

## Habilitation Doctor for Dr. Anna Juras

**Reviewer:** Prof. Dr. Rodrigo Nores, Professor at the Faculty of Philosophy and Humanities, National University of Córdoba, Argentina. Researcher at the Institute of Anthropology of Córdoba, Nacional Scientific and Technical Research Council (CONICET), Argentina.

### Presentation:

Dr. Anna Juras was awarded the degree of Doctor in Biological Sciences by the Faculty of Biology, Adam Mickiewicz University (AMU) in Poznań, Poland, on June 27, 2012. Her thesis was titled "Ethnogenesis of Slavs in the light of ancient DNA studies" and was supervised by Prof. Dr. Hab. Janusz Piontek. From 2012 to date, Dr. Juras is an Assistant professor at the Institute of Human Biology and Evolution, Faculty of Biology at the Adam Mickiewicz University in Poznań, Poland.

This habilitation review for Dr. Anna Juras is prepared in accordance with the Act of 20 July 2018 Law on Higher Education and Science (Journal of Laws of 2022, item 574, as amended) and the criteria for assessing the achievements of candidate for the post-doctoral degree of habilitated doctor contained therein.

*Article 219, paragraph 1, points 1)-3) of the Act:*

*1. The degree of habilitated doctor shall be awarded to a person who:*

- 1) holds a doctoral degree;*
- 2) has scientific or artistic achievements, being a significant contribution to the development of a particular discipline, including at least:*
  - a) 1 scientific monograph published by the publishing house, which in the year the monograph was published was included in the list drawn up in accordance with the regulations issued on the basis of Article 267 para 2. Point 2a) or*
  - b) 1 cycle of thematically related scientific articles published in scientific journals or in peer-reviewed materials from international conferences which in the year the article was published was included in a list drawn up in accordance with the regulations issued on the basis of Article 267 para 2. Point 2b), or*
  - c) 1 completed original design, constructional, technological or artistic achievement;*

3) *demonstrates significant scientific or artistic activity carried out in more than one university, scientific institution or cultural institution, in particular at foreign institutions*

#### **Review:**

The current presentation for acquiring the degree of habilitated doctor is centered on a scientific achievement titled "Origin, migration and kinship in human populations from Central and Eastern Europe based on analyses of ancient mitochondrial genomes". This application includes five relevant scientific publications where Dr. Juras has played a leading role as the first author, corresponding author, and research coordinator. These articles were published between 2017 and 2021 in American Journal of Physical (now Biological) Anthropology (2), Scientific Reports (2), and Forensic Science International: Genetics (1). All of these journals are ranked as Q1, with impact factors ranging between 2.868 and 5.637. The cumulative Impact Factor for the five publications of the scientific achievement is 19.601. Additionally, Dr. Juras has earned 700 total points of scientific achievement awarded by the Ministry of Science and Higher Education (MEiN). While I cannot assess the significance of this value within the Polish scientific system, it demonstrates her recognized contributions. These five publications have received 50 citations (Web of Science Core Collection, excluding self-citations) as of April 14, 2023. It is important to highlight that due to technological advances of the last decade, which have facilitated the sequencing of complete genomes from archaeological samples, studies on ancient mitogenomes, which remain highly informative, are now being published in reputable journals with significantly lower Impact factors compared to those that focus on paleogenomic research. In this context, the journals where Dr. Juras' works have been published are highly valued for the publication of ancient mitogenomes data and rank among the highest-scoring in terms of impact factor within this field.

This series of five related publications included in the scientific achievement aimed to explore the diversity and origins of female lineages, as well as the impact of migration on the genetic structure of ancient human populations from Central and Eastern Europe spanning the Neolithic to the Iron Age (approximately 4200 BC - 200 BC), by obtaining and analyzing ancient mitochondrial genomes. These analyses, combined with archaeological data, skeletal morphological studies, and isotopic data (including radiocarbon dating), offered insights into the demographic changes and evolutionary processes that these ancient human populations experienced. To achieve this objective, Dr. Juras addressed the challenges and particularities of working with ancient DNA (aDNA), which included implementing measures to prevent modern



DNA contamination and employing capture strategies to target and enrich mitochondrial DNA. Bioinformatic methods were utilized to identify authentic aDNA molecules by analyzing specific patterns of damage, detect potential modern DNA contamination, reconstruct mitochondrial genomes, and determine haplogroups and haplotypes. Additionally, phylogenetic, phylogeographic, and population genetic analyses were conducted.

The set of the first four publications (O1-O4) collectively addresses the origin and diversity of different human groups associated with cultures from Poland and other Central Europe regions, allowing for a chronological overview spanning approximately 4 millennia. As Dr. Juras' emphasizes in her review, and as further detailed in the attached complete publications, the analysis of over 340 individuals, resulting in more than 200 complete mitochondrial genomes, yields a substantial amount of novel data. Briefly, article O1 demonstrates evidence of migrations from the Pontiac-Caspian steppe that impacted western European populations associated with the Corded Ware culture. Contrary to previous beliefs that migrations predominantly involved males, this study reveals the involvement of females as well. This migration created an east-to-west genetic gradient. Additionally, this study suggests genetic continuity within the steppe region from at least the Bronze Age to the Iron Age. In article O2, the ancient mitogenomics data reveals that Middle and Late Neolithic populations from present-day Poland shared genetic similarities. However, the population associated with the Corded Ware culture exhibited closer maternal genetic affinities with the steppe. Hunter-gatherer lineages were also detected, meaning that Neolithic farmers, upon arriving to the region, partially admixed with the former groups. Beyond these genetic links, this work also suggest cultural contacts between some groups, where no genetic links were found. Article O3 continues with human population studies in modern-day Poland by analyzing Bronze Age individuals to explore genetic connections with Neolithic populations. The study identifies genetic continuity between these periods and suggests the potential influence of another migration from the steppe, possibly occurring in the latter half of the 3rd millennium BC populations, on Bronze Age cultures. This aspect is currently under investigation using genomic data. The fourth article (O4) focuses on the maternal lineages of human groups that inhabited present-day Moldavia and the North Pontic Region during the first millennia BC, showing that female lineages in the studied population originated from three sources: hunter-gatherers, Neolithic farmers and eastern Eurasia. Finally, while biological kinship was also considered in articles O2 and O3, it was the main focus of paper O5, in which a multiple grave containing two adults and three infants were analyzed using mitochondrial haplotypes and 124 autosomal SNPs. Despite one child being buried within the arms of a female adult, no close maternal lineage relationship was identified,

as all the mitochondrial haplotypes differ. This finding suggests that factors other than genetic kinship influenced burial practices in this culture.

In addition to the five papers that comprise the scientific achievement, Dr. Juras has contributed to 15 publications between 2014 and 2023, including one published in 2014 in PLoS One where she is listed as the first author. These publications appear in scientific journals with Impact Factors ranging from 2.776 (PLoS One, 2018) to 11.501 (Nucleic Acids Research) and 12.804 (Science Advances, 2018), the latter two including ancient genomic data. The total Impact Factor for all her publications (20) amounts to 103.99, and she has been awarded 2100 total points by the Ministry of Science and Higher Education. According to Web of Science (core collection) and Scopus, her scientific production has received 266 and 304 citations, respectively. Excluding self-citations, these numbers stand at 224 and 261 citations. Additionally, her *h*-index is 12.

The mentioned publications primarily focus on ancient DNA studies (genomic and metagenomics) and isotopic research (radiocarbon dating and diet reconstruction) involving archaeological human remains, animals, and microorganisms. Dr. Juras' contributions to these endeavors encompass collecting bone materials for isotopic and genetic analyses, conducting laboratory procedures such as aDNA isolation and preparation of genomic libraries, participating in anthropological analyses, data interpretation, result discussion, and manuscript review. The findings of these publications are thoroughly described in Dr. Juras' review. Overall, these publications offer a comprehensive exploration of the genetic history of Central Europe, shedding light on migrations, admixtures, and cultural interactions over millennia. Her scientific achievements have earned her several scholarships and team awards from the Rector of the Adam Mickiewicz University in Poznań.

Aligned with her research interests, Dr. Juras has also co-authored 9 chapters in scientific monographs (2015-2021) and two post-conference materials (2019). She has outlined her research at 17 presentations (15 post-PhD graduation) and has showcased six posters at national or international scientific conferences between 2008 and 2022. Since 2009, she has been involved in 12 research projects (11 post-PhD graduation), with four ongoing. She acted as Principal Investigator in three completed projects (including one during her PhD) and as a co-investigator in the others. Additionally, she has reviewed six manuscripts for esteemed international journals between 2017 and 2021.

After obtaining her PhD, Dr. Juras completed several internships in scientific institutions across Europe and the Americas. Between 2020 and 2022, she undertook two one-week stays at the Genomics and Bioinformatics Laboratory at the Institute of Molecular Genetics of the Czech



Academy of Sciences in Prague, Czech Republic, as part of a bilateral Polish-Czech exchange program for scientists. These visits were related to grant projects studying aDNA of Bronze and Iron Age populations from Central Europe. Additionally, she was invited to present on aDNA studies during an institute seminar in 2021. In 2019, she participated in a research visit lasting 2.5 weeks at the Archaeological Museum in Arequipa, Peru. There, she conducted morphological analyses of skeletal materials from the Pre-Columbian period and collected bone samples for genetic and isotopic studies. Between 2014 and 2018, Dr. Juras completed five visits, totaling 40 days, at the Department of Organismal Biology at Uppsala University and the Center for Palaeogenetics at Stockholm University, Sweden. These visits involved training in advanced aDNA analysis techniques and collaborative aDNA analyses of prehistoric populations. These international experiences at recognized institutions complement her previous training during her PhD at the Center for GeoGenetics, University of Copenhagen, Denmark, and the Estonian Biocentre, University of Tartu, Estonia, where she acquired skills in working with aDNA and population genetics and carried out research tasks outlined in her PhD.

It is very important to highlight that Dr. Juras has successfully established and continues to expand a collaborative network aimed at contributing to the understanding of the population history of ancient human groups through the genetic analysis of skeletal materials provided by local archaeologists, anthropologists, and institutions from present-day Poland. These partnerships include various museums such as the Archaeological Museum in Cracow, the National Museum in Szczecin, the Museum in Koszalin, the Museum of the First Piasts on Lednica, the Upper Silesian Museum in Bytom, and the Museum of Archaeology in Poznań. Additionally, collaborations extend to universities and units of the Polish Academy of Sciences, including the Maria Curie-Skłodowska University in Lublin, the Ludwik Hirsztfeld Institute of Immunology and Experimental Therapy of the Polish Academy of Sciences in Wrocław, and the Institute of Bioorganic Chemistry of the Polish Academy of Sciences in Poznań. This network ensures the availability of samples for future studies, student training, and doctoral and postdoctoral research endeavors.

Dr. Juras' teaching responsibilities included conducting courses for undergraduate and graduate students of biology, biotechnology, and biology and human health at the Faculty of Biology, AMU, in both Polish and English from 2010 to 2022, among other activities. She co-supervised two doctoral theses completed in 2019 and 2021, and supervised six bachelor's theses and one master's thesis finished before 2022. Currently, she is supervising two additional bachelor's theses related to the study of aDNA. To enhance her teaching skills, she has undergone various training programs for academic staff at the Integrated Center for Competency Development.

Regarding organizational achievements, I consider Dr. Juras' main accomplishment was leading the establishment of a laboratory solely dedicated to aDNA studies at the Institute of Human Biology and Evolution, Faculty of Biology, AMU. This facility enabled the formation of a research group focused on the analysis of aDNA. Under her leadership, the group grew by training and supervising a PhD student and three technicians who conducted analyses in the aDNA laboratory. Additionally, she collaborated with colleagues from other universities and institutes in preparing grant applications to advance aDNA research. This effort also involved overseeing the work of internship students in the aDNA laboratory.

Dr. Juras has also applied her expertise in anthropology and human genetics to collaborate in the exhumation and analyses of the World War II NKVD victims in Vladimir Volynskyi, Ukraine, in cooperation with the Institute of National Remembrance. She has also provided expert opinions on atypical human DNA analyses for the Prosecutor's Office at the Małopolska Local Division of the Department for Organized Crime and Corruption in Cracow from 2019 to 2022.

Finally, in terms of Dr. Juras' activities on science dissemination, she has conducted workshop sessions for high school students during the "Academic days" organized in 2018, 2019, and 2023 at the Faculty of Biology, AMU. She also delivered lectures on aDNA research in Międzyrzecz in 2016, as well as at the Faculty of Archaeology at the AMU, the Genomics and Bioinformatics Laboratory at the Institute of Molecular Genetics of the Czech Academy of Sciences in Prague, and the Department of Organismal Biology at Uppsala University, Sweden. Additionally, she recorded a podcast titled "How to study the DNA of organisms that became extinct thousands of years ago". She has also given interviews to "Newsweek Historia" magazine (2017), the PAP Nauka w Polsce internet service (2012 and 2020), and TVP World (2020). In 2019 and 2020, her research has been the subject of two articles published in the monthly magazine "University Life", edited by the AMU in Poznań.

### **Conclusion:**

Since completing her PhD dissertation in 2012, Dr. Anna Juras has consistently demonstrated her ability to meet the requirements outlined in Article 219, paragraph 1, points 1)-3) of the Act of 20 July 2018 Law on Higher Education and Science (Journal of Laws of 2022, item 574, as amended) for obtaining the degree of habilitated doctor. She has made a significant contribution to the development of paleogenetics, biological anthropology and population genetics by taking a leading role in authoring a series of five thematically related scientific articles published in prestigious journals, focusing on "Origin, migration and kinship in human populations from Central and Eastern Europe based on analyses of ancient mitochondrial genomes". Additionally,



she has co-authored 15 papers and contributed to various other publications and presentations, with a total Impact factor of 103.99, 2100 points recognized by the Ministry of Science and Higher Education, over 200 citations, and an *h*-index of 12. Beyond her research, Dr. Juras has actively engaged in science communication efforts to disseminate her findings and enhance public understanding of the history of Poland and Central Europe. With international experience from renowned institutions specializing in ancient DNA, she led the establishment of a state-of-the-art aDNA research facility at the Faculty of Biology, AMU, significantly advancing the field at her university. She has also imparted her knowledge through teaching graduate and undergraduate students, supervised bachelor, master, and doctoral theses, and provided expert opinions to government offices. Furthermore, she has established a national collaborative network comprising professionals and institutions dedicated to the study of past populations, ensuring access to archaeological material for future research projects.

Given these accomplishments, I strongly support the awarding of the degree of Habilitated Doctor to Dr. Anna Juras.



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