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# INTRODUCING THE INSTITUTE OF ARCHAEOGENOMICS OF THE RESEARCH CENTRE FOR THE HUMANITIES

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The Institute of Archaeogenomics (IAG; <u>https://agi.abtk.hu/en</u>) seceded from the Archaeological Institute of the Research Centre for the Humanities (RCH) in March 2021. The new organisation was introduced at a mini-conference held at the Research Centre for the Humanities headquarters on the 30th November 2021. The altogether eight presentations surveyed the research team, the methodology, and the current major research projects of the Institute. First, Antal Molnár, Deputy Director of the RCH, welcomed the new organisation in his speech, while next, Anna Szécsényi-Nagy, Director of IAG, presented the new institute's structure and conceptions.

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The research community of the Institute comprises about twenty researchers and laboratory assistants, most of whom are at an early phase of their professional careers. The organisation's structure is different from that of the RCH's other institutes, as it is centred around the laboratory, the daily work, which directly connects researchers working on the same element of a project. Besides the professional and technical management of the laboratory, people directing the Institute are continuously engaged with diverse basic tasks, including purchasing consumables and machinery for the laboratory and organising daily work schedules. General organisational and financial tasks are carried out by Balázs Mende, Deputy Director, while Bea Szeifert contributes to the work as Scientific Secretary.

Upon deciding on a name for the new institute, "genetics" were replaced by "genomics" to express the core idea and ambition of IAG's scientific team, already analysing full genomes. The work has remained centred around ancient humans, but its spectre has broadened in time by including biological remains of humans from previously not researched historical periods, and also in variety, as the set of genetics-related research questions has continuously been expanding. Today's topics include the research of genetic diseases of ancient humans and determining connections between morphological characteristics and genetic parameters of mediaeval horses. Upon a request by the Eötvös Loránd Research Network, in the spring of 2021, two strategic research concepts were elaborated for the period 2022–2026, based on the following thematic pillars:

The first strategic research concept is the genetic evaluation of ancient populations in the Carpathian Basin, from the first inhabitants to today's people. It comprises several major topics, including the genetic research of prehistoric communities in the Carpathian Basin. Several projects fit in this line: the IAG team has been studying Copper and Bronze Age peoples since 2015 within the framework of diverse projects, including the National Research, Development, and Innovation Office's (NRDIO) K-128413 research project by Mária Bondár between 2013 and 2018, the ERC-PaleoRider (https://wolfganghaak.com/) project, led by Wolfgang Haak, and a Momentum Mobility project (https://mobilitas.ri.abtk.hu/?lang=en) by Viktória Kiss in 2015–2020 (KISS ET AL. 2021). At the mini-conference held last November, Dániel Gerbert presented bioarchaeological case studies from Transdanubia in the 4th and 3rd millennia BC (GERBERT ET AL. 2022), while Anna Szécsényi-Nagy outlined a new, comprehensive research project focusing on the population of the Carpathian Basin in the 3rd–2nd millennia BC.

In 2021, researchers of the IAG co-authored several international studies involving prehistoric findings from the Carpathian Basin. One discussed the effects of horses' domestication during the Bronze Age, a

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*Fig. 1. Pipetting robot preparing DNA libraries in the clean lab of the IAG. Photo by Márton Ficsor* 

process resulting in changes that are still detectable today (LIBRADO ET AL. 2021), while another investigated Europe's Late Bronze and Early Iron Age (PATTERSON ET AL. 2021).

The second major topic in the first research concept is "Reconstructing the genetic history of the Roman and Migration Periods." IAG's main contributor in this endeavour is the ERC Synergy HistoGenes project (<u>www.histogenes.org</u>) running 2020–2026, in which the Institute participates as a beneficiary project partner. A goal of HistoGenes is to carry out a complex bioarchaeological evaluation of six thousand burials from the 5th–9th centuries AD. IAG's task involves contribution in processing about three thousand samples from the Carpathian Basin. At the mini-conference, the related programme was presented by Balázs Mende, who outlined the Institute's tasks and highlighted the foreseeable challenges of the project. The first results of this research, comprising full genome analyses of the Avar-period elite, have been published in Cell (GNECCHI-RUSCONE ET AL. 2022).

The population of Mediaeval Hungary stands in the focus of the third major research topic, involving several current projects. Within the framework of the "House of Árpád programme IV.2" (39509/2018/ KFSZ), running between 2018 and 2023, the transformations of the population of Transdanubia in the 9th–13th centuries AD are studied, focusing especially on those settled around major power centres like Zalavár, Visegrád, and Székesfehérvár. As the period under study comprises the Late Avar Period and the Árpádian Age, a comprehensive evaluation of the related changes (based on analyses done from a unified approach) is pivotal for a correct assessment of the Hungarian Conquest as a demographic event. The first results of this series of investigations were presented at the conference by Bea Szeifert.

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The research on the mediaeval Sekler/Székely population, a joint venture of the IAG and the Museum of Székelykeresztúr (Cristuru Secuiesc, Romania), started in 2021. The first phase focused on the genetic continuity of the rural population of Székelykeresztúr area, while in next on that of Székelyudvarhely (Odorheiu Secuiesc, Romania). The research was carried out as part of a project (NRDIO FK-127938) led by Anna Szécsényi-Nagy, running 2018–2023.

The fourth major topic of the first strategic concept is entitled "Genetic variability in the current population of the Carpathian Basin" and comprises the research projects of the Institute of Archaeogenomics that focus on the genetic diversity and historical connection web of today's ethnic minorities, linguistic, and ethnographic units in the territory of Hungary and the neighbouring countries. Currently, two projects run under this programme. The first one is NRDIO FK-127938, between 2018 and 2023, within the framework of which the investigation of the populations of the Udvarhely county (Romania), Zobor-region (Slovakia), and Baranja (Croatia) has been carried out; the results were presented at the mini-conference by Noémi Borbély. The other project is NRDIO 1121-1/2020, a Thematic Excellence Program led by Erzsébet Fóthi, aimed at compiling the genetic map of the Carpathian Basin's recent population. As a sub-research within this project, an investigation of paternal lines in the populations of Rétköz (Hungary), the Vág Valley (Slovakia), and Bukovinan Seklers has been carried out, the results of which were presented at the mini-conference by Ábel Fóthi.

The second strategic research concept of the Institute of Archaeogenomics is "The archaeogenomic research of Early Hungarian history." The first projects running under this concept focused on the bioarchaeological evaluation of the former dwelling areas of Early Hungarians and the identification of the population of Magna Hungaria, respectively.

Currently, IAG analyses samples taken from anthropological remains from Russian territories within the framework of the "House of Árpád programme IV.2" and the TKP2020-NKA-11, a Thematic Excellence Program by the *Our Eastern Heritage* History and Archaeology Interdisciplinary Research Team of the



Fig. 2. The IAG collective in the summer of 2021. Photo by Márton Mónus

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Pázmány Péter Catholic University (PPCU). The primary study areas, in this case, are the Volga and the Ural Regions, thus connecting to the work of the Early Hungarians Research Team of the RCH, led by Attila Türk (from PPCU and RCH). However, the next series of samplings will focus on Western Siberia and the Altai Region to outline the eastern connections of the Ural Region's population.

At the mini-conference, two presentations conveyed some particulars and results of the related research. Balázs Gyuris reported on "Full genome analyses of Migration-period and mediaeval samples from Eurasia," while Bea Szeifert gave an account of the results of the "Genetic evaluation of Hungarian-related populations in the Volga and Ural Regions and the population of Mediaeval Hungary." The manuscript of a study on the Volga- and Ural-region-related results of her work are already available online (SZEIFERT ET AL. 2022).

The second major research topic within the second strategic concept covers the preparation of a genetic map of the peoples inhabiting the Eastern European steppe region in the 9th–10th centuries AD. This line also connects with a work aimed at searching for and collecting the archaeological record related to the early history of Hungarians by the Early Hungarians Research Team of the Eötvös Loránd Research Network (ELRN) RCH and the Archaeological Institute of the PPCU, and especially to the surveys in Ukrainian and Moldavian territories. Subsidised by the ELRN, the IAG team has been analysing samples from cemeteries with Subotcy, Pecheneg, and Slavic-type find material in the Middle Dnieper Region and 9–11th-century cemeteries with Hungarian, Slavic, and Pecheneg character in the Lower Dnieper Region since 2021.

The third major research topic is "Investigation of the Hungarian Conquest Period based on related finds from the Carpathian Basin." It is backboned by the NRDIO 1121-1/2020 project, described above, focusing on the 10th century AD by evaluating the Hungarian Conquest-period cemeteries of Heves and Szolnok counties. The related bioarchaeological research combines, besides genetic evaluation, the results of archaeological, anthropological, and isotope analyses (the latter including <sup>87</sup>Sr/<sup>86</sup>Sr,  $\delta^{13}$ C,  $\delta^{15}$ N,  $\delta^{18}$ O stable isotope, and radiocarbon analyses). At the mini-conference, Erzsébet Fóthi presented the program of the Molecular Anthropology Research Group, integrated into the Institute, giving a detailed report on its research plan and the focus points related to the Institute's third major research topic.

The Institute of Archaeogenomics inherited its infrastructure from the Archaeological Institute of the RCH. Research and infrastructure development grants by the NRDIO and the ELRN subsidised the purchase of two pipetting robots in 2020. These robots represented a significant improvement in daily work as they increased considerably the speed of full genome analysis and, thus, the capacity of the laboratory. As a result of another infrastructure development in 2021, IAG's laboratory today is equipped with state-of-the-art technology for genomic analyses. At the mini-conference, recent methodological developments, the types of full genome analyses, and the work processes of the laboratory were surveyed by Botond Heltai.

The Institute of Archaeogenomics adopted the declaration of global research ethical guidelines published in Nature in November 2021 (ALPASLAN ET AL. 2021), outlining a general framework for ethical archaeogenetic research and establishing transparent and fair conditions for sample providers and other related members of the scientific community. According to the principles set in this declaration, IAG's workgroup seeks to comply with the regulation of each workplace and sample source. Moreover, preceding the start of the analysis, the team outlines a detailed research plan in every case and discusses it with other related participants in the project (including archaeologists, anthropologists, museologists, and local communities), who are kept updated throughout the whole process. Upon sampling, IAG's professionals are all out for minimalising destruction in anthropological samples. After the results have been published, all analytic data become available, thus enabling a revision of the scientific results. By working along the already set principles described above, archaeogeneticists are continuing to formulate a detailed framework of research and ethical guidelines, which, in the future, could serve as a good basis for regulating bioarchaeological research in Hungary.

The presentations of the mini-conference are available on the RCH's YouTube channel: (<u>https://www.youtube.com/channel/UC0d\_fbtAqxB76d2szRf8--g</u>).

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