

## Registration form

**This is a registration form for Host Institutions wanting to establish a Dioscuri Centre of Scientific Excellence within Dioscuri 4 call.**

**1. Research institution data** (name and address):

Adam Mickiewicz University, Poznań (AMU)

Wieniawskiego 1

61-712 Poznań

Faculty of Biology (FB AMU)

Uniwersytetu Poznańskiego 6

61-614 Poznań

Faculty of Archaeology (FA AMU)

Uniwersytetu Poznańskiego 7

61-614 Poznań

**2. Type of research institution**

- 1) higher education institution

**3. Head of the institution:**

AMU Rector – prof. dr hab. Bogumiła Kaniewska

**4. Contact information of designated person(s) for applicants and the NCN:**

**Prof. dr hab. Beata Messyasz**

Dean of the Faculty of Biology AMU

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Correspondence address:

Collegium Biologicum AMU

Uniwersytetu Poznańskiego 6, 61-614 Poznań

**Prof. dr hab. Andrzej Michałowski**

Dean of the Faculty of Archeology AMU

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Collegium Historicum AMU

Uniwersytetu Poznańskiego 7, 61-614 Poznań

**5. Research discipline in which the strong international position of the institution ensures establishing a Dioscuri Centre**

Arts, Humanities and Social Sciences

- Fundamental questions of human existence and the nature of reality
- Culture

**x The study of the human past**

- Individuals, institutions, markets
- Norms and governance
- Human nature and human society

## 6. Description of important research achievements from the selected discipline from the last 5 years including a list of the most important publications, patents, other

### Bioarcheology

Our interdisciplinary research teams have studied cultural and socio-economic aspects of life of past human populations. Funerary rituals were examined using Bayesian modelling applied to radiocarbon dates of collective burials of the Middle Bronze Age communities in East Central Europe<sup>1</sup>. Timing and route of the transmission of the idea of collective burials were investigated, and, additionally, spatial and temporal development model of the largest studied necropolis was provided. In a study on c. 3000 BC barrow<sup>2</sup>, for the first time, human remains from such unique archaeological context (a prestigious form of burial) from Polish territories were examined for diet and mobility, including other aspects, such as burial construction, funerary ritual, grave offerings, and social roles. Our study of diet in past humans<sup>3</sup> is an important contribution to the knowledge on timing and the route of arrival of broomcorn millet, one of the most important plants species in prehistory. In our research we also focused on social relations, revealing the biological and cultural evidence of interpersonal violence in the remains of defenders of a castle in Gołańcz, Poland, who were killed in 17<sup>th</sup> c. BC during the Polish-Swedish War<sup>4</sup>.

### Paleodemography

Our teams made an important contribution to paleodemographic research, showing a way to overcome limitations related to poorly preserved and incomplete human remains by using the Bayesian approach<sup>5-6</sup>. We conducted our research on Scythians, nomadic warriors who played a dominant role on the Eurasian steppes in the Early Iron Age, and found that Scythians were distinguished by a higher probability of dying in early adulthood, and low fertility, both related to their way of life and subsistence economy.

### Paleogenomics

The study of the origins and genetic affinities of Bronze Age from southern Poland revealed genetic continuity from the Late Neolithic Corded Ware groups to Bronze Age Mierzanowice and Trzciniec-associated populations<sup>7</sup>. The results of a study on Goth migrations<sup>8</sup> support the idea that the Goths originated in southern Scandinavia, then they moved south through the territory of contemporary Poland towards the Black Sea region, where they mixed with local populations and formed the Chernyakhov culture. In our research on nomadic populations we found that they carried genetic affinities with populations from several other regions including the Far East and the southern Urals, and that eastern Pontic-Caspian steppe was a likely source of western Iron Age nomads<sup>9</sup>. In our study of Neolithisation of Central Europe we found an additional evidence of genetic exchange between farming and hunting-gathering groups taking place at least as far back as in middle Neolithic in the Late Danubian communities<sup>10</sup>.

Using a metagenomic approach our team revealed the procedure allowing for identification of the ancient microorganisms present in the microbiome of archeological remains<sup>11</sup>, and showed the method for identification and analysis of disease-associated microbes<sup>12</sup>.

Kinship analyses were carried out for the Neolithic societies, showing an intentional selection of individuals for burial based on factors other than biological kinship<sup>13-14</sup>.

References: 1. Makarowicz P. et al., *Radiocarbon*, 2021, 1-24. 2. Pospieszny L. et al., *Praehistorische Zeitschrift*, 2015, 90, 185-213. 3. Pospieszny L. et al., *Journal of Archaeological Science*, 2021, 126, 105292. 4. Łukasik S. et al., *International Journal of Osteoarchaeology*, 2019, 29, 281-293. 5. Łukasik S. et al., *American Journal of Physical Anthropology*, 2020, doi: 10.1002/ajpa.24211. 6. Łukasik et al., *Journal of Anthropological Research*, 2017, 73, 584-616. 7. Juras A. et al., *American Journal of Physical Anthropology*, 2020, 172, 176-188. 8. Stolarek I. et al., *Scientific Reports*, 2019, 9, 1-14. 9. Krzewińska M. et al., *American Association for the Advancement of Science*, 2018, 4, 1-13. 10. Chyleński M. et al., *BMC Evolutionary Biology*, 2017, 17, 1-12. 11. Philips A. et al., *GigaScience*, 2017, 6, 1-13. 12. Philips A. et al., *BMC Genomics*, 2020, 21, 1-14. 13. Juras A et al., *Forensic Science International-Genetics*, 2017, 26, 30-39. 14. Chyleński M. et al., *Genes*, 2019, 10, 1-14.

7. **List of no more than 3 important research projects from the selected discipline awarded in national and international calls to the institution in the last 5 years** (title, name of PI, source of funding, amount of funding):

Continuation and change. Kurgan communities from the 3rd and 2nd thousand. before Chr. in the basin of the upper Dniester in the light of multidisciplinary research. PI: Prof. Przemysław Makarowicz, Faculty of Archaeology AMU. Source of funding: National Science Center (NCN). Amount of funding: USD 406 K (PLN 1.5 M).

Podolia as a contact area in the 3rd millennium BC: Kurgans on the rivers Murafa and Riv. PI: Prof. Marzena Szmyt, Faculty of Archaeology AMU. Source of funding: National Science Center (NCN). Amount of funding: USD 352 K (PLN 1.3 M).

Migration and kinship in East-Central Europe in the first half of the 2nd Millennium BC. PI: Professor Przemysław Makarowicz, Faculty of Archaeology AMU. Source of funding: National Science Center (NCN). Amount of funding: USD 180 K (PLN 660 K).

## **8. Description of the available laboratory and office space for the Dioscuri Centre**

The prospective leader of the Centre would be located on AMU Morasko Campus at either Faculty of Biology or Faculty of Archaeology, at the candidate discretion, with the full access to facilities at both faculties.

AMU Morasko campus is newly-built (constructed between 1999 and 2016) and hosts all science faculties of the University as well as several faculties in humanities and social sciences. Two research centres: the NanoBioMedical Centre and the Wielkopolska Centre for Advanced Technologies (WCAT) are also located at the campus. All office and laboratory rooms at the campus have wired access to Internet administered by AMU Computer Centre. University Library provides the access to electronic publications in journals and books as well as to various databases

Collegium Biologicum is the seat of the Faculty of Biology. The surface area of the building amounts to 23 500 m<sup>2</sup>, while the cubature reaches 106 400 m<sup>3</sup>, functionally subdivided into two parts: the research and didactic ones. It also includes the social and administrative facilities as well as the storage areas. The research part of Collegium Biologicum is characterized by an open plan, with no distinct limits set between four institutes constituting FB AMU. This allows for a flexible organization of research. Part of the building is allocated to modern library hosting ca. 20 000 books and journals.

The Faculty of Archeology is located in the modern range of Collegium Historicum, just a few dozen meters from the Faculty of Biology. It has a modern infrastructure of classrooms and researchers' work rooms. Within the space of the building there are faculty laboratories and warehouses with a huge collection of bone materials. Collegium Historicum also has a modern, well-equipped scientific library with an archaeological department, whose book collection is one of the largest of its kind in Poland.

A large assemblage of human bones is located in the building of the Faculty of Biology as a part of Nature Collections. Osteological Collections embrace skeletal remains of approximately 3 000 individuals, mostly dating to medieval and early modern times (c. 10th-18th c. AD). The storage consists of two rooms with working space, and is equipped with a binocular microscope, endoscope, and anthropometric tools. Faculty of Archaeology has its own storage occupying 490 m<sup>2</sup>. It contains skeletal remains of approximately 4 500 humans, mostly dating to medieval and modern times, and, to a lesser extent, to prehistory. There are also archive rooms and working space.

Within the Institute of Human Biology and Evolution of the Faculty of Biology is located Ancient DNA Laboratory, which remains in full isolation from modern DNA laboratories. In addition, the building hosts several core facilities dedicated to the provision of specialized services to both Faculties members and potentially very useful for studies of historical human populations. They are described in detail in p. 9.

For the Centre it is envisioned that one standard research lab (ca. 35 m<sup>2</sup>) and one standard office room (ca. 16 m<sup>2</sup>) will be allocated for a start. Additionally, space for PhD students and post-docs will be allocated in dedicated office space. In line with the development of the potential Dioscuri Centre, further space will be allocated, including access additional research labs and offices.

## 9. List of the available research equipment for the Dioscuri Centre

The equipment available at the Faculty of Biology and Faculty of Archaeology encompasses a range of applications which will be available to Dioscuri Centre. Our capabilities are further extended by access to other important pieces of equipment available at the AMU Morasko campus, particularly at two AMU research centres: Wielkopolska Centre for Advanced Technologies (WCAT) and the NanoBioMedical Centre.

### ➤ Faculty of Biology

**Core Facility for Molecular Biology Techniques** provides access to equipment and services related to DNA/RNA sequencing and analysis. These include: i) Ion Torrent PGM System (Life Technologies) for high throughput sequencing; ii) two ABI PRISM 3130xl sequencers (Applied Biosystems) for Sanger DNA sequencing; iii) 2200 TapeStation Nucleic Acid System (Agilent Technologies) for DNA analysis and Ion Torrent library preparation; and iv) CHEF Mapper® XA system for pulsed-field gel electrophoresis with superior resolution in the range of 100 bp to 10 Mb (BioRad). It also provides access to Next Generation Sequencing based on Illumina MiSeq and HiScan SQ system with cBot. In addition, it includes specialized cleanrooms for work with ancient DNA.

**Bioinformatics cluster for processor time-demanding computation.** The computational resources of FB AMU include a cluster built of 55 nodes (32 threads and 128GB RAM each) connected with 1PB storage array. The resources are integrated with the infrastructure of Poznan Supercomputing and Networking Centre (PSNC) and can be rescaled to include computational potential of PSNC. The cluster is connected via a direct and independent optical fibre network with Collegium Biologicum at AMU Morasko campus.

**Core Facility for Confocal and Electron Microscopy** provides equipment and expertise to perform all steps of the sample preparation and microscopical analysis, starting from embedding, cutting (microtomes and ultramicrotomes), and up to final image analysis. It has a scanning electron microscope SEM Zeiss EVO40, and transmission electron microscope Jeol12Ex. It also provides access to basic Zeiss confocal microscope with 5 laser lines, several basic fluorescence microscopes and binoculars.

**Core Facility for Imaging and Radioisotope Work.** This facility has two phosphorimagers: Typhoon 9500 and FLA-5000, which are available for scanning either radioisotope-labeled or fluorescently labeled samples. The facility also includes two appropriately equipped and protected labs with controlled access for work with radioactivity. It also includes a cold-room. The head of the facility is a licensed isotope work inspector.

**3D Biology Lab** houses three ScanBright scanners (white light and laser), which deliver high-accuracy data capture for small-to-medium sized objects, six computers with Metashape (Agisoft) and Geomagic (3D Systems) software packages for data processing, and a dual-extruder 3D printer developed for professional use certified by TÜV Rheinland, designed to create accurate parts with great detail using soluble support material. Additionally, the Lab stores ZEISS Stemi 508 Greenough Stereo Microscope with 8:1 Zoom with ZEISS Axiocam camera mounted.

**Ancient DNA Laboratory** is intended only for work with DNA isolated from biological fossil material, including bones, plants and microorganisms. The Lab is fully separated from modern DNA laboratories, has an independent positive pressure ventilation system, equipped with high-quality HEPA filters and a system of UVC lamps that allow for the study of human DNA. The laboratory is divided into three rooms: a sluice chamber, a room for cleaning and drilling samples, and a room for DNA extraction and PCR reactions.

➤ **Faculty of Archaeology**

**Archaeometric Laboratory** – lab dedicated mainly to spectrometry, housing FTIR ALPHA II spectrometer by Bruker, XRF Tracer III SD spectrometer by Bruker, and Tracer 5 spectrometer by Bruker. The laboratory equipment is completed with the microwave muffle furnace Phoenix by CEM and microwave samples mineraliser with high-pressure closed teflon containers MARS 6 by CEM.

**3D Archaeology Lab** is equipped with 3D Scanner Artec Space Spider, a high-resolution 3D scanner based on blue light technology, perfect for capturing both small and large objects in high resolution, with steadfast accuracy and brilliant color, followed by the export of the final 3D model to CAD software. The Lab also provides access to 3D printer ATMAT Galaxy 600, which allows to achieve high print quality and at the same time to produce large objects, thanks to available working areas X:500 Y:500 Z:600 mm.

**Archaeological microscope laboratory** – the laboratory is focused on the possibility of microscopic observation of prehistoric materials. It has the latest generation digital microscopes VHX – 6000 and VHX 7000 by Keyence, Image Dimension Measuring System IM-7000 by Keyence, and several professional optical microscopes by NIKON.

**Additional resources available at the AMU Morasko campus**

**NanoBioMedical Centre.** This research centre has several high-end pieces of equipment, which are available for use in biological applications. Among them are: i) *Electron microscopes*: 1. HRTEM Jeol ARM 200F, and 2. 120kV SEM Jeol 7001TTLS; electron microscopes are equipped for work with cryoTEM and cryoSEM techniques; ii) *atomic force microscopes*: 1. Innova Bruker, and 2. Icon Bruker; iii) *Raman spectrometer and scanning microscopes*: 1. Catalyst, and 2. NT\_MDT SNOM; and iv) *confocal microscopes*, including 1. Zeiss LSM 780 NLO with 6 laser lines and 2-photon excitation laser (Chameleon 680-1080nm, 140 fs), spectral detection and FCS (ConfoCor 3), and 2. confocal microscope Leica SP5 with 7 standard laser lines and white laser 470-670 nm, spectral detection, STED superresolution, FCS (Picoquant).

**10. List of the additional benefits (other than listed in call text) that the Institution declares to provide for the Dioscuri Centre (i.e.: additional funds, personal benefits, other)**

As an additional offer, Adam Mickiewicz University and Faculty of Biology declare the following:

1. In addition to the University funding mentioned above, the University will add 10 000 € per year for the whole duration of the project, and when the funding would be renewed – for the following 5 years.
2. In addition to team members employed within the Dioscuri Centre from the project, the Faculty of Biology will fund the full-time position of research technician.
3. Faculty of Biology will provide access to bioinformatics cluster free of charge, and the services of the faculty core facilities for the price of chemicals (no service charges).
4. Providing successful evaluation of the Dioscuri Centre (either 5-year only or renewed for the next 5 years), the University will continue to provide full-time employment of the research group leader.
5. At the beginning of the project, the University will provide the flat for the prospective leader and his/her family. The University will also guide and help other team members to find proper accommodation.
6. Guidance and help in finding suitable job offer for the spouse of the group leader will also be provided.
7. All members of the Dioscuri Centre will have the same rights and access to University benefits for employees, including: e-sport card, University medical care as well as special medical bundles, University holiday centres, etc.
8. An institutional mentor for the DC leader will be appointed. This person will guide the Leader during the first year of funding period through the regulations and working culture of AMU.
9. AMU Project Support Centre will provide assistance in project implementation and all project-related issues.

**11. Other information about the internationalisation of the research institution, international researchers employed at the institution, the availability of English language seminars etc.**

1. The Faculty of Biology and the Faculty of Archeology are basic organizational units of the Adam Mickiewicz University - a university distinguished by the **HR Excellence in Research award** (since 2016).
2. The Adam Mickiewicz University is a signatory of the **EPICUR consortium** (European Partnership for an Innovative Campus Unifying Regions). Its partners are: The University of Strasbourg (project leader, France), The University of Amsterdam (Netherlands), the Albert-Ludwigs-University of Freiburg (Germany), Karlsruhe Institute of Technology (Germany), The University of Upper Alsace (France), the University of Natural Resources and Life Sciences, Vienna (Austria), and the University of Thessaloniki (Greece).
3. Active international cooperation of the Faculty of Biology AMU includes the implementation of a number of international programs. Currently, international programs held at the Faculty include EMBO Installation Grant; COST, COST PERIAMAR, COST ACTION, LIFE17, or CANALETTO (financed by NAWA).
4. International cooperation of the Faculty of Biology is also carried out independently of official research projects and is reflected in numerous publications with authors from other countries.
5. The Faculty of Biology AMU, together with the Institute of Bioorganic Chemistry PAS was granted by the Minister of Science and Higher Education with a prestigious status of a Leading National Research Centre (KNOW). Acting within KNOW, cyclic conferences and numerous seminars in English are organized.
6. Options for international collaboration are now being extended under "Initiative of Excellence - Research University" (ID-UB) started in 2020, which facilitate international exchange and recruitment of outstanding researchers from abroad within visiting professorship program.
7. The Faculty of Biology conducts a program of PhD studies in English. The program is enhanced by two programs funded from EU structural funds (POWER 03.02-00-I022/16 and POWR.03.02.00-00-I022/16-01), which support international exchange and funding courses for PhD students run by outstanding researchers invited for this purpose from abroad (POWER 03.02-00-I022/16). Foreigners currently constitute ca. 20% of students at the Faculty of Biology AMU doctoral school.
8. At the level of post-graduate studies, two MSc programs are offered in English by the Faculty of Biology: Environmental Protection, and Biotechnology.
9. Students and PhD students can take advantage a number of different courses taught in English, organized by AMU-PIE and hosted at the Faculty of Biology AMU.
10. The Faculty of Biology AMU organizes recurring international summer schools: Poznań Bioinformatics Summer School, and Summer School RESTLAKE, and Summer School of Molecular and Theoretical Biology (with Zimin Foundation), which involve international staff and students.