

Registration form for Polish scientific institution

1. Research institution data (name and address):

Jagiellonian University
ul. Gołębia 24
31-007 Kraków, Poland
<https://en.uj.edu.pl/en>

Faculty of Biology, Jagiellonian University
ul. Gronostajowa 7
30-387 Krakow, Poland
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Fax +48 12 664 69 08
https://wb.uj.edu.pl/en_GB/
e-mail wyzdzial.biologii@uj.edu.pl

2. Type of research institution (select one out of 7 listed options):

basic organisational unit of higher education institution (Faculty of Biology, Jagiellonian University)

3. Head of the institution:

Prof. dr hab. Stanisław Kistryn, Vice-Rector for Research and Structural Funds

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

Dr. Elżbieta Kołaczowska (dr hab.)

Associate Professor
the Scientific Director of the Institute of Zoology and Biomedical Research
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5. 5. Research discipline in which the strong international position of the institution ensures establishing a Dioscuri Centre (select one out of 25 listed disciplines):

Biology of tissues, organs and organisms

6. Description of important research achievements from the selected discipline from the last 5 years including list of the most important publications, patents, other (up to one page in A4 format):

Our focus on *Biology of tissues (T), organs (O) and organisms (I, individual)* is indeed very strong. Not only do we work on these three levels of organization but we also work on a huge variety of tissues/organs, systems and animal groups, from invertebrate to human. Below we list most important achievements in respective fields underlying publications and patents.

T-O-I: Human Immunology

1. mechanisms of liver damage during bacterial sepsis were connected to neutrophil extracellular traps (NETs); first report on cons of DNase therapeutic application [1]. **2.** Patent (No. *US 9,422,335 B2*; USA; No. *EP 2 751 133 B1*; EU) on a new group of anti-inflammatory molecules. **3.** Novel concepts on neutrophils [2]. **4.** Importance of cancer-associated glycosylation for tumor progression and metastasis [3].

T-O-I: Fish Immunology

1. brand new discovery of ancestral signaling pathway of behavioral fever regulation in ectotherms which evolved in endotherms to regulate the expression of fever [4]. **2.** Patent (No. *PL226061*; Poland) on treatment and prophylaxis of fish with immunostimulants.

T-I: Biomaterials for Tissue Engineering

1. Optimalization of a 3D cell/tissue culturing combined with various perfusion strategies for osteoblasts/bone tissues [5]. **2.** Patent (No. *P403522*; Poland) on new methods to develop surfaces for dynamic cell and tissue proliferation.

O-I: Neurobiology

1. first demonstration on activation of lateral geniculate nucleus (DLG) neurons by orexins via postsynaptic OX2 receptors [6]. **2.** First report on circadian clock control of retina expression of heme oxygenase ((HO), a scavenger of reactive oxygen species [7]. **3.** First report on a role of astrocytes in the brain response to short-lasting general inflammation by undergoing long-term changes [8].

T-I: Hematology/Cancer

1. discovery that copper therapy reduces intravascular hemolysis and derepresses ferroportin during Menkes disease [9]. **2.** New approach to treat leukemia by inducing apoptosis: combination of BH3 mimetics with a standard therapeutics [10].

T-I: Organ and Organism Toxicology

1-2. First reports showing that bisphenol A (BPA) promotes the progression of epithelial ovarian cancer [11].

T-O-I: Reproductive Tissues and Organs

1. Novel observation of a unique two-phase reproductive strategy in the viviparous earwig, *Arixenia esau*. [12]. **2.** A new insight into the cytoplasmic effects of anti-androgens on adherens junction proteins in prostate cancer cells [13].

I: Evolutionary Genetics

1. An empirical test of the hypothesis that sexual selection, being the inevitable consequence of sexual reproduction, may act against mutation load, which is a widespread cause of fitness decrease [14]. **2.** DNA sequencing of modern and extinct (in wild) species of wisent [15].

[1] Kolaczowska et al. *Nat Commun.* 2015;6:6673 [2] Kolaczowska & Kubes *Nat Rev Immunol.* 2013;13:159; [3] Pocheć et al. *Eur J Cell Biol.* 2013;92:355; [4] Rakus et al. *Cell Host Microbe.* 2017;21:244. [5] Filipowska et al. *Biotechnol Bioeng.* 2016;113:1814 [6] Chrobok et al. *Sci Rep.* 2017;7:7713. [7] Damulewicz et al. *Mol. Neurobiol.* 2017;54:4953 [8] Setkowicz et al. 2017;231:366 [9] Lenartowicz et al. *Biochim Biophys Acta.* 2017;1863:1410 [10] Opydo-Chanek et al. 2016. *Tumor Biol* 2016;37:10839. [11] Ptak, et al. *Toxicology Lett.* 2014; 229:357 [12] Tworzydło et al. *PLOS One* 2013;8:e64087 [13] Górowska-Wójtowicz et al. *Toxicol In Vitro.* 2017;40:324 [14] Lumley, Michalczyk et al. *Nature* 2015. 522;470 [15] Węcek et al. *Mol. Biol. Evol.* 2017;34:598.

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):

Considering the proposed discipline - *Biology of tissues, organs and organisms* - the below listed projects illustrate our devotion to each of its components as well as to the integrative approach:

Global, local or fussy? An integrative test of the 'Everything is Everywhere' hypothesis

PI: Dr. Łukasz Michalczyk

National Science Centre (NCN) – 2017 – 2. 955.850,00 PLN

“Engineering and functionalization of delivery system with *Pelargonium sidoides* biologically active substance on inflamed periodontal surface area – *Pelargodont*” UJ

PI: Dr. Grzegorz Tylko

M-ERA.NET2 (EU - European Research Area) – 2017 – 556 546 EUR (total)/ 42 680 (UJ)

„Study of the hormonal and molecular mechanisms of tumorigenesis in the interstitial tissue of the male gonad”

PI: Dr. Małgorzata Kotula-Balak

National Science Centre (NCN) – 2017 – 1. 210. 500,00 PLN

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

The Faculty of Biology is located in three institutes, Institute of Zoology and Biomedical Research, Institute of Environmental Sciences and Institute of Botany. Within each institute laboratory space, core facilities and offices are located.

Following office space will be designated for Dioscuri Center:

- Office for the PI (located in IZBR*),
- Office space for at least 4 researchers (students, PhD students, postdocs) in at least two offices (located in IZBR),
- Office space for the person providing the administrative support for the Dioscuri Centre (located in IZBR),
- The faculty can also accommodate further requests for additional office space if needed.

Following laboratory space will be designated for Dioscuri Center:

- 2 separate independent laboratory units (10 – 20 m² each) (located in IZBR)
- access to laboratories located within the institutes. Each laboratory is designated towards certain type of work, e.g. we have biochemical laboratories, molecular biology laboratories, cell labs (sterile work), animal surgery rooms etc.,
- animal breeding/housing boxes will be designated for the Dioscuri Center (located in IZBR),
- core labs (e.g. PCR, flow cytometry, microscopy) will be available to Dioscuri Centre members.

As the number of members of the Center as well as the exact profile of her/his work is unknown at the time of the current application, we declare that we will be flexible to adapt to requirement(s) of a given candidate upon her/his interest to apply along with our Faculty for the Dioscuri Center; and this will be confirmed by signing formal agreements with the Head of the Faculty/Institute.

* Institute of Zoology and Biomedical Research

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

The below listed equipment is located in departments within two institutes (Institute of Zoology and Biomedical Research - IZBB; and Institute of Environmental Sciences - IES) of the Faculty of Biology. Access to the facilities will be granted to the members of the Dioscuri Center:

- PCR core (IZBR) – multiple PCR and qRT-PCR thermal cyclers, including Applied Biosystems StepOne™ Real-Time PCR System (Applied Biosystems), thermocycler PTC-200 Peltier (MJ Research). Multiple nanodrops, including spectrophotometer NanoDrop2000 (Thermo Scientific); Biosafety cabinets dedicated to DNA/RNA isolation
- Flow cytometry core (IZBR) – Becton Dickinson FACSCalibur™ platform with a cell sorter system. Magnetic cell isolation and cell separation systems (MACS).
- Microscopy core (IZBR) – equipped with:
 - Confocal Microscopy: LSM 510 META, AxioVert 200M, ConfoCor 3 combined with LSM510 Meta Confocal head (Carl Zeiss); Platform for Live Cell Imaging
 - Transmission Electron Microscopy: JeoL JEM2100 HT CRYO LaB6 transmission electron microscope (JEM); Turbo Pumping Station Model 655 (Gatan); Ultramicrotome Leica EM UC7 with the Cryochamber Leica EM FC7

- preparation of cryo-sections (-15° to -185°C) for TEM and SEM; Freeze Substitution and Low Temperature Embedding System for Light and Electron Microscopy Leica EM AFS2; automated automatic immunogold labelling system (EM IGL Leica); Specimen trimming device for TEM and SEM (Leica EM TRIM2); Glass Knifemaker Leica EM KMR3

- Scanning Electron Microscopy and X-ray Microanalysis: JSM-5410 scanning electron microscope (JEOL) with a NORAN 679A- SES energy-dispersive spectrometer (EDS) equipped with a NORVAR thin-window (Noran Instruments, Middletown, WI, USA); The JEOL Smart Coater to apply gold or platinum (JEOL JFC-1100E); Auto Carbon Coater (JEOL JEC-530); E3100 Critical Point Dryer; ETD4 Edwards Tissue Dryer.
- cryostat chamber (CM1850 UV, Leica Microsystems)
- Multiple fluorescent (up-right and inverted) as well as light microscopes and stereoscopic microscopes equipped with digital cameras are available in the labs

→ Cell labs (6 units) equipped with laminar-flow hoods and/or biosafety cabinets, incubators (humid, CO₂) with temperatures adjusted for mammals, cold-blooded vertebrates and invertebrates, liquid nitrogen freezers/cryostorage containers, autoclaves, water baths, centrifuges, refrigerators and freezers, cell counters, inverted microscopes (IZBR)

→ equipment for SDS-PAGE, Western Blotting, electrophoresis of nucleic acids, zymography (IZBR)) – multiple sets for agarose and polyacrylamide gel electrophoresis (Bio-Rad Labs) and electrophoretic transfer (e.g. Mini Trans-Blot; BioRAD); ChemiDoc™ XRS+ System (Bio-Rad Labs), Gel imaging system (e.g. Bio-Rad Labs)

→ High-performance liquid chromatography (HPLC) (IZBR) – normal phase NP-HPLC (Shimadzu)

→ spectrophotometers (Optical Density); fluorometers (Fluorescence Spectroscopy Analysis), luminescence/chemiluminescence Microplate Readers (e.g. (TECAN) (IZBR)

→ refrigerator/freezer core: multiple horizontal and vertical refrigerators and freezers (–20/–80°C); ice machines/dispensers; ultra-pure water system (MilliQ and HydroLab) (IZBR)

→ small, basic lab equipment: homogenizers, ultrasonic washers, dry heat sterilizers, autoclaves, thermoblocks etc.

→ Equipment dedicated to neurological studies (rodents) (IZBR):

- Four setups for electrophysiological studies of rodent brain *in vivo*:
 - single and multichannel (Plexon systems) extracellular recording of neuronal activity,
 - electrical and optogenetic stimulation of neural tissue,
 - juxtacellular recording and labelling (NPI electronics),
 - iontophoretic and pressure application of drugs.
- Three patch-clamp setups for electrophysiological studies of rodent brain *in vitro*:
 - whole cell recordings of electrophysiological parameters of neurons,

- visual control (infrared DIC) and identification (fluorescence of living cells; Zeiss Colibri system) of studied neurons.
 - equipment for studies of rodent behaviour and physiology:
 - Stoelting ANY-maze system (video tracking, mazes and open field),
 - TSE Phenomaster Home Cage System for metabolic, behavioural, and physiological monitoring,
 - Implantable Telemetry (Data Sciences International) dedicated for wireless recording of physiological parameters (EEG, EMG, Temperature, locomotor activity).
- Animal units (3) – two located in IZBB and one in IES; each Animal House is a shared resource that provides services in laboratory animal experimentation and husbandry, and is supervised by the Local Ethical Committee and an in-house veterinary. Each Animal House contains several rooms equipped with cages for rats, mice, and bank voles. Quarantine rooms, washing and autoclaving systems are available in each unit. Additionally, husbandry for multiple fish species is available, tanks for carp, and aquatic lines/multi tank systems for zebrafish.
- GMO/GMM labs are also located within the Faculty (IZBR, IES)
- walk-in climatic chambers (temperature and humidity-controlled rooms) (IES)

10. List of the additional benefits that the Institution declares to provide for Dioscuri Centre (i.e.: additional funds, personal benefits, other) (up to one in page A4 format):

The Faculty of Biology is located at the new campus of the Jagiellonian University (the so called “Campus of the 600th Anniversary of the Jagiellonian University Revival”). Therefore the facilities located at the campus are brand new (e.g. Institute of Zoology and Biomedical Research was relocated to the new building in 2011) and were designed to fit contemporary laboratories and office space designated for life sciences. All life and biomedical sciences-oriented institutes/facilities of the Jagiellonian University are located close by (within 1 km radius) which facilitates fast personal communication, but foremost, grants easy access to facilities/scientific equipment located at the Faculty of Biochemistry, Biophysics and Biotechnology, Faculty of Chemistry, Faculty of Physics. Moreover, Małopolska Biotechnology Centre and Jagiellonian Center for Innovation are located within a walking distance from our faculty. The facilities are dedicated to research and direct application of life sciences/biomedical research.

In addition, our faculty owns two field stations located in Ochotnica (in the Gorce Mountains; 49.522 N, 20.222 E) and Krempna (49.494 N, 21.482 E). The stations were funded to provide services for research activities, and they facilitate access to (wild) vertebrate and invertebrate species (with a restriction to protected species) and facilitate their analyses (the station in Ochotnica is equipped with a basic laboratory). Each station is also an excellent location for (annual) retreat meetings of the scientific groups within the Faculty. The access to the stations will be fully granted to the Dioscuri Centre.

Additional benefits and assets include:

- Guest accommodation at the faculty (en-suite rooms),
- Support and venues for organization of workshops and conferences (JU Conference unit),
- Access to and experience in using PL-Grid – high-performance computing infrastructure,
- Expert support in intellectual property protection rights
- Proximity of R&D units: i) Jagiellonian Centre for Experimental Therapeutics (JCET), ii) Life Science Park (hosting a number of biotech companies),
- Last but not least, Kraków is a lively and vibrant city, both a top-class tourist destination and a huge university centre with more than 200 thousand students

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

The Faculty of Biology offers a vibrant scientific atmosphere and places a strong emphasis on internationalization. Because of the long tradition of collaboration and teaching in English, foreign researchers would seamlessly integrate themselves into the working environment of the faculty. The most important aspects of internationalization include:

- PhD programmes conducted fully in English: two international PhD programmes were initiated in 2010 and 2017. Since then 8+ foreign researchers obtained their PhD degrees; currently the regular English language PhD programme in Biology accepts applications of prospective PhD students from around the world and the faculty has 6+ active foreign PhD students;
- Three foreign researchers (not counting students or PhD students) are currently employed full time at the faculty
- Master Programme in Ecology & Evolution: since 2014, 2-year studies in English open for candidates from all countries,
- Dozens of Erasmus students, Erasmus Plus and other EU-co-funded programs (e.g. ARGO program co-funded by EU and the Spanish Ministry of Education, Culture and Sports) trainees from multiple countries have been hosted at the faculty

- English is the obligatory language of the bi-monthly seminars run by the Institute of Zoology and Biomedical Research entitled “Distinguished Lecture” to which most prominent scientist are invited. For example, so far in 2017, we hosted Dr. Paul Kubes from the University of Calgary in Canada, Dr. Alain Vanderplasschen Faculty of Veterinary Medicine of the University of Liège, Belgium and Dr. John S. Pezaris from Massachusetts General Hospital, Harvard Medical School, Boston, USA.
- English is the obligatory language of the weekly seminars at the Institute of Environmental Sciences, and monthly seminars at the Institute of Zoology and Biomedical Research are often given in English. Also MSc and PhD seminars are run in English by several research groups
- Four prestigious international cooperation HARMONIA grants have been awarded to the Faculty since 2012
- A prestigious POLONEZ grant (a funding programme addressed to incoming researchers who apply for fellowships in host institutions in Poland), is currently hosted at the Faculty,
- The administrative personnel is used to work together with international researchers helping at all administrative tasks