EVALUATION OF THE HABILITATION THESIS OF ANNA JURAS AT THE FACULTY OF BIOLOGY AT THE ADAM MICKIEWICZ UNIVERSITY In POZNAŃ

Dr. Anna Juras is an Assistant Professor at the Institute of Human Biology and Evolution, at the Faculty of Biology at the Adam Mickiewicz University in Poznań, Poland with a specialization in biological Anthropology and ancient DNA analyses. She applies for the *Venia Legendi* at the Biology Faculty of the Adam Mickiewicz University submitting a cumulative Habilitation thesis.

Academic education and professional experience

Dr. Juras studied biology and biotechnology with a specialization in human biology and ancient DNA. She holds two Master degrees, one in biotechnology from the Faculty of Agriculture at the Poznan University of Life Sciences acquired in 2006 and one in Human Biology with a specialization in ancient DNA and biological Anthropology from the Faculty of Biology at the Adam Mickiewicz University (AMU) acquired in 2011**.** In 2012 received her PhD at the Faculty of Biology at the AMU in Poznań under the supervision of Prof. Janusz Piontek with a work on the Ethnogenesis of Slavs using ancient DNA analyses. From 2012 till present she is an Assistant Professor at the Institute of Human Biology and Evolution, at the Faculty of Biology at the AMU.

Academic teaching and supervising

At the AMU from 2010 till 2022 she has lectured in polish in nine different courses/seminars for under-graduate biology students and co-ordinated two journal clubs in English for doctorate and postgraduate students. The courses cover a very wide spectrum in the field of Biology related to ancient DNA and palaeogenetics, computer science in Biology, laboratory classes in Biology and forensic genetics. She has also participated in an anthropological interdisciplinary course for postgraduate students at the Jajiellonian University. Altogether, she shows an ability and the know-how to offer a complete and updated curriculum for human biology, ancient DNA and computational and laboratory skills at the AMU. Furthermore, she has co-supervised 2 PhD candidates, supervised 1 Master student and 6 Bachelor students. All PhD students have published their work in scientific journals with high-impact factor. It should be mentioned that one of her PhD students is today assistant Professor at the AMU. The above indicate the high quality of Dr. Juras research but also her ability to teach and supervise young researchers successfully.

Overall published work and habilitation

Dr. Juras has 20 peer-reviewed publications in scientific journals (including the five articles submitted as a cumulative habilitation achievement), 9 publications in edited volumes and 2 articles as conference proceedings in journals. From the 20 peer-reviewed articles, she is the first author in 6 articles (in five first and corresponding author). She is the first author in 2 out of the 11 book chapters and post-conference papers. Overall her scientific work shows an IF of **103,99** (all her publications), has been cited according to Google scholar 791 times with a

h-index 16 and i10-index 19 and according to Scopus 426 times with a h-index 14 and i10-index 19 (**accessed 19/04/2024**). She has participated in national and international conferences with an oral presentation 17 times and with a poster presentation, 6 times. She was the first author of those presentations 10 times.

Her published work focuses on population genetics of prehistoric periods mostly of Poland, the Baltic and Neolithic Anatolia (peer-reviewed articles Q1-5, D2-4, D6, D8, D1-13 and M1-2, M4, M7, M9 from the CV of the candidate). But she has published articles on animal ancient DNA (D1), historic period ancient DNA analyses (D9, D15 and conference proceedings articles), lactase evolution, microbiome and microorganisms related studies (D11, D5, D14) and a collective study on developing an ancient mitochondrial database (D7). For almost all her published articles it is evident that she was the main contributor in data production, data management and analysis.

Her habilitation thesis is submitted in a cumulative form of five research articles and encompasses a 12 pages text in which she summarizes the central ideas and connects them to her research articles (Q1-5). In these five articles she is the first and the corresponding author, she designed the studies, produced the data and authored the articles. The five articles have an **IF 19,601** and have a total of 184 citations in Google scholar and 113 in Scopus (**accessed 19/04/2024**).

Dr. Jura's habilitation is engaged with migration from the Pontic-Caspian Steppe region to central, north and southern Europe. This migration is associated with the Yamnaya culture (YAM), took place during the the Late to Final Neolithic (Eneolithic/Chalcolithic 3500–2800 BC for East Central Europe) and resulted in the emergence of the Corded Ware culture (CWC) in Central Europe, in the Bell Beaker phenomenon in western Europe and similar admixture events in other regions of Europe. It is thought to be one of the most striking events for the formation of the genetic composition of modern Europeans after the Neolithic transition.

Her habilitation It is structured under three main aspects:

1) Population history, mainly based on the analysis of ancient mitochondrial genomes *i.e.,* female lineages from the Neolithic to the iron Age (4200 BC-200 BC).

2) Combined analyses of archaeology, radiocarbon dating, burial customs, analyses of human skeletal material and isotopes and palaeogenetic results.

3) Kindship analysis during prehistoric periods mostly from collective burials in Poland as a mean of social structure analysis and contextualization.

The above is coupled with a wide range of methodologies mostly from the ancient DNA field that she is familiar with and she has successfully applied. The methods focus on the assessment of good quality of collagen for DNA. She critically emphasizes the methodological limitations on the study of ancient DNA for which is aware of, and she has designed many studies on archaeological skeletal material in experiment level to be able to acquire authentic signals of DNA from ancient bones. She has also collaborated with established workgroups

from Denmark (Prof. Eske Willerslev) and Sweden (Prof. Mathias Jakobsson, Dr. Elena Malmström) with worldwide scientific impact for the production of the ancient human whole genomes with the newest methodology of Next-Generation Sequencing (NGS). The analysis of NGS data is a rather complex task and her publications comprise important methodological advances.

She has worked to design and establish a dedicated ancient Laboratory lab at the AMU in Poznan. It is obvious that she is familiar with all laboratory restrictions for the production of accurate and authentic aDNA data. But she is also aware of the bioinformatic pipeline and the existing tools for testing contamination. Methodologically, she introduced both shotgun sequencing on high-throughput platform from which she utilized the mitochondrial data from the screening rounds but she also introduced a targeted enrichment method for the mtDNA in order to acquire more accurate results with a more cost-effective way. This shows an excellent capacity to design and implement scientific research.

Her first study proved that the migration from the steppe involved not only males (Goldberg et al. 2017), but also females (although to a lesser extent), which was particularly visible in the eastern group associated with the Corded Ware culture. With her analyses she could demonstrate for the first time that that females with steppe ancestry contributed to the formation of populations associated with the eastern Corded Ware culture while more local people, likely of Neolithic farmer ancestry, contributed to the formation of populations associated with western Corded Ware culture. This study was based on 23 mitochondrial genomes from Late Eneolithic and Bronze Age individuals, included representatives of the north-western Pontic region and the Corded Ware culture from the eastern part of the North European Plain. The skeletal material was an outcome of her collaboration with her colleagues from the Department of Archaeology, who excavated in Ukraine.

Having the same question as a starting point she tried to identify maternal genetic affinities between the Middle to Final Neolithic (3850–2300 BC) populations from present-day Poland and possible genetic influences from the Pontic steppe (based on 86 original mitochrondrial genomes). She could identify the maternal lineages identified in Middle and Late Neolithic populations suggests a genetic continuity of Neolithic farmers and a gradual maternal genetic influx from Mesolithic hunter-gatherers indicated by the higher frequency of haplogroup U5b found in populations associated with Funnel Beaker, Globular Amphora, and Złota *(local culture in Poland)* cultures. For present-day Poland, therefore, her study concluded that, although overlapping in time – and to some extent – in cultural expressions, none of the studied groups (Złota, Globular Amphora, Funnel Beaker), shared a close genetic affinity to Corded-Ware-Culture-associated people, indicating a larger extent of cultural influence from the Pontic steppe than genetic exchange. In turn, the presence of haplogroup U4 in Corded Ware groups is most likely associated with the migrations from the Pontic steppe at the end of the Neolithic as showed by her previous study.

Similarly, she investigated the origins and genetic affinities of Bronze Age populations (2,400–1,100 BC) from the region of southern Poland. Her study based on 80 mitochondrial genomes

revealed genetic continuity from the Late Neolithic Corded Ware groups to Bronze Age Mierzanowice and Trzciniec-associated populations, and possible additional genetic contribution from the steppe to the formation of the Strzyżów- associated group at the end of 3rd millennium BC. She also showed that the populations linked to the Mierzanowice culture and the Trzciniec Cultural circle were, at the maternal level, genetically close not only to each other and to the population associated with the Corded Ware culture, but also to the Bronze Age populations that predominated in other parts of Poland and Europe, *i.e.,* people associated with the Unetice culture, the Bell Beaker culture, or the Bronze Age populations from the Balkans. For the rise of the Strzyżów culture for which the archaeological background is ambiguous, she stretches two plausible hypotheses. Today these hypotheses are part of a published article in Nature Communications in which Dr. Juras is corresponding author (https://www.nature.com/articles/s41467-023-40072-9).

She has also extended her research to the Iron Age nomadic and semi-nomadic Scythian populations of the North Pontic Region (NPR) during the first millennium BCE. Based on 19 mitochondrial genomes she identified three potential mtDNA lineage ancestries of the NPR Scythians tracing back to hunter-gatherer (U5) and nomadic populations of east and west Eurasia as well as the Neolithic farming expansion into Europe. Of these, west Eurasian lineages show a downward cline in the west-east direction while east Eurasian haplogroups display the opposite trajectory.

She also paid attention on burial customs and sociocultural traditions of this important prehistoric period combing archaeological and anthropological data, with biomolecular innovations like the ancient DNA. She combined kinship analyses, funerary practices, radiocarbon dating, isotopic and taphonomic analysis to study two grave clusters from Krusza Zamkowa, Poland dated to the middle Neolithic. Overall, based on the kinship estimations, she concludes that not only biological kinship, but also social relations played an important role in the funerary practice during this time period.

Overall, her work both the published articles and her own description of her habilitation achievement are structured and worded with adequacy and clarity. The description of her aims reveals that Dr. Juras approaches the subject with scientific maturity, has managed to understand and convey with fullness and clarity the theoretical framework of her study and possesses a very satisfactory scientific accuracy and ability to synthesize and critically approach a complex theme of population genetics considering the archaeological context. Dr. Juras builts firmly and solidly her main research question, emphasizing in a balanced way the importance of studying her topic and the contribution of her own research effort to the development of the scientific debate in the field. The design and description of the methods and procedures for collecting the research material are appropriate and are formulated with clarity. They follow the internationally applicable standards and demonstrate that the methodological design is adequate and manages to meet the research requirements. The statistical methodology of its analyses is sound. I consider that her results contribute

Through her published work we can see that Dr. Juras has a great knowledge and research experience about the aDNA studies from Poland and the north Pontic steppe regions

especially for the chronological periods from the Neolithic till the Iron Age. She has a deep and critical understanding of all standard and innovative ancient DNA and population genetic methods and contributed successfully to their innovation in Poland. With the application of novel techniques such as targeted enrichment for mtDNA, she managed to set the focus and produce innovative research for an important, however understudied, period and region of European prehistory from a population genetic perspective. It should be stated, that her first publications about the population genetics and burial customs of this temporospatial setting goes hand in hand with a general scientific interest about this historical period by the scientific community and her work contributes positively to the ongoing scientific debate towards this direction.

Organisational achievements

Dr. Juras has co-supervised the development of a dedicated to ancient DNA laboratory at the AMU. She has visited with research internships other established aDNA dedicated facilities such as the **Center for GeoGenetics at the University of Copenhagen in Denmark** and the during which acquired valuable experience. Dr. Juras has also received several awards for her commitment in team work and her scientific achievements at the AMU. Thus, one can take her as very active and successful in academic and research networks.

General evaluation

Dr. Juras has published articles in important peer-reviewed journals which emphasize on aDNA analyses such as American Journal of Physical Anthropology, Scientific Reports etc. She has given substantial personal contributions into these publications in which she is the first and the corresponding author. She has supervised BA, MA, and PhD doctoral thesis. She has published successfully her research outcomes as well as the research outcomes of the young researchers she supervised. She gave a large number of academic courses either as main instructor or as a collaborating instructor to undergraduate and to postgraduate students.

Evaluating the scholarship and the professional achievements of the candidate I highly recommend that the work of Dr. Anna Juras fulfills the requirements of a habilitation thesis in an excellent way. The habilitation thesis undoubtedly occupies a prominent position in academia. I am of the opinion that the candidate has provided evidence of independent thinking, research innovation, management and mentoring qualities and academic ethos in the field of Human Biology and Evolution with emphasis on ancient DNA and is able to continue promoting the further development of the subject area.

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