

## 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 Geographic and Geological Sciences (FGG AMU)

Krygowskiego 10

61-680 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. Błażej Berkowski**

Head of Institute of Geology, FGG AMU

Head of Environmental Palaeobiology Research Unit

email: bbrk@amu.edu.pl

phone +48 829 6013

Correspondence address:

Environmental Palaeobiology Research Unit

Krygowskiego 10, 61-680 Poznań

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

Natural Sciences and Technology

- Mathematics
- Fundamental constituents of matter
- Condensed matter physics
- Chemistry
- Materials
- Computer science and informatics
- Systems and communication engineering
- Production and processes engineering
- Astronomy and space research

**X Earth sciences**

## 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

### **EU H2020 AquaNES project “Demonstrating synergies in combined natural and engineered processes for water treatment systems” - PI prof dr hab. Józef Górski.**

The project catalyse innovations in water and wastewater treatment processes and management through improved combinations of natural and engineered components. The project focuses on 13 demonstration sites in Europe, India and Israel covering a representative range of regional, climatic, and hydro geological conditions.

Górski J., Dragon K., Kaczmarek P., 2019 – Nitrate pollution in the Warta River (Poland) between 1958 and 2016: trends and causes. *Environmental Science and Pollution Research* 26: 2038-2046.

Kruć R., Dragon K., Górski J., 2019 – Migration of Pharmaceuticals from the Warta River to the Aquifer at a Riverbank Filtration Site in Krajkowo (Poland). *Water* 11: 2238.

Dragon K., Górski J., Kruć R., Drożdżyński D., Grischek T. 2018 – Removal of Natural Organic Matter and Organic Micropollutants during Riverbank Filtration in Krajkowo, Poland. *Water* 10: 1457.

### **Effects of meteorite impact in unconsolidated sediments - case of iron meteorite shower "Morasko", Poland** PI – Witold Szczuciński, funded by: Polish National Science Centre

About 5,000 years ago near Morasko (the district of the present-day city of Poznań, western Poland) the largest known iron meteorite shower in Central Europe took place. The conducted project revealed provided comprehensive insight including studies of the craters, numerical modeling of the impact, as well as multiproxy analyses of the environmental effects of the impact. The Morasko craters field is one of the best-studied examples of small/moderate-sized meteorite impact in unconsolidated sediments.

Włodarski W., Papis J., Szczuciński W. 2017: Morphology of the Morasko crater field (western Poland): Influences of pre-impact topography, meteoroid impact processes, and post-impact alterations, *Geomorphology*, 295, 586–597.

Pleskot K., Tjallingii R., Makohonienko M., Nowaczyk N., Szczuciński W. 2018: Holocene paleohydrological reconstruction of Lake Strzeszyńskie (western Poland) and its implications for the central European climatic transition zone, *Journal of Paleolimnology*, 59, 443–459.

### **Submarine cryptic biocoenoses in the Devonian of Morocco - PI prof. Błażej Berkowski, funded by Ministry of Science and Higher Education and Polish National Science Centre Grant**

Discovery and description of unique of submarine cryptic biocoenoses inhabited mostly by solitary corals growing upside down in the cavities and caves of hydrothermal and methane seep origin in the Devonian of Anti-Atlas (Morocco).

Jakubowicz, M., Berkowski, B. & Belka, Z. 2014.. Cryptic coral-crinoid "hanging gardens" from the Middle Devonian of southern Morocco. *Geology* 42(2): 119-122. DOI: 10.1130/G35217.1

Berkowski, B., Jakubowicz, M. Belka Z., Król J., Zapalski M. 2019. Recurring cryptic ecosystems in Lower to Middle Devonian carbonate mounds of Hamar Laghdad (Anti-Atlas, Morocco). *Palaeogeography, Palaeoclimatology, Palaeoecology* 523: 1–17.

**The Polish-Swiss cooperation project CLIMPEAT - PI prof. Mariusz Lamentowicz; funding – 3.2 mln PLN.** This project clarified key mechanisms, especially the interplay between the responses of plants, soil microorganisms and biogeochemical processes. Testate amoebae emerged as both key actors of C cycling and indicators of hydrological conditions. CLIMPEAT project provided 51 high-ranked publications that were cited 1055 times in 478 articles.

Lamentowicz M. et al., 2016 – *Mires and Peat*, 18(20):1-17. DOI: 10.19189/MaP.2016.OMB.244

Reczuga M.K et al., 2018 – *Ecology and Evolution*, 8(1): 1-13. DOI:10.1002/ece3.4114

Reczuga M.K et al., 2020 – *PeerJ*: 1-26. DOI 10.7717/peerj.9821

Lamentowicz M. et al, 2020 – *Europ. J. Protistology*, 73 : 1-14. DOI: 10.1016/j.ejpp.2020.125674

**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):**

Distinguishing tsunami and storm deposits affected by postdepositional processes – a multi-proxy approach (TSUNASTORM), PI – Witold Szczuciński, NCN OPUS, 977 760 PLN

Neodymium isotopes as a tracer of composition and origin of fluids at fossil methane seeps, PI - Michał Jakubowicz, NCN SONATA, 439 670 PLN

TEvolution and palaeoecology of deep-water coral assemblages from the Devonian of Anti-Atlas, Morocco, PI – prof. Błażej Berkowski, NCN OPUS, 464 815 PLN

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

**Collegium Geographicum and Collegium Geologicum** are located at AMU Morasko Campus next to the Morasko Meteorite Reserve where lumps of iron were found and are treated as evidence of the largest European iron meteorite shower. Our teaching and research cover both terrestrial geography and the environmental impact of human agency. The newly-built campus (constructed between 1989 and 2016) hosts all science faculties of the University together with two research centres: the NanoBioMedical Centre and the Centre for Advanced Technologies. Coll. Geographicum and Coll. Geologicum are the seats of the **Faculty of Geographical and Geological Sciences**. The functional life of the building started in 1991 (Coll. Geologicum) and 2004-2008 (Coll. Geographicum). The surface area of the buildings amounts to 20193m<sup>2</sup>. Both Collegiae are functionally subdivided into two parts: the research and didactic ones. It also includes the social and administrative facilities as well as the storage areas, Museum of Earth and the library hosting in year 2020- 62 660 books and 1181 journals (titles) useful for Earth sciences studies. The access to electronic publications in journals and books as well as to various databases is provided via a membership in University Library. Apart from countrywide access to journal collections, the library offers access to additional journal collections and databases subscribed by the University. The prospective leader of the Centre would be located in **Coll. Geologicum** next to Coll. Geographicum. In 1990 the Chair of Geology had been transformed into Institute of Geology, which was established as the 4<sup>th</sup> Institute of the Faculty of Geographical and Geological Sciences. In 1991 the Rector of the Adam Mickiewicz University, Prof. Fedorowski, who re-initiate the geological studies at AMU in 1988, decided that the Institute was moved to the new buildings at Morasko Campus. The first Director of the Institute from 1990 to 1996 was Prof. Lorenc, and subsequently this position was hold by Prof. W. Stankowski, Prof. J. Górski, Prof. J. Przybyłek and again Prof. Górski. Currently, Prof. Błażej Berkowski holds the position of Director. The Geological Institute consists of team of scientists focusing on different aspects of geological processes occurring currently on Earth as well as during previous geological ages, which have significant influence on its present state. Scientific activities of our staff focus on different research fields what is reflected by internal structure of the Geological Institute. Thus, main scientific fields are basic geological issues like physical geology in its broad sense, sedimentology, mineralogy, petrology, stratigraphy, geochemistry and palaeontology but also hydrogeology, and engineering geology, both having practical applications. Due to location of the Institute in the vicinity of Morasko area, significant and also spectacular scientific issue is the "Morasko meteorite". The biggest fragment of the meteorite is exposed in the Museum of Earth at the Faculty of Geographical and Geological Sciences. Teams of the Institute's scientists conduct research on various rock types, formed during different geological ages in many different areas. Scientific research are conducted for Palaeozoic, Mesozoic, and Cainozoic rocks in Arctic area, Africa, Asia, North America, and obviously Europe. However, most of hydrogeological and engineering geological studies with its applicable character are connected with young, soft rocks occurring mostly in the Wielkopolska area.

For the Centre it is envisioned that one standard research lab (ca. 35 m<sup>2</sup>) and one standard office room (ca. 17 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 at Collegium Geologicum. All office and laboratory rooms have wired access to Internet administered by AMU Computer Centre.

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

**The equipment available at the Faculty of Geographical and Geological Sciences:**

**AMU Isotope Laboratory:** Finnigan MAT-261 special Thermionizing Mass Spectrometer (TIMS), which is a unique device on a national scale. The spectrometer is equipped with 7 collectors and is used to measure isotopes with masses from 38 to 270. The device enables the measurement of isotope ratios in samples with very low contents (on the order of a few ppm) of the examined elements. The research activity of the Laboratory includes measurements of the isotope ratios Rb-Sr, Sm-Nd, U-Th-Pb, Re-Os, B, Fe and Ca. The lab is equipped with "Clean laboratory" for sample preparation.

**Cambridge CL-8200 "cold cathode" type cathodoluminescent device.** The device is used for microscopic observation of rock samples bombarded with an electron beam, as a result of which some geological materials begin to emit radiation (luminescence) in the form of visible light. This method is particularly useful in reconstructing the environment and assessing the diagenesis of rocks and fossils with carbonate mineralogy.

**Zeiss Discovery V20 Microscope with the canon EOS70D camera** allow to make observations and photographs of thin sections and samples in transmitted and reflected light in magnification 4X to 100X.

**The SEM EDS Hitachi 3700N** laboratory allows for taking high-quality scanning photographs with the analysis of the composition of the elements of the tested sample.

**Palaeontology Laboratory** - used for the preparation of microscopic thin sections from larger and smaller samples of rocks and fossils. Cutting is performed with a Struers saw and WS-20W wire saws that perform cuts with an accuracy of 0.05mm.

**Additional resources available at the AMU Morasko Campus Wielkopolska Centre for Advanced Technologies:**

**Scanning electron microscope with analytic FE Quanta 250 FE.**

High resolution FEG-SEM with ESEM end STEM technology. Characterisation of conductive and non-conductive samples with SE and BSE imaging possible in every mode of operation. Resolution in high vacuum 0.8 nm at 30 kV (STEM), 1.0 nm at 30 kV (SE), 3.0 nm at 1 kV (SE); low vacuum 1.4 nm at 30 kV (SE), 3.0 nm at 3 kV (SE); extended vacuum mode (ESEM) 1.4 nm at 30 kV (SE).

Analytical equipment: EDS, WDS, EBSD detectors (EDAX): allow determination of sample composition and crystallographic orientation. Possible mapping.

Preparation equipment: Leica EM TXP automatic trimmer, Q150T ES Combined Sputtering and Carbon Coating System.

**Laser Scanning Microscope Olympus LE XT O 4100.**

Non-contact 3D observations and measurements of surface features at 10 nanometer resolutions for height scale. It also features a fast image acquisition and a high-resolution image over a wide area. Light Source: 405 nm Semiconductor Laser, Total magnification 108× – 17,280×.

**High-Performance Laser Scanning Microscope Olympus FV1200.**

Two GaAsP detectors, live cell imaging experiments, implementing real time Z-drift compensation and touch panel control. Confocal observation of fixed samples, with up to 5 simultaneous fluorescent detection channels, lasers: 405 nm, 458/488/515 nm, 559 nm, 635 nm.

#### **Polarising light microscope Olympus BX-52.**

High quality polarizing microscope permits identification of isotropic and anisotropic materials, forensic analysis, thin film/polymer/crystal and extraneous particulates identification. Reflected/Transmitted light. Camera and measurements software. Objectives up to 100×.

#### **Scanning electron microscope with focused ion beam FEI Helios NanoLab 660.**

Extremely high resolution (XHR), with subnanometer resolution from 500 V to 30 kV, sharp and charge free contrast obtained from up to 6 integrated in-column and below the lens detectors. Fast and precise milling and deposition with critical dimensions of less than 10 nm. Schottky thermal field emitter. Gas injection system (Pt deposition, carbon mill, insulator deposition). EDX analytics.

**NexION 300D ICP-MS spectrometers** (Inductively Coupled Plasma Mass Spectrometer) (PerkinElmerInc.). The system is capable of detecting metals and several non-metals at concentrations as low as one $10^{12}$ . The technique offers great speed, precision and sensitivity and can be used for both qualitative and quantitative approaches. Possible applications are in medical and forensic field, toxicology, industrial and biological monitoring (metal analysis), radiometric dating, and more.

### **10. List of the additional benefits (other than listed in call text) that the Institution declares to provide for the Dioscuri Centre**

As an additional offer, AMU and FGG AMU 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. Possibility to fund an additional scholarship for a PhD student included into the AMU Doctoral School.
3. Additional employment of a technician member of personnel to work for the Dioscuri Center.
4. FGG will provide access to informatics infrastructure free of charge, and the services of the faculty core facilities for the price of chemicals (no service charges).
5. 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.
6. 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.

7. Guidance and help in finding suitable job offer for the spouse of the group leader will also be provided.
8. 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.
9. 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.
10. 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.**

Currently the Faculty of Geographical and Geological Sciences (FGG) is employing as academic teachers, researchers and PIs: prof. Karl Stattegger from Germany (leading the project “Catastrophic sea floods on Baltic Sea southern coast during late Holocene”), prof. Piotr Jankowski from USA (leading the project “Spatial-Explicit Uncertainty and Sensitivity Analysis for GIS Multi-Criteria Models”) and prof. Jiri Chlachula from Czech Republic.

A continuous scientific collaboration is developed with numerous institutions abroad, i.a. Durham University, UK (prof. Anthony Long, prof. Ian Evans), Tromso University, Norway (dr. Mattias Forwick), University Centre in Svalbard (dr. Aga Nowak), University of Cincinnati, USA (prof. Tomasz Stepinski), University of Anchorage, Alaska USA (prof. Jeff Welker), University of Copenhagen, Denmark (prof. Bo Elberling), University of Geneva, Switzerland (prof. Jan Pawłowski), Alfred Wegener Institute, Germany (dr. Birgit Heim). Joint research projects are among others conducted with Tohoku University, Sendai (Japan), University of Hokkaido, Sapporo (Japan) – “Environmental record of 2011 Tohoku earthquake and tsunami”; Department of Mineral Resources, Ministry of Environment (Thailand) – “Indian Ocean tsunami 2004 post-tsunami survey”. Adam Mickiewicz University Polar Station affiliated at FGG is a part of INTERACT Transnational Access EU 7<sup>th</sup>FP, facilitating exchange of scientists within circumpolar stations. The station which is an important platform of international research is included in the Ministry of Sciences and Higher Education Roadmap of Scientific Infrastructure within a POLARPOL Consortium. All FGG field stations (Poznan-Morasko, Central Pomerania, Baltic Sea coast and Spitsbergen) are involved in a project “TeaCompositionH2O” led by Deakin University (Australia).

Scientists from FGG are working in important international boards and bodies as e.g. International Association of Geomorphologists (Z. Zwoliński), International Arctic Science Committee (Z. Zwoliński), Scientific Committee on Antarctic Research (G. Rachlewicz), Agder Academy of Sciences and Letters (A. Kostrzewski), International Scientific Network MODIS 2 (D. Michalska), ClimMani COST Network (M. Lamentowicz).

In 2019 an International Conference “Processes and Palaeo-Environmental changes in the Arctic” was held at FGG. The prestigious conference “Geographic Information



Sciences” planned for the past year with the participation of ca. 700 guests was rescheduled on 2021.

Seminars and a Journal Club led by faculty members and invited speakers are available in English for students of all levels. Poznan Branch of American Association of Petroleum Geologists is affiliated at the Institute of Geology FGG. An extensive offer of 60 geographical, geological and tourism courses in English is proposed for foreign undergraduate and graduate Erasmus students and PhD students in the frame of AMU-PIE program. Two comprehensive study programs in English (in tourism and in natural sciences) are in preparation.