

Registration form

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

Instructions for creating this registration form.

- Fill out the form in accordance with the following points. In the case of points 2 and 5, **choose only one option**.
- This form saved as PDF file must be signed electronically (PAdES format) by a person authorised to represent the research institution (i.e. Rector, Director of PAS Institute, authorized person). Declarations and signatures should be placed upon a separate page. This page should be filled out in Polish. Please do not attach the ATTACHEMENT 1 to the application.
- Along with the signed PDF of this form an editable file (.doc) containing identical information should be submitted. This .doc file should not be signed.
- Information to be included in the submission (all information must be written in English, with the exception of the declarations):

Registration form for Polish research institution

1. Research institution data (name and address):

Institute of Bioorganic Chemistry Polish Academy of Sciences
Z. Noskowskiego 12/14
61-704 Poznan

2. Type of research institution¹ (**select one from the 9 listed options**):

1) research unit of the Polish Academy of Sciences

3. Head of the institution:

Professor Marek Figlerowicz
Director of the Institute

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

Michal Sobkowski, PhD, DSc
Deputy Director for Scientific Affairs
msob@ibch.poznan.pl

¹ As specified in "Addressees of the call"

(+48) 61 852 85 03 – ext. 182
Institute of Bioorganic Chemistry
Polish Academy of Sciences
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5. Research discipline in which the strong international position of the institution ensures establishing a Dioscuri Centre (**select one from the 25 listed disciplines**):

The application of systems theory in biological studies (systems biology) associated with the rapid development of modern omics methods (genomics, proteomics, metabolomics etc.) have recently enabled scientists to perceive living organisms in an unprecedented, deep and holistic manner. Unfortunately, exceptional complexity and highly-specialized character of the aforementioned research methods and vast amount knowledge make it very difficult to transfer this development to the practical spheres of life, such as healthcare and medicine. In order to narrow the still growing gap between basic science and healthcare, by transferring the achievements of systems biology into medicine and clinical practice (precise, personalized medicine), as well as to develop an innovative ecosystem for medicine-dedicated artificial intelligence-based technologies that will allow for building a strategic growth path towards economic development in the Central Eastern part of Europe, we propose to create a world-class research center dedicated **to systems biomedicine**. We are planning to establish a modern and dynamic center of a truly **interdisciplinary character**, our goal is to orchestrate three scientific disciplines within a single project. The Institute of Bioorganic Chemistry is already a renowned research entity with strong potential for biology, chemistry and bioinformatics (research within these disciplines is conducted in a part of IBCH PAS further referred to as the 'Institute'). Furthermore, the informatics/IT branch of IBCH PAS is strengthened with the computational capacity of its affiliated institution - Poznan Supercomputing and Networking Centre (PSNC). Consequently, the Institute's current status and international position is fully predisposing to set up a highly productive interdisciplinary Dioscuri Centre of Systems Biomedicine.

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
- Earth sciences

Life Sciences

Molecular biology, structural biology, biotechnology

Genetics, genomics

- Cellular and developmental biology
- Biology of tissues, organs and organisms
- Human and animal non-infectious diseases
- Human and animal immunology and infection
- Diagnostic tools, therapies and public health
- Evolutionary and environmental biology
- Applied life sciences and biotechnology

Arts, Humanities and Social Sciences

- Fundamental questions of human existence and the nature of reality
- Culture
- 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 (*up to one page in A4 format*): _____

The ICHB PAS is a research centre well-recognized on the scientific map of Poland, Europe and the world. Its uniqueness results from combination of its expertise in chemistry and biology (the Institute), and in informatics and IT (PSNC). The IBCH PAS achieves the most prominent results in the fields of chemistry of nucleic acids, structural biology of RNA, genomics, molecular biology, systems biology, and bioinformatics. Selected recent achievements include:

- Preparation and characterization of new pronucleotides with anti-virus and anti-cancer properties.
- Preparation of new thrombin binding aptamer derivatives and determination of their thermodynamic, anticoagulant, and antiproliferative properties.
- Development of thermolabile protecting groups strategy.
- Development of new bioinformatic tools for studying RNA structures (e.g., <http://rnacomposer.ibch.poznan.pl/> and <http://rnafrabase.cs.put.poznan.pl/>).
- Determination of the structure and biological significance of the 5'-end motif of the tiRNA^{Ala} molecule.
- Determination of the structure and biological significance of the influenza virus segment 5 (+) RNA.
- The discovery and analysis of genetic material of fossil bacteria in human archaeological remains.
- Development of a coherent model describing hypercycles in the RNA world.
- Development of qEva-CRISPR method for quantitative evaluation of CRISPR/Cas-mediated genome editing in target and off-target sites.

Selected publications from the Institute (IBCH PAS authors are shown):

1. R. Kierzek et al., *Nature Methods*, 2014, 11, 413.
2. K. Bąkowska-Żywicka et al., *Molecular Cell*, 2014, 54, 147.
3. T. Zemojtel et al., *Nature Protocols*, 2015, 10, 2004.
4. D. Gudanis, Z. Gdaniec et al. *Nature Commun.*, 2017, 8, 1127.
5. A.J. Jasinska et al., *Nature Genetics*, 2017, 49, 1705.
6. A.J. Jasinska et al., *Nature Genetics*, 2017, 49, 1714.
7. K. Pachulska-Wieczorek, R. Ciosk et al., *Nature Commun.*, 2017, 9, 1549.

Selected publications from PSNC (IBCH PAS authors are shown):

1. T. Piontek, P. Kopta, B. Bosak, Phil. Trans. R. Soc. A, 2019, 377, 20180151.

2. T. Piontek, P. Kopta, B. Bosak et al., Phil. Trans. R. Soc. A, 2019, 377, 20180152.
3. T. Piontek, B. Bosak, P. Kopta, K. Kurowski et al., Future Gen. Comput. Syst., 2019, 91, 335.
4. C. Mazurek, M. Stroinski, Proceedings of the 52nd Hawaii International Conference on System Sciences, 2019, 7390.
5. R. Palma et al., Proceedings of the 13th IEEE International Conference on eScience, 2017, 266.
6. R. Palma, M. Krystek et al., Proceedings of the IEEE 14th International Conference on eScience, 2018, 50.
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):

“Revolutionizing Healthcare by Tracking and Understanding Human Cells during Disease”

project acronym: **LifeTime**

PI: **Prof. Marek Figlerowicz**

Funded by: European Commission (Horizon 2020 framework program)

Total amount of funding: **1 mln EUR**

“Ensuring long-term sustainability of excellence in chemical biology within Europe and beyond”

project acronym: **EU-OPENSSCREEN-DRIVE**

PI: **Dr. Jacek Kolanowski**

Funded by: European Commission (Horizon 2020 framework program)

Total amount of funding: **5 mln EUR**

“Polish Genome Project - European Center for Bioinformatics and Genomics”

PI: **Prof. Marek Figlerowicz**

Funded by: European Commission (Operational Program Smart Growth)

Total amount of funding: **16 mln EUR**

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

The Dioscuri Centre will occupy an entire floor (ca. 370 m²) in a six-storey building at Zwierzyniecka St. 20 in Poznan, where the Living Laboratory facility (<http://www.futurelab.pl/>) is localized. The facility includes both laboratories and offices dedicated to research and cooperation with users. It includes spaces equipped with the most modern ICT devices (e.g. video mapping system, mechatronic systems, programmable robots or traffic

acquisition systems), in which companies and organizations can test or demonstrate innovative solutions. FutureLab allows, among others, to take up social challenges in such areas as: independence of people at risk of exclusion, e-health, education or ecology. It is a pre-incubator of services, undertakings and projects providing access to field laboratories in the "proof-of-concept" methodology and applying mechanisms of user satisfaction research. FutureLab is organized in 4 complementary spaces: Education of the Future, New Media, Smart Space and Digital Humanities.

The Smart Space area, enabling to undertake design, development and pre-pilot validation of smart technologies related to various human-centric applications and services for better quality of life and smart environment. The lab consist of the following four spaces: e-Inclusion space, tele-rehabilitation, immersion space and telework space.

The Lab includes also a coworking and meeting space for ICT enthusiasts. The place is created by experts, practitioners and enthusiasts of various fields, business people and science. It gives the opportunity to establish interesting cooperation and practice among them. In addition to comfortable working conditions, there can be found people and tools for conducting IT experiments. The space is provided with access to broadband internet, working and meeting places. The building is air-conditioned and adapted to the needs of disabled people.

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

The Institute of Bioorganic Chemistry, Polish Academy of Sciences is an interdisciplinary research institution, with full access to modern and efficient equipment. The Dioscuri Centre will be able to use the entire equipment at its disposal, with particular emphasis on three platforms: High Throughput Screening platform – part of [EU-OPENSCREEN ERIC](#) consortium; Poznan Supercomputing and Networking Centre – one of the biggest Supercomputing centers in Poland, widely recognized in Europe; and the [European Center for Bioinformatics and Genomics](#) (ECBG), an integral part of the Institute that has been inscribed on the Polish Roadmap for Research Infrastructures. Furthermore, the Centre will be able to fully exploit the potential of the remaining specialized laboratories of IBCH PAS.

The core laboratories and their major equipment, to be put at disposal of the newly established center, are listed below. For more details, please also visit the relevant websites:

Laboratory of Mass Spectrometry

<https://www.ibch.poznan.pl/laboratory-of-proteomics-and-metabolomics/laboratory-of-mass-spectrometry/>

- HPLC-MS system (Q-TOF) – Bruker micrOTOF-q
- MALDI-TOF mass spectrometer – Bruker Autoflex
- GC-MS (TOF) system – Waters GCT Premier
- nanoLC-MS system (offline MALDI-TOF/TOF) – Proxeon nanoLC + Bruker UltrafleXtreme
- nanoLC-MS system (ion trap) – Waters nanoAcquity + Bruker Amazon SL
- nano/micro LC-MS system (OrbiTrap) – Dionex RSLC nano 3000 + Thermo QExactive
- GC x GC –MS system (TOF) – Leco Pegasus 4D
- GC-MS system (TripleQuad) – Thermo TSQ8000
- Standalone nano ion source with fraction collector – Advion NanoMate TriVersa
- 2D gel electrophoresis system - GE Healthcare IPGphor + EttanDalt six

Laboratory of Cell and Tissue Culture

<https://www.ibch.poznan.pl/laboratory-of-molecular-and-systemic-biology/cell-and-tissue-culture-laboratory/>

- cell and tissue culture units with laminar flow cabinets with BioHazard protection (Alpina, Steril) and waste collecting (Vacusafe-Integra) security systems; units are equipped with air shaker-incubators (New Brunswick, Innova) and incubators for growing biological material in a carbon dioxide atmosphere (Mettler).
- controlled environment tissue culture rooms and plant growth chambers (Percival E-41E with LED illumination) and the Biolistic Particle Delivery System (BioRad PDS-1000/He).
- computer controlled phytotron cluster.
- inverted fluorescence microscope Leica DM IL LED with a CoolLED illumination system.
- stereoscopic microscope Leica M205 FA.
- Macrophotography workstation.

Laboratory of Genomics

<https://www.ibch.poznan.pl/laboratory-of-molecular-and-systems-biology/laboratory-of-genomics/>

- Genome Analyzer IIx sequencing system (Illumina)
- QX200 Droplet Digital PCR (ddPCR™) System (BioRad)

- Rotor-Gene Q real-time PCR cycler (Qiagen)
- 2100 Bioanalyzer (Agilent)
- NanoPrint LM60 microarray printer (Telechem)
- SpotArray24 microarray printer (PerkinElmer)
- HS 4800 Pro microarray hybridization station (Tecan)
- Axon 4200AL microarray scanner (Molecular Devices)
- ScanArray Express microarray scanner (PerkinElmer)
- DNA CL E508 G Crosslinker (Uvitec)
- Bioruptor NextGen sonication system (Diagenode)
- Nanodrop 2000 spectrophotometer (Thermo Scientific)
- Qubit Fluorometer (Invitrogen)
- Quantum St4 system for gel documentation (Fisher Biotec).

Laboratory of Biomolecular NMR

<https://www.ibch.poznan.pl/laboratory-of-rna-chemistry/laboratory-of-biomolecular-nmr/>

- 400 MHz (9.39 T) NMR Spectrometer AVANCE II Bruker
- 500 MHz (11.74 T) NMR Spectrometer AVANCE III Bruker (with Bruker Automatic Sample Changer (B-ACS 120) and IconNMR)
- 700 MHz (16.44 T) NMR Spectrometer AVANCE III Bruker (with SampleCase automated 24-sample changer and IconNMR)
- Spectropolarimeter circular dichroism (CD) Jasco J-815 S.

Laboratory of Subcellular Structures Analyses

<https://www.ibch.poznan.pl/structure/department-of-epigenetics-2/laboratory-of-subcellular-structures-analyses-2/>

- Leica TCS SP5 confocal microscope with LAS AF SP5, LAS X SP8 software with deconvolution and 2D analysis module
- Leica DMI 4000B fluorescence microscope
- Leica stereoscopic microscope
- BD FACS Calibur flow cytometer
- BD Accuri C6 flow cytometer
- Cell harvester.

Laboratory of Protein Engineering

<https://www.ibch.poznan.pl/center-for-biocrystallographic-research/laboratory-of-protein-engineering/>

Workstations for:

- construction of plasmids for protein expression
- overproduction of recombinant protein in E. coli system
- protein purification
- physicochemical analysis of recombinant proteins
- protein crystallization
- high resolution diffraction data collection from synchrotrons: DESY, BESSY (Hamburg, Berlin - Germany) or Lund Synchrotron (Sweden)
- Malvern Microcal PEAQ-ITC - low volume isothermal titration calorimeter for the label-free in solution study of biomolecular interactions
- ForteBio Octet K2 system for detection of protein-protein and protein-small molecule interactions.

Laboratory of High Throughput Screening

<https://www.ibch.poznan.pl/laboratory-of-proteomics-and-metabolomics/laboratory-z/>

- High Throughput Screening (HTS) system.

As it was already mentioned, the newly established Dioscuri Centre shall also benefit from the equipment and infrastructure of PSNC – the Institute’s affiliated entity.

PSNC is a coordinator of PIONIER - the Polish Optical Network and as such is a partner of the GEANT network and thus is able to provide top class networking performance and numerous connections with world network infrastructure. PSNC provides access to HPC and Cloud infrastructures which may be used to host different kind of computing workload. One of the biggest systems is Eagle cluster with 32984 CPU cores and 120,6 TB RAM with computing power 1372,13 TFLOPS. All nodes are connected via fast network using Infiniband FDR and fast Ethernet. Compute nodes are used as a part of powerful HPC cluster managed by Slurm queue system or as a part of IaaS infrastructure based on battle tested cloud stack Openstack.

A significant infrastructure of PSNC are also laboratories located at the Research Centre of Polish Optical Internet (CBPIO) complex and their infrastructure including a relatively large set of various types of equipment allowing to build and design new technologies. The laboratories include among others: Laboratory of Telemedicine, Laboratory of IoT Technologies,

Laboratory of Surround ICT, Laboratory of Voice Interface Technologies and Advanced Visualization.

PSNC visualization laboratory is equipped with CAVE immersive virtual reality device. Based on Barco I-Space, a multi-sided immersive space environment, PSNC cave consists of 3 walls and a floor screen, running with 10 projectors at minimum 1920 x 1200 resolution. Additionally, there is a CAVE2 system installed, equipped with 36 LCD screens, 65" full hd each, in 3x12 configuration. In terms of other devices, PSNC visualization laboratory provides multiple Oculus Rift devices, LeapMotion sensor devices and touch tables.

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*):

The Institute shall secure additional funds at the disposal of the Head of the Dioscuri Center, in the minimum amount of 25 000 EUR per year, throughout the whole funding period. The Head of the Dioscuri Center shall receive sufficient laboratory space and access to the Institute's entire research infrastructure. For the purposes of Center's maintenance, the Institute shall employ an experienced administrative specialist with fluent English, in order to ensure efficient administrative and financial assistance, particularly at the onset of the Center's activity. The Center's staff members will be able to benefit from a rich social package offered by the Institute: supplementary life and health insurance with optional access to private healthcare, enrolment in the Multisport program – enabling them to receive discounts at various sports facilities, co-funding of admission to cultural events, preferential prices at the Institute's recreation center in Jurata, Baltic Sea, or holiday subsidies. One great advantage of the Institute is also its location. The Institute is situated alongside a green park in the city center, where convenient connections with all other parts of the city, including the main train station and the airport, are available. There is a small, cozy restaurant and a hotel offering 48 beds within the Institute's premises. All the Institute's buildings are equipped with air conditioning and free wi-fi access.

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*):

The Institute of Bioorganic Chemistry, PAS (IBCH PAS), along with the Poznan Supercomputing and Networking Center (PSNC) – an institution affiliated to IBCH PAS, is a national leader when it comes to obtaining international research grants. Pursuant to the report of the National Contact

Point published in October 2018, based on the eCORDA and EUROSTAT databases, IBCH PAS was ranked third among Polish institutions as for participation in the Horizon 2020 framework program, being surpassed only by the Fundingbox Accelerator Ltd. and the University of Warsaw. With the total awarded funds amounting to 18,36 mln EUR, IBCH PAS found itself ahead of such estimable institutions as the University of Science and Technology in Krakow (AGH) – 9,53 mln EUR, 4th place, National Science Center (NCN) – 8,77 mln EUR, 5th place, Jagiellonian University – 8,05 mln EUR, 6th place and the National Center for Research and Development (NCBR) – 7,90 mln, 7th place. IBCH PAS, with significant contribution of PSNC, has been conducting intensive research and developmental work under the UE framework programs since 2001. In 2004, 2010 and 2016, 2018 the Institute was awarded with the Crystal Brussel Sprout for outstanding achievements in promoting and implementing research programs within the EU. As of 2018, IBCH PAS has participated in 152 projects, securing the position of a national leader, both in terms of the number of acquired projects and the amount of awarded funding. In 2013-2018, IBCH PAS hosted 79 european research projects, categorized as follows:

- 67 projects within the 7th framework program – including four in which IBCH PAS was the coordinator (DORII, ALIEN, FELIX and COOLEMALL projects) – in the remaining 63 projects the Institute supervised either work packages or specific tasks.

- 69 projects within the Horizon 2020 framework program – including four in which IBCH is the coordinator (COMPLETE, M2DC, IMMERSIFY and INSENSION projects) – in the remaining 65 projects the Institute supervised either work packages or specific tasks.

The Institute also has long-lasting experience in employing and collaborating with researchers from different countries around the world. The number of foreign employees and is constantly growing. Not only do they contribute to the achievements and results of various research groups, but they also acquire their own research grants, being able to implement their individual projects. One great example of such activeness is Dr. Patrick McDevitt Perrigue (a post-doctoral fellow from the USA) who received the SONATA grant funded by NCN, in 2016. Recently, Dr. Takashi Miki from Japan became a head of one of departments at IBCH PAS. Moreover, over the last few years many excellent investigators from Poland, who have been very successful in developing their careers abroad, at excellent scientific centers, have decided to return to our country and continue their research work at IBCH PAS. Perfect examples of such returning scientists are Dr. Rafal Ciosk from the Friedrich Miescher Institute for Biomedical Research in Basel, Switzerland, who has become the Head of the Department of

Integrative Biology at IBCH PAS, and Dr. Jacek Kolanowski from the University of Sydney, Australia, who became the Head of the Department of Molecular Probes and Pro-drugs at our Institute. In order to promote international mobility and multinational cooperation, most of the seminars held at the Institute are available in English. Furthermore, the Institute is well-known for hosting many renowned and honorable guests from all continents, who share their knowledge and experience by giving lectures and participating in multi-topic conferences.