Registration form for Polish research institution

1. Research institution data (name and address):

Jagiellonian University,

Ul. Golebia 24, 31-007 Krakow

Malopolska Centre of Biotechnology

ul. Gronostajowa 7A, 30-387 Krakow

2. Type of research institution:
    1) university research centre established within a single university structure
3. Head of the institution:

Prof. dr hab. Stanisław Kistryn – The Vice Rector of structural founds

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

Katarzyna Maziarka

Deputy Director for administration

katarzyna.maziarka@uj.edu.pl

Phone: 12 664 6334

Malopolska Centre of Biotechnology

Ul. Gronostajowa 7A, 30-387 Kraków

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

Life Sciences

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

The Malopolska Centre of Biotechnology (MCB) hosts several excellent and internationally highly reputed research groups in the fields of molecular biology, structural biology and biotechnology. In detail, the labs of Jonathan Heddle, Kenji Yamada, Justyna Łabuz and Sebastian Glatt will provide an excellent and stimulating scientific environment for the Dioscuri center. In addition, MCB already hosts a Max Planck Research Group since 2015 and is strongly committed to develop as an institute according to the principles of excellence in science defined by the Max Planck society. The new center will strongly benefit from the previous and ongoing efforts in establishing the highest scientific standards and a research-focused mind set within the institute. MCB groups are regularly evaluated by its International Advisory Board (IAB), which is populated by 13 world class scientists and science managers. In the following paragraph we will provide a selection of scientific highlights of the currently active research groups in the selected discipline

(i) The Bionanoscience and Biochemistry Laboratory is headed by **Jonathan Heddle** who recently relocated from Riken, Japan. Their interests include natural nanomachines (such as DNA gyrase) and designed structures made from protein and DNA building blocks. Previously they designed a self-assembled protein nanotube and solved its structure using Cryo-EM. They were also the first to produce an unusual DNA gyrase from the Apicomplexa class of parasites, they produced an artificial virus-like capsid and used the DNA-origami technique to produce a hybrid DNA nanostructure for single molecule detection of malaria. (ii) The research of Plant Molecular Biology Laboratory headed by **Kenji Yamada** is focused on plant endomembrane systems. The group is examining *Brassicaceae* specific endoplasmic reticulum derived organelles, ER bodies. For this purpose, the Yamada group is applying molecular biology, biochemistry and macromolecular crystallography methods to tackle the bases of ER body formation by investigating two key protein components for ER body formation, namely PYK10 and NAI2. (iii) The Laboratory of Photobiology headed by **Justyna Łabuz** focuses on the role of short wavelength light on plant physiology. The group concentrates on the role of blue light in plant signaling and the repair of UV-B induced damage. Biochemical assays, confocal microscopy studies and molecular biology technics are used to study the localization, activity and physiology of photoreceptors – phototropins and DNA photoreactivating enzymes – photolyases, (iv) The Max Planck Research Group is led by **Sebastian Glatt**, who relocated from EMBL Heidelberg in September 2015. The group is focusing on the structural and functional characterization of specific tRNA modification enzymes and their regulatory consequences for protein synthesis on the ribosome. They have solved several high resolution crystal structures of the individual subunits, sub-complexes or regulatory factors. Recently they have also published the pseudo-atomic model of the Elp123 subcomplex and the fully assembled holoElonagtor complex using electron microscopy. The group is actively pursuing molecular biology, protein/RNA biochemistry and biophysics, crystallography, electron microscopy and cell biology.

Godonoga M, et al. "*A DNA aptamer recognising a malaria protein biomarker can function as part of a DNA origami assembly*." Sci Rep 6, 2016

Glatt S, et al. “Kti11/Kti13 structure reveals its dual its role in Elongator dependent tRNA modification and diphthamide biosynthesis”; Structure 23, 2015
Glatt S, et al. “Structural basis for tRNA modification by Elp3 from Dehalococcoides mccartyi” NSMB; 23, 2016
Dauden MI, et al. “Architecture of the yeast Elongator complex” EMBO Rep. 18, 2017
Nagano RT, et al. “PYK10 myrosinase reveals a functional coordination between ER bodies and glucosinolates in Arabidopsis thaliana. Plant J. 89, 2017
Watanabe E, et al. “HSP90 stabilizes auxin-responsive phenotypes by masking a mutation in the auxin receptor TIR1” Plant Cell Physiol. 57, 2016
Oikawa K, et al. “Physical interaction between peroxisomes and chloroplasts elucidated by in situ laser analysis” Nat. Plants 1, 2015
Szelazek B, et al. “Structural Characterization of Human Coronavirus NL63 N Protein” J Virol. 91, 2017
Zak KM, et al. “Structural basis for small molecule targeting of the programmed death ligand 1 (PD-L1)” Oncotarget. 7 2016
Horwacik I. et al. “Structural Basis of GD2 Ganglioside and Mimetic Peptide Recognition by 14G2a Antibody” Mol Cell Proteomics. 14, 2015
Grzyb J, et al. Detailed characterization of Synechocystis PCC 6803 ferredoxin:NADP+ oxidoreductase interaction with model membranes. Biochimica et Biophysica Acta (BBA) - Biomembranes. 1860, 2018
Kowalska E, et al. Inhibition of DNA replication by an anti-PCNA aptamer/PCNA complex. Nucleic Acids Research 46, 2018
Banaś AK, et al. 6,4 - PP Photolyase Encoded by AtUVR3 is Localized in Nuclei, Chloroplasts and Mitochondria and Its Expression is Down-Regulated by Light in a Photosynthesis-Dependent Manner. Plant and Cell Physiology 59, 2018

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):

- Merging programmable DNA nanorobots and microfluidics for orientationally controlled delivery of membrane proteins to protocells; dr Jonathan Heddle, prof. UJ; National Science Centre (SYMFONIA), 6 596 736,00 PLN
- Plant chemical defense based on mustard oil bomb, dr Kenji Yamada, Foundation for Polish Science (TEAM), 2 973 066,00 PLN
- EMBO Installation Grant, dr Sebastian Glatt, European Molecular Biology Organization, 150.000 EUR

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

For Dioscuri Centre usage we initially offer over 64 m^2 equipped laboratory space in the modern MCB building. Additionally researchers and students will have access to the so called common laboratory space when needed. Common laboratory space is not dedicated to any research group acting at MCB and may be used by any group which requires additional space for certain time period. The Centre leader will be provided with separate office room and additional office space for team members employed at MCB. The Centre employees will also have full access to seminar room on regular conditions.

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

High-end Equipment

- QuantStudio, ABI 3500 genetic analyzer, Ion-PGM, Ion-Proton and Agilent microarray scanner (Genomics Core Facility)

- micrOTOF-QII MS (Bruker) and a Q-Exactive Mass Spectrometer (Thermo) both coupled to nano-HPLC (Proteomics Core Facility)
- Laser scanning confocal microscope (Zeiss Axio Observer) equipped with an "Airyscan" detector

Specialized instruments and infrastructure

- HPLC systems
- Chromatography columns for protein and RNA purification
- Typhoon FLA laser scanners and screens (Proteomics CF)
- Cell homogenizer
- Cryogenic bead beater and cell disruptor
- Laminar Flows for work with microbial organisms and eukaryotic cells
- Large centrifuges and rotors
- Ultracentrifuges
- Gel Doc systems (UV and White light)
- UV-Vis spectrophotometer (Nanodrop systems and regular)
- Microwave digester speedwave entry berghof
- Desktop dip coater ptl-mm01
- Fluorescent microscope with nikon equipment
- Stereoscopic microscope with nikon 1500 equipment
- Atomic absorption spectrometer ICE 3500
- UV-Vis q5000 spectrophotometer
- UV-Vis EPOCH2c spectrophotometer
- RT-PCR thermocycler with spectral analysis software
- MAC 50/1 moisture analyser with instrumentation
- UHPLC-DAD-MS system with equipment

Standard instruments and infrastructure

PCR Thermocyclers (gradient and non-gradient), protein and nucleic acid electrophoresis systems (+ power supplies), temperature controlled shakers (large scale and table top), temperature controlled incubators (for bacteria, insect cells and eukaryotic cells), water bath, thermomixers, -80°C and -20°C freezers, refrigerators, manual and automated pipettes, vortex, rotators, rolling tables, microwaves, MilliQ Ultrapure Water Systems, Autoclave and dish washers (Media Kitchen)

Instruments and infrastructure available in neighboring JU faculties

- Solaris synchrotron
- cryo-EM microscope will be installed in 2018 (purchase in progress)
- Electron paramagnetic resonance (EPR)
- Stopped-flow and Quench-flow Systems
- Radioactive Laboratory (including Liquid Scintillation Counter)

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*):

Financial support for the Centre

As a benefit for Dioscuri Centre JU will provide additional financial support in amount of 25 000 EUR annually.

Benefits for Centre employees

Moreover Dioscuri Centre employees will have an access to social benefits offered by JU:

- Access to Multisport programme (50% cost coverage by JU),
- JU resort hotel rooms (Zakopane, Rabka, Ustroń k. Wisły) on preferable prices,
- Loans for buying/renovation of flat/house available on preferable financial conditions,
- Loans from JU social allowance and benefit fund available on preferable financial conditions,
- Trips organized by JU on preferable financial conditions,
- Financing support for self-arranged summer and winter holidays,
- One month additional salary so called thirteen salary,
- Access to JU kindergarten and nursery,
- Language courses at Jagiellonian Language Centre on preferable prices.

Access to JU infrastructure and personnel

Furthermore MCB is located at JU Campus with close neighbourhood of JU Faculties (Chemistry; Physics, Astronomy and Applied Computer Science; Biochemistry, Biophysics and Biotechnology; Mathematics and Computer Science ect.) as well as Jagiellonian Centre for Experimental Therapeutics research unit and synchrotron SOLARIS where soon first in Poland cryo-EM microscope will be installed. This gives the opportunity for cooperation, easy access to specialized equipment not available at the MCB building as well as a convenient contact with MSc and PhD students and researchers working within various scientific fields.

JU administration support

- Project Centre (CAWP) - will provide information concerning present grant achievements possibilities as well as formal support in grant application preparation,
- International Visitors' Office - will help in all formalities concerning persons from abroad employment,
- Technology Transfer Centre (CITTRU) will offer support in all matters concerning Intellectual Property Rights (IPR).

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 aim of Malopolska Centre of Biotechnology (MCB) from the beginning was to carry out research of outstanding quality on international level. Presently the Centre hosts several units led by high class foreign scientists (dr Sebastian Glatt - Max Planck Laboratory, dr Kenji Yamada - Plant Molecular Biology Laboratory, dr Jonathan Heddle, prof. UJ - Bionanoscience and Biochemistry Laboratory) and Polish scientists with wide international cooperation as well as scientists and technical staff employed on the basis of open international contests. English is obligatory language at MCB.

The mission of MCB is to stimulate scientific collaboration within the University and with other Polish, European and world research institutions. Scientific groups collaborate with many high class scientific units all over the world e.g. Kyoto University, Japan; University of Halle, Germany; INRA, France; Jacobs University, Germany; MPI Münster, Germany, University of Regensburg, Germany; EMBL Heidelberg, Germany; University of Kassel, Germany; University of Bonn, Germany; IMB Brisbane, Australia; National Institute for Agrobiological Sciences, Tsukuba, University of Glasgow, United Kingdom.

To maintain excellence in science, the International Advisory Board (IAB) was established with members who are world class scientists and scientific managers eg. Professor Robert Huber and Professor Ada Yonath - Nobel prize laureates, professor Bill Hanson – Vice President of Max Planck Society. The IAB goal is to evaluate the centre and each research group performance and to shape the future of MCB.

Polish scientists who are coming back to Poland after years spent in foreign research institutes are considering and often choosing MCB as a unit for continuation of their research thesis.

Presently almost 30 foreign PhD students and scientists are doing research at MCB. Additional employment on basis of international contests for scientific positions and PhD students is planned.