et al., *Transformations of Romanness*.

Eastern Central Europe has rarely featured in these debates, and this project will ask what population and cultural continuities can be discerned in the region through the Avar period. The second is the putative Roman-barbarian dichotomy. How different were the emerging post-Roman structures between this area of apparent de-Romanization and neighboring regions with more gradual transformation? What, for instance, were the differences between the ways of life under Longobard rule in Pannonia before 568, and in Italy and Pannonia after 568, or indeed under the Avar Empire?<sup>21</sup>

The third and fraught issue, the role of ethnicity, follows from these considerations.<sup>22</sup> From early medieval chronicles to modern scholarly narratives, the history of the period has always been told in terms of collectives whose cohesion was taken for granted: “the” Romans, “the” Longobards, “the” Avars, “the” Slavs. This represents a cognitive scheme in the written sources by which collective agency and political distinctions were understood in ethnic terms. Current attempts to minimize the role of ethnicity are unhelpful because it is a key feature in the sources. Yet, we cannot take these ethnic classifications for granted as modern scholarly categories, and this raises serious issues about the classification of the material culture. Attributing all distinctive features in the archaeological record to particular ethnic groups may ease integration into an overall historical narrative, but it may also be misleading. Did Longobards, Pannonians, or Gepids who adopted Avar culture turn into Avars? Questions like this need to be re-examined on a paradigmatic and methodological level.

The fourth issue the project will investigate is the nature of migration in this region. The conventional image of “the great migrations,” as represented by colored lines on a map, has been deconstructed in the last decades. Current discussion has dealt with the extent to which these “migratory events” were in fact simplified perceptions that condense long-term mobility into a single violent mass migration.<sup>23</sup> Theorists prefer to speak of transnationalism (understood as networks of mobility) rather than migration. Nevertheless, large-scale military exploits, such as the Longobard conquest of parts of Italy and the Avar move to the Carpathian Basin, appear to have involved tens of thousands of individuals. Genetics and isotope analysis can provide clues. In the careful and fine-tuned combination of absolute dates in written sources, (mostly) relative dates in the archaeological record, and the corresponding genetic data, we can construct robust hypotheses on migratory movements.

A final and rather understudied issue is the social structure and cohesion of local communities and the role of kinship and status within them. The social position and cultural profile of women is also a key concern here. A challenge will be

---

21 Amorim et al., “Understanding.”

22 Pohl, “Introduction: Strategies of Identification”; Geary, *Myth of Nations*.

23 Burmeister, “Archaeology and Migration.”

to relate the micro-studies of small communities and their cemeteries, as accessible through the methods of archaeology, genetics, and other scientific methods, to the more general narrative perspectives offered by historical accounts.

## Project aims

### 1. Tracing the population history of the Carpathian Basin in the fifth and sixth centuries and the degree of continuity of the late Roman population<sup>24</sup>

HistoGenes will also contribute to discussions about the “transformation of the Roman World,” and the divergent developments in Eastern Europe (and specifically, in the former Roman province of Pannonia) and the West—among them, the former Roman core area, Italy.<sup>25</sup> Can we find indications of continuous settlement in genetic and isotope data? The Carpathian Basin was a node in the migratory movements of the fifth and sixth centuries; many smaller and larger groups passed through, and some stayed for longer or shorter periods.<sup>26</sup> Does the variety of ethnonyms observed in the written sources correspond to a similarly varied genetic record?

### 2. Reconstructing the populations of the Avar Empire and the neighboring regions, 568–c. 800

Did parts of the post-provincial population remain after a mixed group left Pannonia in 568?

Who lived in Pannonia under the early Avar Khaganate? How was the population composed, and does its genetic signature correspond to its cultural profiles? Concerning the origins and the genetic composition of the Avar military, a preliminary analysis of some of the richest Avar graves (seventh century) has shown substantial Central Asian parallels. This eastern influx corresponds to written evidence; can it also be detected among the lower-status warrior population? Can genomics resolve the debate over whether changes in culture in the late seventh century can be explained by new waves of immigration?<sup>27</sup> In the course of the seventh century, material culture became quite homogeneous.<sup>28</sup> Was this a cultural unification of a

24 Pohl et al., *Transformations of Romanness*.

25 Halsall, *Barbarian Migrations*; Wickham, *Framing the Early Middle Ages*.

26 Knipper et al., *Coalescing Traditions*.

27 Csáky et al., *Genetic Insights into the Social Organisation*.

28 Pohl, *Avars*; Bálint, “Avars, Byzantium and Italy.”

population that continued to be heterogeneous, or did it correspond to a process of genetic admixture and homogenization? Isotope analysis and genetic traces may shed light on internal migration—was there a high degree of mobility within the Avar realm? Can local migration across frontiers be detected?

### 3. Placing the Avar Khaganate in relation to its neighbors and successors

Did long-range human mobility accompany cultural exchanges? How do social developments in the Avar Khaganate compare to the post-Roman Longobard kingdom? One of the long-term outcomes of Avar domination was Slavic expansion over most of Eastern Europe. The earliest Slavs (sixth/seventh century) are mentioned in texts, but in many regions have left little archaeological traces. Skeletal evidence from the eighth century onwards in Slavic environments can be used to assess traces of Avar-Slav interaction, especially in border areas.<sup>29</sup> Soon after the fall of their empire in 795/96, the Avars disappeared from the sources. What happened to the population that had been buried in Avar style in the eighth century? Continuity between the Avar period population and new population groups in ninth-century Pannonia will be studied in the Carolingian center of Mosapurc-Zalavár.<sup>30</sup>

### 4. Small worlds and large realms: focusing on the social structure of the Carpathian Basin

With the genetic mapping of kinship relations in cemeteries, we can trace the structure of small communities in the region—did these burial communities follow similar or different models, and how did these change over time? With the mapping of kinship relations in cemeteries, we can acquire a better understanding of how communities were formed, what family actually meant at the time, and how kinship relations were represented through the burial customs. How did biological origin correspond to social status? How do social structures and ways of life compare to those in neighboring regions? Anthropological study and DNA analysis of pathogens (c. 500 samples) will give general clues about health, especially about the debated impact of the Justinianic plague.<sup>31</sup> Isotope evidence on diet already indicates that repeated transformations of nutrition came with the changes that took place in the Carpathian Basin in the time period studied. As the late Roman infrastructure was abandoned, people had to turn to new ways of subsistence. C and N isotope data suggest millet

29 Curta, *Making of the Slavs*; Dzino, *Becoming Slav, Becoming Croat*.

30 Szőke, “Mosaburg/Zalavár.”

31 Bos et al., “Draft Genome of *Yersinia Pestis*”; Feldman et al., “High-Coverage *Yersinia Pestis* Genome”; Spyrou et al., “Historical *Y. Pestis* Genomes.”

was a well-established staple crop during the fifth century,<sup>32</sup> while its importance decreased in the sixth century.<sup>33</sup> Existing evidence on climate change in the period will be incorporated into the project and complemented by a smaller speleological pilot study on gendered and kin-based forms of representation: Representation on a family level, anthropological sexing of skeletons and models of warrior masculinity are among the issues that will be explored.

HistoGenes will not only collect and interpret data on the transformations in Eastern Central Europe to arrive at a substantially refined picture of the period. A key feature in the project is the systematic reflection of the epistemological process and its methodological implications. The aim is to create a reliable precedent for further interdisciplinary studies involving scientific archaeology and population genetics. This will mainly be achieved by a close collaboration between team members and by an open network involving many other scholars in the field (“connective structure”). We will look for interpretations that match the complexity of the historical process rather than straightforward historical narratives. Additionally, we will reflect on the scholarly language in which we can communicate results and seek to avoid both the misunderstandings caused by specific ethnonyms and terms such as ethnicity, community, or migration and also their reifications. At the same time, we will not abandon “loaded terms” that are often hard to replace. Furthermore, we will experiment with translating the results from the paradigmatic structure of one discipline into another.<sup>34</sup>

## Bibliography

- Alt, Kurt W., Corina Knipper, Daniel Peters, Wolfgang Müller, Anne-France Maurer, Isabelle Kollig, Nicole Nicklisch, Christiane Müller, Sarah Karminia, Guido Brandt, Christina Roth, Martin Rosner, Balász Mende, Bernd Schöne, Tivadar Vida, and Uta von Freeden. “Lombards on the Move—An Integrative Study of the Migration Period Cemetery at Szólád, Hungary.” *PLoS ONE* 9, no. 11 (2014): e110793. <https://doi.org/10.1371/journal.pone.0110793>.
- Amorim, Carlos Eduardo G., Stefania Vai, Cosimo Posth, Alessandra Modi, István Koncz, Susanne Hakenbeck, Maria Cristina La Rocca, Balázs Gusztáv Mende, Dean Bobo, Walter Pohl, Luisella Pejrani Baricco, Elena Bedini, Paolo Francalacci, Caterina Giostra, Tivadar Vida, Daniel Winger, Uta von Freeden, Silvia Ghirotto, Martina Lari, Guido Barbujani, Johannes Krause, David Caramelli, Patrick Geary, and Krishna Veeramah. “Understanding 6<sup>th</sup>-Century Barbarian Social

32 Hakenbeck et al., “Practising Pastoralism.”

33 Alt et al., “Lombards on the Move.”

34 The project is available on the following website: <https://www.histogenes.org/>.

- Organization and Migration through Paleogenomics.” *Nature Communications* 9, no. 1 (2018): 3547. <https://doi.org/10.1038/s41467-018-06024-4>.
- Bálint, Csanád. *The Avars, Byzantium and Italy. A Study in Chorology and Cultural History*. *Varia Archaeologica Hungarica* 31. Budapest: Institute of Archaeology, Research Centre for the Humanities, Hungarian Academy of Sciences, 2019.
- Bemmann, Jan and Michael Schmauder, eds. *The Complexity of Interaction along the Eurasian Steppe Zone in the First Millennium CE*. Bonn: Universität Bonn Institut für Vor- und Frühgeschichtliche Archäologie, 2015.
- Bemmann, Jan and Michael Schmauder, eds. *Kulturwandel in Mitteleuropa: Langobarden—Awaren—Slawen*. Bonn: Universität Bonn Institut für Vor- und Frühgeschichtliche Archäologie, 2008.
- Bierbrauer, Volker. “Die Keszthely-Kultur und die romanische Kontinuität in Westungarn (5.–8. Jh.): Neue Überlegungen zu einem alten Problem.” In *Von Sachsen nach Jerusalem: Menschen und Institutionen im Wandel der Zeit; Festschrift f. Wolfgang Giese zum 65. Geburtstag*, edited by Hubertus Seibert and Gertrud Thoma, 51–72. Munich: Herbert Utz Verlag, 2004.
- Bollók, Ádám, Gergely Csiky, and Tivadar Vida, eds. *Zwischen Byzanz und der Steppe: Archäologische und historische Studien.. Festschrift für Csanád Bálint zum 70. Geburtstag / Between Byzantium and the Steppe: Archaeological and Historical Studies in Honour of Csanád Bálint on the Occasion of His 70<sup>th</sup> Birthday*. Budapest: Institute of Archaeology, Research Centre for the Humanities, Hungarian Academy of Sciences, 2016.
- Bóna, István. *Der Anbruch des Mittelalters: Gepiden und Langobarden im Karpatenbecken*. Budapest: Corvina Verlag, 1976.
- Bos, Kirsten I., Verena J. Schuenemann, G. Brian Golding, Hernán A. Burbano, Nicholas Waglechner, Brian K. Coombes, Joseph B. McPhee, Sharon N. DeWitte, Matthias Meyer, Sarah Schmedes, James Wood, David J. D. Earn, D. Ann Herring, Peter Bauer, Hendrik N. Poinar, and Johannes Krause. “A Draft Genome of *Yersinia Pestis* from Victims of the Black Death.” *Nature* 478, no. 7370 (2011): 506–10. <https://doi.org/10.1038/nature10549>.
- Brather, Sebastian. “New Questions Instead of Old Answers: Archaeological Expectations of aDNA Analysis.” *Medieval Worlds* no. 4 (2016): 22–41. [https://doi.org/10.1553/medievalworlds\\_no4\\_2016s22](https://doi.org/10.1553/medievalworlds_no4_2016s22).
- Brown, Peter. *The Rise of Western Christendom: Triumph and Diversity AD 200–1000*. The Making of Europe. 2nd ed. Oxford: Blackwell, 2003.
- Burmeister, Stefan. “Archaeology and Migration: Approaches to an Archaeological Proof of Migration.” *Current Anthropology* 41, no. 4 (2000): 539–67. <https://doi.org/10.1086/317383>.

- Busby, George B. J., Garrett Hellenthal, Francesco Montinaro, Sergio Tofanelli, Kazima Bulayeva, Igor Rudan, Tatijana Zemunik, Caroline Hayward, Draga Toncheva, Sena Karachanak-Yankova, Desislava Nesheva, Paolo Anagnostou, Francesco Cali, Francesca Brisighelli, Valentino Romano V, Gérard Lefranc, C. Buresi, Jemni Ben Chibani, Amel Haj-Khelil, Sabri Denden, Rafal Ploski, Paweł Krajewski, Tor Hervig, Torolf Moen, Rene J. Herrera, James F. Wilson, Simon Myers, and Cristian Capelli. “The Role of Recent Admixture in Forming the Contemporary West Eurasian Genomic Landscape.” *Current Biology* 25, no. 19 (2015): 2518–26. <https://doi.org/10.1016/j.cub.2015.08.007>.
- Comaroff, John and Jean Comaroff. *Ethnicity, Inc.* Chicago Studies in Practices of Meaning. Chicago: University of Chicago Press, 2009.
- Curta, Florin. *The Making of the Slavs: History and Archaeology of the Lower Danube Region, c. 500–700*. Cambridge: Cambridge University Press, 2001. <https://doi.org/10.1017/CBO9780511496295>.
- Csáky, Veronika, Dániel Gerber, István Koncz, Gergely Csiky, Balázs G. Mende, Bea Szeifert, Balázs Egyed, Horolma Pamjav, Antónia Marcsik, Erika Molnár, György Gulyás, András Pálfi, Bernadett Kovacsóczy, Gabriella M. Lezsák, Gábor Lőrinczy, Anna Szécsényi-Nagy, and Tivadar Vida, “Genetic Insights into the Social Organisation of the Avar Period Elite in the 7<sup>th</sup> Century AD Carpathian Basin.” *Nature: Scientific Reports* 10, no. 1 (2020): 948. <https://doi.org/10.1038/s41598-019-57378-8>
- Daim, Falko. “The Avars and Avar Archaeology: An Introduction.” In *Regna and Gentes: The Relationship between Late Antique and Early Medieval Peoples and Kingdoms in the Transformation of the Roman World*, edited by Hans-Werner Goetz, Jörg Jarnut, and Walter Pohl, 463–595. Leiden–Boston: Brill, 2003.
- Dzino, Danijel. *Becoming Slav, Becoming Croat: Identity Transformations in Post-Roman and Early Medieval Dalmatia*. Leiden–Boston: Brill, 2010. <https://doi.org/10.1163/ej.9789004186460.i-272>.
- Eisenmann, Stefanie, Eszter Bánffy, Peter van Dommelen, Kerstin P. Hofmann, Joseph Maran, Iosif Lazaridis, Alissa Mittnik, Michael McCormick, Johannes Krause, David Reich, and Philipp W. Stockhammer. “Reconciling Material Cultures in Archaeology with Genetic Data: The Nomenclature of Clusters Emerging from Archaeogenomic Analysis.” *Nature: Scientific Reports* 8, no. 1 (2018): 13003. <https://doi.org/10.1038/s41598-018-31123-z>.
- Feldman, Michal, Michaela Harbeck, Marcel Keller, Maria A. Spyrou, Andreas Rott, Bernd Trautmann, Holger C. Scholz, Bernd Pfüffgen, Joris Peters, Michael McCormick, Kirsten Bos, Alexander Herbig, and Johannes Krause. “A High-Coverage Yersinia Pestis Genome from a Sixth-Century Justinianic Plague Victim.” *Molecular Biology and Evolution* 33, no. 11 (2016): 2911–23. <https://doi.org/10.1093/molbev/msw170>.

- Feuchter, Jörg. "Migrationen als Gegenstand der 'Genetic History'." In *Vom Wandern der Völker: Migrationserzählungen in den Altertumswissenschaften*, edited by Felix Wiedemann, Kerstin Hofmann, and Hans-Joachim Gehrke. Berlin Studies of the Ancient World 41, 347–70. Berlin: De Gruyter, 2017.
- Furholt, Martin. "Massive Migrations? The Impact of Recent aDNA Studies on our View of Third Millennium Europe." *European Journal of Archaeology* 21, no. 2 (2018): 159–91. <https://doi.org/10.1017/ea.2017.43>.
- Geary, Patrick J. "Barbarians and Ethnicity." In *Late Antiquity: A Guide to the Postclassical World*, edited by Glenn W. Bowersock, Peter R. L. Brown, and Oleg Grabar, 107–29. Cambridge–London: Harvard University Press, 1999.
- Geary, Patrick J. *Herausforderungen und Gefahren der Integration von Genomdaten in die Erforschung der frühmittelalterliche Geschichte*. Das mittelalterliche Jahrtausend 7. Göttingen: Wallstein Verlag, 2020. <https://doi.org/10.5771/9783835345973>.
- Geary, Patrick J. *The Myth of Nations: The Medieval Origins of Europe*. Princeton: Princeton University Press, 2002.
- Golden, Peter B. *Central Asia in World History*. Oxford: Oxford University Press, 2011.
- Hakenbeck, Susanne, Jane Evans, Hazel Chapman, and Erzsébet Fóthi. "Practising Pastoralism in an Agricultural Environment: An Isotopic Analysis of the Impact of the Hunnic Incursions on Pannonian Populations." *PLoS ONE* 12, no. 3 (2017): e0173079. <https://doi.org/10.1371/journal.pone.0173079>.
- Halsall, Guy. *Barbarian Migrations and the Roman West: 376–568*. Cambridge: Cambridge University Press, 2007. <https://doi.org/10.1017/CBO9780511802393>.
- Heather, Peter J. *Empires and Barbarians: Migration, Development and the Birth of Europe*. London: Macmillan, 2009.
- Jobling, Mark A., Rita Rasteiro, and Jon D. Wetton. "In the Blood: The Myth and Reality of Genetic Markers of Identity." *Ethnic and Racial Studies* 39, no. 2 (2016): 142–61. <https://doi.org/10.1080/01419870.2016.1105990>.
- Koncz, István. "568: A Historical Date and Its Archaeological Consequences." *Acta Archaeologica Academiae Scientiarum Hungaricae* 66, no. 2 (2015): 315–40. <https://doi.org/10.1556/072.2015.66.2.4>.
- Knipper, Corina, István Koncz, János Gábor Ódor, Balázs Gusztáv Mende, Zsófia Rácz, Sandra Kraus, Robin van Gyseghem, Ronny Friedrich, and Tivadar Vida. "Coalescing Traditions – Coalescing People: Community Formation in Pannonia After the Decline of the Roman Empire." *PLoS ONE* 15, no. 4 (2020): e0231760. <https://doi.org/10.1371/journal.pone.0231760>.
- Pohl, Walter. *The Avars: A Steppe Empire in Europe, 567–822 A.D.* Ithaca: Cornell University Press, 2018. <https://doi.org/10.7591/9781501729409>.

- Pohl, Walter. “Die Gepiden und die Gentes an der mittleren Donau nach dem Zerfall des Attilareiches.” In *Die Völker an der mittleren und unteren Donau im 5. und 6. Jahrhundert*, edited by Herwig Wolfram and Falko Daim, 240–305. Denkschriften der Österreichischen Akademie der Wissenschaften 145. Vienna: Verlag der Österreichischen Akademie der Wissenschaften, 1980.
- Pohl, Walter. “Introduction: Strategies of Identification; A Methodological Profile.” In *Strategies of Identification: Ethnicity and Religion in Early Medieval Europe*, edited by Walter Pohl and Gerda Heydemann, 1–64. Turnhout: Brepols, 2013. <https://doi.org/10.1484/M.CELAMA.1.101574>.
- Pohl, Walter. “The Transformation of the Roman World Revisited.” In *Motions of Late Antiquity: Essays on Religion, Politics, and Society in Honour of Peter Brown*, edited by Jamie Kreiner and Helmut Reimitz, 45–62. Turnhout: Brepols 2016. <https://doi.org/10.1484/M.CELAMA-EB.5.108238>.
- Pohl, Walter. *Die Völkerwanderung: Eroberung und Integration*. 2nd ed. Stuttgart: Kohlhammer 2005.
- Pohl, Walter, Clemens Gantner, Cinzia Grifoni, and Marianne Pollheimer-Mohaupt, eds. *Transformations of Romanness: Early Medieval Regions and Identities*. Berlin–New York: De Gruyter, 2018. <https://doi.org/10.1515/9783110598384>.
- Samida, Stefanie, and Jörg Feuchter. “Why Archaeologists, Historians and Geneticists Should Work Together—and How,” *Medieval Worlds* no. 4 (2016): 5–21. [https://doi.org/10.1553/medievalworlds\\_no4\\_2016s5](https://doi.org/10.1553/medievalworlds_no4_2016s5).
- Smith, Julia M. H. *Europe after Rome: A New Cultural History 500–1000*. Oxford: Oxford University Press, 2005.
- Spyrou, Maria A., Rezeda I. Tikhbatova, Michal Feldman, Joanna Drath, Sacha Kacki, Julia Beltrán de Heredia, Susanne Arnold, Airat G. Sitdikov, Dominique Castex, Joachim Wahl, Ilgizar R. Gazimzyanov, Danis K. Nurgaliev, Alexander Herbig, Kirsten I. Bos, and Johannes Krause. “Historical Y. Pestis Genomes Reveal the European Black Death as the Source of Ancient and Modern Plague Pandemics.” *Cell Host & Microbe* 19, no. 6 (2016): 874–81. <https://doi.org/10.1016/j.chom.2016.05.012>.
- Steinacher, Roland. *Rom und die Barbaren: Völker im Alpen- und Donauraum (300–600)*. Stuttgart: Kohlhammer, 2017.
- Schiffels, Stephan, Wolfgang Haak, Pirita Paajanen, Bastien Llamas, Elizabeth Popescu, Louise Loe, Rachel Clarke, Alice Lyons, Richard Mortimer, Duncan Sayer, Chris Tyler-Smith, Alan Cooper, and Richard Durbin. “Iron Age and Anglo-Saxon Genomes from East England Reveal British Migration History.” *Nature Communications* 7, no. 1 (2016): 10408. <https://doi.org/10.1038/ncomms10408>.

- Szóke, Béla Miklós. "Mosaburg/Zalavár und Pannonien in der Karolingerzeit." *Antaeus* 31–32 (2010): 9–52.
- Vida, Tivadar. "Conflict and Coexistence: The Local Population Of The Carpathian Basin Under Avar Rule (Sixth to Seventh Century)." In *The Other Europe in the Middle Ages: Avars, Bulgars, Khazars and Cumans; East Central and Eastern Europe in the Middle Ages, 450–1450*. Vol. 2, edited by Florin Curta, 13–46. Leiden–Boston: Brill, 2008. <https://doi.org/10.1163/ej.9789004163898.i-492.7>.
- Vida, Tivadar. "Local or Foreign Romans? The Problem of the Late Antique Population of the 6<sup>th</sup>–7<sup>th</sup> Centuries in Pannonia." In *Foreigners in Early Medieval Europe: Thirteen International Studies on Early Medieval Mobility*, edited by Dieter Quast, 233–59. Mainz: Verlag des Römisch-Germanischen Zentralmuseums, 2009.
- Vida, Tivadar. "The Many Identities of the Barbarians in the Middle Danube Region in the Early Middle Ages." In *Entangled Identities and Otherness in Late Antique and Early Medieval Europe: Historical, Archaeological and Bioarchaeological Approaches*, edited by Jorge López Quiroga, Michel Kazanski, and Vujadin Ivanišević, 120–31. BAR International Series 2852. Oxford: British Archaeological Reports Oxford Ltd., 2017.
- Wickham, Chris. *Framing the Early Middle Ages: Europe and the Mediterranean 400–800*. Oxford: Oxford University Press, 2005. <https://doi.org/10.1093/acprof:oso/9780199264490.001.0001>.
- Wickham, Chris. *The Inheritance of Rome: A History of Europe from 400 to 1000*. The Penguin History of Europe 2. London: Penguin Books, 2009.
- Wolfram, Herwig. *Das Römerreich und seine Germanen*. Cologne: Böhlau, 2018. <https://doi.org/10.7788/9783412511906>.