

## Registration form

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

### Registration form for Polish research institution

1. Research institution data (name and address):  
**Institute of Biochemistry and Biophysics Polish Academy of Sciences**  
**Pawińskiego 5A, 02-106 Warszawa, Poland**  
[www.ibb.waw.pl](http://www.ibb.waw.pl)
2. Type of research institution<sup>1</sup>:  
**Research unit of the Polish Academy of Sciences**
3. Head of the institution:  
**Prof. dr hab. Jarosław Poznański**
4. Contact information of designated person(s) for applicants and the NCN: first and last name, position, e-mail address, phone number, correspondence address:  
**Anna Płochocka-Youssef**  
**Vice-Head of Research Management Unit**  
[ankapl@ibb.waw.pl](mailto:ankapl@ibb.waw.pl)  
**+48 225922141**  
**Pawińskiego 5A, 02-106 Warszawa, Poland**
5. Research discipline in which the strong international position of the institution ensures establishing a Dioscuri Centre:  
**Life Sciences, Molecular biology, structural biology, biotechnology**
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:  
The scientific interests of the Institute have evolved over the years from classical biochemistry, biophysics and physiological chemistry towards up-to-date molecular biology. The topics of special attention are: RNA biology and DNA repair, epigenetics, plant molecular biology, structural biology, protein-ligand interactions, host-pathogen interactions and bioinformatics. During the last 5 years research at the Institute led to a number of findings which resulted in over 700 publications and 18/20 pending and 28/29 granted national/international patents. Approximately 35% of IBB funding is provided by external competitive sources. At present we have over a hundred projects awarded by: National Science Center (94), National Centre for Research and Development (4), Ministry of Science and Higher Education (6) and Foundation for Polish Science (8).

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<sup>1</sup> As specified in "Addressees of the call"

The laboratory lead by Dr. Roman Szczęsny, who focuses on the posttranscriptional regulation of gene expression in human mitochondria, contributed significantly to our understanding of the mechanisms of mitochondrial RNA maintenance<sup>1-3</sup>. The laboratory of Dr. Szymon Świeżewski, which focuses on regulation of seed dormancy - a crucial developmental transition in plants, described a novel mechanism of epigenetic regulation based on a cis-acting noncoding antisense transcript<sup>4-6</sup>, and further discovered transcription elongation checkpoints at alternative exons in *Arabidopsis thaliana*<sup>7</sup>. Prof. Ewa Świeżewska and Dr. Tomasz Sarnowski laboratories, also working on *Arabidopsis thaliana*, study the mechanism and physiological role of polyprenolsynthesis<sup>8-11</sup> and epigenetic regulation by the SWI/SNF chromatin remodeling complexes<sup>12-15</sup>, respectively. The laboratory of Prof. Michal Dadlez is developing application of HDX-MS in studies on protein assemblies<sup>16-20</sup>, with a special afford to A $\beta$  peptide<sup>21-23</sup>. Laboratories of Prof. Jacek Hennig and Dr. Magdalena Krzymowska were recently succeeded in the identification of new host-patogen interaction mediated by a protein kinase<sup>24</sup> as well as identified long-term sought gene responsible for extreme resistance to potato virus Y<sup>25</sup>. The laboratory headed by Prof. Grażyna Dobrowolska has just succeeded in characterization of SNF1-related protein kinases<sup>26</sup>. The laboratory of Prof. Poznański studies thermodynamics of the protein-ligand interactions in the context of thermodynamics contribution of halogen bonding in potential inhibitors of protein kinase<sup>27-30</sup>. The laboratory of Wojciech Bal focuses on biological impact of metals<sup>31-32</sup>, including role of the interactions between the A $\beta$ 4-42 peptide with copper ions in the context of Alzheimer's disease<sup>33-34</sup>. The laboratory of Piotr Zielenkiewicz identified novel potent small molecule correctors for CFTR- $\Delta$ F508 with great potential for future treatments of cystic fibrosis<sup>35</sup>. Finally, scientific and technical knowledge of IBB employees and well established core facilities allowed the Institute to establish numerous international collaborations, some of which resulted in important scientific discoveries<sup>36-43</sup>.

[1] Nature Comm. 9, 2558; [2] Nature 560, 238; [3] NAR 48, 5572; [4] PNAS 113, E7846; [5] EMBO Rep. 18, 2186; [6] Molecular Cell 73, 1066; [7] EMBO J. 34, 544; [8] Plant Cell 29, 1709; [9] Plant Physiology 174, 857 [10] Prog. Lipid Res. 63, 70; [11] Plant Cell 27, 3336; [12] Plant Cell 27, 1889; [13] NAR 45, 3116; [14] Plant Cell 27, 1889; [15] Amer. J. Cancer Res. 7, 2275; [16] JBC 291, 24931; [17] Open Biol. 6. [18] JMB 428, 1180; [19] NAR 46,4752; [20] Current Biology 24, 2526; [21] JMB 407, 110; [22] JMB 426, 2871; [23] Sci. Rep. 9; [24] Cell 179, 205; [25] Plant Biotechnol J 18, 655; [26] Plant Physiol 182, 1142; [27] SciRep 9; [28] Plos One 12; [29] BBA 1854, 1553; [30] Plos One 9; [31] Coordination Chemistry Reviews 327, 166; [32] Inorganic Chemistry 55, 7829; [33] Angewandte Chemie 55, 8235; [34] Angewandte Chemie 54, 1046; [35] EMBO Molecular Medicine 5, 1484; [36] Nature 524, 485; [37] Blood 123, 4002; [38] PNAS 110, 105; [39] Nature Comm. 7, 10433; [40] Nature Chemical Biology 9, 264; [41] Nature Comm. 9, 3963; [42] NAR 47, 4751; [43] EMBO Molecular Medicine 11, e9561.

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):

- [Bet-hedging in plants - multi level analysis of seed dormancy variability - from singel cell to population](#). Dr hab. Szymon Świeżewski, National Science Center, 3 711 000 PLN.

- [Mass Spectrometry of Biopharmaceuticals - improved methodologies for qualitative, quantitative and structural characterization of drugs, proteinaceous drug targets and diagnostic molecules](#). Prof. dr hab. Michal Dadlez, Foundation for Polish Science, 3 071 706 PLN.
- In 2018, the Institute become the bioinformatics/chemistry partner site in the EUOPENSSCREEN consortium (ERIC - European Research Infrastructure Consortium), capital value of which exceeds 80 mln € (<http://www.roadmap2018.esfri.eu/projects-and-landmarks/browse-thecatalogue/eu-openscreen-eric/>). The primary objective of EU-OPENSSCREEN is to create a distributed research infrastructure to support scientists in order to better understand how basic molecular processes affect biological functions at various levels – from the pathway up to the whole organism. EU-OPENSSCREEN integrates screening platforms in Europe that share a rationally selected collection of compounds, including those commercially available or collected from international chemists.

8. Description of the available laboratory and office space for the Dioscuri Centre: We offer two laboratories (36m<sup>2</sup>, 18m<sup>2</sup>), two offices (9m<sup>2</sup>, 18 m<sup>2</sup>) and two additional rooms (9m<sup>2</sup> and 15m<sup>2</sup>) that can be adapted accordingly. A cold room will be provided for the Dioscuri Center. If required, additional space could be available.

The DC will benefit from full access to our common infrastructure, such as ultracentrifuges, incubators, ultra-deep freezers (-86°C), BSL2 lab, a green house, tissue-culture facilities, a phosphorimager, chemiluminescence imaging systems, fluorescent and confocal microscopes, fluorescent flow cytometer, real-time quantitative PCR instruments, autoclaves, media preparation facilities and washing devices, and will be supplied with common standard services, such as the ultrapure water system.

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

In compliance with IBB rules, the DC will benefit from access to a broad range of research technology platforms:

#### **Recombinant Proteins**

- AKTExpress chromatography system designed for automated, multistep protein purification. The protocols developed by us enable multistep purification of 6 proteins at the same time.
- The set of collaborating devices that use light scattering to determine the molecular weight, mass uniformity (polydispersity), size (hydrodynamic radius) and absolute molecular weight of macromolecules in solution, such as nanoparticles and proteins. The system includes three units: device for measurement of multi-angle light scattering (MALS), device for measurement of light refraction coefficient for precise determination of concentration and device for dynamic light scattering (DLS).
- ITC calorimeter, used for determination of heat and equilibrium constants of macromolecules and ligands reaction.
- DSC Calorimeter enabling determining the temperature and energetics of phase transitions.

- Potentiometric set, enabling very precise measurement of stability constants in low molecular system.
- Circular dichroism spectropolarimeter providing structural information and reaction constants for chiral molecules.
- Spectrofluorometer, enabling measuring the strong reaction constants of fluorophores containing molecules, among others the proteins.
- Set for measuring of retained flow, used for determination of reaction kinetics.
- Two spectrophotometers enabling determination of molecular bonds constants of chromophore molecules in wide range of electromagnetic spectrum.
- Apparatus for microscale thermophoresis (MTS) and the the next one for the label-free MST, innovative devices enabling direct measurement of bond constants for a wide range of macromolecules and biological structures.
- Prometheus system designed for medium-throughput screening for proteinligand interactions.
- RT-PCR hardware, some of which may be also used for DSF measurements.
- A few plate readers supporting a wide-spectrum of screening experiments.
- HPLC and FPLC, IR microspectrometer for molecules purification and for determination of their concentrations.

### **Bioinformatics**

- NVIDIA cluster solutions (24 Tesla K20 Graphic Cards) and INTEL co-processors (24 Xeon Phi5110P Graphic Cards) for calculations. It ensures over 50Tflops of theoretical computational power, placing our cluster in one line with the most efficient solutions in the country.

### **Organic Synthesis**

- Circulating thermostat.
- Apparatus for melting temperature measurement.
- Microwave synthesizer for organic compounds synthesis.

### **High-Throughput Drug Testing and Proteomics**

- Mass spectrometr-based services (<http://mslab-ibb.pl/en/>)
- Automated set LC/MS for long series of samples Synapt G2.
- Mass spectrometer of ESI LC/MS/MS Orbitrap Velos type.
- Mass spectrometry system of MALDI TOF/TOF type.
- Sets HPLC of nano-LC type, integrated with spectrometers.
- Exploris mass spectrometer.

### **High-Throughput Analyses**

- PerkinElmer JANUS MDT and JANUS Varispan Automated Liquid Handling Workstation,
- Sartorius IncuCyte Live-Cell Analysis System for real-time quantitative live-cell imaging and analysis platforms that enable visualization and quantification of cell behavior over time, by automatically gathering and analyzing images around the clock within a standard laboratory incubator.

- BIOLOG-OmniLog for fully automated platform for aerobic identification and phenotypic analysis for microbial and mammalian cells.
- Auxiliary equipment: incubators, laminar chambers, and centrifuges.

### **DNA Sequencing and Oligonucleotide Synthesis**

- NGS Illumina MiSeq and NextSeq550 sequencers.
- GridION Mk1 sequencer.
- 10x Chromium Controller 10x Genomics – Single Cell DNA/RNA Sequencing Library construction.
- Dr.Oligo Synthesizer.
- ABI3730/3730xl sequencer
- Femto Pulse – an automated pulsed-field capillary electrophoresis system to quantify, qualify, and size DNA and RNA low concentrated samples with accuracy and precision.

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):

IBB PAS will provide the following, personal benefits to the DC personnel: on-site basic medical and dental care, multi-sport admission cards to gyms and to the next-door Olympic size swimming pool, accommodation at the Institute's hotel for the initial few months of stay. Additional benefits will be offered, such as extended medical-package at low cost. DC leader will have possibility to apply for a PhD Scholarship funded by IBB PAS. PhD students participating in the DC research will be enrolled in the IBB PhD School, ensuring high level training and alleviating all administrative issues.

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

Studying or working in a country other than the country of origin is an exceptional opportunity that allows for scientific development and new professional and personal experience. It is also a big challenge. At the Institute of Biochemistry and Biophysics of the Polish Academy of Sciences, we have been continuously making an effort to ensure that the stay of foreigners in Poland and their activity at our Institute are effective. We see great benefits from the internationalization of the Institute's community. Currently, at IBB PAS there are researchers from 9 foreign countries. Institute seminars and PhD Student seminars are held in English. Courses at our Doctoral School are given in English. Our administration communicates in English. We offer our employees and students free-cost language courses, including English and Polish. We understand that the stay in a foreign country, with a different culture, may be associated with many difficulties. We are working on implementing solutions that will help overcome these difficulties.