

Registration form for Polish research institution

1. Research institution data (name and address):

Adam Mickiewicz University, Poznań (AMU)

Wieniawskiego 1

61-712 Poznań

Faculty of Biology (FB AMU)

Adam Mickiewicz University, Poznań (AMU)

Umultowska 89

61-614 Poznań

2. Type of research institution:

1) AMU: higher education institution

2) FB AMU: basic organisational unit of higher education institution

3. Head of the institution:

AMU: Rector – prof. UAM dr hab. Andrzej Lesicki

FB AMU: Dean – prof. dr hab. Przemysław Wojtaszek

4. Contact information of designated person(s) for applicants and the NCN: first and last name, position, e-mail address, phone number, correspondence address):

Prof. dr hab. Jacek Radwan, head of Evolutionary Biology Group, Institute of Environmental Biology AMU.

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

Life Sciences

Evolutionary and environmental biology

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 (up to one page in A4 format):

Evolutionary biology: (i) A study of major histocompatibility genes in a guppy fish demonstrated the fundamental process hypothesised to driving evolution of this key element of vertebrate immune system, i.e. selective advantage of novel alleles¹. (ii) Experimental evolution study demonstrated that kin selection can modulate the intensity of the conflict between the sexes².

Evolutionary genetics and genomics: (i) Genome analysis of 1092 individuals from various populations and transcriptomes from 50 individuals, revealed differences between populations in the frequency of transcriptionally active ancient retrocopy loss, as well as differences in retrocopy expression levels³. (ii) A series of papers developed novel, NGS-based methodologies to study highly polymorphic immune gene families (MHC, TCR)⁴⁻⁶. The methods are already being used by research teams throughout the world.

Behavioural ecology: (i) The application of robotics to the study of multimodal signalling helped to decode avian deception⁷. (ii) Field study interspecific social information use in habitat selection decisions among migrant songbirds⁸

Ecology: (i) A theoretical framework for incorporating the effects of individual variation on animal-mediated seed dispersal has been developed⁹. (ii) Assessment of multiple impacts of anthropogenic global changes on tree reproduction revealed fundamentally different mechanisms of pollen limitation in driving mast seeding tree reproduction¹⁰ and documented effects of interacting environmental vetoes and passive resource storage on reproductive behaviour of forest trees¹¹. (iii) Interspecific competition between closely related species results in changes in habitat use across geographic range accompanied with divergence in habitat preferences and bill morphology in sympatry¹².

Phylogenetics: Reconstruction of higher-level phylogeny of water mites (Hydrachnidia), the largest group of arachnids that have invaded and extensively diversified in freshwater habitats¹³.

References:

1. Phillips, K. P. et al. *Proceedings of the National Academy of Sciences USA* 115, 1552-1557, (2018);
2. Lukasiewicz, A., Szubert, A. & Radwan, J. *Science Advances* 3, doi:10.1126/sciadv.1602262 (2017);
3. Kabza, M. et al. *PLoS Genetics* 11, doi:10.1371/journal.pgen.1005579 (2015);
4. Migalska, M., et al. *Heredity* 118, 348-357, (2017);
5. Sebastian, A. et al. *Molecular Ecology Resources* 16, 498-510;
6. Migalska, M., Sebastian, A. & Radwan, J. *Scientific Reports* 8, doi:10.1038/s41598-018-30037-0 (2018);
7. Ręk, P. & Magrath, R. D. *Proceedings of the Royal Society B: Biological Sciences* 284. 2017.1774 (2017);
8. Szymkowiak, J., Thomson, R. L. & Kuczynski, L. *Behavioral Ecology* 28, 767-775,
9. Zwolak, R. *Biological Reviews* 93, 897-913 (2018);
10. Bogdziewicz, M. et al. *Ecology* 98, (2017).
11. Bogdziewicz, M., et a. *Proceedings of the Royal Society B: Biological Sciences* 284, 2017.1784 (2017);
12. Reif, J., et al. *Journal of Animal Ecology* 87, 774-789.
13. Dabert, M., Proctor, H. & Dabert, J. *Molecular Phylogenetics and Evolution* 101, 75-90, (2016).

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):

Evolution of MHC copy number: a test of optimality hypothesis and the analysis of alternatives. PI: Jacek Radwan; source: NCN MAESTRO, amount: 2 282 500 PLN

Functions and mechanisms of acoustic and visual signalling coordination in animals, PI: Paweł Rę́k, source: NCN SONATA BIS, amount: 1 997 768 PLN

A bidirectional selection experiment to test the evolution of specialization and dispersal in the invasive wheat curl mite, *Aceria tosichella*; PI: Anna Skoracka, source: NCN OPUS, amount: 716 330 PLN

8. Description of the available laboratory and office space for the Dioscuri Centre (*up to one page in A4 format*):

FB AMU is located in Collegium Biologicum at the AMU Morasko campus. The newly-built campus (constructed between 1999 and 2016) hosts all science faculties of the University (Chemistry, Geographical and Geological Sciences, Mathematics and Informatics, Physics) together with two research centres: the NanoBioMedical Centre and the Wielkopolska Centre for Advanced Technologies (WCAT).

Collegium Biologicum is the seat of the Faculty of Biology. The functional life of the building started in 2003. The surface area of the building amounts to 23 500 m², while the cubature reaches 106 400 m³. Collegium Biologicum is functionally subdivided into two parts: the research and didactic ones. It also includes the social and administrative facilities as well as the storage areas. Part of the building is allocated to the library hosting ca. 20 000 books and journals useful for biological studies. It is a part of University Library located in the city centre. 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 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. This flexibility allows finding space for new research group and indeed, in since FB moved to a new building, 15 such new research groups have been created at FB.

In addition, the building hosts seven core facilities dedicated to the provision of specialized services to the Faculty members. These core facilities, most of which potentially useful for evolutionary or ecological research (e.g. Core Facility for Molecular Biology Techniques, Bioinformatics cluster for processor-time-demanding computation, BioGIS Core Facility, Core Phytotron Facility which contains four walk-in phytotrons (Convicon): one for high light, two for low light) They are described in detail in p. 9 (pages 8-9).

The prospective leader of the Centre would be located in Collegium Biologicum. For the Centre it is envisioned that one standard research lab (ca. 35 m²) and one standard office room (ca. 16 m²) will be allocated for a start. Additionally, space for PhD students and post-docs will be allocated in dedicated office space at IEB. All office and laboratory rooms have wired access to Internet administered by AMU Computer Centre. In line with the development of the potential Dioscuri Centre, further space will be allocated, including access additional research labs and offices in WCAT. Important core facilities located at WCAT include greenhouse and animal house, and both are described in detail in p. 9 (next page). The space available for biological research is located within 1-2 floors, and the research labs and offices are fully furnished and equipped.

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

The equipment available at the Faculty of Biology 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.

At FB AMU researchers have access to specialized equipment in several core facilities

Core Facility for Molecular Biology Techniques provides access to equipment and services mostly 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 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 Phytotron Facility. This facility contains four walk-in phytotrons (Conviron): one for high light, two for low light, and one exclusively for work with Arabidopsis. It contains space for planting and harvesting.

BioGIS Core Facility supports development of GIS-based research methods, to projects requiring application of GIS and teledetection in ecological and biodiversity studies.

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.

In addition to core facilities, FB researchers can access equipment based at IEB and other institutes. This includes a range of spectrophotometers (Schimadzu UV-1240, SpectroDirect, Sp 830 Metertech, . DR 2800 lange, DREL 2010), a range of microscopes, image analysis system ColorView, Noldus system for behavioural research). **The Laboratory for High-throughput Techniques** located in Institute of Molecular Biology and Biotechnology provides access to Next Generation Sequencing based on Illumina MiSeq and HiScan SQ system with cBot.

Additional resources available at the AMU Morasko campus

Wielkopolska Centre for Advanced Technologies

Among several important facilities at WCAT of particular interest for molecular biology studies are a greenhouse and an animal facility, which are described below. WCAT also has laboratories dedicated for molecular biology studies with appropriate equipment.

Greenhouse. The facility contains a block of in vitro cultures, a block of phytotrons and a greenhouse. The greenhouse enables the studies of the effect of cold stress, high temperature stress, and biotic stresses on plants.

Animal Facility. This facility can house about five thousands of mice in individually ventilated cage system and about six thousands of mice in conventional cages, rats (about three thousands in individually ventilated cage system) and rabbits. Surgery rooms include equipment for computer tomography (Argus CT, Sedecal), in vivo visualization system (either fluorescence or luminescence readout – PhotonImager Optima Basic, Biospace Lab), X-ray machine (RS 2000 X-Ray Biological Irradiator, RadSource) and equipment for behavioral experiments (IntelliCage by New Behavior and ActiMot2 System, TSE Systems). Additionally it contains: i) hematological and biochemical laboratory for analysis of blood and urine, equipped with two modern chromatographs working in both gas (GC – 2010 Plus, Shimadzu) and high performance liquid chromatography formats (HPLC Prominence Shimadzu); ii) histological laboratory with a high quality microscope and equipment for automatic processing of histological samples.

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) (*up to one page in A4 format*):

As an additional offer, AMU and FB AMU declare the following:

1. In addition to the University funding mentioned above, the University will add 5 000 € 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, and will also provide stipends for two additional PhD students.
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.

11. Other information about the internationalisation of the research institution, international researchers employed at the institution, the availability of English language seminars etc. (up to one page in A4 format):

Postdocs are routinely recruited in open international calls. At IEB, to which new PI will most likely be linked, post-docs employed over last five years were recruited from several countries, including Spain (dr Alvaro Sebastian), UK (dr Karl Phillips) Germany (Sophie von Merten), Netherlands (dr Freerk Molleman). Furthermore, two fellowships were recently held at IEB by foreigners (Czech Republic, dr Pavel Linhart, NCN POLONEZ); USA, Prof. Shawn Meagher, Fullbright Teaching Fellowship). Therefore English is a common language for communication.

Research results are presented and discussed in English during regularly organised scientific events and seminars, which hosted many prominent and distinguished scientists from all around the world. Among them one could find three Nobel Prize Winners: Thomas Cech (2013), Robert Huber (2014), and Ada Yonath (2015); the president of the RNA Society Sarah Woodson (2014). IEB organises weekly Seminars on Evolution, Ecology and Behaviour, hosting many speakers from abroad (see <http://popocol.home.amu.edu.pl/seeb/>). These seminars are held in English.

Between 2013 and 2016, the FB AMU hosted 16 international conferences and workshops which have been attended by 1700 guests, including 650 scientists from abroad. Among the conferences organised by the FB AMU one could name: Post-transcriptional Gene Regulation In Plants (2014; 200 attendees, including 100 foreign attendees), 10th International Plant Cold Hardiness Seminar: Stress Recognition Triggers Plant Adaptation (2014, 120/90), IV Post-EURASNET Symposium „RNA Alternative Splicing (2016, 137/77), or Polish Evolutionary Conference (2015, 105/7).

Active international cooperation of FB AMU has been reflected in the implementation of FP7 projects, such as CONTRASTRESS (MCA, 2010-2013); PersonaLiHi (MCA, 2013-2015), EVOLGEN (MCA, 2011-2015). COST has implemented 3 projects: FA0605 (2008-2012), FA1103 (2011-2015) and FA1405 (2015-2019). There are currently 2 projects funded by HORIZON 2020: FLORA ROBOTICA (FET, 2015-2019) and Drug_FXSPreMut (E-RARE, 2014-2018). Moreover, among the projects financed under international agreements the following can be listed: CzechGlobe (2010-2015), Sciex-NMS10.224 (2011-2012), Polish-Taiwanese Joint Research Project (2x, 2013-2016, 2015-2016), Polish-Belgian Joint Research Project (2014-2016) and Polish-Korean Project (2016-2017).

Teaching programmes in English are offered to PhD and MSc students. These programs are open to students from abroad. FB AMU implemented the International PhD programme *From Genome to Phenotype: a Multidisciplinary Approach to Functional Genomics* financed by the FNP in 2011-2015, and supported by European Structural Funds. As of October 1st 2018, FB AMU has started a programme of PhD studies in English (POWER 03.02-00-I022/16). Currently the Faculty hosts 8 PhD students from abroad. As part of the PhD programme, the FB offers seminars held in English. At the level of post-graduate studies, two MSc programmes are offered in English by FB AMU: Environmental Protection, and Biotechnology. FB AMU organises two recurring international summer schools: Poznań Bioinformatics Summer School (12th edition in 2017), and Summer School RESTLAKE (9th in 2017), which involve international staff and students. Journal Clubs are held in every study programme at the FB in English. Students and PhD students can also take advantage of 34 different courses taught in English, organized by AMU-PIE and hosted at FB.