nencki institute
of experimental biology

100 years

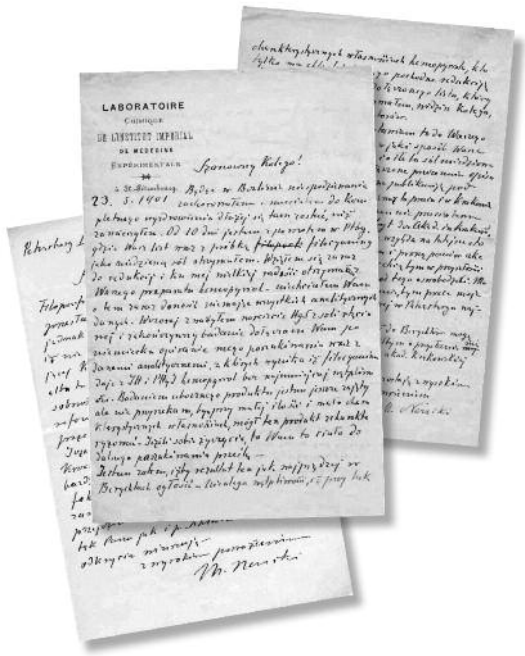
1918-2018

Marceli Nencki

Marceli Nencki was born in 1847 in Boczki near Sieradz in western Poland. He studied medicine in Berlin and obtained the degree of Doctor of Medicine in 1870 for his studies on the oxidation of aromatic compounds. In 1872, he worked as a research assistant at the University of Berne (Switzerland). In 1876, he was appointed Associate Professor and a year later full Professor and Director of the Institute of Medical Chemistry (Medizinisch-Chemisches Institut) at the University of Berne (currently Institut für Biochemie und Molekular-biologie). After 20 years working in Berne, Nencki and the wellknown Russian physiologist Ivan P. Pavlov established the Institute of Experimental Medicine, in St. Petersburg, Russia, where he spent the last decade of his life. He died of stomach cancer in 1901 at the age of 54.

Nencki's scientific interests concentrated, among others, on urea synthesis, chemistry of purines and biological oxidation of aromatic compounds. He was also interested in the structure of proteins, enzymatic processes in the intestine and bacterial biochemistry. One of his key achievements was the demonstration that urea is formed from amino acids, rather than existing in a preformed state on a protein molecule, and that its biosynthesis is accompanied by carbon dioxide fixation. He also demonstrated, together with Pavlov, that the liver is the site of urea synthesis in animals.

Another of his key discoveries, in collaboration with Leon Marchlewski, was on the chemical structure of haemoglobin, the red pigment in blood (see below). Leon Marchlewski (18691946), who studied the chemical nature of the green plant pigment chlorophyll, initially in the United Kingdom and then at the Jagiellonian University in Kraków (Poland), came across Nencki (who by then was interested in the chemical structure of haemoglobin) by chance through his published work. The two scientists started correspondence and exchanging samples of degradation products of their pigments. The ultimate result of this longdistance collaboration was the discovery of a close chemical relation between haem and chlorophyll. Three letters from Nencki to Marchlewski have recently been acquired by the Institute concerning their collaboration.



1918: foundation of the Nencki Institute based on three pre-existing laboratories affiliated with the Scientific Society of Warsaw (Towarzystwo Naukowe Warszawskie): Laboratory of Neurobiology, Laboratory of Physiology and Laboratory of General Biology. The Institute is located in Warsaw at 8 Sniadeckich Street

1918

1920: the Hydrobiological Station in Wigry established in the Plociczno settlement. The station is managed by Alfred Litynski

1920

1928: the Department of Biometry created under the supervision of Jerzy Splawa-Neyman

1928

1932: the Polish Ministry of Religious Affairs and Public Enlightenment, in agreement with the Ministry of Industry and Commerce, entrusts the Nencki Institute with the organization of a marine research station in Hel. Mieczyslaw Bogucki becomes the station director

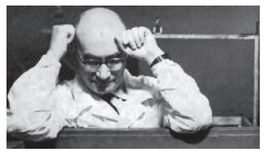
1932

1937: a field station established in Pinsk and managed by Jerzy Wiszniewski

1937

1946: after WWII the Nencki Institute resumes its activity as a state institution in Lodz at 66 South Street. Professors Wlodzimierz and Stella Niemierko (Department of Biochemistry), Jan and Stanislawa Dembowski (Department of Biology), Jerzy Konorski and Liliana Lubinska (Department of Neurophysiology) exceptionally meritorious in this pioneering work

1946



1948: the publication of "Conditioned reflexes and neuron organization" by prof. Jerzy Konorski becomes a breakthrough in modern neurophysiology and the opening of Polish neurophysiology to the world. Never before has any book written by a Polish biologist had such a resonance in the world

1948

1951: the Polish Prime Minister announces the Statute of the State Institute for the Nencki Institute of Experimental Biology

1951: the Institute sets up the Hydrobiological Station in Mikolajki. Its aim is to conduct research in the Great Masurian Lakes complex by scientists from various Polish academic centers. The station is managed by Andrzej Szczepanski

1951

1952: the Institute incorporated into the newly created Polish Academy of Sciences (PAS). Prof. Jan Dembowski is the President of PAS

1952

1953: the construction of the Nencki Institute premises in Warsaw at 3 Pasteur Street completed

1953

1968: the 50th Anniversary of the Nencki Institute

1968

1970: prof. Jerzy Konorski honored with the degree of Doctor Honoris Causa of the University of Pennsylvania, USA

1970

1988: prof. Lech Wojtczak honored with the degree of Doctor Honoris Causa of the University of Magdeburg, Germany

1988

1992: prof. Leszek Kuznicki elected for the President of the Polish Academy of Sciences

1992

2013: the Nencki Institute awarded with the prestigious HR Excellence in Research logo as the first research institution in Poland

2013: the construction of the Nencki Institute Neurobiology Center premises completed. The project coordinated by the Nencki Institute Board of Directors (2008-2013): Adam Szewczyk, Urszula Slawinska, Hanna Fabczak and Anna Jachner.

2013

2014: the Hydrobiological Station in Mikolajki re-incorporated into the structure of the Nencki Institute

2014

2015: the Nencki Institute leads a Euro-BioImaging Node

2015: prof. Jerzy Duszynski elected the President of the Polish Academy of Sciences

2015

2016: the first ERC grant in the Institute obtained by Dr. Ewelina Knapska

2016

2018: the 100th anniversary of the Nencki Institute of Experimental Biology, Polish Academy of Sciences

2018

Timeline of the First 100 Years

Director of the Institute

Adam Szewczyk

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Anna Jachner-Miśkiewicz

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Mission of the Nencki Institute

"The mission of the Nencki Institute of Experimental Biology PAS is to strive for excellence in basic research in the broad sense of biological sciences, with maintaining the highest quality of research in the creation and dissemination of knowledge that can be applied in the context of the society needs to improve the quality of life.

The Institute carries out the mission by investing in human capital and modern research technology as well as national and international scientific cooperation. Strategic directions pursued by the Nencki Institute include the testing of the nervous system and the biological and molecular basis of lifestyle diseases.

Investing in human capital is achieved by hiring the best researchers and by assuring the optimum environment for the development of the research staff, from PhD students to professors, as well as administrative support in carrying out research projects and providing a wide range of scientific cooperation for the research staff.

Using the leading research technologies is implemented through purchase or construction of modern research equipment, providing access to a variety of research models, including transgenic animals, investing in the development of computer technologies, inventiveness stimulation and environmental laboratory formation which leads to the access to unique research equipment for the scientific community.

Scientific cooperation is fostered by stimulating and supporting the soliciting of international research projects within the limits of bilateral agreements and programs of the European Union and the organization of the international workshops and conferences."

Nencki Institute of Yesterday

The Institute was founded in 1918, shortly after the re--establishment of Poland as an independent country. It was based on three pre-existing laboratories affiliated with the Scientific Society of Warsaw (Towarzystwo Naukowe Warszawskie): Laboratory of Neurobiology (1911), Laboratory of Physiology (1913) and Laboratory of General Biology (1918). Formation and development of the Institute was supported in part by a donation of Nadine Sieber-Shumova, a close co-worker of Marceli Nencki from Berne and St. Petersburg.

Over the next two decades the Institute grew to become the leading biological research centre in Poland. The outbreak of World War II interrupted a period of its intensive expansion and achievement of scientific excellence in the field of experimental biology. After the turmoil of the war, during which over a dozen of the Institute's staff lost their lives and its premises (including most of its 30,000-volume library) were destroyed, the surviving staff members (Jan Dembowski, Stanisława Dembowska, Jerzy Konorski, Liliana Lubińska, Włodzimierz Niemierko and Stella Niemierko) re-established the Nencki Institute. In 1952 the Institute was incorporated into the newly founded Polish Academy of Sciences and the Institute's director, Prof. Dembowski, became the first President of the Academy. During the period of 1953-55 a newly erected building at 3 Pasteur Street in Warsaw became the home of the Nencki Institute.

In 1990 the Institute was invited to become a member of the Global Network for Molecular and Cell Biology (MCBN) within UNESCO. Continuously hiring new talented researchers and awarding approximately 15-20 doctoral degrees annually, the Nencki Institute is known for its competitiveness in securing external funding for research projects, as well as for the number and quality of its scientific publications. Recent success of its researchers in competitive European Community proposals is demonstrated by the formation of two European Centres of Excellence within the Institute.

Nencki Institute of Today

At the beginning of the 21st century, biology is faced with the enormous task of understanding how the information of the entire genome results in the complex biology of living organisms. Employing over 332 full-time staff (of whom about 103 are research scientists) and training 180 PhD students doing their research in 38 laboratories located in 5 departments (Department of Neurophysiology –10 laboratories, Department of Molecular and Cellular Neurobiology - 8 laboratories, Department of Biochemistry – 10 laboratories, Department of Cell Biology – 4 laboratories, Neurobiology Center - 6 laboratories), the Nencki Institute is currently the largest non-university biological research centre in Poland. The Institute is committed to generating, disseminating, and preserving biological knowledge in order to meet contemporary challenges of the Polish society. High quality of externally funded research, excellent publication record, and strong international links place the Nencki Institute among the leading biological institutions of Central and Eastern Europe.

The research goals of the Nencki Institute are to arrive at molecular, cellular and systemic explanations of excitability, movement, development, memory, learning, behaviour, ageing and disease. All those tasks need to be both intellectually satisfying and relevant to problems of human health.

Neurobiology and biochemistry represent two main research areas of the Institute. The Nencki Institute is the only research centre in Poland in which neurobiology is thoroughly studied from the molecular to the systemic level. Research projects in this field are carried out by teams belonging to the Department of Neurophysiology, Department of Molecular and Cellular Neurobiology and the Department of Biochemistry. For the teams of the two latter departments neural tissue and cells are the principal models, whereas in the Department of Neurophysiology studies are also conducted on rodents, cats, insects and humans. In addition, research in the Department of Biochemistry is focused on structure and functional properties of cytoskeletal and motor proteins, on regulation of contractile processes, on biological membranes, bioenergetics of cellular processes, metabolic regulation, signal transduction, and regulation of gene expression. The Department of Cell Biology and several other laboratories carry out studies on signaling, plasma membrane dynamics, cell growth and differentiation, cilia, the microtubule-based structures and cell motility of eukaryotic cells.

The Neurobiology Centre (NC) new facilities at the Nencki Institute have been established in 2012 as a part of the Centre for Preclinical Research and Technology (CePT) project. A number of NC core facilities are furnished with state-of-the-art research equipment and provide services not only to researchers working at the Nencki Institute and partners of the CePT consortium, but also to scientists from other research centres in Poland and abroad as well as to biotech industry. Implementation of the NC investment will enable the Institute to play an important role in pan-European initiatives, such as the EuroBioImaging project listed on the roadmap of the European Strategy Forum for Research Infrastructures (ESFRI).

The Institute also places a high emphasis on education and training. We actively recruit the best PhD candidates with the highest academic achievements, keen intellectual curiosity, and the desire to excel professionally and personally. Our staff provides them with a rigorous background in scientific concepts, tools and a hands-on learning environment. After completing PhD studies with honours and a successful external postdoctoral stage, the best students have the opportunity to return to one of our scientific teams as assistant professors, or to form a new team. New laboratories are created at the Institute to facilitate recruitment of the best specialists in research areas that are new and complementary to our current research profile. The Nencki Institute is an equal opportunity employer with full awareness of gender issues in scientific research (women account for approximately 65% of the Institute's research and administrative staff, including senior level positions).

Scientific Council in the term of 2015-2018

Chairman
Andrzej Wróbel

Vice-chairman
Anna Członkowska, Maria Jolanta Rędowicz

Secretary
Katarzyna Łukasiuk

MEMBERS FROM THE NENCKI INSTITUTE

Agnieszka Dobrzyń
Jerzy Duszyński
Hanna Fabczak
Anna Filipek
Anna Grabowska
Leszek Kaczmarek
Bożena Kamińska-Kaczmarek
Stefan Kasicki
Witold Konopka
Małgorzata Kossut
Katarzyna Kwiatkowska
Katarzyna Łukasiuk
Katarzyna Nałęcz
Sławomir Pikuła
Katarzyna Piwocka
M. Jolanta Rędowicz
Ewa Sikora
Małgorzata Skup
Urszula Sławińska
Adam Szewczyk
Krzysztof Turlejski
Grzegorz Wilczyński
Urszula Wojda
Lech Wojtczak
Daniel Wójcik
Andrzej Wróbel
Krzysztof Zabłocki
Ksenia Meyza
Tomasz Prószyński
Ilona Kotlewska-Kowalska

EXTERNAL MEMBERS

Anna Maria Ciemerych-Litwinienko
Anna Członkowska
Krzysztof Dołowy
Marek Figlerowicz
Jacek Jaworski
Jolanta Jura
Anna Kamińska
Marek Konarzewski
Jan Kotwica
Włodzimierz Krzyżosiak
Jerzy Łazarewicz
Marta Miączyńska
Barbara Przewłocka
Kazimierz Wierzchowski
Romuald Zabielski
Piotr Zielenkiewicz

WORKING GROUPS

Laboratory of Lipid Biochemistry

Laboratory of Bioenergetics and Biomembranes

Laboratory of the Molecular Bases of Ageing

Laboratory of Intracellular Ion Channels

Laboratory of Cell Signaling and Metabolic Disorders

Laboratory of Cellular Metabolism

Laboratory of Molecular Medical Biochemistry

Laboratory of Motor Proteins

Laboratory of the Molecular Basis of Cell Motility

Laboratory of Cytometry

Head:
Katarzyna Piwocka

The Department of Biochemistry is composed of nine groups and associated Laboratory of Cytometry. Individual programs are engaged within the common research area of molecular mechanisms of civilization diseases, including metabolic and mitochondrial diseases, cancer, aging, myopathies and others.

Molecular mechanisms involved in regulation of cell metabolism and the development of insulin resistance and pancreatic beta-cell dysfunction are studied by Prof. A. Dobrzyń group. In particular, they investigate signaling and transcriptional cascades as well as the role of epigenetics in human metabolic diseases, mainly type 2 diabetes.

Physiology of mitochondria in metabolic, neurodegenerative diseases and in cancer are studied by the group led by Prof. Duszynski. They focus on the mechanisms of mitochondrial stress signaling, mitochondrial dynamic processes including transport, fusion/fission and mitophagy, as well as the role of the oxidative stress in these diseases.

Energy metabolism and calcium homeostasis in normal and pathological conditions are studied by group led by Prof. Zabłocki. In particular, mechanisms responsible for regulation of calcium signaling in dystrophic muscle cells and mitochondria-related processes in vascular endothelial cells challenged by pathological stimuli are investigated.

Mitochondrial ion channels are investigated by Prof. Szewczyk's group. In particular, they study pharmacology of intracellular potassium channels, interaction of channel openers with mitochondrial proteins and the role of ion translocating mechanisms in cytoprotection and cardiovascular function during health and disease.

The cellular and molecular mechanisms of heart dysfunction are investigated by Prof. P. Dobrzyń group. The research involves *in vivo* and *in vitro* studies of signaling pathways and transcription factors associated with cardiomyocyte apoptosis and pathogenesis of the left ventricle hypertrophy.

Calcium- and lipid-binding proteins, including annexins, mechanism of the early stages of biomineralization with a focus on biogenesis and function of matrix vesicles as well as intracellular transport of cholesterol in norm and pathology are investigated by Prof. Pikula's team.

The role of cell senescence in normal and pathological ageing of the organism are studied by Prof. Sikora's team. Particularly, the molecular and cellular mechanisms of stress induced senescence, autophagy and cell death of normal and cancer cells are investigated.

Mechanisms of cell motility in physiology and pathology are studied by Prof. Redowicz's group. They investigate involvement of the actin and tubulin cytoskeleton and unconventional myosins in cell migration and invasion, and muscle contraction as well. Also, mechanisms of engagement of prion protein in pathogenesis of prion and Alzheimer diseases are in focus.

Microtubular motor proteins, kinesins and their structure and function relationship are investigated by Prof. Kasprzak's team. They study the role of the End-Binding protein 1 in the microtubule tip-tracking of kinesin-14 and the influence of posttranslational modifications of tubulin on the interaction between microtubules and kinesins.

Cellular stern response and cross-talk within the leukemia microenvironment are studied at the Laboratory of Cytometry led by Prof. K. Piwocka. They focus on the molecular mechanisms participating in the disease progression and modification of the leukemia microenvironment to propose novel therapeutic strategies.

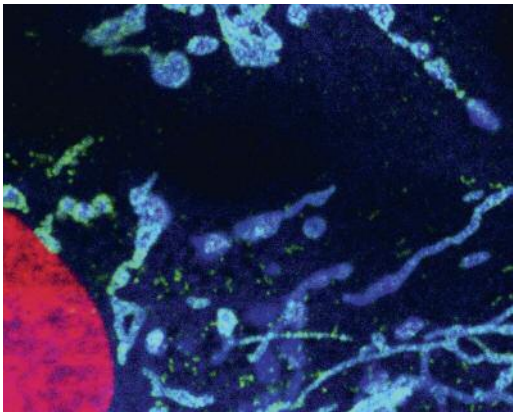


Image of mitochondria (blue), nucleus (red), and mitochondrial protein (green) in human fibroblasts.

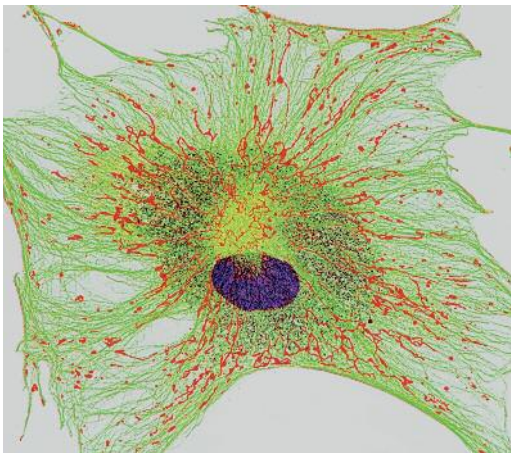


Image of mitochondria (red), nucleus (blue) and actin filaments (green) in human fibroblasts.

Head:
Sławomir Pikuła

Degrees:
2002 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
1995 DSc Habil (biochemistry), Nencki Institute of Experimental Biology, PAS
1985 PhD in Biology (biochemistry), Nencki Institute of Experimental Biology, PAS
1977 MSc in Biology, University of Warsaw

Research trainings:
1985-1988 Postdoctoral Fellow, Department of Biochemistry and Molecular Biology, Health, Science Center at Syracuse, State University of New York, Syracuse, NY (Dr. Anthony N. Martonosi)
1993-1994 Visiting Scientists, Department of Medicine, University of Arkansas for Medical Sciences, Little Rock, AR (Dr. Piotr Zimniak)
1995-1998 Visiting Scientists, Department of Human Biochemistry and Genetics, University of Texas Medical Branch at Galveston, Galveston, TX (Dr. Yogesh C. Awasthi)

Professional employments:
1997-present Head of the Laboratory of Lipid Biochemistry
2007-2011 Head of the Department of Biochemistry, Nencki Institute of Experimental Biology, PAS

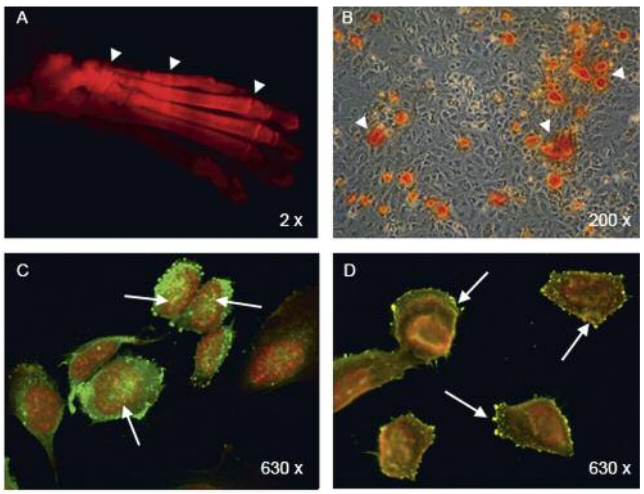
Honors and fellowships:
2007-present Member of the Scientific Council, Nencki Institute of Experimental Biology, PAS
2007-2014 Member of the Committee of Biochemistry and Biophysics, PAS
2003 present Member of the editorial board of international journal Acta Biochimica Polonica (associate editor)
2005-present Editor-in-chief of polish scientific journal Postępy Biochemii (Advances in Biochemistry)
1995 present Polish Biochemical Society

Staff: Łukasz Bożycki (PhD student), Magdalena Komiażyk-Mikulska (PhD student), Monika Roszkowska (PhD student), Krzysztof J. Skowronek, Agnieszka Strzelecka-Kiliszek

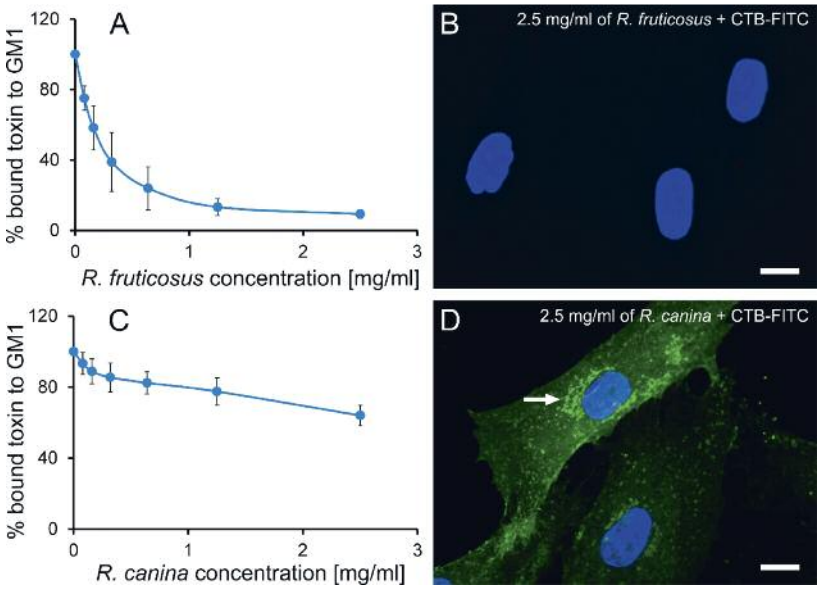
Laboratory of Lipid Biochemistry

Research profile:
• calcium homeostasis with an emphasis on calcium- and lipid-binding proteins, including mammalian and plant annexins
• early stages of biomineralization with a focus on biogenesis and the function of matrix vesicles
• membrane dynamics and membrane repair process
• vesicular transport with a focus on intracellular transport of cholesterol in norm and pathology
• lipid metabolism in health and disease with a focus on signal transduction and transport of ions, metabolites and xenobiotics through biological membranes
• ion channels formed by calcium- and membrane-binding proteins with a focus on nucleotides as intracellular messengers and their target proteins
• annexin-related human diseases, annexinopathies

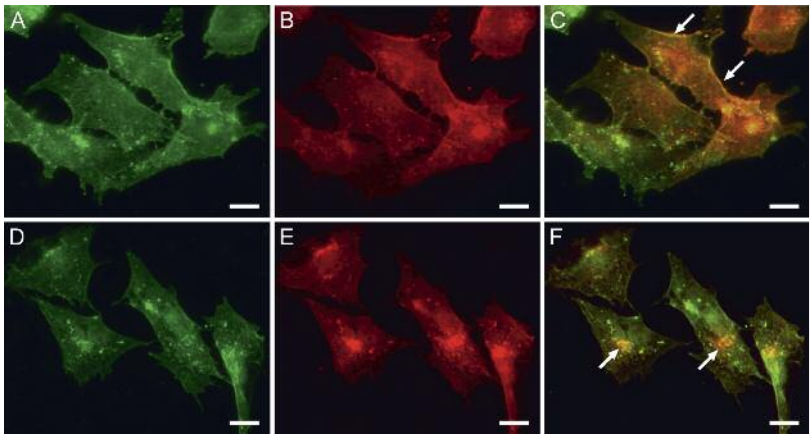
Current research activities:
• structure-function relationship within the mammalian family of membrane- and calcium-binding proteins, annexins, with special emphasis on the physiological and pathological mineralization
• ion channel properties of annexins
• participation of annexins in transport of cholesterol and secretion of catecholamines
• factors affecting annexins, alkaline phosphatase, and S100 protein functioning during matrix vesicles-mediated biological mineralization



Mineralization of rat leg bone (A) and human Saos-2 osteosarcoma cells (B, C, D). A – Organ was cleared by PARTY method and stained with AR-S. B, C, D – The cell cultures were stimulated for mineralization by 7 days with AA and β-GP. Then probes were stained with AR-S (B) or fixed, and stained with AnxA6-FITC (C, D, green color) together with Src-TRITC (C, red color) or ROCK-TRITC (D, red color) antibodies. Red color visible on low magnification images (A, B) indicates on calcium-phosphate minerals deposition (arrowheads). Yellow color visible on high magnification merged images (C, D) indicates on proteins (AnxA6-kinases) co-localization (arrows) (taken from Postepy Biochemii 63(2). 2017).



Some aqueous plant extracts can inhibit binding of cholera toxin β subunit (CTB) to the GM1 receptors, what can improve the treatment of cholera-like diarrhea. A, C - Modified ELISA binding assay showing the amount of CTB immobilized on GM1-coated microplates in the presence of aqueous extract of Rubus fruticosus (A) and Rosa canina (C). B, D - Fluorescent microscope assay showing the CTB-FITC labeling in the fibroblast after incubation with R. fruticosus (B) or R. canina (D). Bars indicate 10 μm.



Co-localization of lipid raft markers in transdifferentiated Vascular Smooth Muscle Cells. Resting (A, B, C) or stimulated (D, E, F) for mineralization by 21 days with AA and β-GP cells were fixed, stained with CTB-FITC binding to GM1 (A, D, green color) together with filipin recognizing free cholesterol (B, E, red color). Yellow color visible on merged images (C, F) indicates on lipid rafts markers, GM1 and cholesterol, accumulation on the plasma membrane of resting cells (C, arrows) and in the apical region of stimulated cells (F, arrows). Bars indicate 10 μm.

Selected publications: Strzelecka-Kiliszek A., Mebarek S., Roszkowska M., Buchet R., Magne D., Pikuła S. (2017) Functions of Rho family of small GTPases and Rho-associated coiled-coil kinases in bone cells during differentiation and mineralization. Biochim Biophys Acta, 1861: 1009-1023.

Francois-Moutal L., Ouberai M.M., Maniti O., Welland M.E., Strzelecka-Kiliszek A., Woś M., Pikuła S., Bandorowicz-Pikuła J., Marcillat O., Granjon T. (2016) Two-step membrane binding of NDPK-B induces membrane fluidity decrease and changes in lipid lateral organization and protein cluster formation. Langmuir, 32: 12923-12933.

Woś M., Szczepanowska J., Pikuła S., Tylki-Szymanska A., Zabłocki K., Bandorowicz-Pikuła J. (2016) Mitochondrial dysfunction in fibroblasts derived from patients with Niemann-Pick type C disease. Arch Biochem Biophys, 593: 50-59.

Ren Z., Do L.D., Bechkoff G., Mebarek S., Keloglu N., Ahamada S., Meena S., Magne D., Pikula S., Wu Y., Buchet R. (2015) Direct determination of phosphatase activity from physiological substrates in cells. PLoS One, 10(3): e0120087.

Ćmoch A., Podszywalow-Bartnicka P., Palczewska M., Piwocka K., Groves P., Pikula S. (2014) Stimulators of mineralization limit the invasive phenotype of human osteosarcoma cells by a mechanism involving impaired invadopodia formation. PLoS One, 9(10): e109938.

Head:
Jerzy Duszyński

Degrees:
1993 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
1983 DSc Habil, Nencki Institute of Experimental Biology, PAS
1975 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1971 MSci in Biology, University of Warsaw

Research trainings:
1985-1986, France (1 year in the laboratory of P.V. Vignais, Nucleaire Centre, Grenoble) Numerous short-term internships in laboratories of P.V. Vignais (Grenoble), France J.M. Tager (Amsterdam), W. Kunz (Magdeburg), F. Palmieri (Bari), J.P. Mazat (Baurdeaux), V.P. Skulachev (Moscow), Russia
1976-1978, 1992 the USA (3 years in the laboratories of J.R. Williamson, Pennsylvania University, Philadelphia and K.F. LaNoue, PennState Univ., Hershey), USA

Professional employments:
2015-present President, the Polish Academy Sciences
2008-2009 Undersecretary, Ministry of Science and Higher Education
1971-present Professor, Head of the Laboratory of Bioenergetics and Biomembranes, Nencki Institute of Experimental Biology, PAS

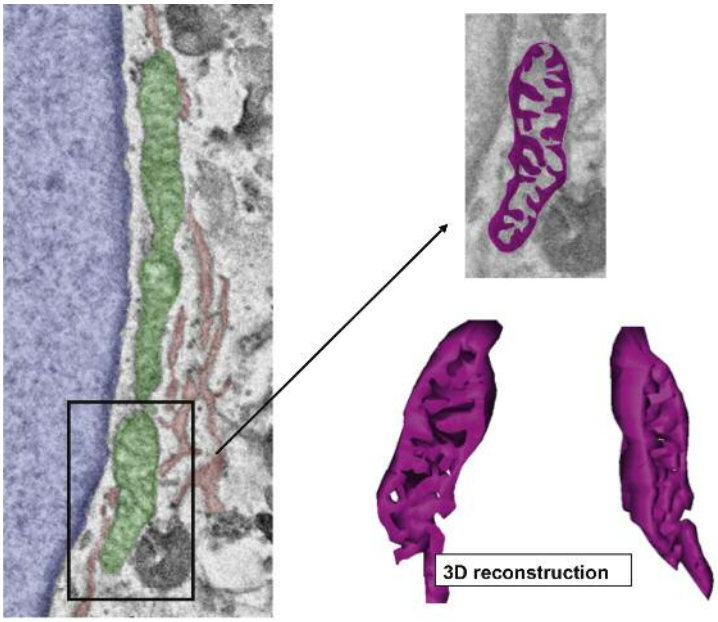
Honors and fellowships:
2016-2017 Grant from Philip Morris International
2011- 2014 Human Frontiers Scientific Program
2012 Member Academia Europaea
2007 Member of the Polish Academy of Sciences

Staff: Violetta Biernat, Karolina Drabik (PhD student), Irina Kamarieva (PhD student), Magdalena Lebiedzińska-Arciszewska, Dominika Malińska, Bernardeta Michalska (PhD student), Małgorzata Partyka (PhD student), Paulina Patalas-Krawczyk (PhD student), Monika Prill (PhD student), Joanna Szczepanowska, Jędrzej Szymański, Jarosław Walczak, Mariusz Więckowski, Lech Wojtczak (Professor emeritus)

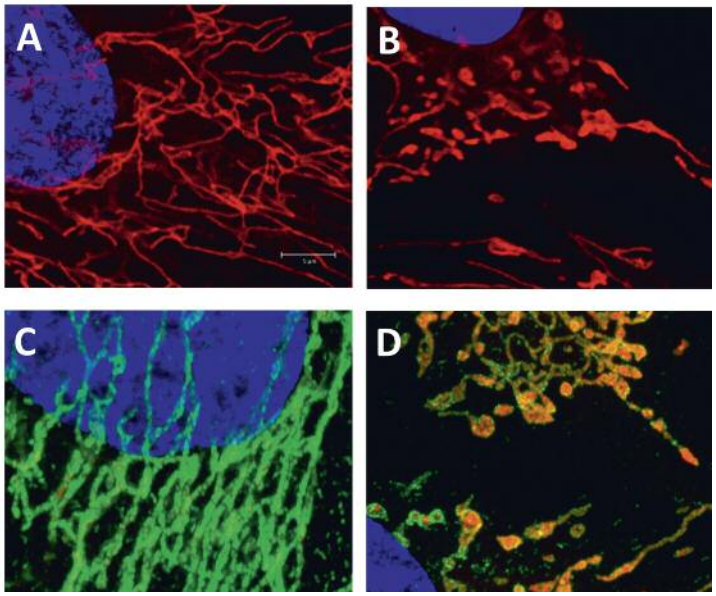
Laboratory of Bioenergetics and Biomembranes

Research profile:
- bioenergetics, mitochondrial energy metabolism and energy coupling
- mitochondrial function in neurodegenerative diseases and in cancer
- mitochondrial stress signaling – biogenesis and mitophagy
- mitochondrial dynamics, transport and mitochondrial network

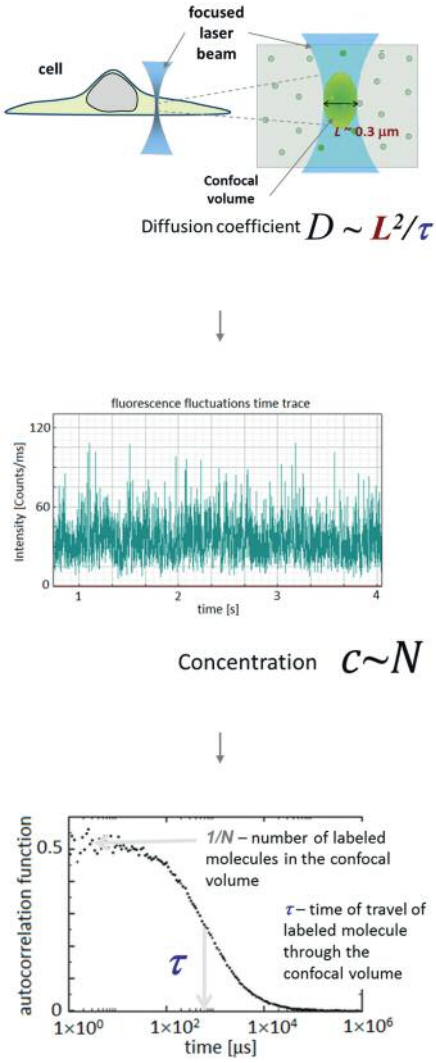
Current research activities:
- molecular composition of the mitochondrial permeability transition pore
- role of MAM (Mitochondria Associated Membranes) components in cell physiology
- fusion/fission and morphology of mitochondrial network
- intracellular dynamics of selected proteins (Drp1 and GBE1)
- mitochondrial functions in sporadic and familial forms of neurodegenerative diseases (Alzheimer, Parkinson, Amyotrophic Lateral Sclerosis)
- mitochondrial biogenesis and mitophagy processes in mitochondrial stress signaling (retrograde signaling)
- involvement of p66Shc protein in the oxidative stress
- GDSs – glycogen storage diseases: role of glycogen in the nervous system
- calcium signaling in mitochondrial transport



Mitochondria in fibroblast – EM and 3D reconstruction



Mitochondrial network in fibroblasts derived from ALS patients (B,D) and control subjects (A,C); blue – nuclei (DAPI), red – mitochondria (Mito Tracker) (C,D) Colocalization of Fis1 protein (green fluorsecence) with mitochondria (red fluorescence)



Fluorescence Correlation Spectroscopy – technique to measure diffusion and concentration in the living cell.

Selected publications: Oparka M., Walczak J., Malinska D., van Oppen L.M.P.E., Szczepanowska J., Koopman W.J.H., Wieckowski M.R. (2016) Quantifying ROS levels using CM-H2DCFDA and HyPer. Methods, S1046-2023(16)30172-4.

Wojewoda M., Walczak J., Duszyński J., Szczepanowska J. (2015) Selenite activates the ATM kinase-dependent DNA repair pathway in human osteosarcoma cells with mitochondrial dysfunction. Biochem Pharmacol, 95(3): 170-176.

Lebiedzinska-Arciszewska M., Oparka M., Vega Naredo I., Karkucinska-Wieckowska A., Pinton P., Duszyński J., Więckowski M.R. (2015) The interplay between p66Shc, Reactive Oxygen Species and cancer cell metabolism. Eur J Clin Invest, 1:25-31.

Suski J.M., Lebiedzinska M., Wojtala A., Duszyński J., Giorgi C., Pinton P., Wieckowski M.R. (2014) Isolation of plasma membrane--associated membranes from rat liver. Nature Protocols, 9(2): 312-322.

Szczepanowska J., Malinska D., Wieckowski M.R., Duszynski J. (2012) Effect of mtDNA point mutations on cellular bioenergetics. Biochim Biophys Acta-Bioenerg, 1817(10): 1740-1746.

Head:
Ewa Sikora

Degrees:

2002 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
1998 DSc Habil, Nencki Institute of Experimental Biology, PAS
1983 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1977 MSc in Biology, University of Warsaw

Professional employments:

2003 Professor Nencki, Institute of Experimental Biology, PAS
1999 Associate Professor, Nencki Institute of Experimental Biology, PAS
1995 Contract Professor of University of Modena, Italy
1983 Assistant Professor (adjunct), Nencki Institute of Experimental Biology, PAS
1981 Assistant, Nencki Institute of Experimental Biology, PAS

Honors and fellowships:

2009 Polonia Restituta
2007 The award of Polish Academy of Sciences for a series of papers: „Molecular Mechanisms of cellular senescence and cell death"
1996 Godeski Visiting Professorship at Cross Cancer Institute, Edmonton, Canada
1994 UNESCO stipend for training at the University of Modena School of Medicine, Modena, Italy
1992-1993 FEBS fellowship for training at the University of Modena School of Medicine, Modena, Italy
1986-1987 Postdoctoral fellowship of National Union Against Cancer for postdoc position in Institute of Cancer Research, Sutton, Surrey, England

Staff: Anna Bielak-Żmijewska, Agnieszka Bojko, Agata Ciołko (PhD student), Joanna Czarnecka (PhD student), Magdalena Dąbrowska, Magdalena Dudkowska, Wioleta Grabowska (PhD student), Dorota Janiszewska, Anna Karpa, Karolina Kucharewicz (PhD student), Grażyna Mosieniak, Anna Strzeszewska (PhD student), Piotr Sunderland (PhD student)

Laboratory of the Molecular Bases of Ageing

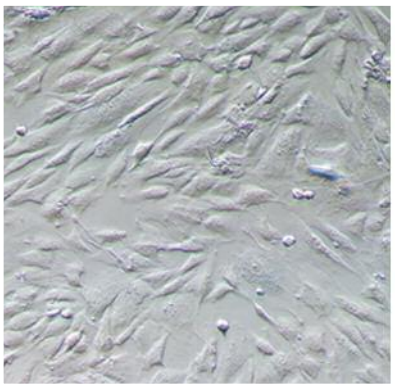
Research profile:

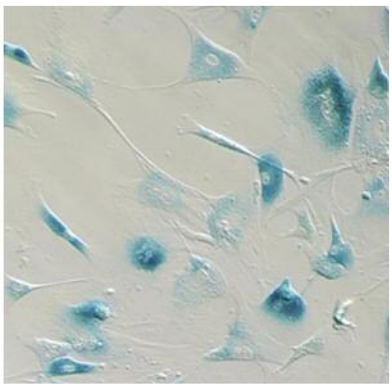
We are interested in the molecular mechanisms of cell senescence, which is considered as an irreversible arrest of cell proliferation involved in normal and pathological ageing of the organism. Senescent cells remain alive and metabolically active. They secrete a mix of molecules which can influence other cells. We are interested whether these molecules are secreted in exosomes and how they change the function of the immune cells. Senescent cells can also communicate with other cells by cytoplasmic bridges which are of our interest. We study the mechanisms of cell autophagy and its molecular and functional connection with cell senescence. DNA double strand breaks (DSBs) triggers a signaling and effector pathway known as the DNA damage response (DDR) that coordinates cell-cycle arrest and DNA repair. It is believed that persistent DDR signaling establishes cellular senescence. Our studies indicate that this paradigm is not valid in some models of cell senescence. Moreover, ATM the key protein of DDR can still have unrecognized role in DDR-independent senescence as well as senescence of non-dividing post-mitotic (neuronal) cells. In senescing human VSMCs we aim to dissect the role of epigenetic modification and compaction of chromatin. Cell senescence can be also induced in cancer cells as an outcome of anticancer treatment. As we showed previously that the process of cancer cell senescence can be reversible we are interested in dissecting the mechanisms of divisions of cancer cells induced to senescence and the role of polyploidy and stemness in this process.

Current research activities:

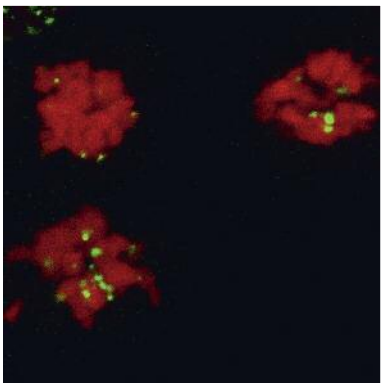
The projects are aimed to dissect:

- the role of senescence induced secretory phenotype (SIPS) of senescing human vascular smooth muscle cells (VSMCs) in modulating of the immune cell function,
- the role of chromatin modulation in normal cell senescence (VSMCs, human skin fibroblasts),
- the role of cytoskeletal proteins in direct communication between human senescent cells (VSMCs),
- the influence of natural polyphenol, curcumin on DNA damage and its role in senescence of normal and cancer cells,
- the role of DNA damage and DNA damage response (DDR) in senescence, autophagy and cell death of rodent neurons and human iPSCs,
- mechanisms of cell senescence and induction of secretory phenotype in cancer cells with non-functional DDR, particularly due to the lack of the functional p53 protein,
- the interconnection between senescence, polyploidy and stemness of cancer cells,
- the mechanisms of autophagy regulation by tacrin--melatonin derivatives in normal and cancer cells,
- the role of the immune system and inflammaging in healthy and unhealthy ageing,
- the influence of novel agents targeting telomeres on cancer and normal cell fate.

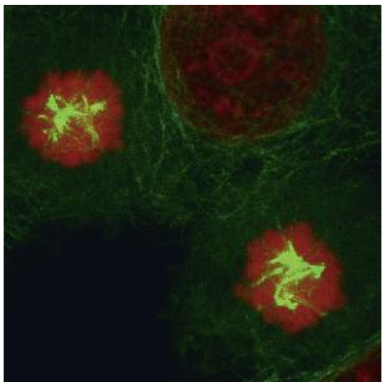




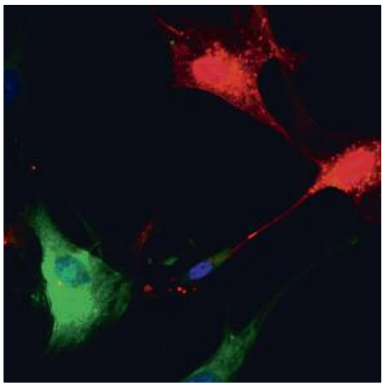
Young, proliferating (left) and senescent (right) vascular smooth muscle cells (VSMCs). Blue staining reflects increased activity of SA-β-galactosidase (marker of cellular senescence).



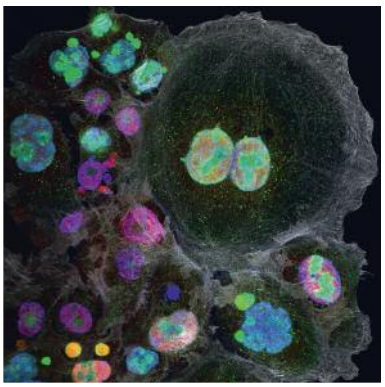
Double strand DNA breaks recognized by γH2AX foci in human colon cancer cells arrested in mitosis upon curcumin treatment.



Aberrant mitotic spindles formed in curcumin treated human breast cancer MCF-7 cells.



Cytoplasmic bridges that enables direct cell-to-cell communication between two populations of vascular smooth muscle cells stained in green or red.



Giant polyploid cancer cells with different expression of Ki67 proliferation marker and p21 cell cycle inhibitor.

Selected publications: Piechota M., Sunderland P., Wysocka A., Nalberczak M., Śliwińska M.A., Radwańska K., Sikora E. (2016) Is senescence-associated β-galactosidase a marker of neuronal senescence? Oncotarget, 7(49): 81099-81109.

Przybylska D., Janiszewska D., Goździk A., Bielak-Żmijewska A., Sunderland P., Sikora E., Mosieniak G. (2016) NOX4 downregulation leads to senescence of human vascular smooth muscle cells. Oncotarget, 7(41): 66429-66443.

Grabowska W., Suszek M., Wnuk M., Lewińska A., Wasiak E., Sikora E., Bielak-Zmijewska A. (2016) Curcumin elevates sirtuin level but does not postpone in vitro senescence of human cells building the vasculature. Oncotarget, 7(15): 19201-19213.

Mosieniak G., Śliwinska M.A., Przybylska D., Grabowska W., Sunderland P., Bielak-Zmijewska A., Sikora E. (2016) Curcumin-treated cancer cells show mitotic disturbances leading to growth arrest and induction of senescence phenotype. Int J Biochem Cell Biol, 74: 33-43.

Mosieniak G., Śliwinska M.A., Alster O., Strzeszewska A., Sunderland P., Piechota M., Was H., Sikora E. (2015) Polyploidy Formation in Doxorubicin-Treated Cancer Cells Can Favor Escape from Senescence. Neoplasia. 17(12): 882-893.

Head:
Adam Szewczyk

Staff: Piotr Bednarczyk, Agnieszka Kiełbasa (PhD student), Piotr Koprowski, Milena Krajewska (PhD student), Bogusz Kulawiak, Michał Laskowski (PhD student), Anna Olszewska, Daria Rotko (PhD student), Shur Kucman (PhD student), Antoni Wrzosek, Monika Zochowska

Degrees:

2004 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
1998 DSc Habil, Nencki Institute of Experimental Biology, PAS
1989 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1984 MSc in Chemistry, Chemical Faculty, University of Warsaw

Research trainings:

1997-1998 Visiting Scientists, Eduardo Marban Lab, Johns Hopkins University, USA
1990-1991 Postdoctoral Fellow, Michel Lazdunski Lab, University of Nice, Sophia Antipolis, France
1989-1990 Postdoctoral Fellow, Angelo Azzi Lab, Bern University, Switzerland

Professional employments:

2008-present Director of the Nencki Institute of Experimental Biology, PAS
2004-2008 Deputy Director of the Nencki Institute of Experimental Biology, PAS
2001-present Head of the Laboratory of Intracellular Ion Channels, Nencki Institute of Experimental Biology, PAS
1998-2004 Associate Professor of Biochemistry, Nencki Institute of Experimental Biology, PAS
1992-1998 Assistant Professor of Biochemistry, Nencki Institute of Experimental Biology, PAS

Honors and fellowships:

2008-present Deputy President of Biochemical Society
2008-2011 Deputy Head, Division of Biological Sciences, Polish Academy of Sciences
2006-2009 Director of Polish Mitochondrial Network MitoNet.pl
2006-2014 Congress Counselor at Executive Committee of Federation of European Biochemical Societies
2001-2004 Secretary of Polish Biochemical Society
2001 Roche Organ Transplantation Research Foundation Grant
1989 PhD thesis Cum Laude

Laboratory of Intracellular Ion Channels

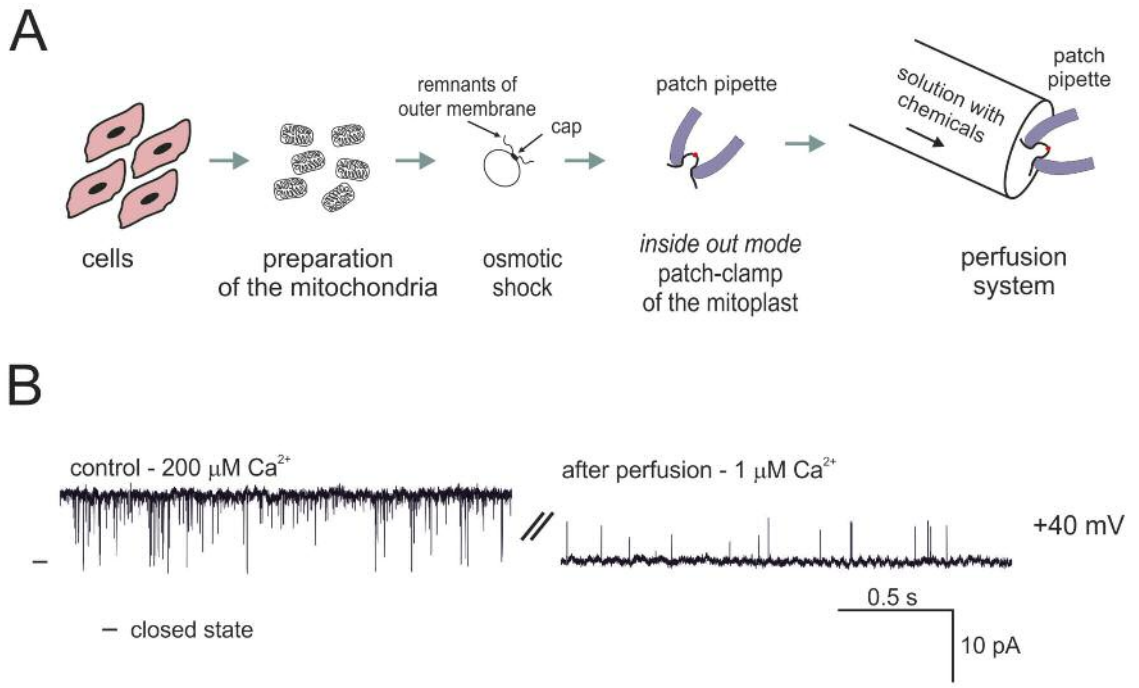
Research profile:

Intracellular ion channels regulate many key cellular functions by controlling the ion fluxes across different intracellular compartments. Our laboratory is particular interested in potassium channels found in inner mitochondrial membrane. We focus on pharmacology of intracellular potassium channels, interaction of potassium channel openers with mitochondria and the role of mitochondria in cytoprotection. Our overall objective is to study the role of intracellular potassium channels in cellular function during health and disease.

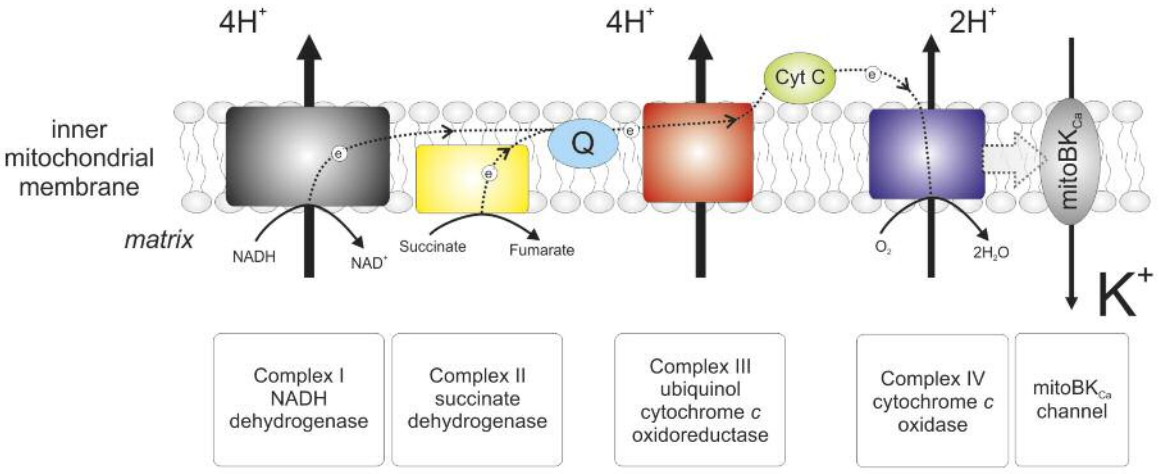
Current research activities:

The laboratory, established in June 1999 is focused on mitochondrial potassium channels. We study the following topics:

- interaction of mitochondrial potassium channels with regulatory proteins,
- mechanism of (neuro) cytoprotective action of potassium channel openers,
- functional role of mitochondrial ATP-regulated and BK-types potassium channels,
- regulation of mitochondrial potassium channels by plant derived substances such as flavonoids, and gaseous signaling molecules,
- role of mitochondrial potassium channels in skin physiology.



Ion channels reside in the inner membrane of mitochondria. A) Scheme of procedure leading to the recording of the activity of mitochondrial ion channels. B) Activity of a mitochondrial calcium-activated large conductance potassium channel (mitoBKCa) in the presence of high (left) and low (right) concentration of calcium ions.



Cartoon demonstrating a physical and functional interaction between mitoBKCa and complex IV of mitochondrial electron transport chain. We showed that substrates of the respiratory chain, such as NADH or succinate, decrease the activity mitoBKCa.

Selected publications: Laskowski M., Augustynek B., Kulawiak B., Koprowski P., Bednarczyk P., Jarmuszkiewicz, W., Szewczyk A. (2016) What do we not know about mitochondrial potassium channels? Biochim Biophys Acta-Bioenerg, 1857 (8): 1247-1257.

Toczyłowska-Mamińska R., Olszewska A., Laskowski M., Bednarczyk P., Skowronek K., Szewczyk A. (2014) Potassium channel in the mitochondria of human keratinocytes. J Invest Dermatol, 134 (3): 764-772.

Augustynek B., Kudin A.P., Bednarczyk P., Szewczyk A., Kunz W.S. (2014) Hemin inhibits the large conductance potassium channel in brain mitochondria: A putative novel mechanism of neurodegeneration. Exp Neurol, 257: 70-75.

Wrzosek A. (2014) The potassium channel opener NS1619 modulates calcium homeostasis in muscle cells by inhibiting SERCA. Cell Calcium, 56 (1): 14-24.

Bednarczyk P., Wieckowski M.R., Broszkiewicz M., Skowronek K., Siemen D., Szewczyk A. (2013) Putative Structural and Functional Coupling of the Mitochondrial BKCa Channel to the Respiratory Chain. PLoS ONE, 8 (6): e68125.

Head:
Agnieszka Dobrzyń

Degrees:
2015 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
2006 DSc Habil in Medical Sciences, Medical University of Bialystok
2001 PhD in Medical Sciences, Medical University of Bialystok
1997 MSc in Biology, University of Warsaw

Research trainings:
2002-2006 Dep. of Biochemistry, University of Wisconsin-Madison, USA
2001 Dep. of Surgery, Vienna University Hospital, Austria
1998 Dep. of Biochemistry, University of Munster, Germany

Professional employments:
2007-present Head of the Laboratory of Cell Signaling and Metabolic Disorders, Nencki Institute of Experimental Biology, PAS
2002-2006 Postdoc, Dep. of Biochemistry, University of Wisconsin, Madison, USA
1997-2002 Assistant, Dep. of Physiology, Faculty of Medicine, Medical University of Bialystok

Honors and fellowships:
2016 Award for Outstanding Scientific Achievements awarded by the Minister of Science of Higher Education
2017- present Chair of the 'ERC starting grants' expert panel, Brussels, Belgium
2016-present Member of the Committee of Molecular and Cellular Biology, PAS
2015-present Chair of the 'Mobility plus' expert panel, Polish Ministry of Science and Higher Education
2007-present Member of EMBO YIP
2003, 2005 Polish Public Health Minister's Research Awards
2004-2005 American Heart Association Fellowship

Staff: Aneta Dobosz (PhD student), Anna Dziewulska, Justyna Janikiewicz, Katarzyna Kolczyńska (PhD student), Sai Santosh Babu Komakula (PhD student), Błażej Krupa (PhD student), Patrycja Kucharczyk (PhD student), Paulina Pawelec, Aleksandra Rumińska (PhD student)

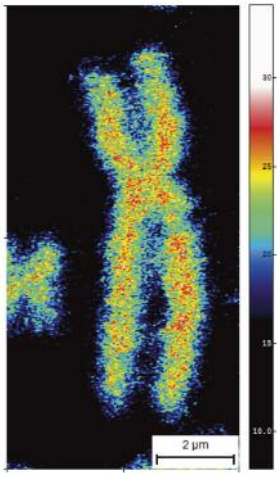
Laboratory of Cell Signaling and Metabolic Disorders

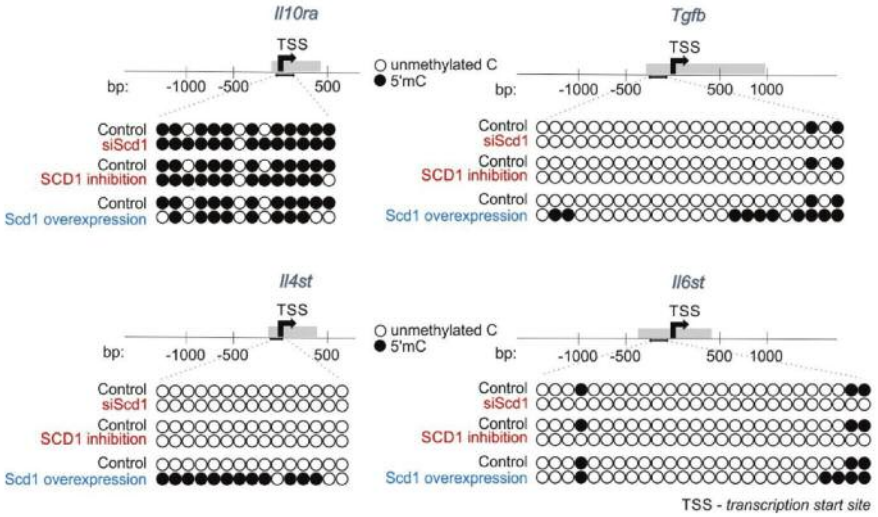
Research profile:
Our research group carries out multidisciplinary studies on signaling and transcriptional cascades that have far-reaching implications on cell metabolism and human metabolic diseases, mainly type 2 diabetes. Our main priority is to understand the role of lipid metabolites and epigenetic modifications of gene expression in the development of insulin resistance and pancreatic β-cell dysfunction. We are also interested in gaining insights into the functional role of stearoyl-CoA desaturase (SCD) in regulation of pancreatic islet metabolism and development because it will increase our awareness of lipid partitioning, and may have important implications for pathogenesis of the Metabolic Syndrome. Our research is focused on signaling pathways affected by fatty acids during pancreatic organogenesis in healthy and insulin resistant models and determination the role for lipid mediators in pancreatic β-cell – α-cell communication as well as the cross-talk between insulin resistant tissues (i.e. skeletal muscle and adipose tissue) and pancreatic islets. Our genuine intension is to provide solid foundation for knowledge about the role of lipid mediators in pancreatic islet organogenesis and function, and to increase an understanding of molecular mechanisms that trigger pancreatic β-cell adaptation towards systemic insulin resistance. We are also a partner of a multi-sectorial consortium whose ultimate goal is to generate Human Bionic Pancreas – a 3D functional scaffold for islet transplants that could become a fully-fledged method for the treatment of diabetes.

Current research activities:

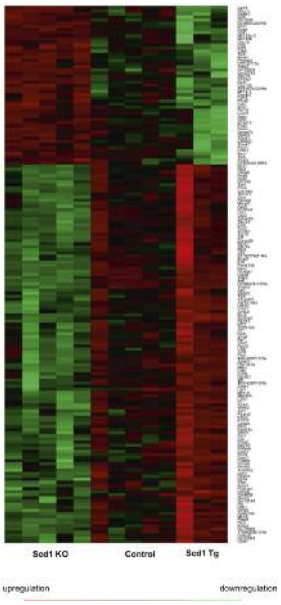
- metabolic regulation of the DNA damage response in pancreatic β cells in different models of type 2 diabetes
- lipid signaling in regulation of organogenesis and embryonic development of pancreatic islets
- epigenetic regulation of pancreatic islets' metabolism and function
- metabolic and genetic abnormalities in endocannabinoid-related regulation of insulin sensitivity
- heat shock protein HSP72 in the development of lipid--induced insulin resistance in skeletal muscle
- adipose-derived stem cells as a source of insulin- and glucagon- producing cells for tissue engineering and regenerative medicine applications

Methyl-group spatial distribution within chromosome 1 of pancreatic beta-cell.

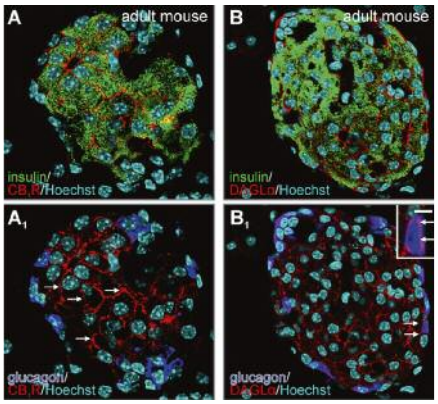




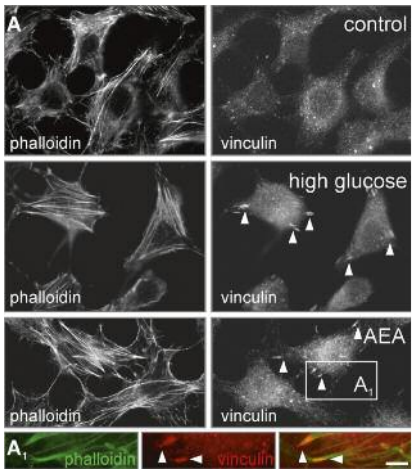
SCD1 regulates promoter methylation of genes involved in inflammatory response. Representative bisulfite sequencing analysis of CpG sites within promoters of Tgfb, Il10ra, Il4st, Il6st genes.



SCD1 regulates gene transcription in skeletal muscle. Microarray analysis of muscle transcriptome of wild type mice (Control), Scd1 knock-outs (Scd1 KO), and mice with muscle-specific over--expression of Scd1 (Scd1 Tg).



Organization of endocannabinoid signaling networks in pancreatic islets.



Activation of CB1 receptor induces insulin secretion via cytoskeletal remodeling.

Selected publications: Koziński K., Jazurek M., Dobrzyń P., Janikiewicz J., Kolczyńska K., Gajda A., Dobrzyń A. (2016) Adipose- and muscle-derived Wnts trigger pancreatic β-cell adaptation to systemic insulin resistance. Sci Rep, 6: 31553.

Maleńczyk K., Keimpema E., Piscitelli F., Calvigioni D., Björklund P., Mackie K., Di Marzo V., Hökfelt T.G., Dobrzyń A., Harkany T. (2015) Fetal endocannabinoids orchestrate the organization of pancreatic islet microarchitecture. Proc Natl Acad Sci USA, 112: E6185-6194.

Janikiewicz J., Hanzelka K., Dziewulska A., Koziński K,. Dobrzyń P, Bernaś T, Dobrzyń A (2015) Inhibition of SCD1 impairs palmitate-derived autophagy at the step of autophagosome-lysosome fusion in pancreatic β-cells. J Lipid Res, 56: 1901-1911.

Malodobra-Mazur M., Dziewulska A., Koziński K., Dobrzyń P., Kolczyńska K., Janikiewicz J., Dobrzyń A. (2014) Stearoyl-CoA desaturase regulates inflammatory gene expression by changing DNA methylation level in 3T3 adipocytes. Int J Biochem Cell Biol, 55: 40-50.

Malenczyk K., Jazurek M., Keimpema E., Silvestri C., Janikiewicz J., Mackie K., Di Marzo V., Redowicz M.J., Harkany T., Dobrzyń A. (2013) CB1 cannabinoid receptors couple to focal adhesion kinase to control insulin release. J Biol Chem, 288: 32685-32699.

Head:
Krzysztof Zabłocki

Degrees:
2014 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
2005 DSc Habil, Nencki Institute of Experimental Biology, PAS
1988 PhD in Biochemistry, Institute of Biochemistry, University of Warsaw
1979 MSc in Biochemistry, Institute of Biochemistry, University of Warsaw

Research trainings:
2001 Institute of Biochemistry, Academic Medical Centre, University of Amsterdam, Netherland
1989-1991 Postdoctoral fellowship in the Laboratory of Kidney and Electrolyte Metabolism, National Heart, Lung and Blood Institute, National Institutes of Health, Bethesda MD, USA

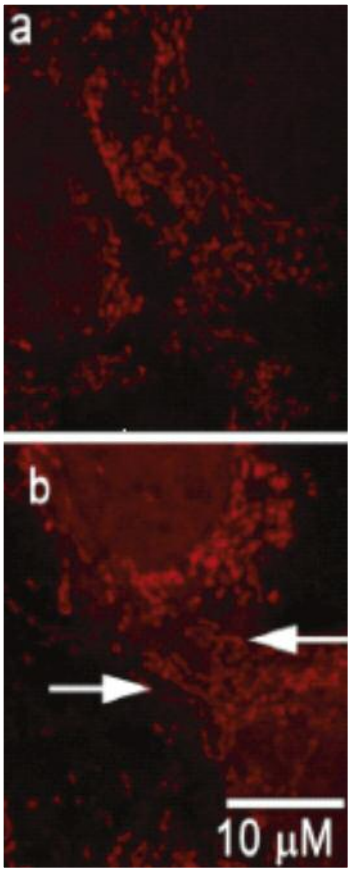
Professional employments:
2014-present Professor, Nencki Institute of Experimental Biology, PAS
2007-present Head of the Laboratory of Cellular Metabolism, Nencki Institute of Experimental Biology, PAS
2005-2013 Associate professor, Nencki Institute of Experimental Biology, PAS professor, Nencki Institute of Experimental Biology
1991-1995 Assistant professor, Institute of Biochemistry, Faculty of Biology, University of Warsaw
1989-1991 Visiting Fellow in Laboratory of Kidney and Electrolyte Metabolism, National Heart, Lung and Blood Institute, National Institutes of Health, Bethesda MD, USA
1978-1989 Technician, Assistant and Senior assistant, Institute of Biochemistry, Faculty of Biology, University of Warsaw

Staff: Joanna Bandorowicz Pikuła, Dorota Dymkowska, Zofia Magier (PhD student), Aleksandra Oksiejuk (PhD student), Justyna Róg

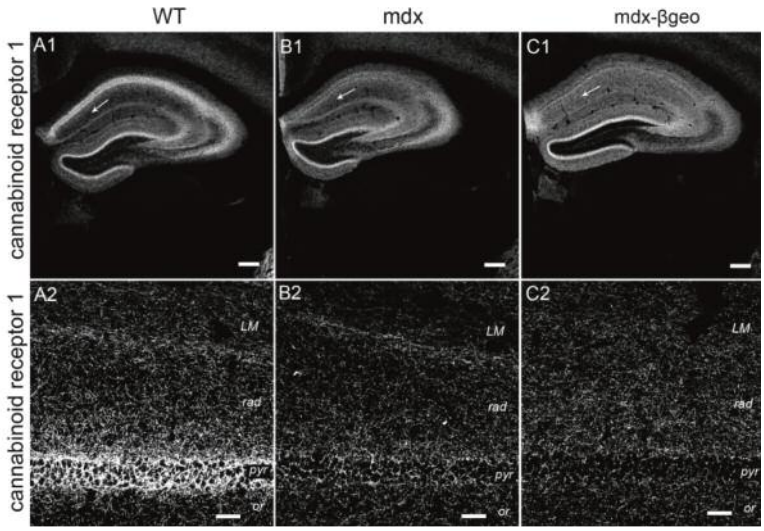
Laboratory of Cellular Metabolism

Research profile:
The laboratory is focused on cellular calcium handling and bioenergetics of mammalian cells under normal and pathological conditions. In particular, we are interested in:
• effects of mutation in the dystrophin gene on calcium signaling, intracellular calcium homeostasis and energy metabolism in muscle and non-muscle cells derived from mdx mice (animal model of Duchenne Muscular Dystrophy)
• response of human endothelial cells to various stress-inducing stimuli such as: inflammation, insulin resistance, genotoxicity etc. with special emphasis on mitochondrial metabolism and function
• characterization of cellular bioenergetics in various cells with mutations within mitochondrial or nuclear DNA, affecting mitochondrial and extramitochondrial metabolic pathways

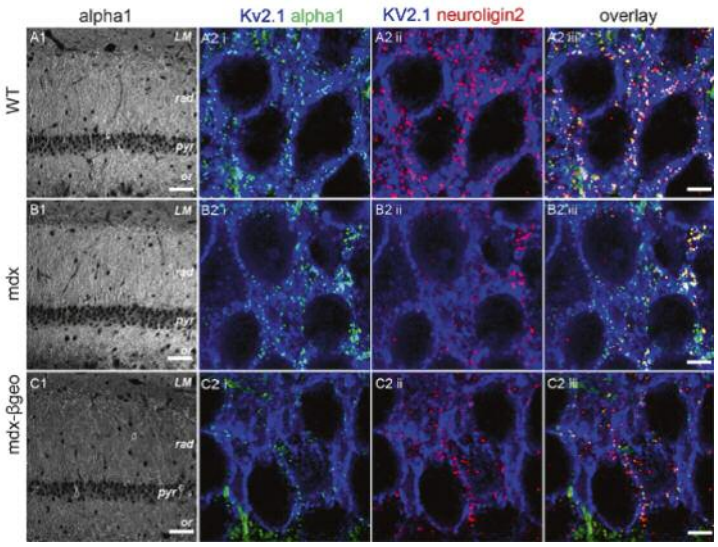
Current research activities:
• biochemical and molecular mechanisms responsible for impaired calcium metabolism in undifferentiated myoblasts derived from mdx mice. The role of P2Y and P2X receptors in abnormal calcium homeostasis in dystrophic muscle cells is the current topic of our investigation. In our study we are using both immortalized cell lines (myoblasts and myotubes) and primary myoblasts derived from mdx mice.
• study of TNFα and insulin resistance in human vascular endothelial cells. The role of nicotinamide N-methyltransferase and mitochondrial mechanisms in a cellular response to these stimuli. Cellular bioenergetics, oxidative stress, nitric oxide synthesis and mitochondrial biogenesis are of particular interest.
• study on calcium homeostasis and the role of annexins in endothelial cells with induced insulin resistance.



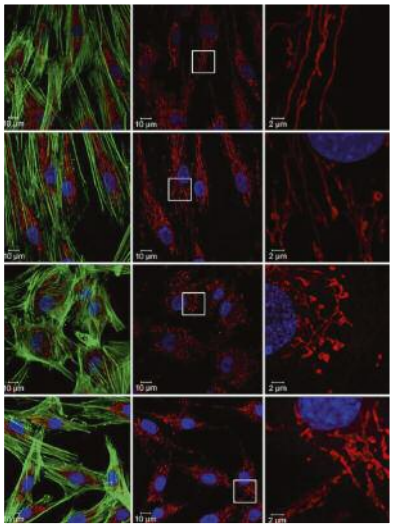
Effect of TNFa on mitochondrial network architecture in endothelial WE,hy926 cells. a, control; b, treated with TNFa. Arrows indicate tubular mitochondria which suggest cellular stress response. (Drabarek et al. 2012)



Localisation and quantification of CB1 immunoreactivity within the hippocampus of WT and dystrophin-deficient mice, reacted and imaged under identical conditions. (Krasowska et al. 2014)



Localisation and quantification of GABAAR alpha1 subunit immunoreactivity within the CA1 region of the hippocampus of WT and dystrophin-deficient mice, reacted and imaged under identical conditions (Krasowska et al. 2014)



Visualization of the mitochondrial network in control and NPC1 mutant N466 and N521 cells. The left column: Mitochondria were stained with MitoTracker Red CMXRos and are shown in red. Actin filaments were stained with phalloidin-A488 while nucleus with DAPI and are visible in green and blue, respectively. Zoomed views (from the regions indicated in the middle column photographs) of spatial organization of the mitochondrial network are displayed in the right column (Woś et al.2016).

Selected publications: Mebarek S., Abousalham A., Magne D., Do L.D., Bandorowicz-Pikula J., Pikula S., Buchet R. (2013) Phospholipases of mineralization competent cells and matrix vesicles: roles in physiological and pathological mineralizations. Int J Mol Sci, 14: 5036-5129.

Dymkowska D., Drabarek B., Podszywałow-Bartnicka P., Szczepanowska J., Zabłocki K. (2014) Hyperglycaemia modifies energy metabolism and reactive oxygen species formation in endothelial cells in vitro. Arch Biochem Biophys, 542: 7-13.

Krasowska E., Zabłocki K., Górecki D.C., Swinny J.D. (2014) Aberrant Location of Inhibitory Synaptic Marker Proteins in the Hippocampus of Dystrophin-Deficient Mice: Implications for Cognitive Impairment in Duchenne Muscular Dystrophy. PLoS ONE, 9(9): e108364.

Onopiuk M., Brutkowski W., Young C., Krasowska E., Róg J., Ritso M., Wojciechowska S., Arkle S., Zabłocki K., Górecki D.C. (2015) Store-operated calcium entry contributes to abnormal Ca2+ signaling in dystrophic mdx mouse myoblasts. Arch Biochem Biophys, 569: 1-9.

Woś M., Szczepanowska J., Pikuła S., Tylki-Szymanska A., Zabłocki K., Bandorowicz-Pikuła J. (2016) Mitochondrial dysfunction in fibroblasts derived from patients with Niemann-Pick type C disease. Arch Biochem Biophys, 593: 50-59.

Head:
Paweł Dobrzyń

Degrees:
2013 DSc Habil, Nencki Institute of Experimental Biology, PAS
2006 PhD in Biology, Institute of Biology, University of Bialystok
1996 MSc in Biology, University of Warsaw

Research trainings:
2009 Department of Biochemistry, University of Wisconsin-Madison, USA
2002-2005 Department of Biochemistry, University of Wisconsin-Madison, USA
2001 Department of Surgery, Vienna University Hospital, Austria
1996-1997 University Courses on Svalbard, Norway

Professional employments:
2012-present Head of the Laboratory of Molecular Medical Biochemistry, Nencki Institute of Experimental Biology, PAS
2007-2012 Adjunct, Nencki Institute of Experimental Biology, PAS
1997-2007 Assistant, Institute of Biology, University of Bialystok
2002-2005 Associate Researcher, Department of Biochemistry, University of Wisconsin--Madison, USA
1996-1997 Fellow - The University Courses on Svalbard (UNIS), Norway

Honors and fellowships:
Patent claim "A method for the early diagnosis of a pre-diabetic state and type 2 diabetes and the pancreatic and cardiovascular effects thereof, its use and a kit for performing the method". Application number: PL411390
2007 Award from the American Association for the Advancement of Science (AAAS)
1997 Fellowship founded by The Research Council of Norway

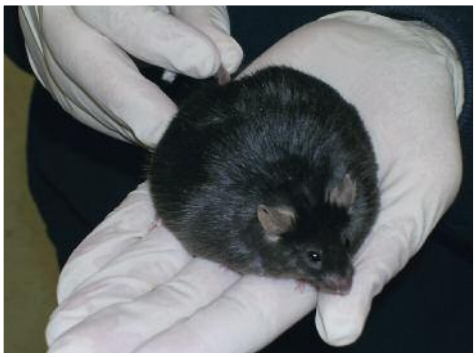
Staff: Tomasz Bednarski (PhD student), Anna Filip, Ana-Maria Gan, Viktor Navrulin (PhD student), Adam Olichwier (PhD student)

Laboratory of Molecular Medical Biochemistry

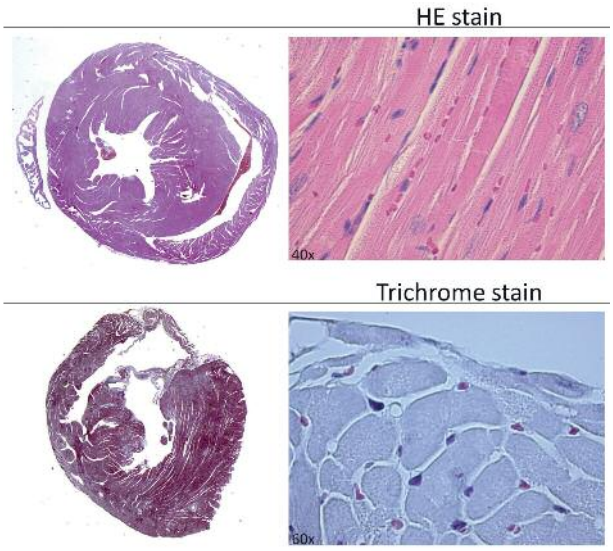
Research profile:
Our research is focused on the cellular and molecular mechanisms of heart dysfunction. The research involves in vivo and in vitro studies of signaling pathways and transcription factors associated with the regulation of cardiomyocyte metabolism and pathogenesis of the left ventricular hypertrophy, lipotoxic cardiomyopathy and atherosclerosis. In particular, we decipher the mechanisms controlling pericardial and pericoronary adipose tissue function, coronary plaque formation and angiogenesis by functional analysis of stearoyl-CoA desaturase (SCD)-dependent signaling in murine models of lipotoxic heart disease and atherosclerosis. Our second priority is to examine the role of SCD1 and SCD4 genes in coronary atherosclerosis and to determine the role of lipid mediators in cardiomyocyte - pericoronary adipose tissue - endothelial cells communication. We are also interested in mechanisms linking hypoxic cardiomyocytes with angiogenic capacity of endothelial progenitor cells and plasticity of vascular smooth muscle cells. Understanding how hypoxia and lipotoxicity affect vascular homeostasis will not only gain an insight into the basic mechanisms governing vascular biology in health and disease, but it will also provide opportunities for development of new treatment strategies to augment cardiac vascular function and heart remodeling.

Current research activities:
- cellular cross-talk between thyroid hormone signaling and lipid mediators in the regulation of heart metabolism and function
- functional role of stearoyl-CoA desaturase in the regulation of angiogenesis in hypoxic cardiac muscle
- role of stearoyl-CoA desaturase in regulation of vascular wall structure in physiology and pathology

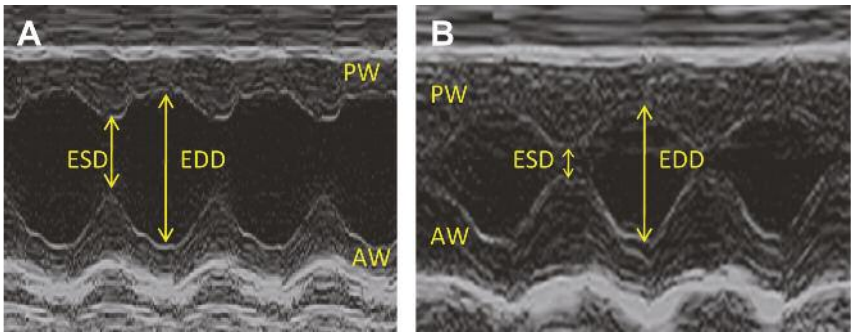
• involvement of stearoyl-CoA desaturase-dependent signaling in adipogenesis, secretory function and inflammation of pericardial and pericoronary adipose tissue in the healthy heart and in lipotoxic cardiomyopathy and atherosclerosis
• signal transduction and genetic abnormalities in obesity related heart dysfunctions



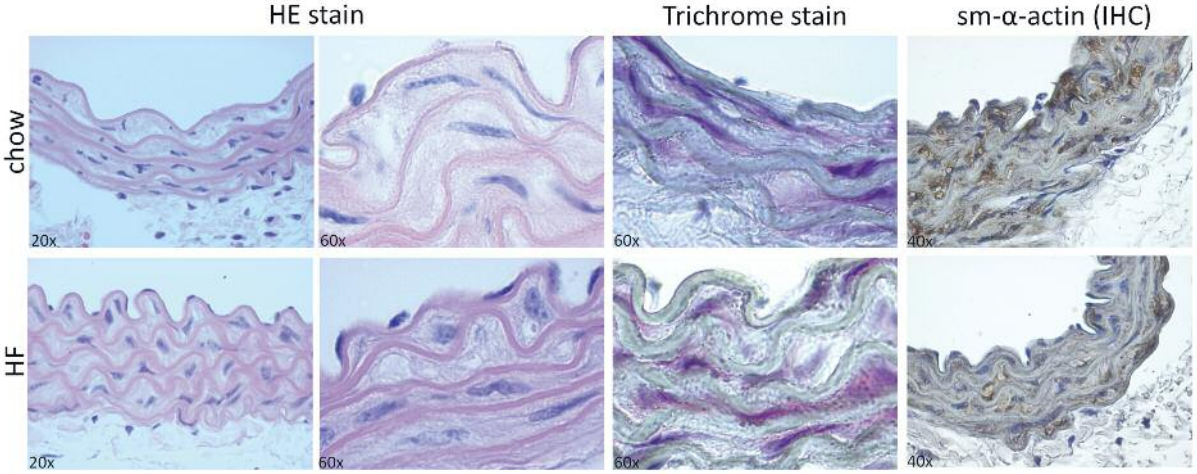
Leptin deficient ob/ob mouse.



Morphology of the mouse heart.



Echocariographic analysis of heart function and structure of abdominal aortic banded (model of cardiac hypertrophy that is induced by pressure overload) and sham rats.
ESD – end diastolic diameter;
PW – posterior wall thickness;
AW – anterior wall thickness.



Aorta wall of mouse fed chow or high fat (HF) diet.

Selected publications: Bednarski T., Olichwier A., Opasińska A., Pyrkowska A., Gan A.M., Ntambi J.M., Dobrzyń P. (2016) Stearoyl-CoA desaturase 1 deficiency reduces lipid accumulation in the heart by activating lipolysis independently of peroxisome proliferator-activated receptor α. Biochim Biophys Acta-Mol Cell Biol Lipids, 1861: 2029-2037.

Dobrzyń P., Bednarski T., Dobrzyń A. (2015) Metabolic reprogramming of the heart through stearoyl-CoA desaturase. Prog Lipid Res, 57: 1-12.

Dobrzyń P., Pyrkowska A., Duda M., Bednarski T., Mączewski M., Langfort J., Dobrzyń A. (2013) Expression of lipogenic genes is upregulated in the heart with exercise training-induced but not pressure overload-induced left ventricular hypertrophy. Am J Physiol Endocrinol Metab, 304: E1348-E1358.

Dobrzyń P., Dobrzyń A. (2013) Stearoyl-CoA desaturase in the control of heart metabolism. In: Stearoyl-CoA desaturase genes in lipid metabolism J.M. Ntambi (ed.) Springer, New York, 85-101.

Dobrzyń P., Pyrkowska A., Jazurek M., Dobrzyń A. (2012) Increased availability of endogenous and dietary oleic acid contributes to the upregulation of cardiac fatty acid oxidation. Mitochondrion, 12: 132-137.

Head:
Andrzej A. Kasprzak

Degrees:
2013 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
1997 DSc Habil, Nencki Institute of Experimental Biology, PAS
1979 PhD in Chemistry, Wroclaw University of Science and Technology
1971 MSc in Physical Chemistry, Wroclaw University of Science and Technology

Research trainings:
1980-1981 University of Illinois at Urbana-Champaign, Department of Biochemistry, USA, Prof. Gregorio Weber

Professional employments:
2013 Professor, Nencki Institute of Experimental Biology, PAS
1998-present Head of the Laboratory of Motor Proteins, Nencki Institute of Experimental Biology, PAS
1992-1997 Chargé de Recherche 1ère Classe; Centre National de la Recherche Scientifque, CRBM, Montpellier, France
1984-1989 Research Assistant Professor, University of California, San Francisco, USA

Honors and fellowships:
2010 Polish Academy of Sciences Award for scientific achievements of the team led by Andrzej A. Kasprzak

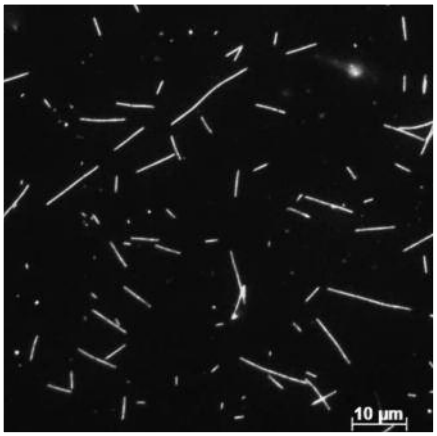
Staff: Beata Kliszcz (PhD student), Katarzyna Mańko

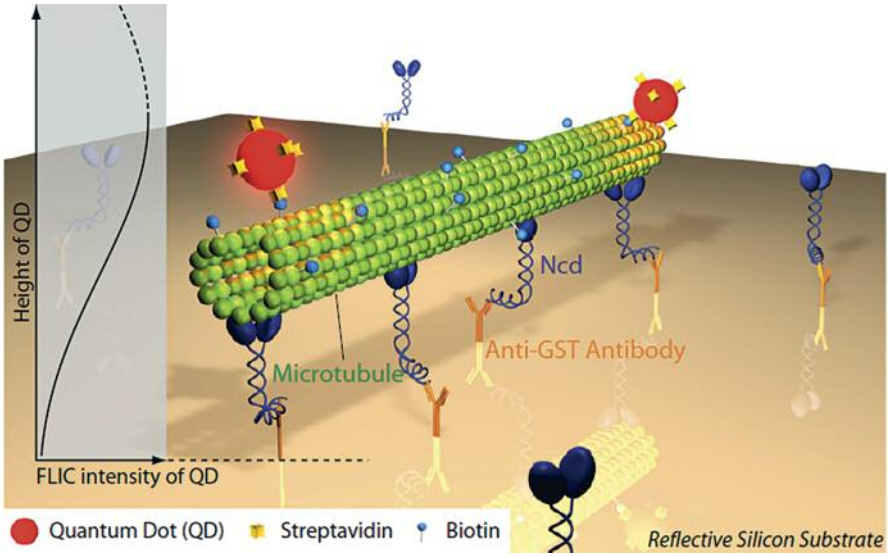
Laboratory of Motor Proteins

Research profile:
Molecular motors are systems of one or several molecules, which are capable of cyclically converting chemical energy derived from adenosine triphosphate (ATP) hydrolysis into mechanical work. The generation of movement takes place when the motor molecule is bound to an elongated polymer such as microtubule or actin. While the structure and function of the motor is clearly fundamental, the role of the 'tracks' on which the motors carry their cargoes is also important. The cellular functions of the microtubule do not depend only on the overall polymer structure but to a large extent on the local post-translational modification of tubulin. These modifications are detected and decoded by motor proteins, MAPS, and other proteins whose properties are changed when a particular modification is detected. The whole process constitutes a general and powerful cellular regulatory mechanism and has been named the "tubulin code". Our work is focused on the molecular mechanisms by which molecular motors recognize and use the information embedded in the microtubules.

Current research activities:
Often a kinesin's-1 cargo is another microtubule, therefore, in this case, the motor generates microtubule-microtubule sliding. There are some indications that the sliding between the microtubules is regulated by post-translational tubulin modification. The microtubule-microtubule movement generated by kinesin-1 occurs in many cellular processes and was observed in live cells. In Drosophila neurons, it was demonstrated that kinesin-1 mediates the sliding. But the factors contributing to this process were never examined. Therefore, the focus of our research is to study the effect of post-translational modification on kinesin-generated sliding movement between two microtubules in vitro and in mammalian neurons. To achieve these goals we combine protein engineering with classical biochemistry and high-resolution imaging techniques such as TIRF microscopy.

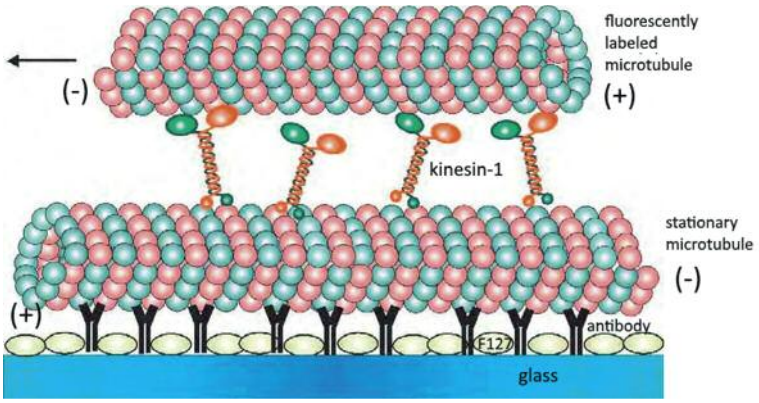
Rhodamine-labeled microtubules gliding over kinesin-14 (Szczęsna & Kasprzak, 2012, modified)





Measurement of the longitudinal and angular motion of microtubules gliding on a kinesin-coated surface (Nitzsche B., Vilfan A., Dudek E., Hajdo L., Kasprzak A. A., Diez S. 2016, modified)

Two microtubules are cross-linked and slid by kinesin-1 when they are in antiparallel orientation



Selected publications: Robaszkiewicz K., Dudek E., Kasprzak A.A., Moraczewska J. (2012) Human congenital myopathy-related mutations in TPM3 have heterogeneous functional effects. Biochim Biophys Acta, 1822: 1562-1569.

Szczęsna E., Kasprzak A.A. (2012) The C-terminus of kinesin-14 Ncd is a crucial component of the force generating mechanism. FEBS Letters, 586: 854-858.

Braun M., Lansky Z., Bajer S., Fink G., Kasprzak A.A., Diez S. (2013) The human kinesin-14 HSET tracks the tips of growing microtubules in vitro. Cytoskeleton, 70: 515-521.

Nitzsche B., Vilfan A., Dudek E., Hajdo L., Kasprzak A.A., Diez S. (2016) The working stroke of the kinesin-14, ncd, comprises at least two substeps of different direction. Proc Natl Acad Sci USA, 113(43): E6582-E6589.

Szczęsna E., Kasprzak A.A. (2016) Insights into the process of EB1-dependent tip-tracking of kinesin-14 Ncd. The role of the microtubule. Eur J Cell Biol, 95(12): 521–530.

Head:
Maria Jolanta Rędowicz

Degrees:
2010 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
2002 DSc Habil, Nencki Institute of Experimental Biology, PAS
1991 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1984 MSc in Pharmacy (Diploma cum laude), Medical University of Warsaw

Research trainings:
1999 Laboratory of Cell Biology, NHLBI, NIH, Bethesda, USA
1992-1998 Laboratory of Cell Biology, NHLBI, NIH, Bethesda, USA
1987, 1988 Institute of Molecular Biology, Austrian Academy of Sciences, Salzburg, Austria
1985 Eötvös Loránd University, Budapest, Hungary

Professional employments:
2011-present Professor, Nencki Institute of Experimental Biology, PAS
2005-present Head of the Laboratory of Molecular Basis of Cell Motility, Nencki Institute of Experimental Biology, PAS
2011-2015 Head of the Department of Biochemistry, Nencki Institute of Experimental Biology, PAS
2003-2007 Head of the Department of Muscle Biochemistry, Nencki Institute of Experimental Biology, PAS
2003-2011 Associate Professor, Nencki Institute of Experimental Biology, PAS
1998-2003 Adjunct, Nencki Institute of Experimental Biology, PAS
1984-1991 Research Assistant, Nencki Institute of Experimental Biology, PAS

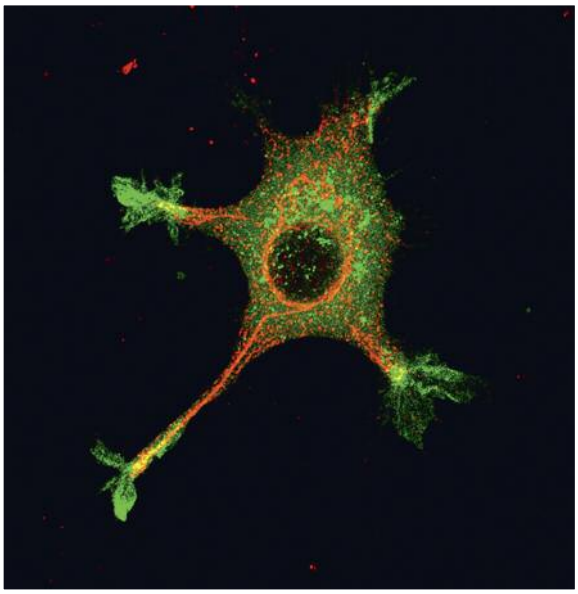
Honors and fellowships:
2014 Diplôme d'Honneur, Nencki Institute of Experimental Biology, PAS
2008 Team Award of the Polish and Russian Academies of Sciences for scientific collaboration
1989, 2005 Team awards, Biological Division of Polish Academy of Sciences

Staff: Magdalena Bandyszewska (PhD student), Solomiia Boyko (PhD student), Vira Chumak, Olena Karatsai (PhD student), Damian Matyśniak (PhD student), Hanna Nieznańska, Krzysztof Nieznański, Jolanta Nowak, Paweł Pomorski, Dariusz Stępkowski, Małgorzata Suszek (PhD student), Emilia Wojtera, Zbigniew Zieliński

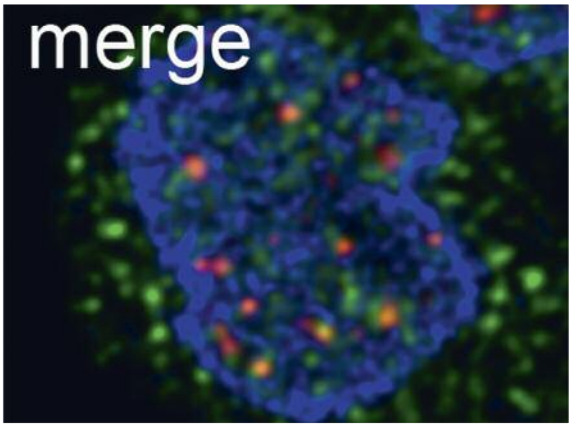
Laboratory of the Molecular Basis of Cell Motility

Research profile:
- unconventional myosins and actin-binding proteins in cell migration and intracellular trafficking: studies on normal and transformed mammalian cells
- muscle plasticity and muscle pathology
- effects of arginine deprivation on cell migration and invasiveness
- calcium signaling
- multiple signaling pathways of selected nucleotide receptors
- role of prion protein in Alzheimer disease and other tauopathies
- the mechanism of cytotoxicity of the cytosolic form of prion protein.

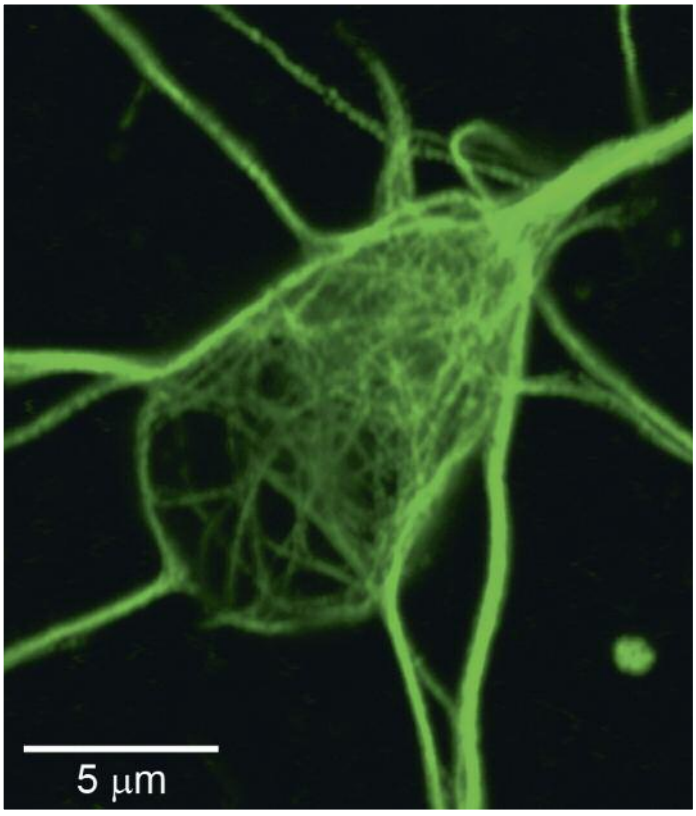
Current research activities:
- involvement of unconventional myosins (in particular of class VI) in cell migration and intracellular trafficking of organelles and nuclear functions
- analysis of interaction of myosin VI with its tissue-specific partners
- understanding mechanisms of limb girdle muscle dystrophy (LGMD): analysis of LGMD patients' muscle biopsies
- probing arginine analogs as a component of a potential arginine deprivation-based anti-cancer therapeutical strategy
- non-calcium signaling from P2X7 nucleotide receptor
- crosstalk between calcium and small Rho GTPases signaling in glioma cells
- prion protein in therapy of Alzheimer disease
- the role of prion protein in amyloidogenesis and neurotoxicity of Tau protein
- the consequences of the interaction of cytosolic form of prion protein with microtubular cytoskeleton.



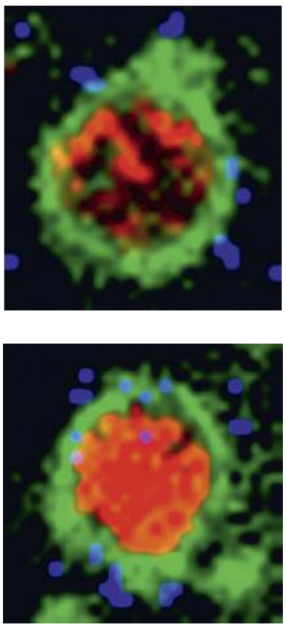
Myosin VI (in green) colocalizes with DOCK7 in the neurites of NGF-stimulated PC12 neurosecretory cells



Myosin VI (in green) co-localizes with PML bodies (in red) in the nuclei (in blue) of PC12 neurosecretory cells



Confocal microscopy showing microtubular cytoskeleton of cortical neuron



Myosin VI (in blue) surrounds early endosomes (in green) containing AKAP9 (in red)

Selected publications: Sobczak M., Chumak V., Pomorski P., Wojtera E., Majewski L., Nowak J., Yamauchi J., Rędowicz M.J. (2016) Interaction of myosin VI and its binding partner DOCK7 plays an important role in NGF-stimulated protrusion formation in PC12 cells. Biochim Biophys Acta-Mol Cell Res, 1863: 1589-1600.

Karolczak J., Pavlyk I., Majewski Ł., Sobczak M., Niewiadomski P., Rzhepetskyy., Sikorska A., Nowak N., Pomorski P., Prószyński T., Ehler E., Rędowicz M.J. (2015) Involvement of unconventional myosin VI in myoblast function and myotube formation. Histochem Cell Biol, 144: 21-38.

Pavlyk I., Rzhepetskyy Y., Jagielski A.K., Drozak J., Wasik A., Pereverzieva G., Olchowik M., Kunz-Schughart L.A., Stasyk O., Rędowicz M.J. (2015) Arginine deprivation affects glioblastoma cell adhesion, invasiveness and actin cytoskeleton organization by impairment of β-actin arginylation. Amino Acids, 47: 199-212.

Zajkowski T., Nieznańska H., Nieznański K. (2015) Stabilization of microtubular cytoskeleton protects neurons from toxicity of N-terminal fragment of cytosolic prion protein. Biochim Biophys Acta-Mol Cell Res, 1853: 2228-2239.

Nieznański K., Surewicz K., Chen S,. Nieznańska H., Surewicz W.K. (2014) Interaction between prion protein and Aβ amyloid fibrils revisited. ACS Chem Neurosci, 5: 340-345.

Head:
Katarzyna Piwocka

Staff: Łukasz Bugajski, Wioleta Dudka-Ruszkowska (PhD student), Agata Kowalczyk, Paulina Podszywałow-Bartnicka, Julian Swatler (PhD student), Marta Kolba (PhD student), Agnieszka Wesołowska (PhD student), Magdalena Wołczyk (PhD student)

Laboratory of Cytometry

Degrees:

2013 DSc Habil, Nencki Institute of Experimental Biology, PAS
2001 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1994 MSc in Biology, Biology Department, University of Warsaw

Research trainings:

2003-2004 Postdoctoral training, BioSciences Institute, University College Cork, Ireland
2008, 2013 Shorter trainings, Lady Davis Research Institute, McGill University, Montreal, Canada
2002, 2005 Shorter trainings, BioSciences Institute, Cork Cancer Research Centre, University College Cork, Ireland

Professional employments:

2010-present Associate Professor, Head of the Laboratory of Cytometry, Nencki Institute of Experimental Biology, PAS
2004-2010 Assistant Professor, Laboratory of Molecular Bases of Aging, Nencki Institute of Experimental Biology, PAS
2003-2004 Post-doctoral Research Fellow, Development and Disease Laboratory, BioSciences Institute, University College Cork, Cork, Ireland
1995-2002 Assistant, Nencki Institute of Experimental Biology, PAS

Honors and fellowships:

2016-2018 Member of the ISAC Marylou Ingram Scholars Program Committee
2012-2016 ISAC Scholar fellowship by the International Society for Advancement of Cytometry
2007 Team Scientific Award of Division II of Polish Academy of Sciences
2007 Team Scientific Award of Minister of Health

Research profile:

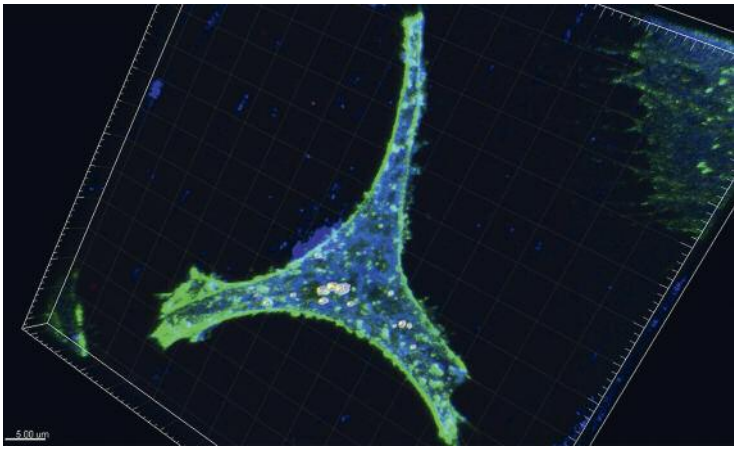
Our research group carries out multidisciplinary studies on signaling networks that regulate cellular stress response and cell-cell communication which allow adaptation to disturbances of cellular or microenvironmental homeostatis in leukemia. Our priority is to understand mechanisms promoting leukemia progression and development of resistance, to propose novel therapeutic strategies.

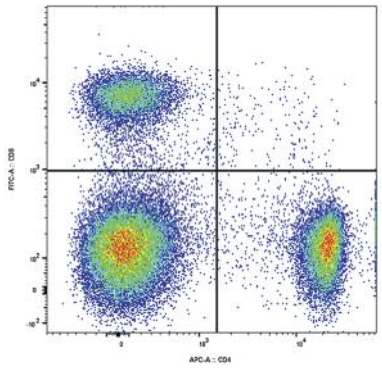
Our research concentrates on investigation of the prosurvival pathways activated in leukemia cells, with the special interest in the unfolded protein response and the PERK-eIF2alpha signaling, as well as genomic instability and BRCA1 deficiency. Apart from that, we want to gain insights into the role of leukemia microenvironment and cross-talk of leukemia cells with other, surrounding cells, like stroma or immune system cells. We investigate what role in the cancer development plays intercellular communication mediated by secreted factors, exosomes and direct cell-cell connections called tunneling nanotubes (TnTs). Part of our research is dedicated to verification of the novel targets and potential therapeutic treatments. We realize these aims by studies at the genomic, proteomic and cellular levels, with the use of broad range of molecular and cellular techniques, using *in vitro* and *in vivo* models.

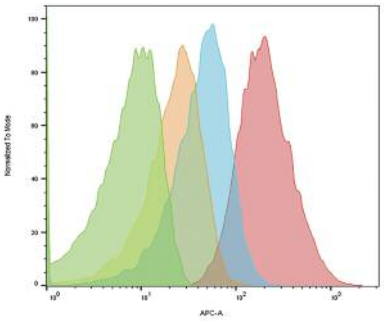
Current research activities:

- studying role of the Unfolded Protein Response and the PERK-eIF2alpha- dependent signaling in leukemia development, progression and resistance to therapy. Examining influence of the eIF2alpha-mediated secretion of leukemia-promoting proteins and exosome-transferred molecules, including miRNAs
- identifying key molecules involved in regulation of miRNAs expression in stress--dependent conditions
- studies of mechanisms and role of interactions of leukemia cells with immune system upon adaptive stress response to rearrange functions of immune cells
- identification of mechanisms leading to BRCA1 deficiency in leukemia
- examining the therapeutic utility of BRCA1 deficiency in personalized therapy in leukemias and other types of cancers
- studies of role and mechanisms of leukemia-stroma interactions mediated by secreted soluble factors, exosomes or direct intercellular connections – tunneling nanotubes (TnTs).

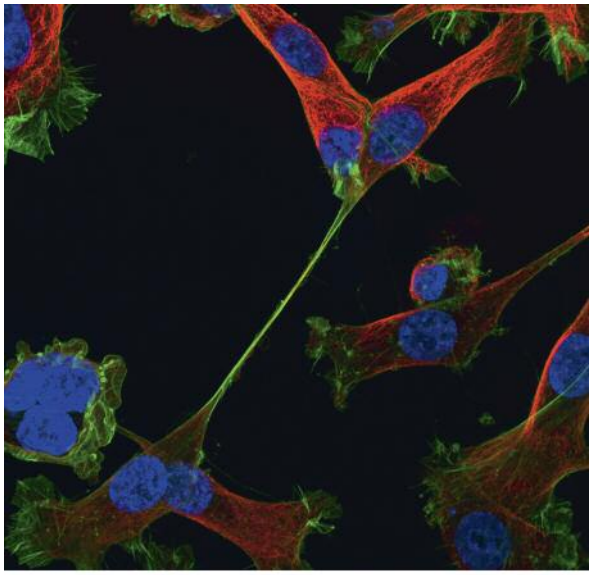
3D projection of collected confocal images of fibroblast cell, prepared using the Imaris software (β-actin – green, cortactin – blue and intracellular vesicles – white).

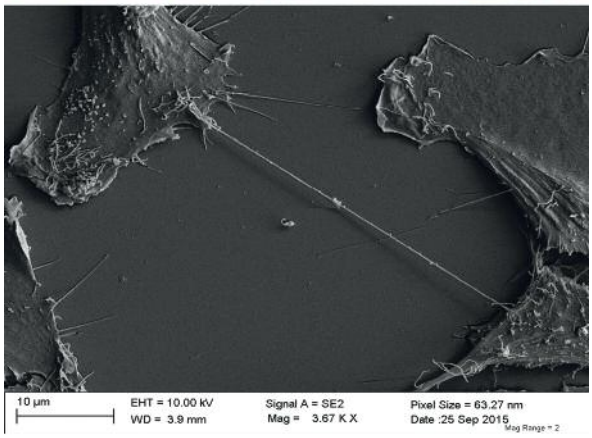






Flow cytometry analysis of CD4 (APC) and CD8 (FITC) surface receptors in lymphoid cells (left panel); Flow cytometry analysis of BRCA1 intracellular protein levels (APC) in progenitor and leukemia cells (right panel).





Direct cell-cell connections – tunneling nanotubes (TnTs) formed between stroma HS-5 cells. Upper panel – confocal overlay of actin (green), microtubules (red) and nuclei (blue). Lower panel – SEM micrograph of TnTs formed between two cells.

Selected publications: Wolczyk M., Podszywalow-Bartnicka P., Bugajski L., Piwocka K. (2017) Stress granules assembly affects detection of mRNA in living cells by the NanoFlares; an important aspect of the technology. Biochim Biophys Acta, 1861 (5PtA): 1024-1035.

Podszywalow-Bartnicka P., Cmoch A., Wolczyk M., Bugajski L., Tkaczyk M., Dadlez M., Nieborowska-Skorska M., Koromilas A., Skorski T., Piwocka K. (2016) Increased phosphorylation of eIF2α in chronic myeloid leukemia cells stimulates secretion of matrix modifying enzymes. Oncotarget, 7(48): 79706-79721.

Mikuła-Pietrasik J., Sosińska P., Murias M., Wierzchowski M., Brewińska-Olchowik M., Piwocka K., Szpurek D., Książek K. (2015) High Potency of a Novel Resveratrol Derivative, 3,3',4,4'-Tetrahydroxy-trans-stilbene, against Ovarian Cancer Is Associated with an Oxidative Stress-Mediated Imbalance between DNA Damage Accumulation and Repair. Oxid Med Cell Longev, 2015:135691.

Podszywalow-Bartnicka P., Wolczyk M., Kusio-Kobialka M., Wolanin K., Skowronek K., Nieborowska-Skorska M., Dasgubta Y., Skorski T., Piwocka K. (2014) Downregulation of BRCA1 protein in BCR-ABL1 leukemia cells depends on stress-triggered TIAR-mediated suppression of translation. Cell Cycle, 13(23): 3727-3741.

Kusio-Kobialka M., Podszywalow-Bartnicka P., Peidis P., Glodkowska-Mrowka E., Wolanin K., Leszak G., Seferynska I., Stoklosa T., Koromilas A.E., Piwocka K. (2012) The PERK-eIF2α phosphorylation arm is a pro-survival pathway of BCR-ABL signaling and confers resistance to imatinib treatment in chronic myeloid leukemia cells. Cell Cycle, 11(21): 4069-4078.

Laboratory of Signal Transduction

Laboratory of Molecular Membrane Biology

Laboratory of Synaptogenesis

Laboratory of Cytoskeleton and Cilia Biology

Head:
Katarzyna Kwiatkowska

The Department of Cell Biology consists of research groups whose common interests address fundamental issues of plasma membrane receptor activation and signal transduction under physiological and pathological conditions. Conducted studies are closely related to distinct human diseases, including ciliopathies, inflammation, cancer, and neuromuscular diseases. Approaches range from molecular biology to whole-organism physiology.

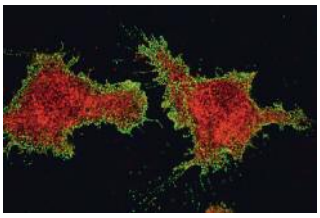
Cilia and basal body analysis are conducted by Dr. Wloga's group with application of molecular, biochemical, immunocytochemical and ultrastructural approaches. Cilia are assembled by nearly all type of cells in human body and lack or dysfunction of cilia in human lead to wide range of disorders called ciliopathies. The main goal of the group is to elucidate the molecular mechanisms that control cilia assembly and transduction of signal that regulates cilia beating. Particularly, studies are undertaken to identify and perform functional analysis of new proteins involved in the regulation of cilia and basal bodies assembly using ciliate *Tetrahymena thermophila* and mammalian cells as a models. Group analyze also a role of microtubule severing proteins and microtubule posttranslational modifications in the microtubular cytoskeleton reorganization and motile cilia assembly.

Immunoresponses and their underlying mechanisms, such as TLR4 signalling in macrophages, are investigated by Prof. Kwiatkowska's group. The essential approach is to examine how activated receptors initiate cascades of events leading to pro-inflammatory responses of cells which are related to sepsis and several other human diseases. In particular, this group focuses on the involvement of lipids and proteins enriched in rafts of the plasma membrane in receptor signalling, including the role of the turnover of PI(4,5)P2, ceramide and acylated proteins in modulation of LPS-induced signalling pathways, cytokine production and submembrane cytoskeleton reorganization.

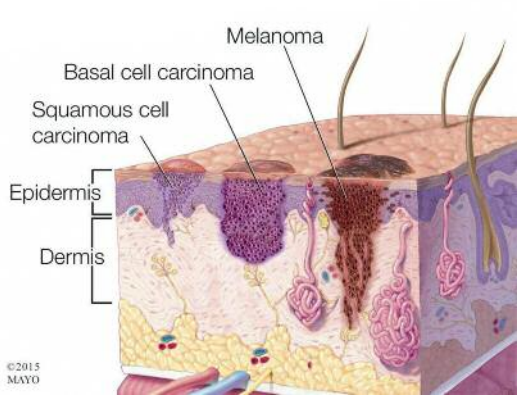
Grainyhead-like (GRHL) transcription factors in signal transduction in mammalian cells are investigated by Dr. Wilanowski's group. The research is focused on regulation of gene expression by the GRHL proteins, regulation of expression of GRHL genes and post-translational regulation of the activity of GRHL factors. The studies aim at unraveling the mechanisms of GRHL functions in health and disease, in particular, on roles of the GRHL factors in various types of cancer.

Synapse development and neuronal organization are investigated by Dr. Prószyński's group, which uses mouse models including conditional knockout mice to elucidate mechanisms underlying cytoskeleton organization in synaptogenesis and during neuronal development. The research is focused on candidate genes that were identified in biochemical screens with the aim to understand their function in the organization of neuromuscular junctions as well as in the development of neuronal networks in the central nervous system.

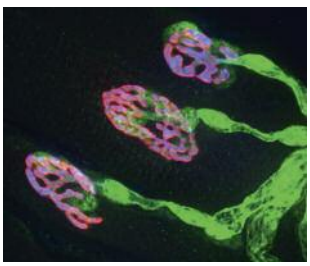
Localization of CCDC146A protein (red) in *Tetrahymena* cells. Tubulin shown in green (Laboratory of Cytoskeleton and Cilia Biology).



Localization of CD14 and flotillin-2 in J774 macrophage-like cells. CD14 was visualized on the cell surface with (green) while after permeabilization, flotillin-2 was labeled (red) (Laboratory Molecular Membrane Biology).



There are three major types of skin cancer: melanoma, basal cell carcinoma and squamous cell carcinoma. The latter two are collectively known as non-melanoma skin cancers, and are the subject of research in the Laboratory of Signal Transduction (image source: Mayo Foundation).



NMJs postsynaptic machinery shown in red, presynaptic parts shown in blue and Schwann cells in green (Laboratory of Synatogenesis).

Head:
Tomasz Wilanowski

Degrees:

2013 DSc Habil, Nencki Institute of Experimental Biology, PAS

1995 PhD in Biology, Australian National University, Research School of Biological Sciences, Canberra, Australia

1990 MSc in Chemistry, University of Warsaw

Professional employments:

2009-present Head to the Laboratory of Signal Transduction, Nencki Institute of Experimental Biology, PAS

1998-2009 Senior Research Officer, Royal Melbourne Hospital, Rotary Bone Marrow Research Laboratories, Melbourne, Australia

1995-1998 Postdoctoral Fellow, Australian National University, Research School of Biological Sciences, Canberra, Australia

Honors and fellowships:

Patent applications:

Pawlak M, Kikulska A, Wilanowski T, Wesoły J: A method for detecting an increased risk of developing renal cancer and a use of a genotype variant of the GRHL1 and/or GRHL2 and/or GRHL3 gene. Submission no. P.414469, 23.10.2015 (Poland).

Kikulska A, Wilanowski T, Rutkowski P: A method for detecting an increased risk of developing skin cancer and a use of a genotype variant of the GRHL3 gene. Submission no. MI2013A002141, 16.12.2013 (Italy).

Staff: Aleksandra Głowacka, Grzegorz Kotarba, Ewa Krzywińska, Magdalena Pawlak, Agnieszka Taracha (PhD student), Marek Żórawski

Laboratory of Signal Transduction

Research profile:

The main research interests of Laboratory of Signal Transduction concern signaling pathways in mammalian cells. In particular, we investigate the role of Grainyhead-like (GRHL) transcription factors in signal transduction. This includes regulation of gene expression by these transcription factors; regulation of expression of GRHL genes; and post-translational regulation of activity of the GRHL proteins. These transcription factors are very important in health and disease in humans and animals. They are essential for the functioning of the epidermis and other epithelia, for neural tube closure and wound healing. They are also involved in various types of cancer, including cancers of the breast, skin, kidney, liver, stomach and colon. The GRHL proteins are not merely passive indicators of progression of tumor growth, but they also have a direct influence on the process of carcinogenesis. Their correct functioning is essential for their anti-oncogenic function, therefore mutations which affect the functioning of GRHL transcription factors impair their antitumor roles and thereby increase the risk of cancer in affected people. If the mechanisms regulating functioning of proteins from the GRHL family could be enhanced or inhibited by specific drugs or other chemical compounds, such compounds could then be used to treat specific types of cancer. Furthermore, we do not limit our research interests to the GRHL transcription factors only; we also collaborate with a number of scientific teams studying other proteins involved in signal transduction.

Current research activities:

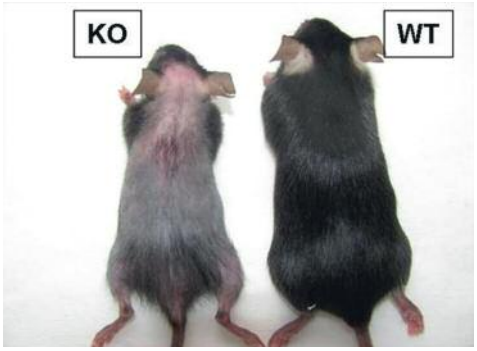
We investigate some of the functions of GRHL transcription factors using animal models: mouse and zebrafish. These include their involvement in the development and maintenance of skin barrier and in skin cancer, neural tube closure and wound healing.

We also employ animal models to analyze the role of these proteins in the functioning of the kidneys, in the regulation of blood pressure and heart rate.

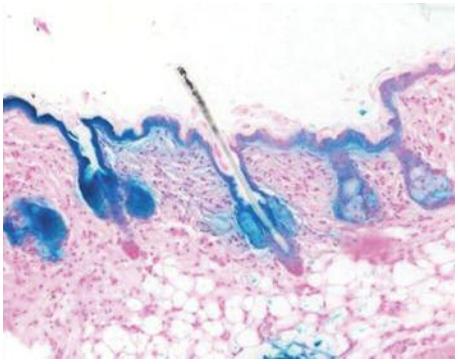
We are currently studying the involvement of GRHL transcription factors in two types of cancer: non-melanoma skin cancer and clear cell renal cell carcinoma. In these projects we examine tumor samples obtained from cancer patients.

We investigate the mechanisms responsible for the regulation of expression of GRHL genes and post-translational regulation of the activity of GRHL proteins. We carry out these experiments in cultured human cells.

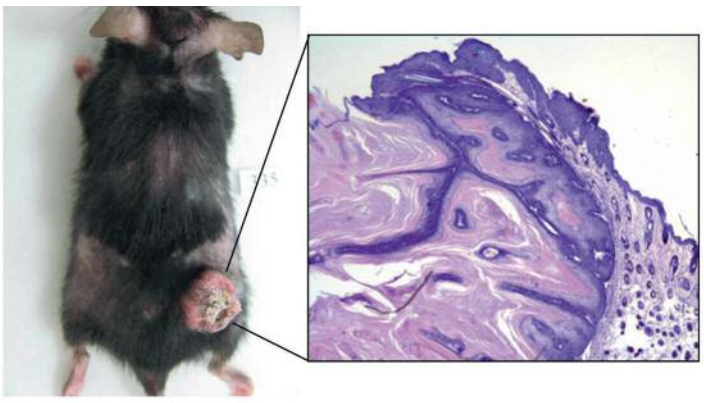
We discovered that certain mutations in the genes from the GRHL family occur with significantly altered frequencies in patients with skin cancer or kidney cancer. We would like to use this information to identify people with increased risk of cancer. Such people could then take appropriate steps to protect themselves from the disease; for example, in the case of skin cancer they could avoid excessive sunbathing. Such people could also have regular check-ups, as early diagnosis greatly increases the chances of successful treatment of cancer.



Grhl1-null mouse (KO) and control wild-type littermate (WT).



Grhl1 expression in mouse skin (blue staining).



Induced non-melanoma skin cancer in a Grhl1-null mouse (macroscopic and microscopic appearance).

Selected publications: Pawlak M., Kikulska A., Wrzesinski T., Rausch T., Kwias Z., Wilczynski B., Benes V., Wesoly J., Wilanowski T. (2017) Potential protective role of Grainyhead-like genes in the development of clear cell renal cell carcinoma. Mol Carcinog., doi: 10.1002/mc.22682

Grabowska A., Wilanowski T. (2017) FOXN1 transcription factor in epithelial growth and wound healing. Mol Cell Biol., doi: 10.1128/MCB.00110-17

Cangkrama M., Darido C., Georgy S. R., Partridge D., Auden A., Srivastava S., Wilanowski T., Jane S. M. (2016) Two ancient gene families are critical for maintenance of the mammalian skin barrier in postnatal life. J Invest Dermat., 136: 1438-1448.

Mlacki M., Kikulska A., Krzywinska E., Pawlak M., Wilanowski T. (2015) Recent discoveries concerning the involvement of transcription factors from the Grainyhead-like family in cancer. Exp Biol Med., 240: 1396-1401.

Mlacki M., Darido C., Jane S. M., Wilanowski T. (2014) Loss of Grainy head-like 1 is associated with disruption of the epidermal barrier and squamous cell carcinoma of the skin. PLoS One, 9: e89247.

Head:
Katarzyna Kwiatkowka

Degrees:
2012 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
2003 DSc Habl, Nencki Institute of Experimental Biology, PAS
1993 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1986 MSc in Biology, Nicolaus Copernicus University in Toruń

Research trainings:
1993-1995 Postdoctoral fellowship, University of Texas Southwestern Medical Center, Dallas, USA

Professional employments:
2013-present Head of the Laboratory of Molecular Membrane Biology, Nencki Institute of Experimental Biology PAS, Warsaw
2006-2012 Associate professor, Nencki Institute of Experimental Biology PAS
2006-present Head of the Department of Cell Biology, Nencki Institute of Experimental Biology PAS, Warsaw
1993-2006 Adjunct professor, Nencki Institute of Experimental Biology PAS, Warsaw
1992-1993 Assistant scientist in the Laboratory of Cytochemistry, Nencki Institute of Experimental Biology PAS

Honors and fellowships:
2001, 2004, 2011 Prizes of the Second Division of the Polish Academy of Sciences for the team of the Laboratory of Plasma Membrane Receptors

Staff: Anna Ciesielska, Justyna Dembińska (PhD student), Aneta Hromada-Judycka, Orest Matveichuk (PhD student), Andrzej Sobota (Professor emeritus), Gabriela Traczyk, Kamila Prymas (PhD student), Ewelina Ziemlińska

Laboratory of Molecular Membrane Biology

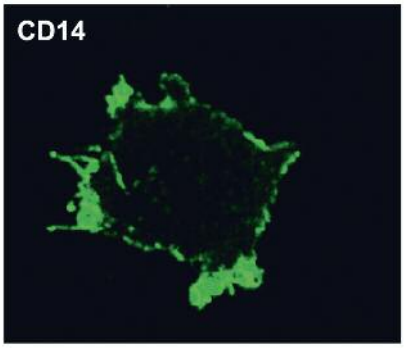
Research profile:
Our studies concern the molecular mechanisms of activation of receptors localized in the plasma membrane of immune cells with a focus on signal transduction by TLR4 which serves as a signaling receptor for bacterial lipopolysaccharide (LPS). Activated TLR4 triggers downstream pathways leading to production of pro-inflammatory mediators which can evoke a septic shock. TLR4 is assisted by CD14 protein anchored in the plasma membrane nanodomains (rafts) enriched in distinct lipids and contribution of those lipids to LPS-inducing signaling is in the center of our studies. We are especially interested in the role of the turnover of PI(4,5)P2, ceramide and acylated proteins in LPS-stimulated macrophages. Our aim is to elucidate how signaling complexes of TLR4 are assembled in the plasma membrane, how they interact with the actin cytoskeleton, and how microdomain organization of the plasma membrane affects formation of those complexes and subsequent endocytosis of the receptor. We conduct the studies on cell culture lines, CD14 knockout mice and primary macrophages transiently or stably depleted/overexpressing distinct proteins of LPS-induced signaling pathways. For analyses we utilize an array of molecular biology and immunobiology techniques, and also immunoelectron and confocal microscopy, various biochemical techniques including "click chemistry" and mass spectrometry. These complementary approaches are dedicated to unravel factors shaping the mode and magnitude of activation of macrophages by LPS and can in the future help to invent new therapeutic tools for the treatment of sepsis.

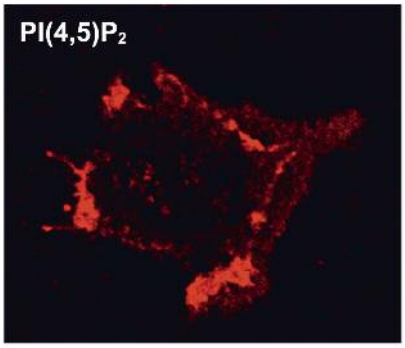
Current research activities:
• elucidating the role of plasma membrane lipid, PI(4,5)P2, in LPS-induced production of pro-inflammatory mediators and cell migration. We aim to dissect the contribution of CD14 and TLR4 to signaling pathways which controls phosphatidylinositol turnover

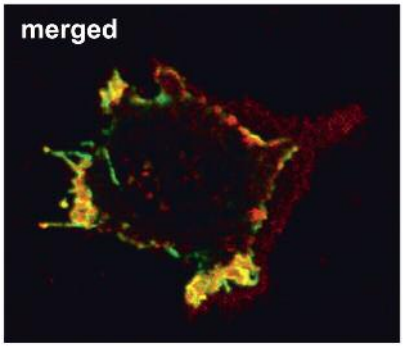
in LPS-stimulated cells, identify enzymes involved in PI(4,5)P2 generation and depletion in these conditions and reveal effectors of the lipid shaping the response of macrophages to LPS.

• exploring the role of S-acylation (palmitoylation) of proteins in signaling activity of TLR4. These studies include proteomics analysis of changes of S-acylation of proteins based on metabolic labeling of macrophages with palmitic acid analogue, "click chemistry" and application of mass spectrometry to identify labeled proteins. The goal of these studies is to establish whether modification of proteins with palmitic acid, a typical component of the westernized diet, can affect pro-inflammatory signaling triggered by LPS.

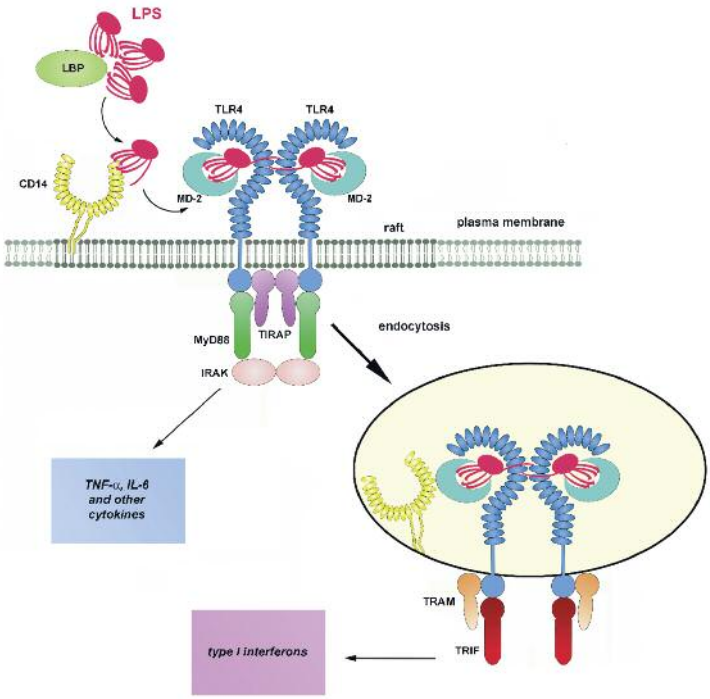
• examining how activation of macrophages by LPS depends on the participation of raft lipids, sphingomyelin and ceramide, and raft proteins, including CD14 and tyrosine kinase Lyn, and how this activation is modulated by naturally occurring exogenous lipids, like bis(monoacylglycerol)phosphate. Studies include microscopic and biochemical analysis of an assembly of TLR4 signaling complex and immune responses of macrophages depleted or enriched in distinct raft proteins and lipids.







Colocalization of CD14 and PI(4,5)P2 induced by CD14 clustering in the plasma membrane. HEK293 cells, devoid of endogenous CD14 and TLR4, were transfected with cDNA encoding CD14 and exposed to rat antibody against CD14 and the F(ab ´)2 fragment of donkey anti-rat IgG conjugated to Alexa Fluor 488. This induced CD14 cross-linking and clustering in the plasma membrane (green). After permeabilization, PI(4,5)P2 was visualized in cells with the PLC-PH–GST probe and a secondary antibody conjugated with TRITC (red). Clusters of CD14 co-localize with assemblies of PI(4,5)P2, as revealed by yellow color in the merged image.



Activation of TLR4 by LPS. LBP, a serum protein, facilitates transfer of LPS monomers to CD14 and CD14 subsequently shifts the LPS to TLR4/MD-2 complex. Dimerization of the receptor induces the assembly of a signaling complex containing TIRAP and MyD88 adaptor proteins leading eventually to production of pro-inflammatory cytokines. After endocytosis, TRAM and TRIF associate with TLR4 triggering a signaling pathway which controls production of type I interferons and some other cytokines. Plasma membrane raft is marked by dark grey lipids. From: Płóciennikowska A., Hromada-Judycka A., Borzęcka K., Kwiatkowska K. (2015) Co-operation of TLR4 and raft proteins in LPS-induced pro-inflammatory signaling. Cellular and Molecular Life Sciences, 72:557-581.

Selected publications: Płóciennikowska A., Hromada-Judycka A., Dembińska J., Roszczenko P., Ciesielska A., Kwiatkowska K. (2016) Contribution of CD14 and TLR4 to changes of PI(4,5)P2 level in LPS-stimulated cells. J Leukoc Biol, 100: 363-1373.

Ciesielska A., Sas-Nowosielska H., Kwiatkowska K. (2016) Bis (monoacylglycerol) phosphate inhibits TLR4-dependent RANTES production in macrophages. Int J Biochem Cell Bio, 83: 15-26.

Płóciennikowska A., Zdioruk M.I., Traczyk G., Świątkowska A., Kwiatkowska K. (2015) LPS-induced clustering of CD14 triggers generation of PI(4,5)P2. J Cell Sci, 128: 4096-4111.

Kwiatkowska K., Marszałek-Sadowska E., Traczyk G., Koprowski P., Musielak M., Ługowska A., Kulma M., Grzelczyk A., Sobota A. (2014) Visualization of cholesterol deposits in lysosomes of Niemann-Pick type C fibroblasts using recombinant perfringolysin O. Orphanet J Rare Dis, 9: 64.

Borzęcka K., Płóciennikowska A., Björkelund H., Sobota A., Kwiatkowska K. (2013) CD14 mediates binding of high doses of LPS but is dispensable for TNF-α production. Mediators Inflamm, 2013: 824919.

Head:
Tomasz J. Prószyński

Degrees:
2001-2005 PhD in Biology, Max-Planck Institute for Cell Biology and Genetics, Dresden, Germany

Research trainings:
2006-2012 Post-doctoral training: Harvard University, Joshua Sanes' Laboratory, USA
2005-2006 Max-Planck Institute for Cell Biology and Genetics, Kai Simons' Laboratory, Dresden, Germany

Professional employments:
2013-present Head of Laboratory at the Nencki Institute of Experimental Biology

Honors and fellowships:
2007 EMBO Long Term Fellowship
2007 HFSP Long Term Fellowship

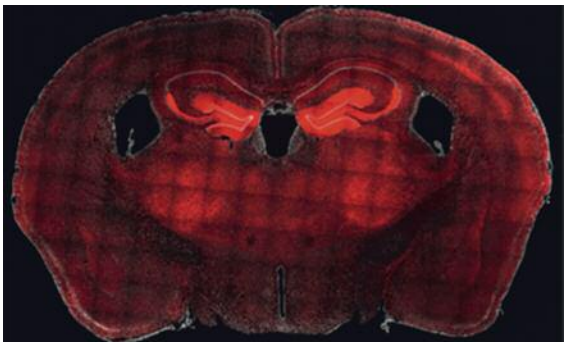
Staff: Krzysztof Bernadzki (PhD student), Agata Błażewicz, Marta Gawor, Adrian Kobiela (PhD student), Joanna Krzemień (PhD student), Paula Mazurek (PhD student), Marcin Peziński (PhD student), Anna Protasiuk, Katarzyna Rojek (PhD student)

Laboratory of Synaptogenesis

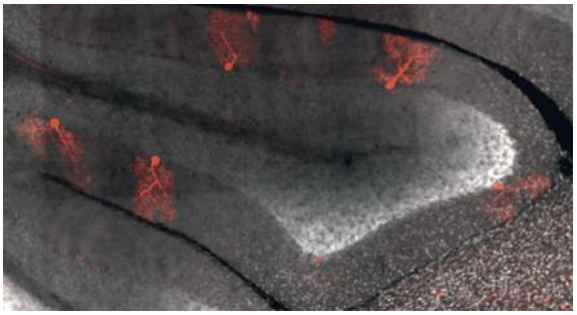
Research profile:
The focus of our laboratory lies within the various aspects of synapse development and cellular communication in the nervous system. We are particularly interested in the developmental remodeling of the neuromuscular junction (NMJ) in the peripheral nervous system. This highly specialized synapse enables transmission of signals from motor neurons to muscle fibers, triggering their contraction. Interestingly there are an estimated 300 types of neuromuscular disorders, and half of these have unknown etiology. This shows how important it is to study the communication between muscle and nerve. Our investigations involve the organization of cytoskeleton at the muscle postsynaptic machinery. We use the state-of-the-art biochemical and molecular approaches to identify novel organizers of these structures, and support our studies with confocal microscopy using the specialized microscopic facility at Nencki Institute. Each project in our laboratory involves conditional knockout mice allowing dissection of the gene's of interest function, specifically at either the pre- or the postsynaptic compartments. Many proteins involved in the organization of the muscle synaptic machinery are also implicated in synaptic plasticity in the brain. Therefore, the novel NMJ organizers are studied in our laboratory also in the context of neuronal network organization in the brain. This approach led us to the discovery of angiomotin family of proteins that are widely expressed in the brain and regulate neuroskeleton, cellular organization and the social behavior of mutant animals.

Current research activities:
We carry out several projects that should allow for a better understanding of the molecular pathways regulated by the newly identified postsynaptic regulators. We are particularly interested in signaling molecules and actin cytoskeletal organizers that regulate

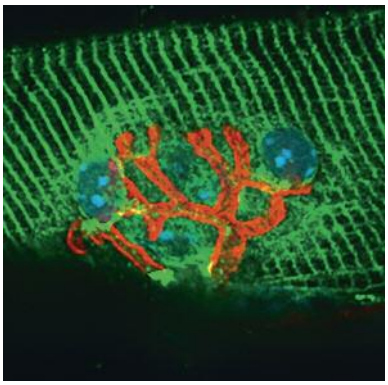
remodeling of the NMJ from juvenile, simple, oval plaques into topologically complex structures referred to as "pretzels". To better understand regulatory processes at the postsynaptic compartments we conduct in vitro experiments on cultured muscle cells able to form post-synaptic specialization. Ongoing projects on the brain are aimed to unravel the molecular functions of Angiomotin family of proteins in neuronal organization. We use several different techniques to evaluate their function in vitro in cultured hippocampal neurons. To study the function in vivo we generated conditional knockout mice with neuron-specific deletion of individual angiomotins. These mice are used to study behavioral abnormalities as well as development of the neuronal networks. To visualize morphology of individual neurons in vivo we crossed mice to Thy1-GFP transgenic line allowing for sparse labeling of cells or inject brains with low titer GFP-expressing AAV viruses.



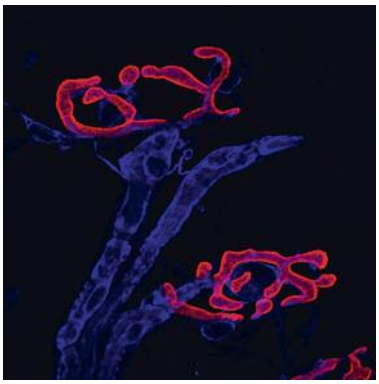
Cryostat section from a LoxP-STOP-LoxP-Tomato reporter mice brain, expressing CRE recombinase under a neuron-specific promoter. Cre activity led to excision of the STOP codon within the transcription cassette and expression of Tomato fluorescent reporter protein was triggered.



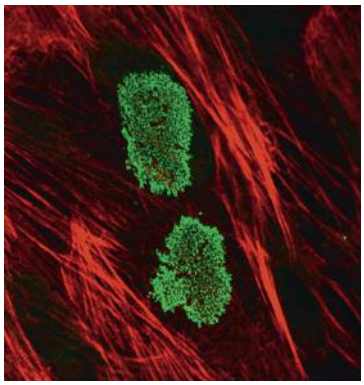
Cryostat section from a LoxP-STOP-LoxP-Tomato reporter mice cerebellum (fragment), infected with CRE-expressing AAV virus. Injection of a low dose of virus triggers recombination in sparse population of neurons, allowing for examination of neuronal morphology in the mutant (CRE active, red) cells.



Neuromuscular Junctions are specialised synapses on skeletal muscles. These structures often acquire complex topology called "pretzels". The postsynaptic machinery is shown in red, the synaptic (specialised) nuclei are shown in blue and muscle fibre with its contractile machinery is in green.



NMJs are often visually appealing. On this image postsynaptic machinery is visualised in red and Schwann cells (both myelinating around the axon and non-myelinating terminal cells) are shown in blue.



In vitro cultured differentiated myotubes derived from myoblasts obtained from human patient biopsies also make assemblies of the postsynaptic machinery, making them a useful model to study neuromuscular disorders. On this image postsynaptic acetylcholine receptors (AChR) are shown in green and actin cytoskeleton is in red.

Selected publications: A-Dystrobrevin-1 recruits Grb2 and α-catulin to organize neurotransmitter receptors at the neuromuscular junction. Gingras J, Gawor M, Bernadzki KM, Grady RM, Hallock P, Glass DJ, Sanes JR, Prószyński TJ. J Cell Sci., 2016 Mar 1;129(5):898-911.

Podosomes in muscle cells and their role in the remodeling of neuromuscular postsynaptic machinery. Bernadzki KM, Rojek KO, Prószyński TJ. Eur J Cell Biol., 2014 Oct;93(10-12):478-85.

Amotl2 interacts with LL5β, localizes to podosomes and regulates postsynaptic differentiation in muscle. Prószyński TJ, Sanes JR. J Cell Sci, 2013 May 15;126(Pt 10):2225-35.

Interaction of α-catulin with dystrobrevin contributes to integrity of dystrophin complex in muscle. Oh HJ, Abraham LS, van Hengel J, Stove C, Proszynski TJ, Gevaert K, DiMario JX, Sanes JR, van Roy F, Kim H. J Biol Chem, 2012 Jun 22;287(26):21717-28.

Podosomes are present in a postsynaptic apparatus and participate in its maturation. Prószyński TJ, Gingras J, Valdez G, Krzewski K, Sanes JR. Proc Natl Acad Sci USA. 2009 Oct 27;106(43):18373-8.

Head:
Dorota Włoga

Degrees:
2013 DSc Habil, Nencki Institute of Experimental Biology, PAS
1999 PhD in Biology, University of Warsaw
1993 MSc in Biology, University of Warsaw

Research trainings:
2000-2001 University of Georgia, Athens, USA
1996 University of Konstanz, Konstanz, Germany
1994-1995 University of Konstanz, Konstanz, Germany

Professional employments:
2015-present Head of the Laboratory of Cytoskeleton and Cilia Biology, Nencki Institute of Experimental Biology, PAS
2010-2015 Assistant Professor, Nencki Institute of Experimental Biology, PAS
2002-2009 Postdoctoral Research Associate, Cellular Biology Department, University of Georgia, Athens, USA
2001-2002 Research and teaching Assistant, Faculty of Biology, University of Warsaw

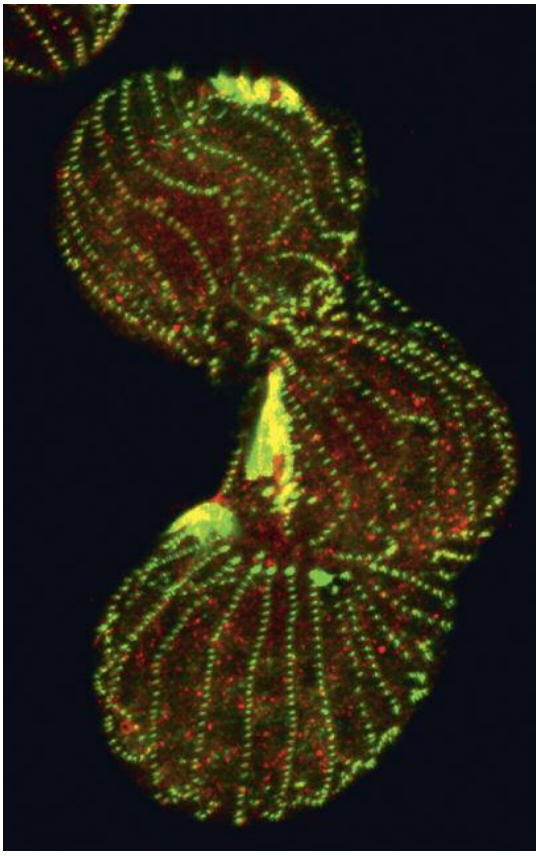
Honors and fellowships:
2012 EMBO Installation Grant
2011 Marie Curie International Reintegration Grant
2000 Kosciuszko Foundation Postdoctoral Fellowship
1999 Individual Award of the Provost of Warsaw University
1997 Fellowship of Polish Network of Cellular and Molecular Biology UNESCO / PAS

Staff: Rafał Bazan (PhD student), Hanna Fabczak, Hanan Farahat (PhD student), Ewa Joachimiak, Leszek Kuźnicki (Professor emeritus), Michał Niziołek (PhD student), Anna Osinka, Martyna Poprzeczko (PhD student), Ewa Wacławek

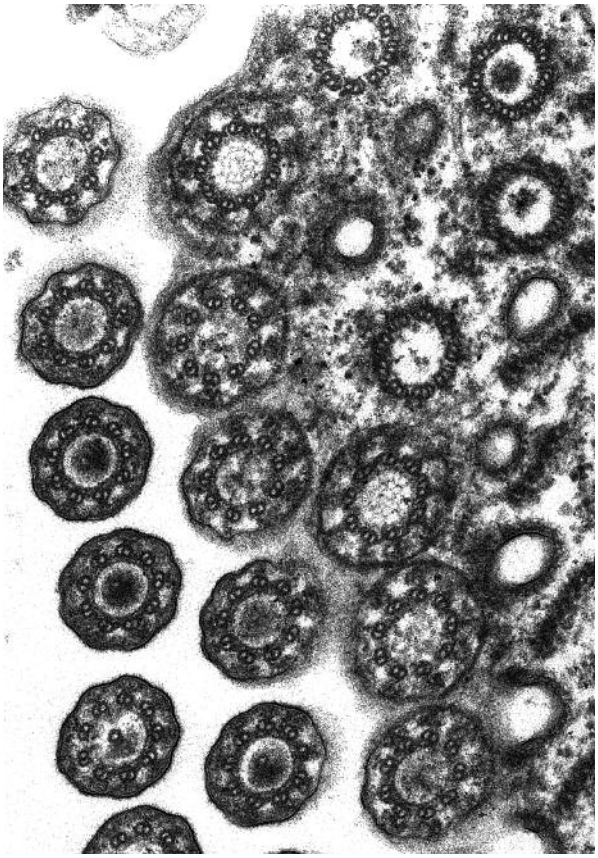
Laboratory of Cytoskeleton and Cilia Biology

Research profile:
Cilia, the microtubule-based structures, are assembled by nearly all types of cells in the human body. Lack of cilia or their defects lead to disorders called ciliopathies. The primary ciliary dyskinesia, the disorder caused by improper function or loss of motile cilia, affects one in 15 000 individuals. Using free living ciliate *Tetrahymena thermophila* and mammalian cells as models we perform functional analysis of new proteins that are involved in the regulation of cilia and basal bodies assembly and motile cilia beating. One of our main goals is to decipher the molecular mechanism that regulates cilia beating. To do so we search for new ciliary proteins (we called them "missing links") that play roles in the transduction of the mechanochemical signals from the central pair complex to the dynein arms. Our group is also investigating a role of the microtubule associated proteins including microtubule severing proteins and microtubule posttranslational modifications in the microtubular cytoskeleton reorganization and in motile cilia assembly.

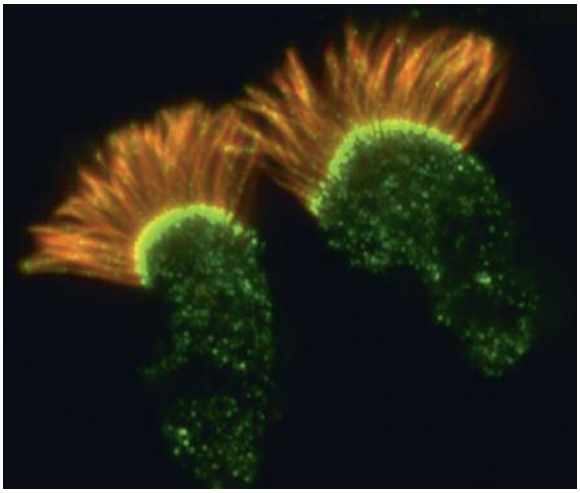
Current research activities:
- identification and functional analysis of new ciliary proteins using ciliate *Tetrahymena thermophila* and ciliated mammalian cells as models
- analysis of the molecular mechanisms that regulate motile cilia beating
- role of katanin, a microtubule severing protein and tubulin posttranslational modifications in cilia assembly and function
- identification and functional analysis of regulators of cilia assembly
- identification and functional analysis of the posttranslational modifications of non-microtubular tubulins
- identification and role of the new basal body proteins.



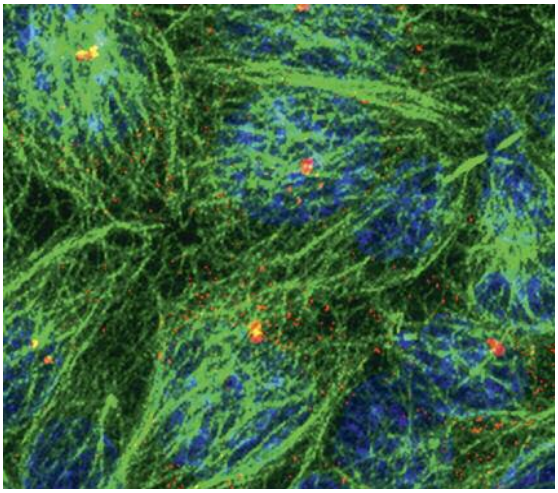
Tetrahymena mutant with inhibited cytokinesis due to prolonged overexpression of katanin regulatory subunit KAT3 (in red); basal bodies stained with centrin (in green). (confocal microscopy)



Cross sections of the proximal part of cilia, transition zone or basal bodies in *Tetrahymena oral apparatus*. (transmission electron microscopy)



Co-localization of FAP61 (in green) and acetylated tubulin (in red) in cilia of rat trachea epithelial cells. (confocal microscopy)



Co-localization of gamma tubulin (in red), microtubules (in green) and nuclei (dark blue) in mIMCD3 mammalian cells. (confocal microscopy)

Selected publications: Włoga D., Joachimiak E., Louka P., Gaertig J. (2017) Post-translational Modifications of Tubulin and Cilia. Cold Spring Harb Perspect Biol. 9(6), doi: 10.1101/cshperspect.a028159.

Wacławek E, Joachimiak E, Hall MH, Fabczak H, Włoga D. (2017) Regulation of katanin activity in the ciliate Tetrahymena thermophila. Mol Microbiol., 103 (1):134-150.

Krzemień-Ojak Ł, Góral A, Joachimiak E, Filipek A, Fabczak H. (2017) Interaction of a novel chaperone PhLP2A with the heat shock protein Hsp90. J Cell Biochem., 118: 420-429.

Urbańska P, Song K, Joachimiak E, Krzemien-Ojak L, Koprowski P, Hennessey T, Jerka-Dziadosz M, Fabczak H, Gaertig J, Nicastro D, Wloga D. (2015) The CSC proteins FAP61 and FAP251 build the basal substructures of radial spoke 3 in cilia. Mol Biol Cell, 26(8): 1463-1475.

Vasudevan KK, Song K, Alford LM, Sale WS, Dymek EE, Smith EF, Hennessey T, Joachimiak E, Urbańska P, Włoga D, Dentler W, Nicastro D, Gaertig J. (2015) FAP206 is a microtubule-docking adapter for ciliary radial spoke 2 and dynein c. Mol Biol Cell, 26(4): 696-710.

Laboratory of Psychophysiology

Laboratory of Neurobiology of Emotions

Laboratory of Ethology

Laboratory of Neuropsychology

Group of Restorative Neurobiology

Laboratory of Neuromuscular Plasticity

Laboratory of Molecular and Systemic Neuromorphology

Laboratory of Neuroinformatics

Laboratory of Visual Neurobiology

Laboratory of Preclinical Studies in Neurodegenerative Diseases

Head:
Małgorzata Skup

The Department of Neurophysiology was founded in1946 by Jerzy Konorski. It is composed of ten independent laboratories carrying individual research programs, which are all complementary in the area of anatomical and functional connectivity of the developing and mature central nervous system. They are integrated by 2 topics: 1) intrinsic mechanisms of behavior and 2) structural and functional plasticity.

Sensory systems are investigated by the groups led by Wioletta Waleszczyk (visual system), Andrzej Wróbel and Ewa Kublik (somatosensory system). Research is devoted to functional physiology (coding of movement in the extrageniculate visual pathway and multiwhisker information in barrel cortex, properties of thalamo-cortical synapses, circuit plasticity in cats and rats), cognitive and emotional processes in the perception.

Neuronal networks for motor control (rodent models of brain and spinal cord injury) are investigated by the groups led by Urszula Sławińska and Małgorzata Skup. Anatomical plasticity of preserved circuit, molecular properties of neurons, glia, extracellular matrix and muscles, design of therapies to restitute functions are studied. Postural abnormalities and locomotion in humans are the focus of Janusz Błaszczyk.

Neuronal systems involved in ageing are studied by Grażyna Niewiadomska's group. Mechanisms are investigated using rats and transgenic mice models of Alzheimer's and Parkinson's diseases.

Neuromorphology of the brain, structure of neuronal nuclei and higher-order chromatin organization are studied by the group led by Grzegorz Wilczyński. Role of nuclear changes and of extracellular matrix receptors in the pathological plasticity in rodent models of epilepsy is investigated.

Emotions and memory in rats and mice are investigated by Ewelina Knapska group. The role of limbic structures in emotions and social behavior, influence of psychotomimetic compounds on the limbic system activity, mechanisms of socially transferred emotions, extinction and renewal of memories are studied.

Ethology is investigated by Ewa Godzinska's group. Ants are model animals in comparative research devoted to ontogeny and neurochemical basis of aggressive and social behavior.

Neuropsychology research is conducted by the groups led by Anna Grabowska and Elżbieta Szeląg. Cognitive deficits in stroke, epileptic and Parkinsonian patients, patients with cochlear implants and children with developmental disorders are studied. Focus is on temporal aspects of information processing, language and on the development of neurorehabilitation methods. Animal studies led by Małgorzata Węsierska concern neural substrates of learning and memory.

Neuroinformatics is a research field of Daniel Wójcik's group; aiming to develop computational tools and models to understand neural processing of sensory information.

Weekly open seminars are held on Wednesday. Each spring a scientific session is organized for members of the Department, with Ph.D. students' reports on their achievements.

The Department has established a Polish node of the neuroinformatics network, INCF. Within the last decade, the Department contributed significantly to successful organization of the 1st FENS Featured Regional Meeting (2009), the Advanced Courses in Computational Neuroscience (auspices of FENS-IBRO; 2011-2013); 1st Nencki Symposium on Jerzy Konorski contribution to modern neuroscience (2013). We serve on committees of FENS, EBBS, INCF, and on editorial boards (Eur. J. Neurosci., Neuronformatics, Acta Neurobiol. Exp.).

Secretariat: Grażyna Rybka
Surgery Room: Ewa Nosecka
Histology Unit: Agnieszka Kępczyńska
Electronic Workshop: Wojciech Borkowski

Head:
Anna Grabowska

Degrees:

2000 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
1993 DSc Habil, Nencki Institute of Experimental Biology, PAS
1979 PhD in Biology (psychophysiology), Nencki Institute of Experimental Biology, PAS
1971 MA in Psychology, University of Warsaw

Professional employments:

2006-present University of Social Sciences and Humanities, Chair of Experimental Neuropsychology, Warsaw
1998-2005 Jagiellonian University, Cracow
1971-present Head of the Laboratory of Psychophysiology, Nencki Institute of Experimental Biology, PAS

Honors and fellowships:

2016-present Member of the Polish Academy of Arts and Sciences (PAU)
2008 V-ce President of the Polish Neuropsychological Society
2000 Member of the Committee of Neurobiology of Polish Academy of Sciences
1994-1997, 2000-2003 Member of the Executive Committee of the European Brain and Behaviour Society

Staff: Katarzyna Chyl (PhD student), Agnieszka Dębska, Katarzyna Jednoróg, Agnieszka Kacprzak, Emilia Kolada (PhD student), Ilona-Kotlewska-Waś (PhD student), Anna Nowicka, Maria Nowicka (PhD student), Magdalena Łuniewska (PhD student), Krystyna Rymarczyk, Iwona Szatkowska, Aleksandra Zasada, Łukasz Żurawski (PhD student)

Laboratory of Psychophysiology

Research profile:

The research is focused on neural correlates of higher mental functions in man using neuroimaging (MRI), neuropsychological, neurophysiological and behavioral approaches. The topics involve issues ranging from basic mechanisms of perception, language, memory and attention through modulatory effect of emotion on cognition, to deception and self-consciousness. The main goal of the studies performed on healthy human subjects, patients with brain injuries, and children with neurodevelopmental disorders (dyslexia, autism) is to get a better insight into the mind-brain relationship and to provide knowledge contributing to elaboration of better tools for clinical diagnosis and remediation. Neuroimaging and electrophysiological methods are used enabling monitoring brain functions with high spatial and temporal resolution (functional Magnetic Resonance Imaging and Event-Related Potentials/Electromiography, respectively). These measures are coupled with structural approaches (VBM, DTI). Clinical studies of the effects of focal brain lesions upon cognitive and emotional performance are also represented. Recent studies focus more on functional integration (connectivity) rather than functional localization. More information can be found on the web page: http://pslab.nencki.gov.pl

Current research activities:

- neural markers of dyslexia
- subtypes of dyslexia and their associations with cognitive dysfunctions and structural brain alterations
- modulatory effect of emotion on encoding and retrieval from memory in intentional remembering vs. forgetting experimental paradigms
- brain activation during deceptive behaviours – the role of personality and intelligence

- organisation of the human amygdala investigated with functional magnetic resonance imaging (fMRI)
- neural correlates of the self-processing assessed with EEG/ERP and fMRI
- name recognition in autism: EEG evidence of altered patterns of brain activity and connectivity
- neural foundation of automatic facial mimicry: simultaneous fMRI and EMG study
- facial mimicry and individual traits: role of personality, empathy, gender, and social anxiety
- mechanisms of associative learning in man investigated with appetitive and aversive gustatory stimuli delivered in MRI scanner.

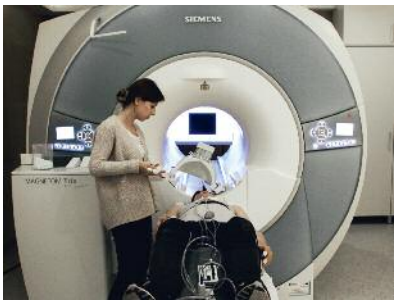
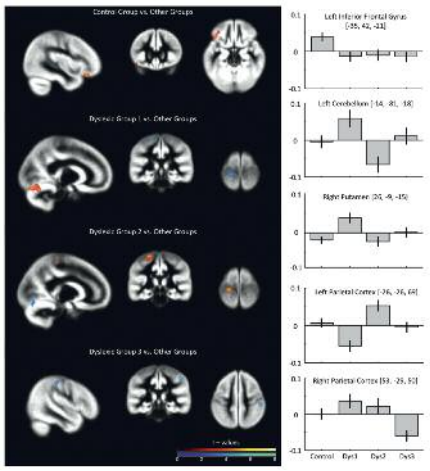
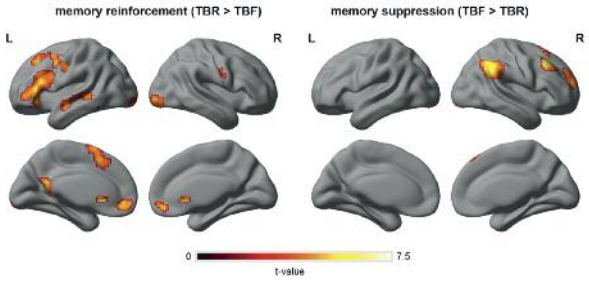


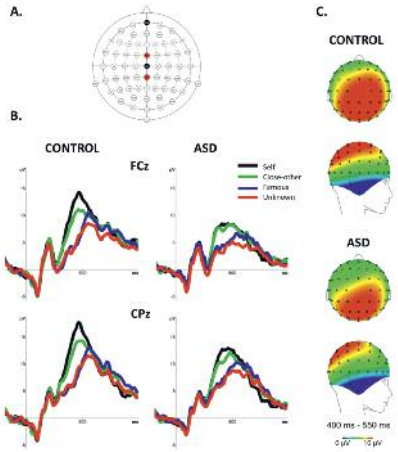
Illustration of an fMRI study of associative learning in man investigated with gustatory stimuli delivered in MRI scanner. Appetitive and aversive gustatory stimuli (liquids) are contained in separate syringes, connected to an electronic pump. During each reinforced trial, 0.5 ml of liquid is delivered to the subjects' mouth via polyethylene tubes.



Grey matter volume (GMV) differences, measured with voxel based morphometry (VBM) between controls and subtypes of dyslexia showing distinguishable cognitive deficits (phonological, rapid naming, magnocellular/dorsal, and auditory attention shifting). VBM revealed GMV clusters specific for each studied group of children including areas of left inferior frontal gyrus, cerebellum, right puta- men, and bilateral parietal cortex. In red - decreased GMV; in blue increased GMV) together with contrast estimates for five ignificant clusters. Results are displayed at uncorrected p<0.001



Neural correlates of intentional remembering and intentional forgetting. During the fMRI study subjects viewed neutral and emotionally loaded words, which they were instructed either to remember (memory reinforcement) or to forget (memory suppression) the presented stimulus. We found the left lateral frontal areas to be specifically involved in memory reinforcement, whereas the right lateral frontal areas in memory suppression. Specifically, we found the right MFG and the right SFG to be more active during memory suppression.



ERPs to self- name and other names in control participants and individuals with Autism Spectrum Disorders (ASD). Electrodes marked in red in the extended 10-20 system indicate locations at which P300 was analyzed (A). Grand average ERPs at FCz and CPz in the control group (B - left side) and in the group of individuals with ASD (B – right side). Topographical distribution of P300 – in control group (C – upper part) and in group of individuals with ASD (C – lower part). ERP results showed enhanced P300 to one's own name in the control group when compared to all other names, whereas in the ASD group P300 to one's own name and close-other's name did not differ, suggesting a lack of preferential attention allocation to one's own name.

Selected publications: Jednoróg K., Gawron N., Marchewka A., Heim S., Grabowska A. (2014) Cognitive subtypes of dyslexia are characterized by distinct patterns of grey matter volume. Brain Struct Funct, 219 (5): 1697-1707.

Riegel M., Wierzba M., Wypych M., Żurawski Ł., Jednoróg K., Grabowska A., Marchewka A. (2015) Nencki Affective Word List (NAWL): the cultural adaptation of the Berlin Affective Word List – Reloaded (BAWL-R) for Polish. Behav Res Methods, 47(4): 1222-1236.

Dębska A., Łuniewska M., Chyl K., Banaszkiewicz A., Żelechowska A., Wypych M., Marchewka A., Pugh K.R., Jednoróg K, (2016) Neural basis of phonological awareness in beginning readers with familial risk of dyslexia-results from shallow orthography. Neuroimage, 132: 406-416.

Kotlewska I., Nowicka A. (2016) Present-self, past-self and the close-other: neural correlates of assigning trait adjectives to oneself and others. Eur J Neurosci, 44: 2064-2071.

Rymarczyk K., Żurawski Ł., Jankowiak-Siuda K., Szatkowska I. (2016) Emotional empathy and facial mimicry for static and dynamic facial expressions of fear and disgust. Front Psychol, 7: 1853.

Head:
Ewelina Knapska

Degrees:
2013 DSc Habil, Nencki Institute of Experimental Biology, PAS
2006 PhD in Biology, Nencki Institute of Experimental Biology, PAS
2001 MSc in Biology, University of Warsaw

Research trainings:
2006-2008 Postdoctoral Research Training in the Department of Psychology, University of Michigan, Ann Arbor, USA
2004 Research Training, Division of Neuroanatomy and Behavior, Institute of Anatomy, University of Zurich, Switzerland

Professional employments:
2013-present Associate Professor, Head of Neurobiology of Emotions Laboratory,
2008-2013 Adjunct, Nencki Institute of Experimental Biology, PAS

Honors and fellowships:
2016 ERC Starting grant
2016 member of the Dana Alliance for Brain Initiatives (DABI)
2015 AcademiaNet member
2014 ENINET member
2014 member of European Brain and Behaviour Society committee
2014 Polish Prime Minister Award for Habilitation
2013 Burgen Scholarship (for outstanding scientific achievements), Academia Europea
2010-2012 Fellowship for Outstanding Young Researchers awarded by Ministry of Science and Higher Education
2007 Polish Prime Minister Award for the PhD thesis
2006-2007 Foundation for Polish Science fellowship (KOLUMB), for postdoctoral research training
2005 Young investigator award of Polish Neuroscience Society

Staff: Zuzanna Borzymowska (PhD student), Jerzy Bukowczan (PhD student), Patrycja Dzianok (PhD student), Anna Goncerzewicz (PhD student), Tomasz Górkiewicz, Kacper Kondrakiewicz (PhD student), Mateusz Kostecki (PhD student), Ewa Kublik, Tomasz Lebitko (PhD student), Magdalena Majkowska, Ksenia Meyza, Tomasz Nikolaev (PhD student), Michał Pasierski, Karolina Rojek-Sito, Karolina Rokosz (PhD student), Joanna Sadowska, Aleksandra Składowska (PhD student), Weronika Szadzińska (PhD student), Maciej Winiarski, Jakub Wojciechowski (PhD student), Karolina Ziegart-Sadowska (PhD student)

Laboratory of Neurobiology of Emotions

Research profile:
Research activities of our laboratory are focused on the neurobiological basis of emotions. We are particularly interested in the mechanisms of socially transferred emotions (in rodent models of emotional contagion). Emotional contagion, i.e., the capacity to be affected by and/or share the emotional state of another individual, is considered to be the simplest form of empathy. In our laboratory we study neuronal circuits in the amygdala underlying social transfer of positive and negative emotions. In order to understand how the systems underlying social communication operate we employ rat and mouse models, as well as neuronal tracing and optogenetic techniques. The two main questions our research is focused on are: (1) Are the neural circuits underlying positive and negative social emotions distinct? (2) Does the social brain exist, i.e., are there neural circuits specialized in social emotions? We also investigate the brain circuits and cellular mechanisms underlying impaired social interactions and the possibilities of therapeutic intervention in mouse genetic and idiopathic models of autism spectrum disorder. Using state-of-the-art automatic systems for assessing social behavior and neurobiology tools we try to explain why some individuals suffer from autism.
Thalamo-Cortical Processing Group focuses on the effect emotional and cognitive state of the brain has on information processing within first and higher order thalamo-cortical pathways as well as the salience and valence of sensory stimuli.

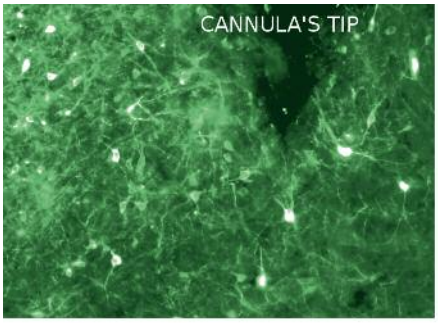
Current research activities:
• Socially transferred emotions – the neural basis of empathy. We investigate neural representations of emotional states in interacting animals using behavioral models of socially transferred positive and negative emotions designed in our laboratory

• Neural mechanisms of impaired social behaviors. Using high-throughput behavioral measures of social interactions we have developed (Eco-HAB system) we characterize neuronal circuits and cellular mechanisms underlying social interactions and validate tissue-specific therapeutic interventions using mouse models of synaptopathies relevant to autism spectrum disorders

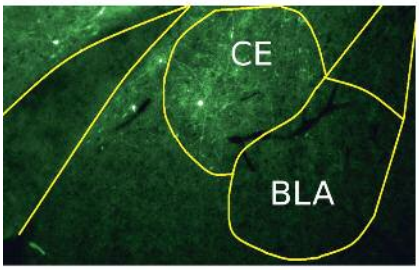
• Social buffering. We are interested in the functional interplay between the prefrontal cortex, hippocampus, and amygdala resulting in fear contagion or social buffering effects

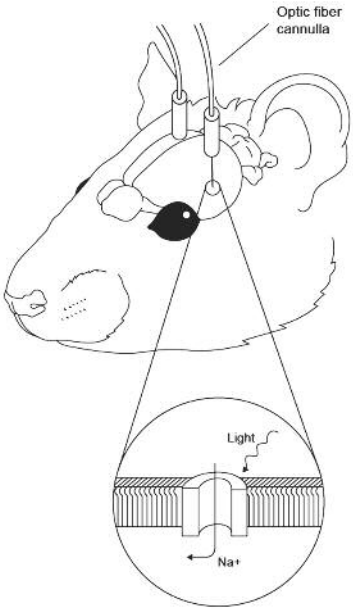
• Fear related activation of higher order thalamic pathways. We investigate whether overexcitation of the neural circuitry including cortex and amygdala underlies sensory related pathologies such as hypersensitivity in autism or hallucinations in schizophrenia

• EEG fingerprint of attention and executive control. By combining fMRI, EEG and novel analytical algorithms we search for distinct spatio-temporo-frequency patterns that specifically represent the level of activation of nodes of brain attentional networks in humans.

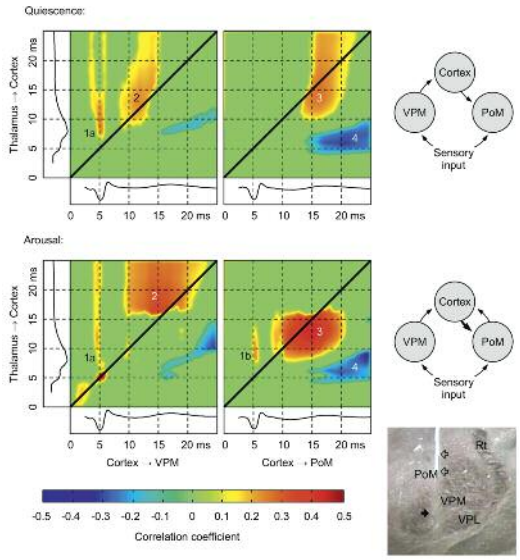


Optogenetic activation of neuronal circuits involved in socially transferred emotions. Channelrhodopsin expressed under control of c-fos promoter in the amygdala is used to stimulate neurons involved during social interaction with blue light.





Eco-HAB - a fully automated and ecologically relevant system for measurement and analysis of social preference and in-cohort sociability in mouse models of autism.



Behavioral reactions to sensory stimuli vary with the level of arousal, but little is known about the underlying reorganization of neuronal networks. In the study on rat whisker system, we have shown that during quiet wakefulness tactile signals are transmitted to S1 cortex via a classical first order thalamic relay (VPM). In high arousal, however, this network is modified to include higher order thalamic nucleus (PoM) to transmit peripheral input to the cortex. We thus demonstrate how the thalamo-cortical system, despite fixed anatomy, reconfigures its functional connectivity in concert with the behavioral state.

Selected publications: Meyza K.Z., Bartal I.B., Monfils M.H., Panksepp J.B., Knapska E. (2016) The roots of empathy: Through the lens of rodent models. Neurosci Biobehav Rev, pii: S0149-7634(15)30343-2. doi: 10.1016/j.neubiorev.2016.10.028.

Puścian A., Łęski S., Kasprowicz G., Winiarski M., Borowska J., Nikolaev T., Boguszewski P.M., Lipp H.P., Knapska E. (2016) Eco-HAB as a fully automated and ecologically relevant assessment of social impairments in mouse models of autism. Elife, 5. pii: e19532. doi: 10.7554/eLife.19532.

Mikosz M., Nowak A., Werka T., Knapska E. (2015) Sex differences in social modulation of learning in rats. Sci Rep, 5: 18114. Knapska E., Lioudyno V., Kiryk A., Mikosz M., Górkiewicz T., Michaluk P., Gawlak M., Chaturvedi M., Mochol G., Balcerzyk M., Wojcik D.K., Wilczynski G.M., Kaczmarek L. (2013) Reward learning requires activity of matrix metalloproteinase-9 in the central amygdala. J Neurosci, 33(36): 14591-14600.

Knapska E., Macias M., Mikosz M., Nowak A., Owczarek D., Wawrzyniak M., Pieprzyk M., Cymerman I.A., Werka T., Sheng M., Maren S., Jaworski J., Kaczmarek L. (2012) Functional anatomy of neural circuits regulating fear and extinction. Proc Natl Acad Sci U S A, 109(42): 17093-17098.

Sobolewski A., Kublik E., Świejkowski D.A., Kamiński J., Wróbel A. (2015) Alertness opens the effective flow of sensory information through rat thalamic posterior nucleus. Eur J Neurosci, 41: 1321-1331.

Head:
Ewa Joanna Godzińska

Degrees:
2005 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
1995 DSc Habil, Nencki Institute of Experimental Biology, PAS
1984 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1978 MSc in Biology, University of Warsaw

Research trainings:
2007 Institute of Research on Insect Biology (IRBI), University François Rabelais, Tours, France
1988-1993 Laboratory of Ethology and Sociobiology (renamed Laboratory of Experimental and Comparative Ethology), University Paris Nord, Villetaneuse, France
1985 Department of Zoology, University of Oxford, UK

Professional employments:
1988-1989 Lecturer (during a post-doc stage): University Paris Nord, Villetaneuse, France
1982-present Nencki Institute of Experimental Biology, PAS

Honors and fellowships:
2010 The title „Media-Friendly Scientist 2010" awarded by the Polish Science Journalists' Association

Staff: Jerzy Andrzej Chmurzyński (Professor emeritus), Julita Korczyńska, Beata Symonowicz, Anna Szczuka

Laboratory of Ethology

Research profile:
We work in the field of ethology, sociobiology and social neuroscience of social insects, studying various ant species including facultative and obligatory social parasites and their slaves. We lay stress on comparative research which allows us not only to broaden our knowledge about interindividual interactions displayed by social insects, but also to gain a better understanding of biological roots of social phenomena encountered in humans. We are particularly interested in the analysis of multidirectional information flow between various levels of organization present in ant societies, and in ontogeny and neurochemical correlates of ant aggressive and social behaviour. Our current research is focused on the analysis of the impact of neurochemical, endocrine and social causal factors on various forms of ant aggressive behaviour (both ritualized and overt aggression), and on friendly social behaviour of these insects (various worker-worker interactions including the so called rescue behaviour, i.e., providing help to endangered individuals, various forms of brood care). We are also interested in the role of social context in the control of expression/suppression of various elements of ant behaviour. In particular, we try to unravel the effects of behavioural status (nurse versus forager) on behaviour and physiology of ant workers, and to identify behavioural, morphological, physiological and neurochemical correlates of ant behavioural maturation (transition nurse – forager) and behavioural reversion (return of a forager to the behavioural status of a nurse).

Current research activities:
- ontogeny of ant behaviour: behavioural correlates of behavioural maturation and behavioural reversion
- behavioural correlates of specialisation in intranidal versus extranidal tasks in major workers of the carpenter ants of the genus *Camponotus*

- interrelationships between worker behavioural status, responses to brood and responses to illumination conditions in workers of the red wood ant *Formica polyctena*
- role of neurochemical, hormonal and social factors in the ontogeny of aggressive and defensive behaviour of workers of *F. polyctena*
- effects of chronic oral administration of octopamine and caffeine on various patterns of aggressive behaviour and friendly social behaviour displayed by workers of *F. polyctena* during various laboratory bioassays
- factors influencing rescue behaviour of ants from various species and subfamilies including facultative and obligatory social parasites and their slaves
- cognitive aspects of rescue behaviour in formicine and myrmicine ants
- effect of training on the defensive behaviour and rescue behaviour shown by workers of *F. polyctena*
- interactions between host and slavemaker workers in natural mixed ant colonies composed of social parasites and their slaves
- long-term impact of agriculture on the survival of wood ants of the *Formica rufa* group
- general rules underlying decision making processes.

Two workers of the red wood ant (*Formica polyctena*), a mature one and a newly eclosed one.

A worker of the red wood ant (*Formica polyctena*) carrying a pupa.

Workers of the red wood ant (*Formica polyctena*) during the brood hiding test.

A worker of the red wood ant (*Formica polyctena*) responding to a nymph of the house cricket (*Acheta domesticus*).

Workers of the red wood ant (*Formica polyctena*) responding to a dead fly.

Selected publications: Szczuka A., Korczyńska J., Wnuk A., Symonowicz B., Gonzalez Szwacka A., Mazurkiewicz P., Kostowski W., Godzińska E. J. (2013) The effects of serotonin, dopamine, octopamine and tyramine on behavior of workers of the ant *Formica polyctena* during dyadic aggression tests. Acta Neurobiol Exp (Wars), 73: 495-520.

Godzińska E.J., Wróbel A. (2014) Capturing the essence of decision making should not be oversimplified. Behav Brain Sci, 37: 85.

Wnuk A., Kostowski W., Korczyńska J., Szczuka A., Symonowicz B., Bieńkowski P., Mierzejewski P., Godzińska E.J. (2014) Brain GABA and glutamate levels in workers of two ant species (Hymenoptera: Formicidae): interspecific differences and effects of queen presence/absence. Insect Sci, 21: 647-658.

Czechowski W., Godzińska E. J. (2015) Enslaved ants: not as helpless as they were thought to be. Insectes Soc, 62: 9-22.

Godzińska E.J. (2016) Human and ant social behavior should be compared in a very careful way to draw valid parallels. Behav Brain Sci, 39: e98 (21-22).

Head:
Elżbieta Szeląg

Degrees:

2005 Professor of Biological Sciences (neuropsychology), nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
1996 DSc Habil, Nencki Institute of Experimental Biology, PAS
1985 PhD in Biology (psychophysiology), Nencki Institute of Experimental Biology, PAS
1984 MSc in Biology, University of Warsaw

Research trainings:

Several research visits in: Institute of Medical Psychology and Human Science Center, University of Munich and Magdeburg; Department of Psychology, Beijing University; International Institute for Advanced Scientific Studies, University of Napoli
2016-2017 Practical courses in transcranial magnetic and electrical stimulation, Munich and Göttingen
2010-2014 Co-chair, COST TD 0904 TIMELY
2013-2014 External Expert, Science|Business, Horizon 2020, Brussels, Belgium
1991-1993 Humboldt Research Fellowship, Institute of Medical Psychology, Munich University, Germany

Professional employments:

Professor, Head of the Laboratory of Neuropsychology, Nencki Institute of Experimental Biology, PAS.
Chair in Neurorehabilitation, University of Social Sciences and Humanities

Honors and fellowships:

Chair of the Senate Ethic Commission, Universityof Social Sciences and Humanities
Member of the Human Science Center, University of Munich, Germany

Staff: Anna Bombińska, Mateusz Choiński (PhD student), Anna Dacewicz (PhD student), Weronika Duda (PhD student), Katarzyna Jabłońska (PhD student), Magdalena Piotrowska (PhD student), Aneta Szymaszek, Małgorzata Węsierska

Laboratory of Neuropsychology

Research profile:

We study the neurophysiology and neuropsychology of cognition in human and animal models in norm and pathology. The studies are combined with behavioral electrophysiological, fMRI, molecular, pharmacological, neuroanatomical and lesion techniques.

Human studies are focused on temporal aspects of information processing, time & timing, language, memory with a special focus on real spatial memory, learning, attention and executive functions and are aimed at the development of innovative neurorehabilitation methods. Our research involves normal subjects (children and adults), patients suffering from various brain diseases (stroke, focal brain damage, dementia, Alzheimer's disease), cochlear implant users, as well as children with various speech and/or language disorders, e.g. language learning impairment, aphasia, deafness, stuttering, infantile autism. Animal studies are focused on neural substrates of learning, short- and long-term memory and other cognitive processes, like cognitive coordination and flexibility. Pathological states of the animal brains are induced by changes in excitatory/inhibitory systems silver e.g. nanoparticles application.

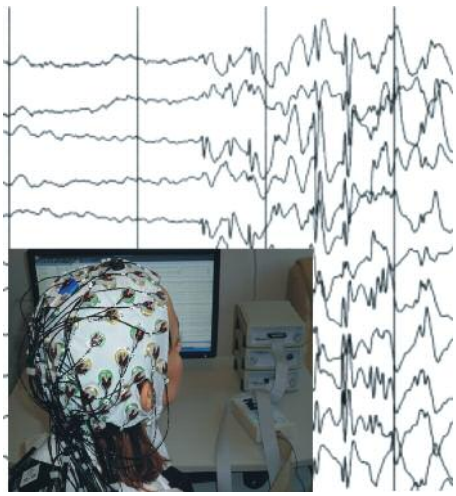
More information about Laboratory on the web page:
http://www.pracownia-neuropsychologii.nencki.gov.pl/ , http://elzbietaszelag.pl/

Current research activities:

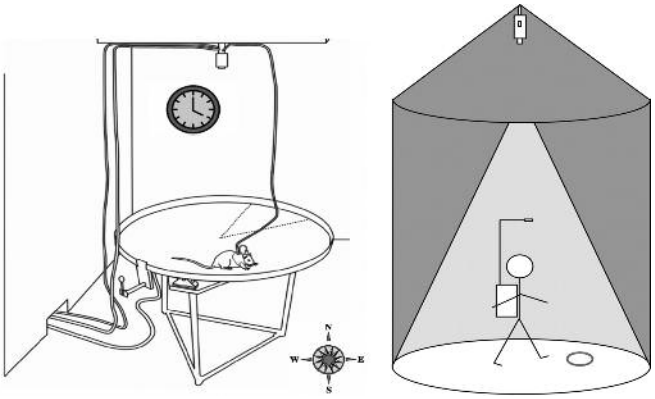
- neuropsychological and neuroanatomical basis of human and animal cognition
- application of cognitive and physical training in enhancement of mental health in older adults
- neuropsychology of normal chronological aging, longevity and neurodegeneration
- development and validation of innovative neurorehabilitation program Dr Neuronowski®, http://neuronowski.com/

- temporal aspects of information processing in norm and pathology
- language representation in the brain, hemispheric asymmetry
- cognitive abilities in patients with brain damage, aphasia, hearing deficits, as well as neurodevelopmental or neurodegenerative diseases
- links between changing brain activity and cognitive functions across the human life span
- effect of cognitive distractors on performance of real spatial memory task in dark conditions in human
- animal studies on memory and cognitive processes under silver nanoparticles application in rats.

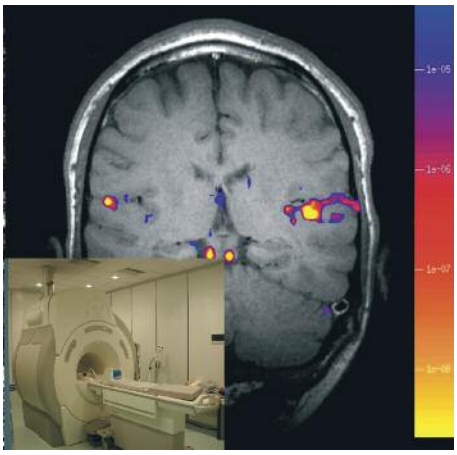
Professor Elżbieta Szeląg and Professor Małgorzata Węsierska are leading the pioneering research on real idiothetic memory in humans.



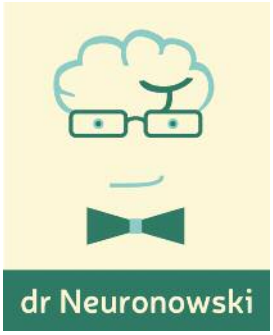
An EEG study



Human real spatial memory set-up



An fMTI study



Dr Neuronowski® – neurorehabilitation program (http://neuronowski.com)

Selected publications: Nowak K., Dacewicz A., Broczek K., Kupisz-Urbanska K., Galkowski T., Szeląg E. (2016) Temporal Information Processing and its Relation to Executive Functions in Elderly Individuals, Front Psychol, 7:1599.

Duda W., Węsierska M., Ostaszewski P., Vales K., Nekovarova T., Stuchlik A. (2016) MK-801 and memantine act differently on short-term memory tested with different time-intervals in the Morris water maze test. Behav Brain Res, 311: 15-23.

Oroń A., Wolak T., Zeffiro T., Szeląg E. (2016) Cross-modal comparisons of stimulus specificity and commonality in phonological processing. Brain Lang, 155: 12-23.

Nowak K., Oroń A., Szymaszek A., Leminen M., Näätänen R., Szeląg E. (2016) Electrophysiological indicators of the age-related deterioration in the sensitivity to auditory duration deviance. Front Aging Neurosci, 8:2.

Węsierska M.J., Duda W., Dockery C.A. (2013) Low-dose memantine induced working memory improvement in the allothetic place avoidance alternation task (APAAT) in young adult male rats. Front Behav Neurosci, 7:1-12.

Head:
Małgorzata Skup

Degrees:
2014 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
2004 DSc Habil, Nencki Institute of Experimental Biology, PAS
1988 PhD in Biology, Nencki Institute of Experimental Biology, PAS

Research trainings:
1998 Visiting professor, National Institute of Physiological Sciences (S. Mori), Okazaki, Japan
1991-1993 Postdoctoral trainee, McGill University, Department of Pharmacology and Therapeutics (A.C. Cuello, A. Ribeiro-da-Silva), Montreal, Canada
Short visits:
2007 Universität Goettingen, Germany
2003 Zentrum für Molekulare Neurobiologie, Universität, Hamburg, Germany
1991 Neurologische Instytut, Max Pfchlesig Universität, Leipzig, Germany
1984 Fidia Research Laboratories, Department of Biochemistry (G. Toffano), Abano Terme, Italy
1982 Universita degli Studi di Firenze, Department of Pharmacology (G. Pepeu), Italy
1981 Freie Universitat Berlin, Institute of Pharmacology (F. Cooper/H. Rommelspacher), Germany

Professional employments:
2016-present Head of the Group of Restorative Neurobiology, Nencki Institute of Experimental Biology, PAS
2014-present Head of the Department of Neurophysiology, Nencki Institute of Experimental Biology, PAS

Honors and fellowships:
2015-2017 President of the Polish Neuroscience Society
2015-2017 Member of the Governing Council of Federation of European Neuroscience Societies
2011-2015 Vice-President of the Committee of Neurobiology, Polish Academy of Sciences
2009-2011 Vice-President of the Polish Neuroscience Society
1991 Medical Research Council of Canada Fellowship, Canadian Network of Excellence for Neuronal Regeneration and Functional Recovery

Staff: Julita Czarkowska (Professor emeritus), Olga Gajewska-Woźniak, Anna Głowacka (PhD student), Kamil Grycz (PhD student), Benjun Ji (PhD student)

Group of Restorative Neurobiology

Research profile:
Injury of the CNS alters transcriptional programs that determine neuronal fate: survival and recovery, or death. A powerful pro-survival/recovery program in neurons and glial cells may be triggered by neurotrophic factors. We focus on neurotrophins, their receptors, and related molecules; assuming that their selective regulation may limit signaling through pro-apoptotic pathways and promote recovery processes. To modulate their expression after spinal cord injury; locomotor exercise, electrical stimulation of the peripheral nerves and tissue transduction with AAV-carried transgenes are in use. These treatments cause remodeling of the spinal network and lead to functional improvement. We search for the mechanisms of neurotrophic regulation of neurotransmission in motoneurons and at the neuro-muscular junction. Contribution of extracellular matrix proteoglycans and postsynaptic excitatory and inhibitory receptors are in focus.

Advanced immunohistochemistry combined with wide field and confocal microscopy are used to study architecture and activation of neuronal networks. Neuronal, dendritic and axonal tracing supported by immunolabeling, DNA/RNA staining and histological identification of myelin and glia are used to examine morphological changes and localization of specific proteins in single cells and synapses. Tissue sampling and Laser Capture Microdissection of single cells are used to identify local changes in gene and protein expression with the use of RT PCR, ELISA, and Western blotting. Behavioral and electrophysiological setups provide data on animal kinematics during locomotion.

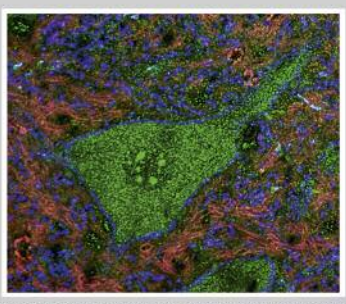
Current research activities:

• potential of AAV-mediated BDNF transgene overexpression in early responses of excitatory and inhibitory neurotransmitter systems in the transected spinal cord: assessment of contribution of pre- and post-synaptic molecules to altered signaling to motoneurons and at neuro-muscular junctions

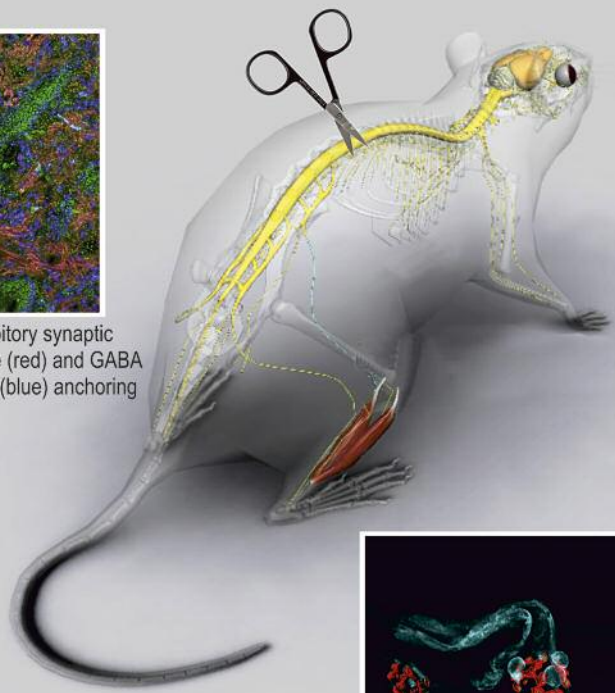
• the reorganization of synaptic input to the ankle flexor and extensor motoneurons induced by chronic electrical stimulation of proprioceptive fibers in rats after complete transection of the spinal cord

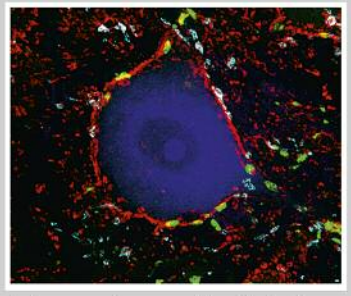
• the role of extracellular matrix and perineuronal nets surrounding motoneurons in the spontaneous recovery processes in the transected spinal cord: modulation by locomotor exercise and electrical stimulation of proprioceptive fibers

Changes in organization of neurotransmitter systems after spinal cord injury in the rat studied at the level of the spinal network, peripheral nerve and neuromuscular junction

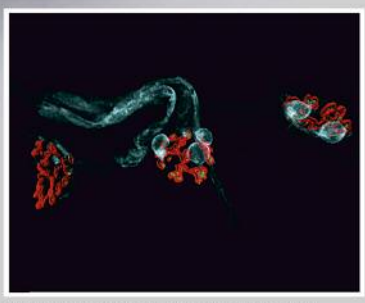


Spinal neuron receiving inhibitory synaptic inputs. Receptors for Glycine (red) and GABA (green) acompany Gephyrin (blue) anchoring them in plasma membrane.

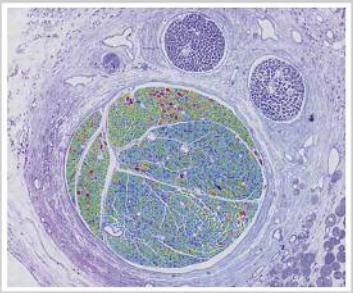




Soleus α-motoneuron identified with neurotracer. Synaptic inputs are immunolabeled for synaptophysin (all terminals, red), VGluT1 (turquise) and VAChT (green) identifying Ia glutamatergic and cholinergic terminals, respectively.



3D reconstruction of neuromuscular junctions. Nerve with terminal Schwann cells (turquise) forms cholinergic terminals (green) which abut on postsynaptic membrane rich in acetylocholine receptors (red).



Cross section of tibial nerve stained with Toluidine Blue. In the main bundle myelinated nerve fibers are colored according to their thickness.

Selected publications: Gajewska-Woźniak O., Grycz K., Czarkowska-Bauch J., Skup M. (2016) Electrical Stimulation of Low-Threshold Proprioceptive fibers in the adult rat increases density of glutamatergic and cholinergic terminals on ankle extensor α-motoneurons. PLoS One, 11(8): e0161614.

Wójcik-Gryciuk A., Skup M., Waleszczyk W.J. (2015) Glaucoma - state of the art and perspectives on treatment. Restor Neurol Neurosci, 34: 107-123.

Ziemlińska E., Kügler S., Schachner M., Wewiór I., Czarkowska-Bauch J., Skup M. (2014) Overexpression of BDNF increases excitability of the lumbar spinal network and leads to robust early locomotor recovery in completely spinalized rats. PLoS One, 9(2): e88833.

Gajewska-Woźniak O., Skup M., Kasicki S., Ziemlińska E., Czarkowska-Bauch J. (2013) Enhancing proprioceptive input to motoneurons differentially affects expression of neurotrophin 3 and brain-derived neurotrophic factor in rat hoffmann-reflex circuitry. PLoS One, 8(6):e65937.

Skup M., Gajewska-Wozniak O., Grygielewicz P., Mankovskaya T., Czarkowska-Bauch J. (2012) Different effects of spinalization and locomotor training of spinal animals on cholinergic innervation of the soleus and tibialis anterior motoneurons. Eur J Neurosci, 36(5): 2679-2688.

Head:
Urszula Sławińska

Degrees:
2010 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
2002 DSc Habil, Nencki Institute of Experimental Biology, PAS
1993 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1982 MSc in Physics, University of Warsaw

Research trainings:
Physiology, electrophysiology and behavior of locomotor control in chronic and acute experimental conditions in rats in norm and after CNS or PNS injury (with Vrbová in London; Jankowska in Göteborg; Orsal in Paris; Jordan in Winnipeg)

Professional employments:
2007-2014 Deputy Director for Scientific Matters at the Nencki Institute, PAS
1998-present Head of the Laboratory of Neuromuscular Plasticity at the Nencki Institute, PAS
1981-1998 Institute of Biocybernetics and Biomedical Engineering, PAS

Honors and fellowships:
2010-2016 Visiting Professor, University of Manitoba, Winnipeg, Canada
2001, 2006 Göteborg University, Göteborg, Sweden
1994-1995 University of Rene Descartes, Paris, France
1987 - 2000 Short time Fellowships by The Wellcome Trust, British Society, Royal Council at the University College of London, London, UK

Staff: Anna M. Cabaj, Henryk Majczyński, Mona Nazzal (PhD student), Małgorzata Zawadzka

Laboratory of Neuromuscular Plasticity

Research profile:
The overall goal of our studies is to understand the basic mechanisms of neuronal plasticity in the neuronal network responsible for locomotor control. We are also interested in the role of different neurotransmitters in the control of locomotor movements. Particularly, our research involves the functional aspects of locomotor hind limb movements after central and peripheral nervous system injury in young as well as in adult rats. The restitution of motor function related to changes in the locomotor hind limb movements and the recovery of inter-limb and intra-limb coordination after nervous system injury are investigated.

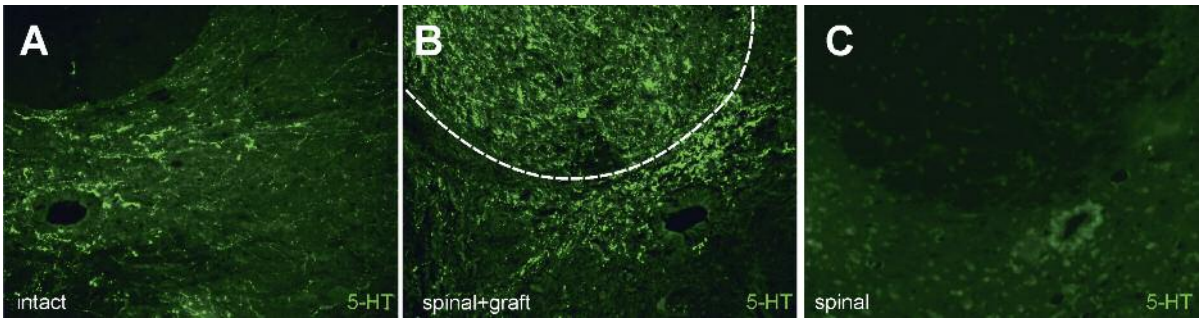
We aim to promote spinal cord recovery by:
- identifying and applying novel factors activating the neural niche to produce new neurons
- restitution of serotonergic innervation
- enhancing endogenous repair response and remyelination in the injured spinal cord white matter.

We aim to evolve new strategies for treatment of the injured spinal cord or peripheral nerves to enhance the restitution of motor function. A core feature of our research is directed towards identifying new rehabilitation methods that can stimulate the neuronal plasticity mechanisms responsible for restitution of motor functions after injury. Particularly, the effects of the rehabilitation approaches that employ intraspinal neural transplantation and various pharmacological treatments are investigated.

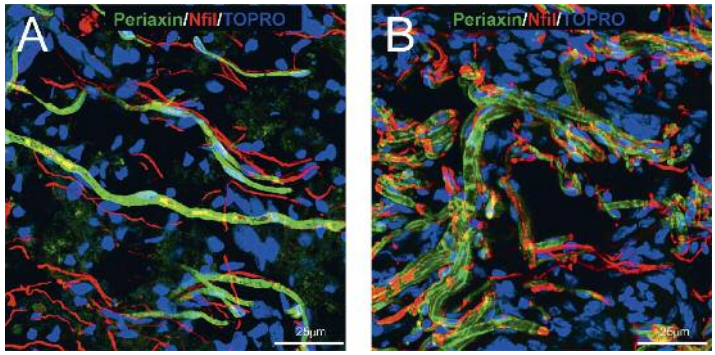
Current research activities:

• Development of a new method to enhance locomotor recovery using direct activation of serotonergic neurons transplanted into the spinal cord below the total transection in paraplegic rats (Polish NSC grant). We are investigating the use of controlled activation of DREADDs (Designed Receptors Exclusively Activated by Designer Drugs) in serotonergic neurons in the graft for the initiation of locomotion. We are striving to use chemical activation of transplanted serotonergic neurons to improve functional recovery of locomotion after spinal cord injury

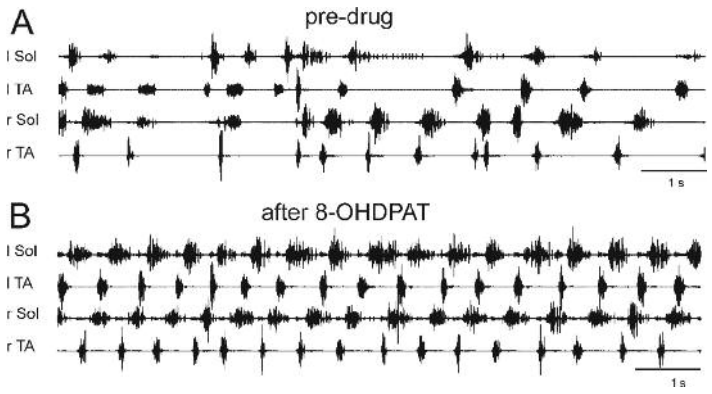
• The same strategy of intra-spinal grafting for enhancing locomotor recovery is used to investigate whether reestablished serotonergic innervation in the spinal cord below a total transection can promote host neurogenesis or natural axonal growth of host neural networks as found for descending serotonergic neurons in zebrafish the "NEURONICHE" (Era-Net Neuron grant). Together with the other members of the "NEURONICHE" Era-Net consortium we plan to identify the signals acting on the stem cells and use them to improve the serotonergic innervation in the injured spinal cord in the rat model of paraplegia and enhance recovery of locomotion.



Serotonergic innervation of the spinal cord low thoracic level in intact rat (A) in comparison to serotonergic innervation in the spinal cord of paraplegic rat with (B) and without the graft (C). The graft is delineated by dashed lines in B. Note that the spinal cord of paraplegic rat below total transection is totally devoid of any serotonergic fibers.



Spontaneous axonal regeneration related to presence of peripheral myelin cells at the adjacent area (A) and epicentre (B) of the lesion of spinal cord in the rat. Green – Periaxin (peripheral myelin protein), red- Neurofilament, blue – DNA



Comparison of EMG activity patterns of soleus (Sol) and tibialis anterior (TA) muscles recorded during locomotor hind limb movements of paraplegic rat before (A) and after 8-OH-DPAT (an agonist of 5-HT7/1A receptors) application (B).

Selected publications: Cabaj A.M., Majczyński H., Couto E., Gardiner P.F., Stecina K., Sławińska U., Jordan L.M. (2017) Serotonin controls initiation of locomotion and afferent modulation of coordination via 5-HT7 receptors in adult rats. J Physiol, 595(1): 301-320.

Leszczyńska A.N., Majczyński H., Wilczyński G.M., Sławińska U., Cabaj A.M. (2015) Thoracic hemisection in rats results in initial recovery followed by a late decrement in locomotor movements, with changes in coordination correlated with serotonergic innervation of the ventral horn. PLoS One, 10(11): e0143602.

Sławińska U., Miazga K., Jordan L.M. (2014) 5-HT$_2$ and 5-HT$_7$ receptor agonists facilitate plantar stepping in chronic spinal rats through actions on different populations of spinal neurons. Front Neural Circuits, 8: 95.

Sławińska U., Miazga K., Cabaj A.M., Leszczyńska A.N., Majczyński H., Nagy J.I., Jordan LM. (2013) Grafting of fetal brainstem 5-HT neurons into the sublesional spinal cord of paraplegic rats restores coordinated hindlimb locomotion. Exp Neurol, 247: 572-581.

Sławińska U., Majczyński H., Dai Y., Jordan L.M. (2012) The upright posture improves plantar stepping and alters responses to serotonergic drugs in spinal rats. J Physiol, 590(7): 1721-1736.

Head:
Grzegorz Wilczyński

Degrees:
2016 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
2002 PhD (summa cum laude), Medical University of Warsaw
1997 MD (summa cum laude), Medical University of Warsaw

Research trainings:
1999 Postdoctoral training in the Neuromuscular Center, University of Southern California, Los Angeles, USA

Professional employments:
2016-present Professor, Nencki Institute of Experimental Biology, PAS
2010-2016 Associate Professor, Nencki Institute of Experimental Biology, PAS
2006-present Head of the Laboratory of Molecular and Systemic Neuromorphology, Nencki Institute of Experimental Biology, PAS
2006-2010 adjunct

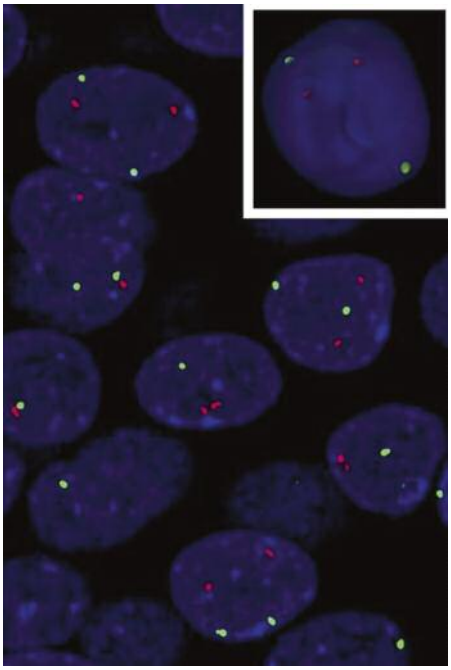
Honors and fellowships:
2006 Visiting scientist at University of Oslo, Norway
2002 Visiting scientist at the Leibniz Institute in Magdeburg, Germany
Team award from the Ministry of Science and Higher Education for the research in experimental oncology;
Team award from Head of the Polish Academy of Sciences for the research in neurobiology and Konorski Prize for the best publication in neurobiology

Staff: Artur Choroś, Agnieszka Chwedorowicz (PhD student), Iwona Czaban (PhD student), Agnieszka Czechowska (PhD student), Hubert Doleżyczek, Joanna Dzwonek, Ana Martin Gonzales (PhD student), Dagmara Holm (PhD student), Elżbieta Januszewicz, Patrycja Kruk (PhD student), Katarzyna Krawczyk (PhD student), Adriana Magalska, Monika Malinowska, Gabriela Olech-Kochańczyk (PhD student), Katarzyna Pels, Anna Skupień (PhD student), Andrzej Szczepankiewicz, Paweł Trzaskoma (PhD student)

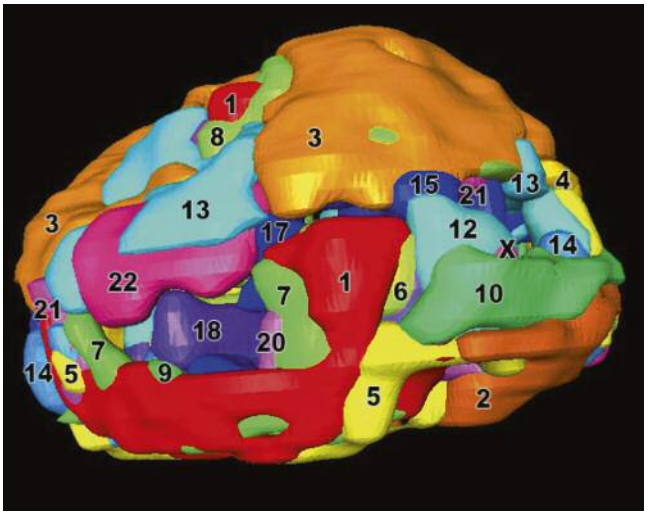
Laboratory of Molecular and Systemic Neuromorphology

Research profile:
Our research interest focuses on the structural and functional plasticity of the nervous system, in both health and disease. We study phenomena occurring at various levels of organization, including anatomical sub-structures of the brain, the nervous tissue with all its cellular constituents, subcellular-, and macromolecular levels. One major issue that we investigate is the role of neuronal nuclear structure and immediate-early gene expression in learning and behaviour, and in epileptogenesis. Another major project focuses on the role of the extracellular matrix receptors in synaptic plasticity in the brain, this also involves studies of pathological plasticity occurring in various forms of epilepsy. We are also interested in advances of microscopy and tissue-visualization techniques. We cooperate extensively with several groups in the Nencki Institute and at the Jackson Laboratories USA, University of Bergen, Norway, Institute of Neurobiology, Alicante, Spain.

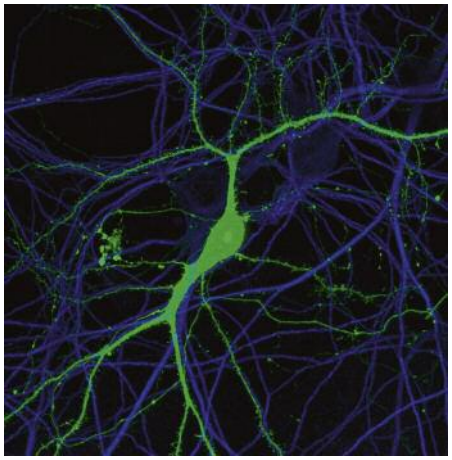
Current research activities:
- investigation of the neuronal nuclear architecture in plasticity and epileptogenesis
- studies on the role of CD44, an adhesion and signaling receptor, in neural plasticity.



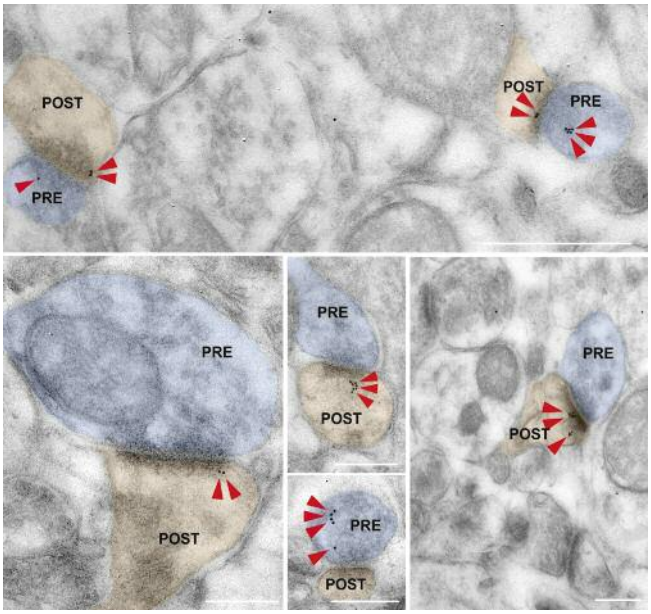
Spatial distributions of Bdnf and Trkb in the nuclei of rat hippocampal dentate gyrus neurons. FISH labeling of the rat dentate gyrus for Bdnf (green) and Trkb (red); DNA was counterstained using TOPRO 3 (blue). Inset show 3D neuronal nucleus reconstruction.



3D reconstruction of all chromosomes: GM12878 human lymphoblastoid cell line (Tang, Luo, Li et al., Cell 2015)



Confocal image of rat hippocampal neurons in culture transfected with GFP (green fluorescent protein) coding gene (green) and immunostained with anti-MAP-2 antibody (blue, neuronal marker).



Immunogold electron microscope detection (after embedding) of CD44 in the CA3 region of the hippocampus. Immunogold particles indicating CD44IR (red arrowheads) are present within the dendritic spines (POST, orange) and axonal boutons (PRE, blue). Scale bar, 250 nm.

Selected publications: Roszkowska M., Skupien A., Wójtowicz T., Konopka A., Gorlewicz A., Kisiel M., Bekisz M., Ruszczycki B., Dolezyczek H., Rejmak E., Knapska E., Mozrzymas J.W., Wlodarczyk J., Wilczynski G.M., Dzwonek J. (2016) CD44 – a novel synaptic cell adhesion molecule regulating structural and functional plasticity of dendritic spines. Mol Biol Cell, 27(25): 4055-4066.

Tang Z., Luo O.J., Li X., Zheng M., Zhu J.J,. Szalaj P., Trzaskoma P., Magalska A., Wlodarczyk J., Ruszczycki B., Michalski P., Piecuch E., Wang P., Wang D., Tian S.Z., Penrad-Mobayed M., Sachs L.M., Ruan X., Wei C.L., Liu E.T., Wilczynski G.M., Plewczynski D., Li G., Ruan Y. (2015) CTCF-Mediated Human 3D Genome Architecture Reveals Chromatin Topology for Transcription. Cell, 163(7):1611-1627.

Ito S., Magalska A., Alcaraz-Iborra M., Lopez-Atalaya J.P., Rovira V., Contreras-Moreira B., Lipinski M., Olivares R., Martinez-Hernandez J., Ruszczycki B., Lujan R., Geijo-Barrientos E., Wilczynski G.M., Barco A. (2014) Loss of neuronal 3D chromatin organization causes transcriptional and behavioural deficits related to serotonergic dysfunction. Nat Commun, 5: 4450.

Skupien A., Konopka A., Trzaskoma P., Labus J., Gorlewicz A., Swiech L., Babraj M., Dolezyczek H., Figiel I., Ponimaskin E., Wlodarczyk J., Jaworski J., Wilczynski G.M., Dzwonek J. (2014) CD44 regulates dendrite morphogenesis through Src tyrosine kinase-dependent positioning of the Golgi apparatus. J Cell Sci, 127(23): 5038-5051.

Walczak A., Szczepankiewicz A.A., Ruszczycki B., Magalska A., Zamlynska K., Dzwonek J., Wilczek E., Zybura-Broda K., Rylski M., Malinowska M., Dabrowski M., Szczepinska T., Pawlowski K., Pyskaty M., Wlodarczyk J., Szczerbal I., Switonski M., Cremer M., Wilczynski G.M. (2013) Novel higher-order epigenetic regulation of the Bdnf gene upon seizures. J Neurosci, 33(6): 2507-2511.

Head:
Daniel Krzysztof Wójcik

Degrees:
2015 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
2008 DSc Habil, theoretical physics, Institute of Physics, PAS
2000 PhD in theoretical physics, University of Warsaw
1996 MSc in physics, University of Warsaw

Research trainings:
2004, 2005 Visiting Scientist Ecole Normal Superieure de Lyon, Laboratoire de Physique, France
1993-1993 Summer Student Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany

Professional employments:
2015-present Head of the PhD Studies, Nencki Institute of Experimental Biology, PAS
2011-present Head of the Laboratory of Neuroinformatics, Nencki Institute of Experimental Biology, PAS
2003-present Professor, Nencki Institute of Experimental Biology, PAS
2002-2003 Joseph Ford Fellow, Center for Nonlinear Science, Georgia Institute of Technology, USA
2000-2002 Research Associate, Institute for Physical Science and Technology, University of Maryland, College Park, USA
1996-2003 Research Assistant, Center for Theoretical Physics, PAS
1994-1996 Teaching Assistant, Physics Department, University of Warsaw

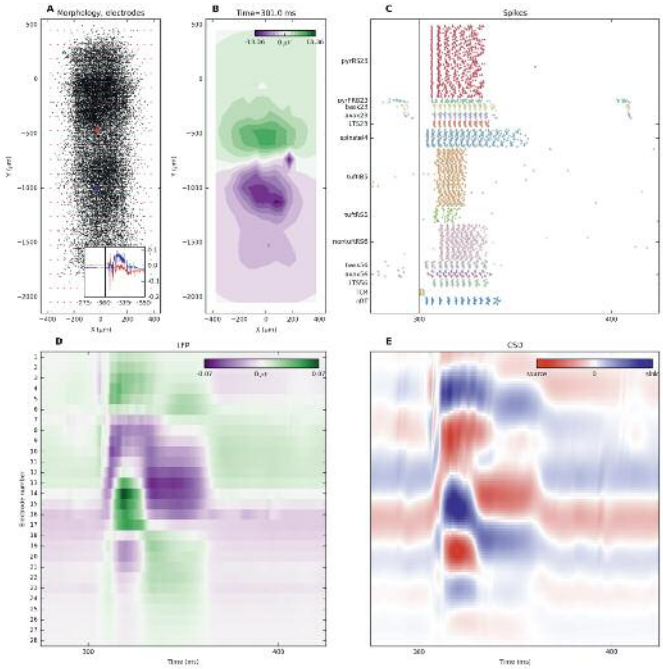
Honors and fellowships:
2015-2017 Organization for Computational Neuroscience, Director (elected)
2011-2018 Polish Academy of Sciences, Neurobiology Committee, Member (elected)
2011-2015 Polish Society for Neuroscience, Governing Board Member and Treasurer (elected)
2007-2015 International Neuroinformatics Coordinating Facility, Polish Representative at the INCF Governing Board (nominated)

Staff: Sylwia Bednarek, Michał Czerwiński (PhD student), Jakub M. Dzik (PhD student), Natalia Jermakow, Marta Kowalska (PhD student), Piotr Majka, Karolina Sokołowska, Maciej Śmigielski, Władysław Średniawa (PhD student)

Laboratory of Neuroinformatics

Research profile:
The main activity of the group is development of computational tools and models, and using them to understand brain structure and function. We analyze and model electrophysiological, behavioral and imaging data from mice, rats, opossums, cats, marmosets, and humans. An important part of our activity is the development of neuroinformatics infrastructure for storage and processing of histological information and creation of histology-based 3D brain atlases from different input sources (http://www.3dbars.org/).

Current research activities:
• development and application of methods to reconstruct brain activity at different scales from various measurements of extracellular potential (LFP, ECoG, MEA), in particular reconstruction of current sources in the human brain from combined SEEG and ECoG recordings;
• development and application of methods to analyze behavioral data from intelligent animal cages (EcoHab, IntelliCage);
• development and application of methods to process and integrate multimodal imaging data (MR, histology, tracing, brain atlas data).



Thalamocortical network modelling and generation of ground truth data to validate methods of analysis. Caption: (A) Shows the Traub's single Thalamocortical column which we model to track the transmembrane currents from every compartment, the small red diamonds represent the electrode array (16 x 20) placed 25 µm away from the cylindrical axis of the cortical column, while the black circles indicate the mid points of the segments of the cortical cells from a down-scaled network model. The inset figure is the extracellular potential recorded on two selected electrodes marked by red and blue squares. The x and y axis of the inset figure are time (ms), and potential (mV). (B) Shows the linearly interpolated extracellular potential recorded at 301 ms from the onset of recorded simulation, which is indicated in the inset figure on the left plot with a vertical black line. (C) Shows the raster plot of the network activity. Up and down pointing triangles indicate excitatory and inhibitory neurons, respectively, the black vertical line shows the stimulus onset. (D) LFP (extracellular potential filtered below 100 Hz using second order Butterworth filter) as recorded by 28 electrodes with inter-electrode distance of 92.6µm, the y-axis shows electrode number. (E) The current source density (CSD) computed using the KCSD 1D algorithm for the potentials shown in (D).

References:

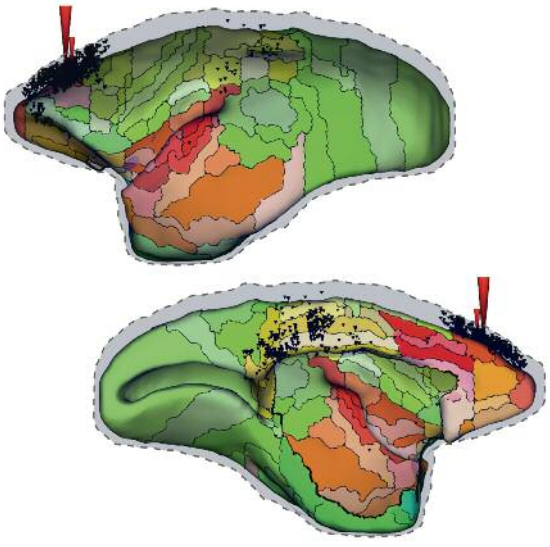
1. Thalamocortical column model : Traub et al., Single-column thalamocortical net- work model exhibiting gamma oscillations, sleep spindles, and epileptogenic bursts., Journal of Neurophysiology, 93(4), 2194– 2232 (2005)

2. Simulation results: Dataset 24 from Głąbska et al., Collection of simulateddata from a thalamocortical network model., Neuroinformatics 15:1 (2017)

3. KCSD : Potworowski et al., Kernel current source density method., NeuralComputation, 24(2), 541–575 (2012).

Resources:

1. This figure and its variations: https://github.com/Neuroinflab/Thalamocortical/figures
2. KCSD implementation in python: https://github.com/Neuroinflab/kCSD-python



Towards a comprehensive atlas of cortical connections in a primate brain: Mapping tracer injection studies of the common marmoset into a reference digital template. Piotr Majka, Tristan A. Chaplin, Hsin-Hao Yu, Alexander Tolpygo, Partha P. Mitra, Daniel K. Wójcik and Marcello G.P. Rosa, 3 JUN 2016 | DOI: 10.1002/cne.24037

Caption:

Distribution of retrogradely labeled neurons in the marmoset cerebral cortex, visualized against a reference template derived from Paxinos et al. (2012, The Marmoset Brain in Stereotaxic Coordinates, Academic Press). This has been achieved by 3-dimensional reconstruction and co-registration of retrograde tracer data into the template. Lateral (top) and medial (bottom) views of labeled neurons plotted against the mid-thickness of the cortical surface, with colors representing different cortical areas. Red cones indicate the center of the injection site, as estimated by automated (large cone) and expert-based (small cone) procedures. The dashed outline depicts the external surface of the cortex. Journal of Comparative Neurology, Volume 524, Number 11, pages 2161–2181.

Selected publications: Głąbska H., Chintaluri H.C., Wójcik D.K. (2017) Collection of simulated data from a thalamocortical network model. Neuroinformatics, 15: 1.

Puścian A., Łęski S., Kasprowicz G., Winiarski M., Borowska J., Nikolaev T., Boguszewski PM., Lipp H-P., Knapska E. (2016) Eco-HAB– fully automated and ecologically relevant assessment of social impairments in mouse models of autism. eLife doi: 10.7554/eLife.19532.

Majka P., Chaplin T.A., Yu Hsin-Hao, Tolpygo A., Mitra P.P., Wójcik D.K., Rosa M.G.P. (2016) Towards a comprehensive atlas of cortical connections in a primate brain: Mapping tracer injection studies of the common marmoset into a reference digital template. J Comp Neurol, 11: 2161-2181.

Ness T.V., Chintaluri C., Potworowski J., Łęski S., Głąbska H., Wójcik D.K., Einevoll G.T. (2015) Modelling and analysis of neural electrical potentials recorded in microelectrode arrays (MEAs). Neuroinformatics, 13(4):403-426.

Głąbska H., Potworowski J., Łęski S., Wójcik D.K. (2014) Independent components of neural activity carry information on individual populations, PLoS One, 9(8):e105071.

Head:
Wioletta Joanna Waleszczyk

Degrees:
2006 DSc Habil, Nencki Institute of Experimental Biology, PAS
1995 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1988 MSc in Physics, Faculty of Physics, University of Warsaw

Research trainings:
1997-2000 Post-doctoral training in the Bogdan Dreher's Laboratory of Adult and Developing Visual System, at the Department of Anatomy and Histology, University of Sydney, Australia
1988-1997 Doctoral and post-doctoral training in the Laboratory of Visual Perception in the Nencki Institute of Experimental Biology, PAS

Professional employments:
2013-present Head of the Laboratory of Visual Neurobiology in the Nencki Institute of Experimental Biology, PAS
2009 Visiting scientist, University of Sydney, Australia
2000-present Assistance and Associate Professor at the Nencki Institute of Experimental Biology, PAS
1997-2000 Research Associate, Department of Anatomy and Histology, University of Sydney, Australia
1988-1997 Research Assistant, Department of Neurophysiology, Nencki Institute of Experimental Biology, PAS

Honors and fellowships:
2017-present Editor-in-Chief, Acta Neurobiologiae Experimentalis
201-present Member of the Neurobiology Committee, Polish Academy of Sciences
2011-2015 Governing Board Member and Secretary-General of the Polish Society for Neuroscience

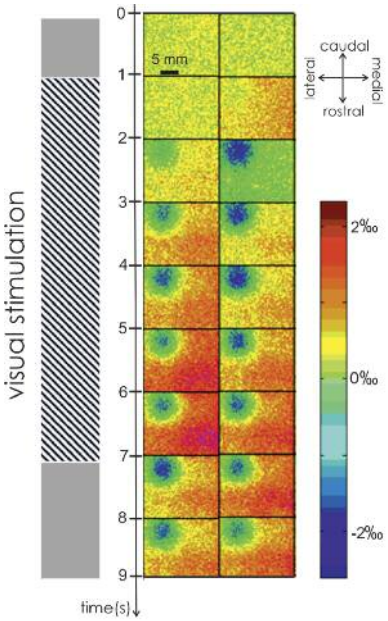
Staff: Marek Bekisz, Ryszard Cetnarski (PhD student), Piotr Dzwiniel (PhD student), Katarzyna Jurewicz (PhD student), Katarzyna Kordecka (PhD student), Katarzyna Paluch (PhD student), Ida Raciborska (PhD student), Jacek Rogala, Ninad Shendye (PhD student), Anna Wieczorek-Taraday (PhD student), Agnieszka Wierzbicka, Andrzej Wróbel

Laboratory of Visual Neurobiology

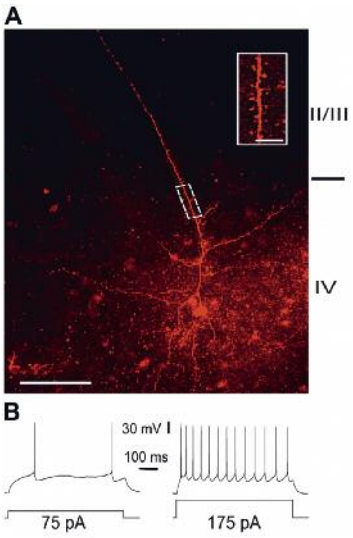
Research profile:
The research in the laboratory focuses on the functional processing of visual information with strong aspects directed to translational science. The specific goals include: coding of visual information, function of the extrageniculate pathway and plasticity following damage of the visual pathway. Translational studies concern rehabilitation of visual functions with the use of various methods: visual stimulation, noninvasive current stimulation and gene therapy.
Methods used in our laboratory include:
- in vitro intracellular recordings, single-, multi-unit and LFP/EP recordings from subcortical and cortical visual structures in behaving animals; intrinsic signal optical imaging
- EEG/EP and fMRI recordings in humans
- non-invasive current stimulation
- sensory and behavioral training
- computational analysis of electrophysiological signals and modeling.

Current research activities:
- Electrophysiological correlates of visual attention in cat
  – the role of the EEG beta frequency band in attentive vision – temporal analysis (frequency, phase and amplitude envelopes) of LFPs registered from different parts of cat's thalamo-cortical system during behavioral task based on intermingled trials of delayed spatial discrimination of visual or auditory stimuli
- Cognitive functions of the human brain
  – electrophysiological (EEG) and BOLD (fMRI) correlates of attention and working memory. The validation of neurofeedback-EEG method

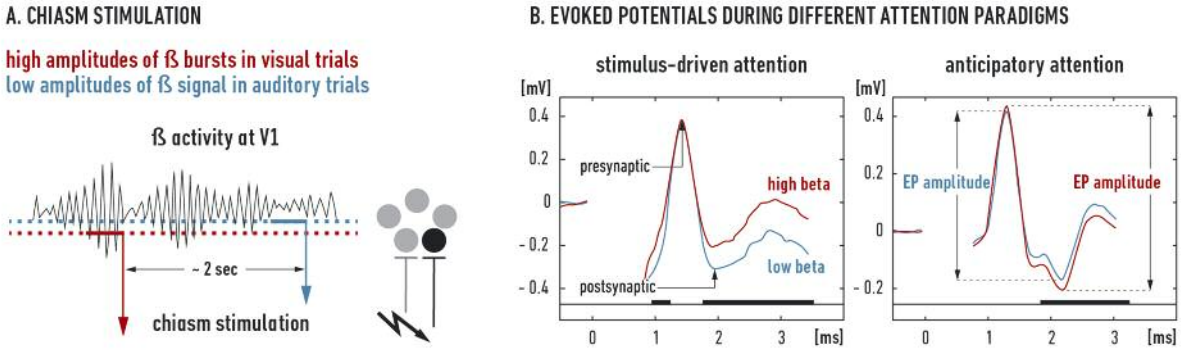
- Information processing in the cortico-thalamic sensory systems
  – the role of primary and secondary sensory pathways in different behavioral situations;
  – the role of thalamic and cortical inhibition in different behavioral situations – physiology and modeling
  – ex vivo studies of functional mechanisms in subcortical and cortical neuronal networks in brain slices using electrophysiological intracellular recordings with whole-cell patch-clamp method
- The role of the extrageniculate visual pathway
  – information processing in the subcortical structures of extrageniculate visual pathway (response properties of visual neurons, oscillatory activity, brain state--dependent modulation of neuronal activity)
- Mechanisms of plasticity in the visual system following damage
  – visual information processing in the visual pathway after retinal lesion, retinal neurodegeneration, cortical stroke
- Rehabilitation of visual functions
  – influence of visual training and noninvasive current stimulation on visual information processing.



Activation maps of the mouse visual cortex caused by presentations of moving horizontal gratings (to the right; spatial frequency 0.05 cycle/degree, temporal frequency 2 Hz) obtained with intrinsic signal optical imaging. The graphic depicts frame images collected every 0.5 s. Stimulus was presented to the left eye, and each frame covers the activity response in the right (contralateral) hemisphere. The color bar indicates range of response relative to baseline.



A. Star-pyramidal neurone from layer 4 of somatosensory barrel cortex filled with fluorescent dye during electrophysiological recording (scale 50 µm). A fragment of apical dendrite with dendritic spines was additionally enlarged (scale 5 µm). Cortical layers are shown on the right. **B.** Action potentials generated by star-pyramidal cell during direct depolarization by 75 i 175 pA rectangular current injected through recording electrode.



Examples of the averaged evoked potentials (B) obtained to optic chiasm stimulation calculated during periods of small (A; blue lines) and large (A; red lines) amplitudes of beta oscillatory activity recorded for two visual attentional paradigms in two cats.

Selected publications: Rogala J., Jurewicz K., Paluch K., Kublik E., Cetnarski R., Wróbel A. (2016) The Do's and Don'ts of Neurofeedback Training: A Review of the Controlled Studies Using Healthy Adults. Front. Hum. Neurosci, 10:301.

Bekisz M., Bogdan W., Ghazaryan A., Waleszczyk W.J., Kublik E., Wróbel A. (2016) The Primary Visual Cortex Is Differentially Modulated by Stimulus-Driven and Top-Down Attention. PLoS One, 11(1):e0145379.

Foik A.T., Kublik E., Sergeeva E.G., Tatlisumak T., Rossini P.M., Sabel B.A., Waleszczyk W.J. (2015) Retinal origin of electrically evoked potentials in response to transcorneal alternating current stimulation in the rat. Invest Ophthalmol Vis Sci, 56(3): 1711-1718.

Sobolewski A., Kublik E., Świejkowski D.A., Kamiński J., Wróbel A. (2015) Alertness opens the effective flow of sensory information through rat thalamic posterior nucleus. Eur J Neurosci, 41: 1321-1331.

Wypych M., Wang C., Nagy A., Benedek G., Dreher B., Waleszczyk W.J. (2012) Standardized F1 - A consistent measure of strength of modulation of visual responses to sine-wave drifting gratings. Vision Res, 72: 14-33.

Head:
Grażyna Niewiadomska

Degrees:
2008 DSc Habil, Nencki Institute of Experimental Biology, PAS
1988 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1978 MSc in Biology, Department of Biology, University of Warsaw

Research trainings:
1999, 2002, 2003, 2006 Post-doctoral training and fellowships, Biomedical Sciences, IMS, Aberdeen University, UK
1997 Post-doctoral training and fellowships, Department of Comparative Physiology, Etvos University, Hungary
1990-1991 Post-doctoral training and fellowships, Department of Neuroanatomy, Semelweiss University, Budapest, Hungary

Professional employments:
2010-present Associate Professor, Head of the Laboratory of Preclinical Studies in Neurodegenerative Diseases, Nencki Institute of Experimental Biology, PAS
2008-2010 Assistant Professor, Nencki Institute of Experimental Biology, PAS
1991-2008 Senior researcher, Nencki Institute of Experimental Biology, PAS
1984-1991 Researcher, Nencki Institute of Experimental Biology, PAS
1984-1984 Assistant, Nencki Institute of Experimental Biology, PAS
1982-1984 PhD student, Nencki Institute of Experimental Biology, PAS
1980-1982 PhD student, Mossakowski Medical Research Centre, PAS

Honors and fellowships:
2014 Jerzy Konorski Award of the Polish Neuroscience Society and the Committee of Neurological Sciences of the Polish Academy of Sciences for the Best Publication in Neurobiology.
2008 Silver Cross of Merit from the President of the Republic of Poland for the research on the role of hyperphosphorylation of tau protein in the dysfunction of microtubular transport
2007 present Member of the Scientific Steering Committee of WISTA LABORATORIES Ltd., University of Aberdeen

Staff: Teresa Cymbalak, Radosław Folcik, Anna Gąsiorowska, Ewelina Pałasz (PhD student), Marta Steczkowska, Adrianna Wysocka (PhD student), Maciej Zadrożny

Laboratory of Preclinical Studies in Neurodegenerative Diseases

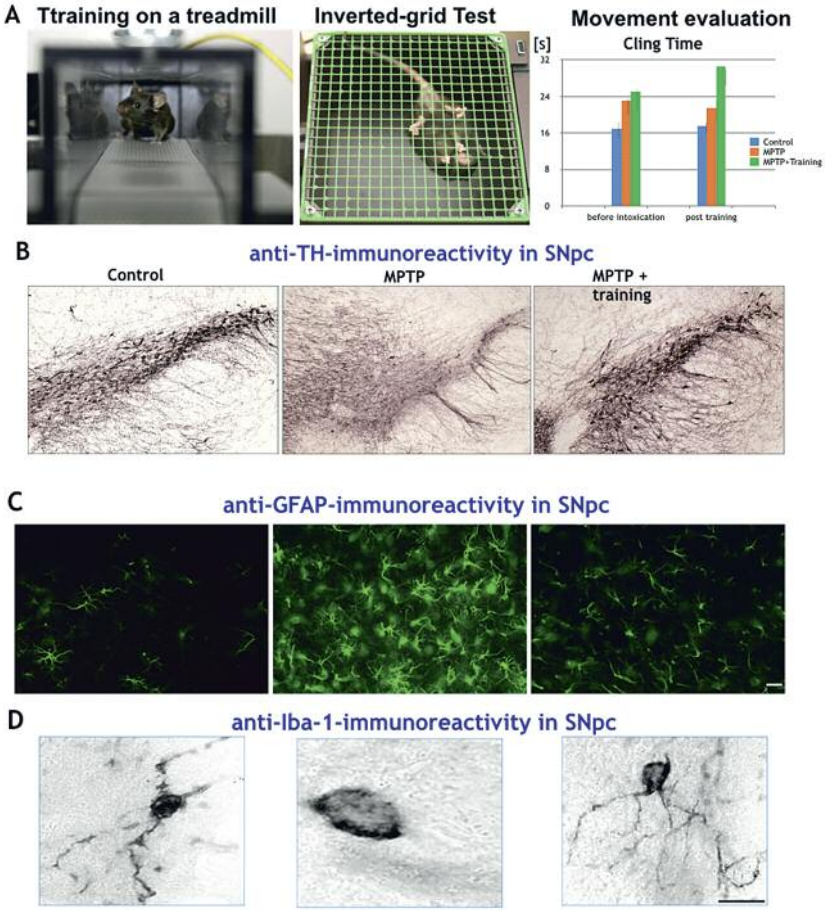
Research profile:
Neurodegeneration is a common theme of many nervous system diseases, such as Alzheimer's disease, Parkinson's disease, ALS, head trauma, epilepsy and stroke. The occurrence of these devastating disorders is increasing rapidly in the ageing population and current treatments are inadequate. Our main research interest is to understand the mechanisms involved in neural ageing. Towards this end, we have tried to implement new experimental protocols and conduct longitudinal studies that can be used in neurodegenerative disorders like Alzheimer's disease and Parkinson's disease. The work uses rats and transgenic mice and has centred on studies of the reversal of brain dysfunction induced by ageing. We attempt to link cellular and behavioral levels of the brain processes present during physiological and pathological ageing. Therefore, we develop quantitative approaches to the study of behaviour which offer to analyse the relationships between the elements of a given behavioural proxies. Currently the additional team's main interest is the development of novel treatments, animal models and diagnostic procedures for the nervous system's diseases and assessment of toxicology, safety pharmacology, pharmacokinetics and complex behavioral effects of therapeutic compounds.

Current research activities:
• Assessment of the state and function of the brain cholinergic system in animal models of Alzheimer-type and frontotemporal dementia-type tauopathy
  – behavioural, morphologic and biochemical evaluation of the cholinotrophic system in two transgenic mouse lines which develop mild (TgL1) and advanced (TgL66) tauopathy without amyloidopathy
  – cholinergic anabolism and signalling

– the retrograde transport in basal forebrain cholinergic neurones and correlation of these changes with age-dependent structural reorganisation of the axonal cytoskeleton
– TrkA receptor expression and NGF-TrkA signalling
– cytoskeletal transport and post-translational modifications of microtubule associated proteins during physiological ageing and neurodegenerative diseases in animal models
– profiling age-related cognitive impairments in spatial memory tasks.

• Counteraction Parkinson's disease by application of progressive training in humans and evaluation of factors which determine neuroprotective effect of this training using an animal model of Parkinson's disease
– effects of time of physical training initiation, its duration and intensity on the number and morphology of dopaminergic neurons in substantia nigra and in the ventral tagmental area, on the neurotrophic factors levels and brain tissue inflammation, and on motor function in mouse models of Parkinsonism.

• Development of novel treatments for neurodegenerative diseases: testing in animal models and assessment of drug safety and pharmacology.



Running exercise improves motor skills and prevents loss of nigrostriatal dopaminergic neurons by inhibiting brain inflammation in mice MPTP model of Parkinson's disease. A: C57BL/6 mice were treated for five weeks with 12,5 mg/kg 1-methyl-4-phenyl1,2,3,6-tetrahydropyridine (MPTP) in combination with 250 mg/kg probenecid. Mice were subdivided into: Control, MPTP (non-exercised with induction of PD), and MPTP-trained (exercised before during and after the induction of PD) groups. Multiple movement proxies were calculated using semi-automatic MATLAB script TracMouse in mice performing the traction test (inverted grid with mice clinging to the underside). Subtle motor impairment was revealed in Parkinsonian mice after physical training. B: Histological analysis of frank dopamine cell loss in substantia nigra pars compacta (SNpc) in MPTP mice compared to control. Treadmill training restores the presence of TH-immunopositive neurons after the damaging action of MPTP neurotoxin. C and D: Treadmill training reduced the expression of glial inflammatory markers in SNpc in MPTP trained group in relation to MPTP non-trained mice. In MPTP mice increased number of activated astrocytes marked against glial fibrillary acidic protein (GFAP) was observed (C). Also in Parkinsonian mice antibody against ionized calcium-binding adapter molecule 1 (Iba-1) reacted strongly with amoeboid-shaped cells corresponding to active microglia. In control and MPTP-trained animals anti-Iba-1 antibody recognizes ramified cells with small bodies and finally branched processes typical for resting microglia (D).

Selected publications: Niewiadomski W., Palasz E., Skupinska M., Zylinski M., Steczkowska M., Gasiorowska A., Niewiadomska G., Riedel G. (2016) TracMouse: A computer aided movement analysis script for the mouse inverted horizontal grid test. Sci Rep, 6: 39331.

Koss D.J., Robinson L., Mietelska-Porowska A., Gasiorowska A., Sepčić K., Turk T., Jaspars M., Niewiadomska G., Scott R.H., Platt B., Riedel G. (2015) Polymeric alkylpyridinium salts permit intracellular delivery of human Tau in rat hippocampal neurons: requirement of Tau phosphorylation for functional deficits. Cell Mol Life Sci, 72(23): 4613-4632.

Melis V., Zabke C., Stamer K., Magbagbeolu M., Schwab K., Marschall P., Veh R.W., Bachmann S., Deiana S., Moreau P.H., Davidson K., Harrington K.A., Rickard J.E., Horsley D., Garman R., Mazurkiewicz M., Niewiadomska G., Wischik C.M., Harrington C.R., Riedel G., Theuring F. (2015) Different pathways of molecular pathophysiology underlie cognitive and motor tauopathy phenotypes in transgenic models for Alzheimer's disease and frontotemporal lobar degeneration. Cell Mol Life Sci, 72(11): 2199-2222.

Mietelska-Porowska A., Wasik U., Goras M., Filipek A., Niewiadomska G. (2014) Tau protein modifications and interactions: their role in function and dysfunction. Int J Mol Sci, 15(3): 4671-4713.

Wasik U., Schneider G., Mietelska-Porowska A., Mazurkiewicz M., Fabczak H., Weis S., Zabke C., Harrington C.R., Filipek A., Niewiadomska G. (2013) Calcyclin binding protein and Siah-1 interacting protein in Alzheimer's disease pathology: neuronal localization and possible function. Neurobiol Aging, 34(5): 1380-1388.

Laboratory of Calcium Binding Proteins

Laboratory of Transport Through Biomembranes

Laboratory of Neuroplasticity

Laboratory of Neurobiology

Laboratory of Epileptogenesis

Laboratory of Cell Biophysics

Laboratory of Molecular Basis of Behavior

Laboratory of Spatial Memory

Head:
Leszek Kaczmarek

The Department of Molecular and Cellular Neurobiology is composed of eight independent laboratories headed by Anna Filipek, Leszek Kaczmarek, Małgorzata Kossut, Katarzyna Łukasiuk, Katarzyna Nałęcz, Katarzyna Radwańska, Jakub Włodarczyk and Rafał Czajkowski. Individual research programs in the laboratories are all complementary and interdependent within the common research area of molecular and cellular neurobiology.

Calcium homeostasis and its impact on processes related to cell proliferation and differentiation is investigated by the group led by Prof. Filipek. In particular, the group studies the role of the calcium binding protein, S100A6, and its ligands: Sgt1, CacyBP/SIP and p53 in ubiquitination, cytoskeletal organization and cellular response to stress.

Prof. Kaczmarek's group aim is to understand **brain-mind connection.** Presently, their major research effort is focused on matrix metalloproteinase, MMP-9 and its fundamental role in controlling morphological and functional plasticity of the excitatory synapses, especially in the central nucleus of the amygdala, which they have implicated as pivotal for the appetitive learning as well as in motivation driving alcohol addiction.

Epileptogenesis is the main theme of the group led by Prof. Łukasiuk. Molecular mechanisms and the role of altered gene expression that can lead to epilepsy and the design of new therapeutic strategies are investigated.

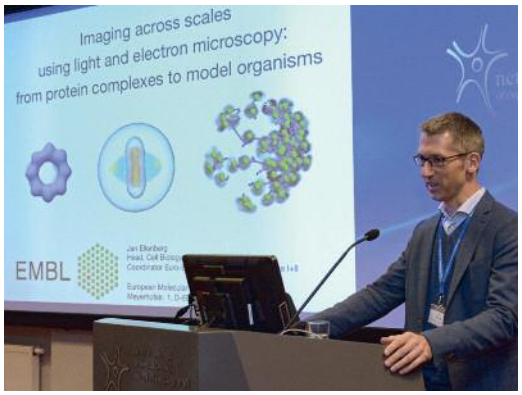
Neuronal mechanisms of learning and plasticity in adult and ageing brain are studied by Prof. Kossut and her team. The models of plasticity developed in her laboratory serve to measure the effects of genetic modifications, brain disease and trauma upon functioning of the cerebral cortex.

Membrane transporters, in particular the expression of carnitine and amino acid transporters in highly specialized brain cells, including those making the blood-brain barrier are investigated by Prof. Nałęcz. Other research topics cover carnitine and palmitoylcarnitine and their role in signal transduction pathways in differentiating neural cells.

Molecular bases of behavior with a focus on learning and memory formation, in health and diseases such as alcohol addiction, are investigated by Prof. Radwańska and her colleagues. The role of kinases in the regulation of structural dendritic spine plasticity in these behaviors is a major area of their investigation.

Synaptic modifications regulated by extracellular matrix proteolytic modifiers is studied by Prof. Włodarczyk and his team. Specifically, they investigate the role of extracellular matrix proteins and cell adhesion molecules in synapse formation/stabilization and their influence on postsynaptic receptor composition. Imaging based techniques are used to assess the reorganization of activity patterns accompanied by local volumetric changes at the synapses.

Role of retrosplenial cortex in spatial memory is the main research interest of Dr. Czajkowski and his colleagues. They use a variety of modern behavioral, molecular and physiological techniques to address this issue.



Head:
Anna Filipek

Degrees:
2009 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
2000 DSc Habil, Nencki Institute of Experimental Biology, PAS
1990 PhD in Biology, Nencki Institute of Experimental Biology, PAS
1985 MSc in Chemistry, University of Warsaw

Research trainings:
1990-1991 Post-doc, Vollum Institute, OHSU, Portland, USA
1990 Cell Biology course, Aarhus, Denmark
1989 Biophysics and Chemistry Institute, Gottingen, Germany
1988 University Zurich-Irchel, Switzerland

Professional employments:
2009-present Associate Professor and Head the of Laboratory of Calcium Binding Proteins, Nencki Institute of Experimental Biology, PAS
2002-2009 Assistant professor, Nencki Institute of Experimental Biology, PAS
1985-2002 Assistant, Nencki Institute of Experimental Biology, PAS

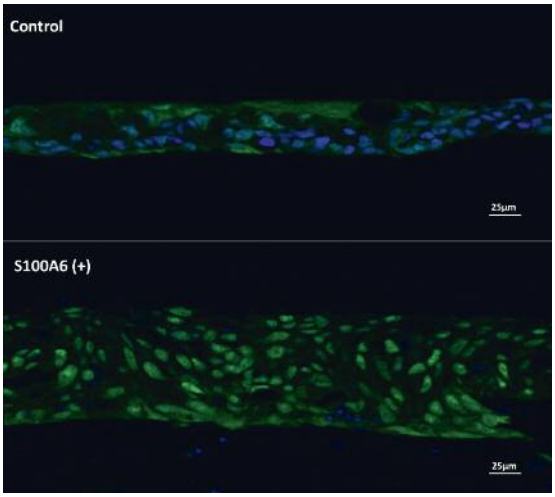
Honors and fellowships:
2014 Jerzy Konorski Award of the Polish Neuroscience Society and the Committee of Neurological Sciences
2001 Award of the Department of Biological Sciences, PAS
1990 FEBS fellowship (2 weeks)
1989 Max Planck fellowship (3 months)
1988 FEBS fellowship (3 months)
1987 Polish Biochemical Society Award (Mozolowski)
1986 Polish Histochemistry and Cytochemistry Society Award

Staff: Katarzyna Bartkowska, Anastasiia Bohush (PhD student), Ruzanna Djavadian, Agnieszka Góral, Ewelina Jurewicz, Beata Kądziołka (PhD student), Wiesława Leśniak, Sara Rosińska (PhD student), Barbara Sobiak (PhD student), Beata Tepper (PhD student)

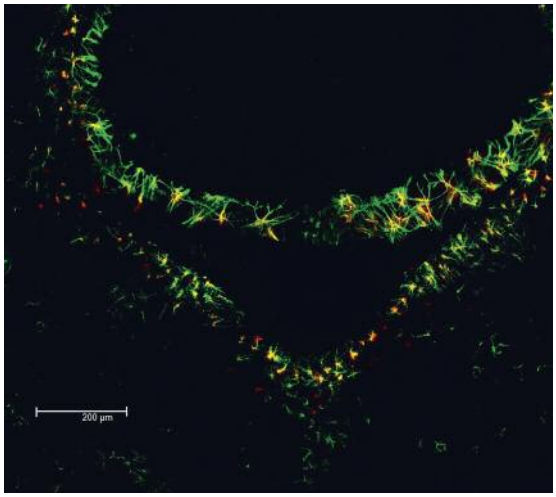
Laboratory of Calcium Binding Proteins

Research profile:
Research carried by the laboratory centers on: the role of a calcium binding protein S100A6, and its ligand, CacyBP/SIP, in signaling pathways involved in cell proliferation and differentiation; involvement and activity of MAP kinases in signaling pathways under normal and stress conditions; the role of Hsp90 and its co-chaperones, and of tau and α-synuclein in neurodegenerative diseases; transcriptional and epigenetic regulation of the S100 protein family gene expression. To study these processes we apply various biological and biochemical methods, among them are: cell transfection, immunoprecipitation, Western blot, immunocyto/histochemistry, ELISA, luciferase assay, gel-shift, chromatin immunoprecipitation (ChIP), bisulfite DNA modification. Another line of research conducted in the laboratory is investigation of the molecular mechanisms regulating development of the cerebellum in the opossum (Monodelphis domestica) and search for molecular basis of corpus callosum development during evolution. This study requires a multidisciplinary approach from behavioral observations to gene/protein expression.

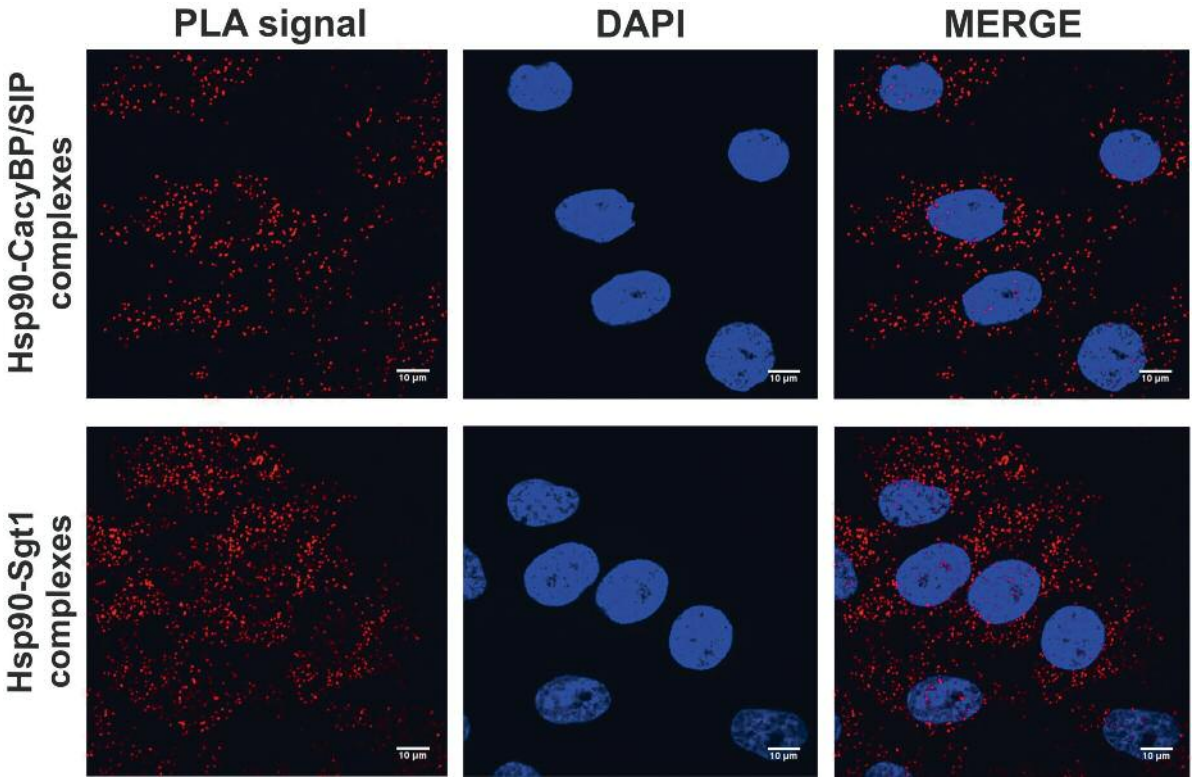
Current research activities:
- studies of CacyBP/SIP and MAP kinases in cytoskeletal organization, cell proliferation and differentiation
- investigation of CacyBP/SIP gene expression
- studies of Hsp90 co-chaperones and α-synuclein in neurodegenerative diseases
- studies of extracellular activity of the S100 proteins
- investigation of epigenetic factors regulating S100 genes expression during keratinocyte differentiation
- construction of a transgenic opossum (Monodelphis domestica); development of the cerebellum; generation of callosum-like structures in the opossum
- investigation of interleukin 6 and its receptor in brain functioning.



Immunofluorescent staining of p-ERK1/2 (green) in organotypic cultures of control and S100A6-overexpressing (S100A6+) human keratinocytes (HaCaT cells). Cell nuclei are in blue.



Immunofluorescent staining of astrocytes (green) producing IL-6 (red) in the periventricular zone of the fourth ventricle.



Hsp90-CacyBP/SIP and Hsp90-Sgt1 complexes (red) in HEp-2 cells visualized by proximity ligation assay (PLA). Cell nuclei are in blue.

Selected publications: Sobiak B., Graczyk-Jarzynka A., Leśniak W. (2016) Comparison of DNA Methylation and Expression Pattern of S100 and Other Epidermal Differentiation Complex Genes in Differentiating Keratinocytes. J Cell Biochem, 117: 1092-1098.

Topolska-Woś A.M., Shell S.M,. Kilańczyk E., Szczepanowski R.H., Chazin W.J., Filipek A. (2015) Dimerization and phosphatase activity of calcyclin-binding protein/Siah-1 interacting protein: the influence of oxidative stress. FASEB J, 29: 1711–1724.

Aniszewska A., Chłodzińska N., Bartkowska K., Winnicka M.M., Turlejski K., Djavadian R.L. (2015) The expression of interleukin-6 and its receptor in various brain regions and their roles in exploratory behavior and stress responses. J Neuroimmunol, 284: 1-9.

Bartkowska K., Aniszewska A., Turlejski K., Djavadian R.L. (2014) Distribution and function of TrkB receptors in the developing brain of the opossum Monodelphis domestica. Develop Neurobiol, 74: 707-722.

Jurewicz E., Góral A., Filipek A. (2014) S100A6 is secreted from Wharton's jelly mesenchymal stem cells and interacts with integrin β1. Int J Biochem Cell Biol, 55: 298–203.

Head:
Katarzyna A. Nałęcz

Degrees:
2001 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS
1993 DSc Habil, specialized in biochemistry, Nencki Institute of Experimental Biology, PAS
1982 PhD in Biology (Diploma cum laudae), Nencki Institute of Experimental Biology, PAS
1976 MSc in Biology (Diploma cum laudae,) specialized in biochemistry, University of Warsaw

Research trainings:
1990-1992 Long-term stay, University of Berne, Switzerland
1982-1985 Long-term stay, University of Berne, Switzerland

Professional employments:
2002 Visiting professor, 5-month stay at the Université d'Artois, France
1998-present Head of the Laboratory of Transport through Biomembranes, Nencki Institute of Experimental Biology, PAS
2001-present Professor, Nencki Institute of Experimental Biology, PAS
1994 Associate professor, Nencki Institute of Experimental Biology, PAS
1985 Assistant professor, Nencki Institute of Experimental Biology, PAS
1982 Assistant, Nencki Institute of Experimental Biology, PAS

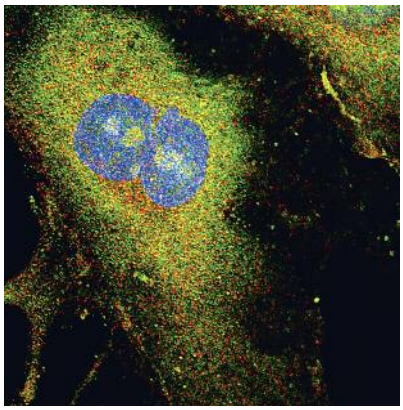
Honors and fellowships:
2003-2005 President of the Polish Neuroscience Society
1996 Polish Academy of Sciences awards for exceptional scientific achievements
1990 Polish Academy of Sciences awards for exceptional scientific achievements
1982 PhD Diploma cum laudae

Staff: Barbara Juraszek (PhD student), Dominika Jurkiewicz-Trząska (PhD student), Vasylyna Kovalchuk (PhD student), Karolina Rogala (PhD student)

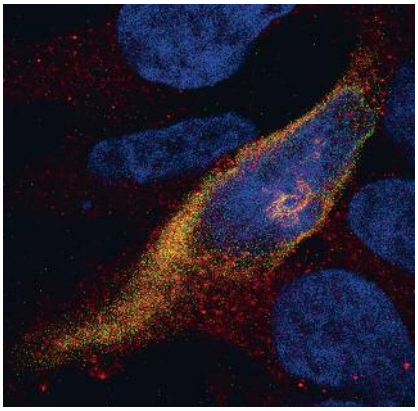
Laboratory of Transport Through Biomembranes

Research profile:
Studies on proteins transporting carnitine to the cell, in particular on organic cation/carnitine transporter – OCTN2 (SLC22A5) and amino acid transporter B(0,+) – ATB(0,+) (SLC6A14). The experiments have been focused on the mechanism of transporters trafficking to plasma membrane and the role of other proteins in this process. The main goal is to establish the role of transporters domains in interaction with other protein. The role of OCTN2 and ATB(0,+) in cancer cells is also investigated

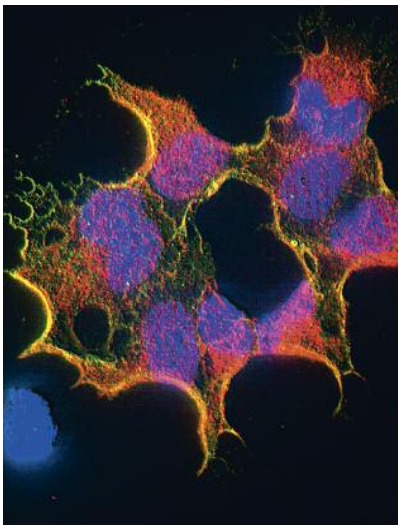
Current research activities:
- studies on the mechanism of ATB(0,+) exit from endoplasmic reticulum
- studies on interaction of OCTN2 with PDZ-domain containing proteins
- studies on OCTN2 proteome and transporter interaction with PP2A phosphatase
- studies on ATB(0,+) in cancer cells.



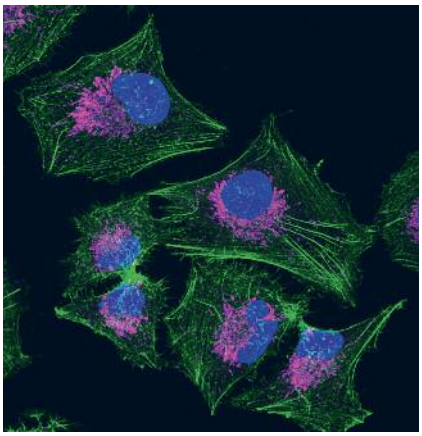
Co-localization of protein phosphatase 2 regulatory subunit SG2NA (red) and carnitine transporter Octn2 (green) in rat astrocytes (Barbara Juraszek).



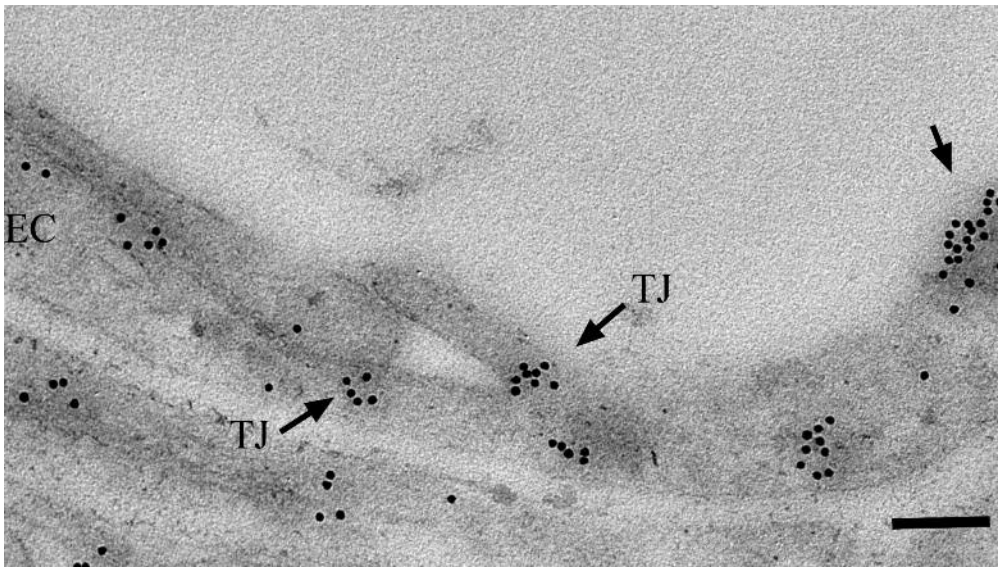
Vesicular trafficking of B(0,+) (red) to the plasma membrane after transient transfection of HEK293 cells with vector coding the transporter. Endoplasmic reticulum marker – calnexin (green) (Barbara Juraszek).



Co-localization of Octn2 (red) with zonula Occludens protein ZO-1 (green) in HEK293 cells stably transfected with vector coding rat Octn2 (Dominika Jurkiewicz).



Localization of OCTN2 (magenta) in human glioblastoma multiforme LN229 cell line. Actin (green), nuclei (blue) (Barbara Juraszek).



Immunogold detection of Octn2 in rat brain slices with use of transmission electon microscope. EC – capillary endothelial cell forming the blood-brain barrier, TJ – tight junction. Bar 200 nm (Katarzyna Michalec).

Selected publications: Jurkiewicz D., Michalec K., Skowronek K., Nałęcz K.A. (2017) Tigh junction protein ZO-1 controls organic cation/carnitine transporter OCTN2 (SLC22A5) in a protein kinase C-dependent way, BBA-Mol Cell Res, 1864: 797-805.

Nałęcz K.A. (2017) Solute carriers in the blood-brain barrier: Safety in abundance, Neurochem Res, 42(3): 795-809.

Juraszek B., Nałęcz K.A. (2016) Protein phosphatase PP2A – a novel interacting partner of carnitine transporter OCTN2 (SLC22A5) in rat astrocytes, J Neurochem, 139, 537-551.

Michalec K., Mysiorek C., Kuntz M., Bérézowski V., Szczepankiewicz A.A., Wilczyński G., Cecchelli R., Nałęcz K.A. (2014) Protein kinase C restricts transport of carnitine by amino acid transporter ATB0,+ apically localized in the blood-brain barrier, Archiv Biochem Biophys, 544: 28-35.

Czeredys M., Samluk Ł., Michalec K., Tułodziecka K., Skowronek K., Nałęcz K.A. (2013) Caveolin-1 – a novel interacting partner of Organic Cation/carnitine Transporter (Octn2): Effect of protein kinase C on this interaction in rat astrocytes, PLoS ONE, 8: e82105.

Head:
Małgorzata Kossut

Degrees:
Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS

Research trainings:
University of Pennsylvania, USA
University of Oxford, USA
Max Planck Institute for Brain Research, Germany

Professional employments:
Professor and Head of the Neuroplasticity Laboratory, Nencki Institute of Experimental Biology, PAS, University of Social Sciences and Humanities

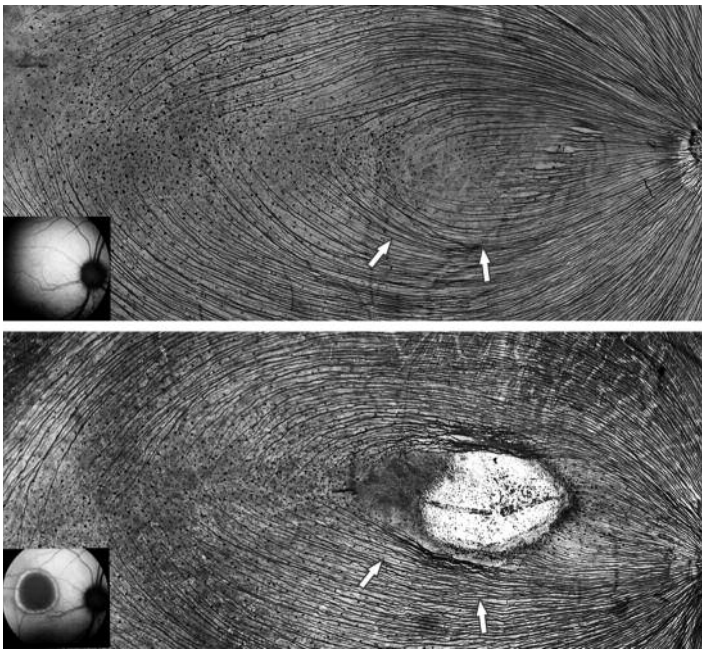
Honors and fellowships:
Polish Academy of Arts and Sciences (corresponding member), Polish Academy of Sciences (full member)

Staff: Maria Bierzyńska, Kalina Burnat-Kuijpers, Anita Cybulska-Kłosowicz, Grzegorz Dobrzański (PhD student), Katarzyna Giertuga (PhD student), Anna Grabowska, Anna Kozak (PhD student), Monika Liguz-Lęcznar, Anna Posłuszny, Aleksandra Różycka (PhD student), Ewa Siucińska, Renata Zakrzewska

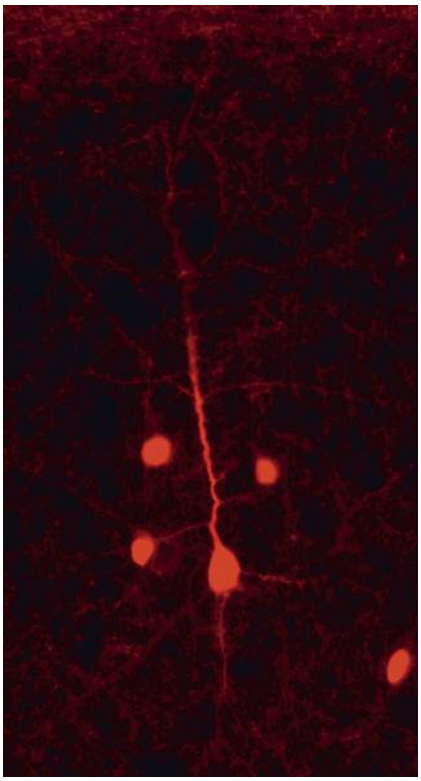
Laboratory of Neuroplasticity

Research profile:
Cellular, molecular and systemic mechanisms of neuroplasticity are explored in three experimental models:
• learning-induced plasticity in somatosensory barrel cortex of rodents. We investigate the role of GABA-ergic inhibition in modifications of cortical sensory representations by learning
• reorganization of cerebral cortex after stroke and during ageing. Using mouse model of photothrombotic stroke localized in the vicinity of somatosensory cortex, we investigate the effectiveness of different anti-inflammatory interventions in preserving functional cortical plasticity in the acute post-stroke period
• plasticity of adult cat visual cortex after lesions of central retina, an animal model of brain reorganization after macular degeneration.

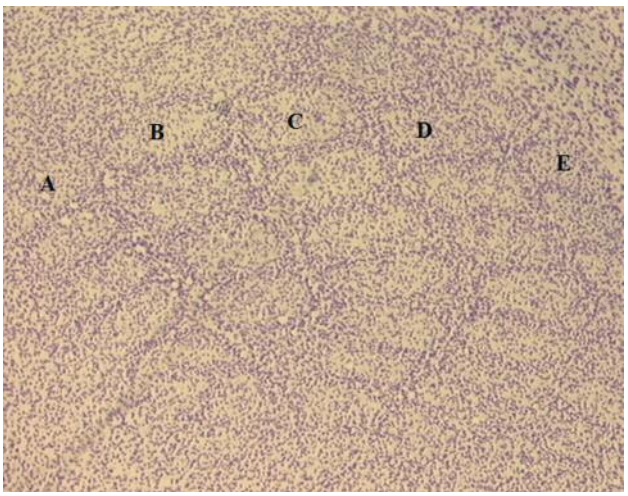
Current research activities:
• optical recording of vibrissae representations in brain cortex; observations of learning induced plasticity
• live imaging of axons of somatostatin interneurons in brain cortex after learning and in the aging brain
• investigations of the role of somatostatin and VIP interneurons in learning-induced plasticity using chemogenetic tools
• investigation of participation of electrical synapses in learning-induced plasticity of the barrel cortex
• examination of the motion processing pathway involvement in restoration of cortical activity in cat brain after binocular lesions of central retina using behavioral tests, MRI spectroscopy and DTI techniques.



Lesions of retina and optic nerve axons.



Martinotti neuron in somatosensory cortex.



Barrel field (mouse)

Mouse Cre-SOM.

Selected publications: Liguz-Lecznar M., Lehner M., Kaliszewska A., Zakrzewska R., Sobolewska A., Kossut M. (2015) Altered glutamate/GABA equilibrium in aged mice cortex influences cortical Plasticity. Brain Struct Funct, 220(3): 1681-1693.

Laskowska-Macios K., Zapaśnik M., Hu T.T., Kossut M., Arckens L., Burnat K. (2015) Zif268 mRNA Expression Patterns Reveal a Distinct Impact of Early Pattern Vision Deprivation on the Development of Primary Visual Cortical Areas in the Cat. Cereb Cortex, 25: 3515-3526.

Liguz-Lecznar M., Zakrzewska R., Kossut M. (2015) Inhibition of Tnf-α R1 signaling can rescue functional cortical plasticity impaired in early post-stroke period. Neurobiol Aging, 36(10): 2877-2884.

Posłuszny A., Liguz-Lecznar M., Turzynska D., Zakrzewska R., Bielecki M., Kossut M. (2015) Learning-Dependent Plasticity of the Barrel Cortex Is Impaired by Restricting GABA-Ergic Transmission. PloS One, 10(12): e0144415.

Dębowska W., Wolak T., Nowicka A., Kozak A., Szwed M., Kossut M. (2016) Functional and Structural Neuroplasticity Induced by Short-Term Tactile Training Based on Braille Reading. Front Neurosci, 10:460.

Head:
Leszek Kaczmarek

Degrees:

1996 Professor of Biological Sciences, nomination by the President of the Republic of Poland, Nencki Institute of Experimental Biology, PAS

1988 DSc Habil, Hirszfeld Institute of Immunology and Experimental Therapy, PAS, Wroclaw, Poland

1983 PhD in Biology, Nencki Institute of Experimental Biology, PAS

1981 MSc in Molecular Biology, University of Warsaw

Research trainings:

2015 Visiting Professor, Institute for Photonic Sciences, ICFO, Castelldefels, Spain

2001-2002 Visiting Senior Fulbright Scholar, Department of Neurobiology, UCLA, USA

1994-1996, 1998 Visiting Professor, Dept. Psychology, McGill University, Montreal, Canada

1987, 1988, 1990, 1992 Contract Professor, University of Catania, Italy

1984-1986 Postdoc, Temple University, Philadelphia, PA, USA (mentor: R. Baserga)

Professional employments:

2015-2018 Dean, Division for Biological and Agricultural Sciences, Polish Academy of Sciences

2015-2019 Chairman, Department of Molecular and Cellular Neurobiology, Nencki Institute of Experimental Biology, PAS

Honors and fellowships:

2013 Elected full member of the Polish Academy of Sciences

2011 Prime Minister of Poland Award for the life time achievements in science

2009 Polonia Restituta Officer Cross (by the President of the Republic of Poland)

2001 Elected member of Academia Europaea

2000 FNP (Foundation for Polish Science) Prize '2000

2000 Elected member of EMBO (European Molecular Biology Organization)

1998 Elected corresponding member of the Polish Academy of Sciences

1998 Polonia Restituta Bachelor Cross

Staff: Anna Beroun, Katarzyna Biegańska, Ewa Banach (PhD student), Artur Czupryn, Marta Doliwa (PhD student), Katarzyna Gralec (PhD student), Adam Gorlewicz, Tomasz Jaworski, Katarzyna Kalita-Bykowska, Dominik Kanigowski (PhD student), Danylo Khomiak (PhD student), Klaudia Kogut (PhD student), Agnieszka Kostrzewska-Księżyk, Anna Krysiak (PhD student), Diana Legutko, Katarzyna Łepeta (PhD student), Lena Majchrowicz (PhD student), Olga Markina (PhD student), Paweł Matryba, Jarosław Mazuryk, Shiladitya Mitra, Karolina Nader (PhD student), Jewgeni Nikolajew, Monika Pawłowska, Barbara Pijet, Rafał Płatek, Emilia Rejmak-Kozicka, Piotr Rogujski, Izabela Rutkowska-Włodarczyk, Ahmad Salamian (PhD student), Marzena Stefaniuk, Bogusia Sudoł-Rutkowska, Joanna Urban-Ciećko, Behnam Vafadari (PhD student), Zbigniew Zieliński (PhD student)

Laboratory of Neurobiology

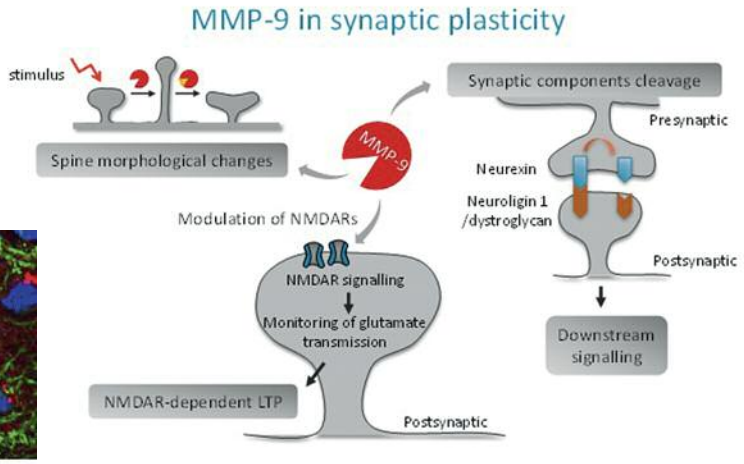
Research profile:

Our research aim is to understand brain-mind connection. We believe that is possible to localize specific mind functions in the brain and then to reveal their molecular and cellular underpinnings. The window to understand mind is learning and memory that can be successfully studied in experimental animals. At the molecular and cellular levels, synaptic plasticity appears to provide a plausible explanation for those phenomena. Thirty ago, together with H.J. Matthies and his colleagues from Magdeburg and simultaneously with K.V. Anokhin and his co-workers in Moscow, we discovered gene expression in the mammalian brain in learning. The first such gene was c-fos, encoding a component of transcription factor AP-1. This led us to identify c-Fos/AP-1 such target genes in activated neurons as TIMP-1 (tissue inhibitor of matrix metalloproteinases) and MMP-9 (matrix metalloproteinase). Over the last fifteen years we have shown that MMP-9 is produced and released at the excitatory synapses in response to enhanced neuronal activity to play a paramount role in the synaptic plasticity, learning and memory as well as in neuropsychiatric disorders, including epilepsy, alcohol addiction, schizophrenia and bipolar disorder. Presently, our major research effort is focused on MMP-9 and its fundamental role in controlling morphological and functional plasticity of the excitatory synapses, especially in the central nucleus of the amygdala, which we have implicated as pivotal for the appetitive learning.

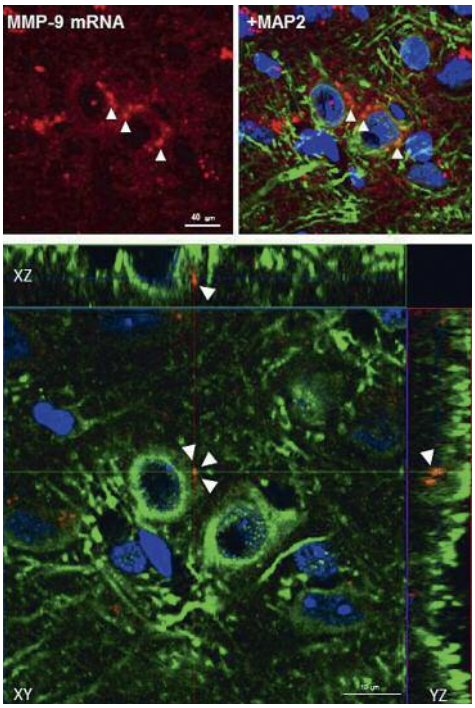
Current research activities:

- matrix metalloproteinases (especially MMP-9) and their endogenous inhibitors (e.g., TIMP-1) in neuronal plasticity (physiological and pathological: epilepsy, addiction) and cell death

- synaptic plasticity of memory formation (appetitive learning and addiction)
- SRF, serum response factor and its cofactors in physiological and pathological neuronal plasticity
- glutamate receptors in epileptogenesis
- GSK-3β in physiological and pathological synaptic plasticity
- whole-brain imaging of mouse and rat brains using a self-built light-sheet microscope
- inhibitory interneurons and their plasticity.

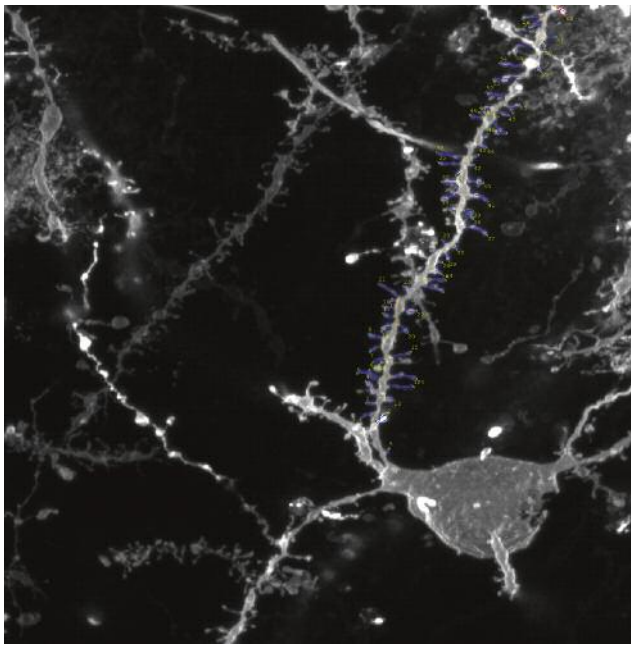


MMP-9 in synaptic plasticity. MMP-9 plays a role in synaptic plasticity via proteolytic remodeling of the synaptic microenvironment, dendritic spine shaping and control of NMDA receptor surface diffusion.



MMP-9 mRNA and MAP-2 labeling in ipsilateral cortex in animal model of Traumatic Brain Injury.

Confocal images of fluorescent in situ hybridization to detect mmp-9 mRNA (white arrowheads) in cortex with immunohistochemistry for neuronal marker MAP-2 (green channel). The cell nuclei were counter-stained with DAPI (blue channel). Orthogonal view of confocal Z-stacks showing co-localization (indicated with white arrowheads) of mmp-9 mRNA with MAP-2.



Dendritic spines of central amygdala neuron stained with lipophilic dye DiI. Image acquired using confocal microscope (LSM780 Zeiss).

Selected publications: de Hoz L., Gierej D., Lioudyno L., Jaworski J., Blazejczyk M., Cruces-Solís H., Beroun A., Lebitko T., Nikolaev T., Knapska E., Nelken I., Kaczmarek L. (2017) Blocking c-Fos expression reveals the role of auditory cortex plasticity in sound frequency discrimination learning. Cereb Cortex, doi: 10.1093/cercor/bhx060.

Stefaniuk M., Beroun A., Lebitko T., Markina O., Leski S., Meyza K., Grzywacz A., Samochowiec J., Samochowiec A., Radwanska K., Kaczmarek L. (2017) Matrix metalloproteinase-9 and synaptic plasticity in the central amygdala in control of alcohol seeking behavior. Biol Psychiatry, doi: 10.1016/j.biopsych.2016.12.026.

Van der Kooij M., Fantin M., Rejmak E., Grosse J., Zanoletti O., Fournier C., Ganguly K., Kalita K., Kaczmarek L., Sandi C. (2014) Role for MMP-9 in stress-induced down-regulation of nectin-3 in hippocampal CA1 and associated behavioral alterations. Nat Commun, 5: 4995.

Janusz A., Milek J., Perycz M., Pacini L., Bagni C., Kaczmarek L., Dziembowska M. (2013) The Fragile X Mental Retardation Protein regulates Matrix Metalloproteinase 9 mRNA at synapses. J Neurosci, 33: 18234-18224.

Knapska E., Lioudyno V., Kiryk A., Gorkiewicz T., Mikosz M., Michaluk P., Gawlak M., Chaturvedi M., Mochol G., Balcerzyk M., Wojcik D.K., Wilczynski G.M., Kaczmarek L. (2013) Reward learning requires activity of matrix metalloproteinase-9 in the central amygdala. J Neurosci, 33: 14591–14600.

Head:
Katarzyna Łukasiuk

Degrees:
2005 DSc Habil, Nencki Institute of Experimental Biology, PAS
1996 PhD in Neurophysiology, Nencki Institute of Experimental Biology, PAS
1989 MSc in Biology, Department of Embryology, University of Warsaw

Research trainings:
1995 KBN/British Council British-Polish Joint Research Program Grant; Neurobiology Unit, Royal Free Hospital, London, UK
1994 Fellowship of UNESCO Global Network for Molecular and Cell Biology, Neurobiology Unit, Royal Free Hospital, London, UK
1993 Fellowship of Trans-European Mobility Scheme for University Studies TEMPUS; Institute of Biochemistry, University of Catania, Italy
1991 Fellowship of Trans-European Mobility Scheme for University Studies TEMPUS; Institute of Biochemistry, University of Catania, Italy

Professional employments:
2006-present Head of the Epileptogenesis Lab, Nencki Institute of Experimental Biology, Warsaw, PAS
2003-2005 Adjunct, Laboratory of Transcription Regulation, Nencki Institute of Experimental Biology, Warsaw, PAS, Poland
1996-2002 Researcher, Epilepsy Research Group, A. I. Virtanen Institute for Molecular Sciences, Kuopio, Finland
1989-1999 Tissue Culture Unit and Molecular Neurobiology Group, Nencki Institute of Experimental Biology, Warsaw, PAS

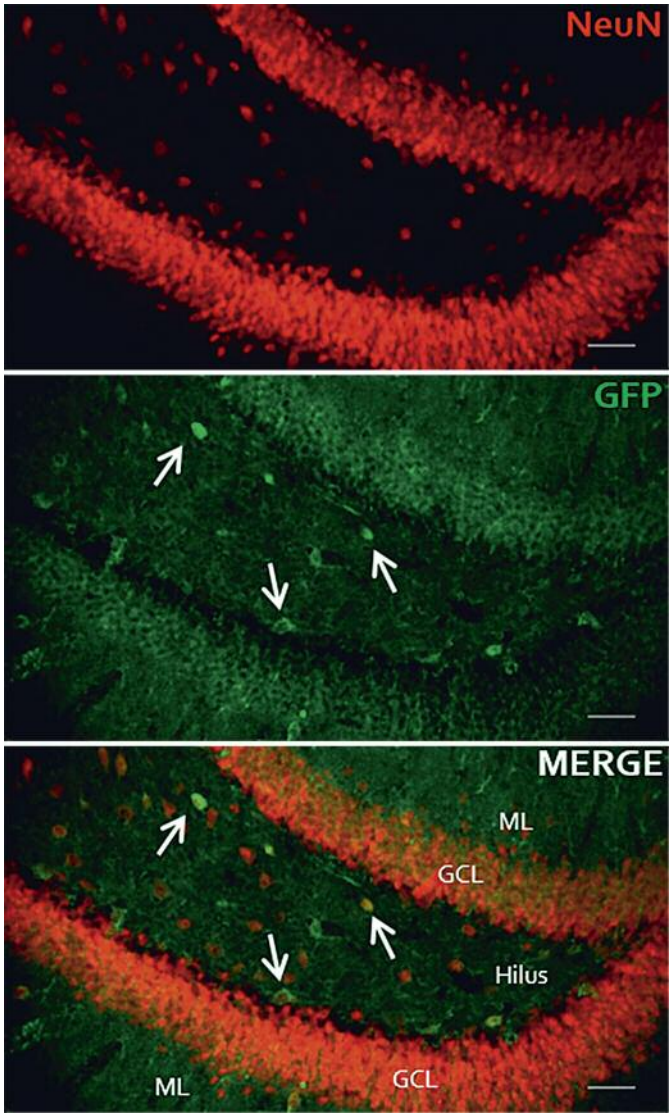
Honors and fellowships:
2016-2019 Secretary of the Committee for Neurobiology, Polish Academy of Sciences
2015-2018 Scientific Council of the Nencki Institute
2015-2018 Secretary of the Scientific Council of the Nencki Institute
2012-2015 Secretary of the Committee for Neurobiology, Polish Academy of Sciences
2011-2014 Scientific Council of the Nencki Institute
2011-present Member of the editorial boards of Epilepsy Research (board member)

Staff: Anna Bot (PhD student), Ilke Guntan (PhD student), Małgorzata Górniak-Walas (PhD student), Anna Gręda (PhD student), Karolina Nizińska (PhD student), Dorota Nowicka, Maciej Olszewski, Aleksandra Stępniak, Kinga Szydłowska

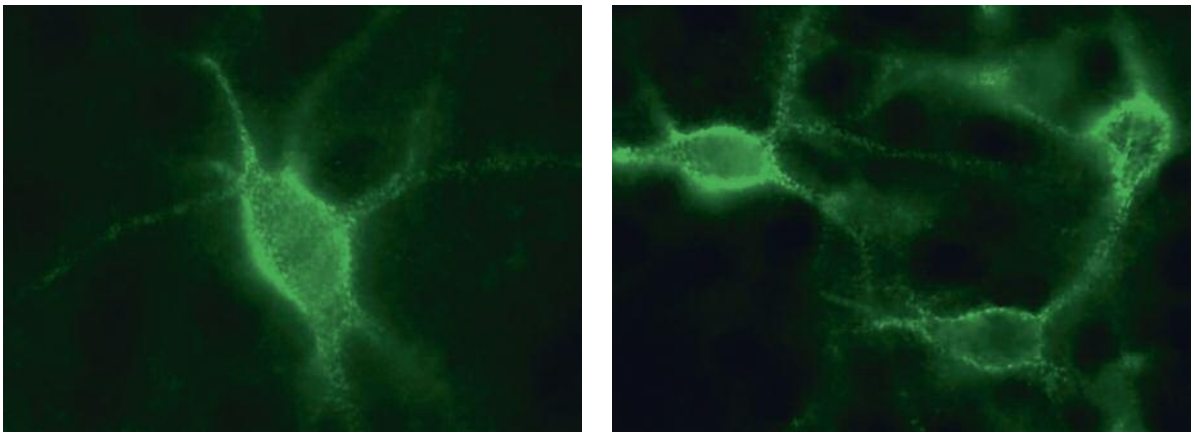
Laboratory of Epileptogenesis

Research profile:
Our research interests concentrate on molecular events resulting from brain damage and molecular basis of epileptogenesis. Our research projects aim at the description of transcriptome changes in experimental models of epileptogenesis and epilepsy in vivo, deciphering the role of candidate epileptogenesis and epilepsy genes and mechanisms of regulation of gene expression. In particular we are interested in epigenetic mechanisms of gene regulation, including the role of microRNA. Another field of research conducted in our lab is search for noninvasive biomarkers of epileptogenesis and epilepsy: circulating microRNA and behavior. Finally, we work on creating new and the improvement of existing models of epilepsy.

Current research activities:
- role of epiegenetic mechanisms of regulation of gene expression in epileptogenesis
- search for noninvasive biomarkers of epileptogenesis and epilepsy and for new targets of antiepileptogenic therapies
- creating new experimental epilepsy models in vivo
- role of perineuronal nets in animal model of stroke.



Immunohistochemical staining for fusion protein: TTYH1-GFP (green) and neuronal marker: NeuN (red) in the dentate gyrus of transgenic rat overexpressing TTYH1 protein. Arrows indicate some neurons expressing TTYH1-GFP. ML – Molecular Layer, GCL – Granular Cell Layer, scale bar: 50 µm.



Fluorescently labelled perineuronal nets surrounding neurons in the mouse cortex.

Selected publications: Bednarczyk J., Dębski K.J., Bot A.M., Łukasiuk K. (2016) MBD3 expression and DNA binding patterns are altered in a rat model of temporal lobe epilepsy. Sci Rep, 6: 33736.

Dębski K.J., Pitkanen A., Puhakka N., Bot A.M., Khurana I., Harikrishnan K.N., Ziemann M., Kaspi A., El-Osta A., Łukasiuk K., Kobow K. (2016) Etiology matters – Genomic DNA Methylation Patterns in Three Rat Models of Acquired Epilepsy. Sci Rep, 6: 25668.

Miszczuk D., Dębski K.J., Tanila H., Lukasiuk K., Pitkänen A. (2016) Traumatic Brain Injury Increases the Expression of Nos1, Aβ Clearance, and Epileptogenesis in APP/PS1 Mouse Model of Alzheimer's Disease. Mol Neurobiol, 53(10): 7010-7027.

Pitkänen A., Roivainen R., Łukasiuk K. (2015) Development of epilepsy after ischaemic stroke. Lancet Neurol, pii: S1474-4422(15)00248-3.

Bot A.M., Dębski K.J., Lukasiuk K. (2013) Alterations in miRNA levels in the dentate gyrus in epileptic rats. PLoS One, 11;8(10):e76051.

Head:
Jakub Włodarczyk

Degrees:
2014 DSc Habil, Nencki Institute of Experimental Biology, PAS
2006 PhD in Physical Science, Institute of Experimental Physics, Warsaw University
2001 MSc in Physics, Institute of Experimental Physics, Warsaw University

Research trainings:
2008 Short term fellowship, Centre Medical Universitaire, Geneva, Switzerland
2006–2008 Postdoctoral training: Max Planck Institute, Göttingen, Germany

Professional employments:
2014-present Associate Professor, Nencki Institute of Experimental Biology, PAS
2012-present Head of the Laboratory of Cell Biophysics, Nencki Institute of Experimental Biology, PAS
2008-2012 Assistant professor, Laboratory of Neurobiology, Nencki Institute of Experimental Biology, PAS
2006-2008 Postdoc, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany
2001-2006 PhD student, Faculty of Physics, Warsaw University

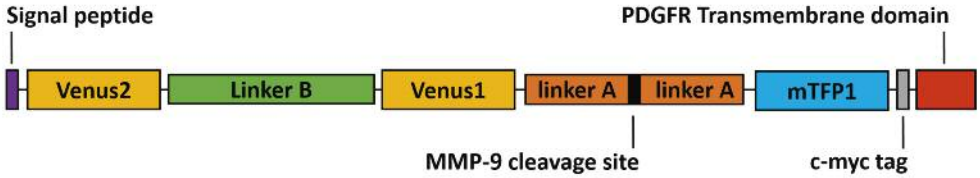
Honors and fellowships:
2015 Konorski Distinguished Work: Stawarski et al., Biomaterials 2014
2015 Award of Polish Academy of Science, Division II
2013-present Member of the Network of European Neuroscience Institute (ENI NET)
2006-2008 Max Planck Institute for Biophysical Chemistry Scholarship from Prof. E. Neher
2008 EMBO Short Term Fellowship

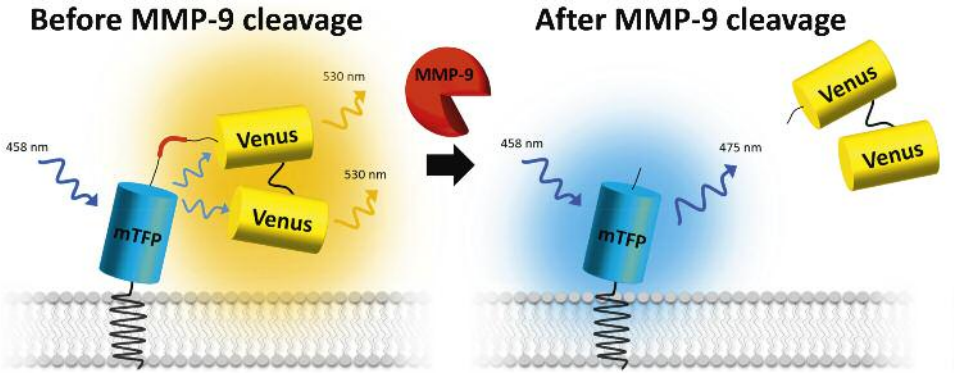
Staff: Svitlana Antoniuk (PhD student), Anna Bartkowiak-Kaczmarek (PhD student), Ewa Bączyńska (PhD student), Monika Bijata, Izabela Figiel-Ożóg, Joanna Kielan, Adam Krzystyniak, Marta Magnowska (PhD student), Matylda Roszkowska (PhD student), Monika Zaręba-Kozioł

Laboratory of Cell Biophysics

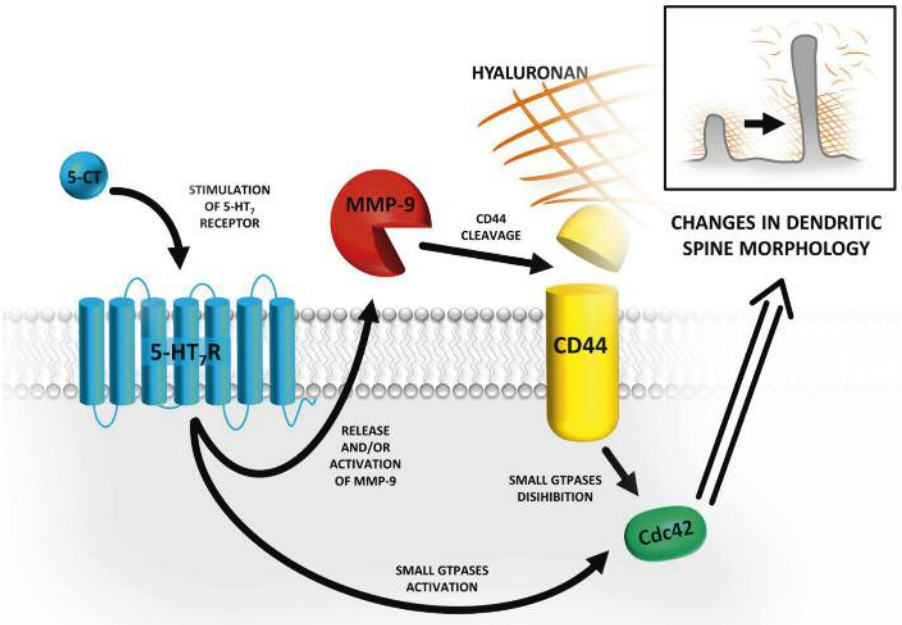
Research profile:
Processes like learning and memory require functional modification of neuronal networks through reorganization of existing synapses, modification of their efficacy, or modulation of neuronal endogenous excitability. Synapses are particularly prone to dynamic alterations and thus are believed to play a major role in plasticity. We study structural and functional synaptic modifications regulated by posttranslational modifications including: i) protein-specific proteolysis by extracellular matrix proteolytic modifiers, ii) S-nitrosylation and S-palmitoylation i.e. addition of palmitate or nitric oxide that reversibly modifies numerous classes of neuronal proteins. We focus on the role of rapid posttranslational modifications of synaptic proteins in protein organization in the synapse under physiological stimuli as well as pathological conditions (such as chronic stress). We employ novel imaging based techniques and mass spectrometry methods to assess the reorganization of activity patterns accompanied by local volumetric and molecular changes at the synapses.

Current research activities:
- cooperative involvement of serotonin signaling pathways and extracellular matrix in synaptic plasticity underlying the pathogenesis of stress-related disorders
- structural brain plasticity driven by extracellular matrix modifiers
- quantitative analysis of dendritic spine turnover, morphological changes and receptor composition within the spine
- interplay between the posttranslational modifications in the chronic stress disorders
- novel methodical approaches to analyze posttranslational modifications.

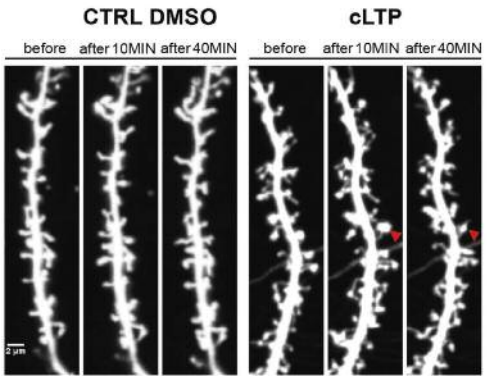




MMP-9 activity sensor (Stawarski M., et al., Biomaterials, 2014)



Model of the functional cross-talk between CD44, MMP-9, and 5-HT7 receptors in neurons. (Bijata et al., Cell Rep., 2017)



Live cell imaging of 21 DIV hippocampal neurons that expressed EGFP, reveals changes in dendritic spine morphology (indicated by red arrows) after incubation with cLTP. (Magnowska et al., Sci Rep, 2016)

Selected publications: Magnowska M., Górkiewicz T., Suska A., Wawrzyniak M., Rutkowska-Włodarczyk I., Kaczmarek L., Włodarczyk J. (2016) Transient ECM protease activity promotes synaptic plasticity. Sci Rep, 6: 27757.

Basu S., Plewczyński S., Saha S., Roszkowska M., Magnowska M., Bączyńska E., Włodarczyk J. (2016) 2dSpAn: semiautomated 2-d segmentation, classification and analysis of hippocampal dendritic spine plasticity. Bioinformatics, 32(16): 2490-2498.

Tang Z., Junhong Luo O., Li X., Zheng M., Jufen Zhu J., Szalaj, Trzaskoma P., Magalska A., Włodarczyk J., Ruszczycki B., Michalski P., Piecuch E., Wang P., Wang D., Zhongyuan Tian S., Penrad-Mobayed M., M Sachs L., Ruan X., Wei C., T Liu E., Wilczyński G., Plewczyński D., Li G., Ruan Y. (2015) CTCF-mediated human 3D genome architecture reveals chromatin topology for transcription. Cell, 163 (7): 1611-1627.

Bijata M., Włodarczyk J., Figiel I. (2015) Dystroglycan controls dendritic morphogenesis of hippocampal neurons in vitro. Front Cell Neurosci, 9: 199.

Stawarski M., Rutkowska-Wlodarczyk I., Zeug A., Bijata M., Madej H., Kaczmarek L., Wlodarczyk J. (2014) Genetically encoded FRET-based biosensor for imaging MMP-9 activity. Biomaterials, 35: 1402-1410.

Head:
Kasia Radwańska

Degrees:
2012 DSc Habilitation in Neuroscience, Nencki Institute of Experimental Biology, PAS
2005 PhD in Neuroscience, Nencki Institute of Experimental Biology, PAS
1999 MSc in Biology, University of Warsaw

Research trainings:
2001, 2002, 2003 Laboratory of Neuronal Signaling and Gene Regulation, Dr Jocelyne Caboche, Université Pierre et Marie Curie, Paris, France

Professional employments:
2013-present Head of the Laboratory of Molecular Basis of Behaviour, Nencki Institute of Experimental Biology, PAS
2008-2013 Postdoctoral research fellow at the Laboratory of Molecular Neurobiology of Prof. Leszek Kaczmarek, Nencki Institute of Experimental Biology, PAS
2006-2008 Marie Curie postdoctoral research fellow, Laboratory of Molecular Analysis of Memory of Prof. Karl Peter Giese, Centre for the Cellular Basis of Behaviour, IoP, KCL, UK

Honors and fellowships:
2013 Award from Polish Prime Minister for the Outstanding Habilitation
2010 Foundation for Polish Science POMOST grant for women
2009 Marie Curie Reintegration Grant
2006 Marie Curie Intra-European Fellowships for a post-doctoral training

Staff: Małgorzata Borczyk (PhD student), Ashish Gorule, Kacper Łukasiewicz (PhD student), Zofia Mijakowska, Maria Nalberczak-Skóra (PhD student), Agata Nowacka, Roberto Pagano (PhD student), Małgorzata Piechota, Kamil Tomaszewski (PhD student), Anna Trąbczyńska (PhD student), Magdalena Ziółkowska

Laboratory of Molecular Basis of Behavior

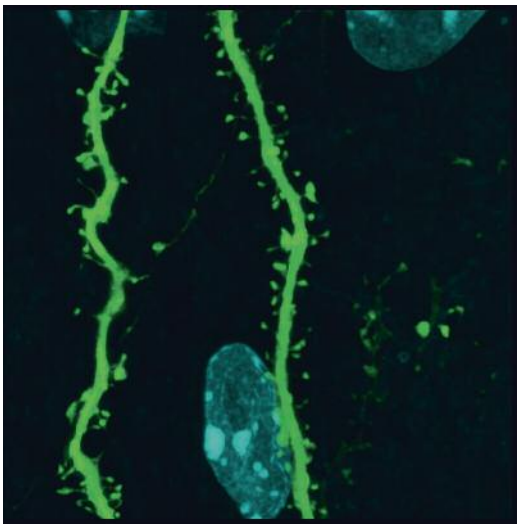
Research profile:
Memory processes, including memory formation or extinction, are fundamental for brain function and they are affected in various psychiatric illnesses such as post-traumatic stress disorder or addiction. Currently, the molecular basis of memory processes is not sufficiently well understood to develop successful treatments for memory dysfunctions. Our team is studying alcohol addiction and cognitive impairments in laboratory animals. We apply both behavioral analysis of transgenic mice in the IntelliCage system as well as patch clamp electrophysiology, confocal (Fig. 1), electron (Fig. 1) and correlative 3D microscopy (Fig. 3) to study molecular, functional and structural alterations in different brain regions.

The long-term aim to our research is to develop insights for treatments for memory dysfunctions in psychiatric illnesses.

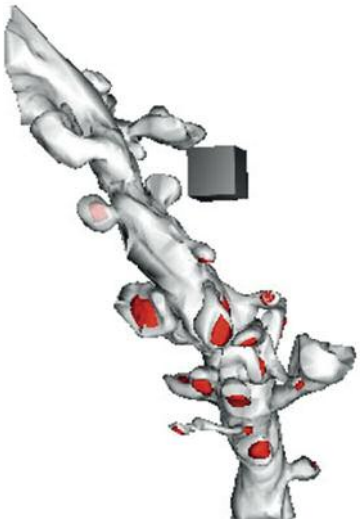
Current research activities:
• The role of multi-innervates dendritic spines in memory formation.
We use the tools of molecular biology and electron microscopy to study how and when multiinervated spines are formed. These are big dendritic spines innervated by at least 2 presynaptic buttons. We ask whether they contribute to memory formation and which molecular processes underlie their formation. The role of CaMKII and PSD95 proteins is tested.

• The role of silent synapses in alcohol addiction.
We use the tools of molecular biology and whole cell patch clamp electrophysiology to check the function of silent synapses which miss functional AMPA receptors. We ask whether they contribute to development of alcohol addiction using recently developed model in the IntelliCages. We also test the molecular processes involved in generation of silent synapses, in particular the role of Arc protein.

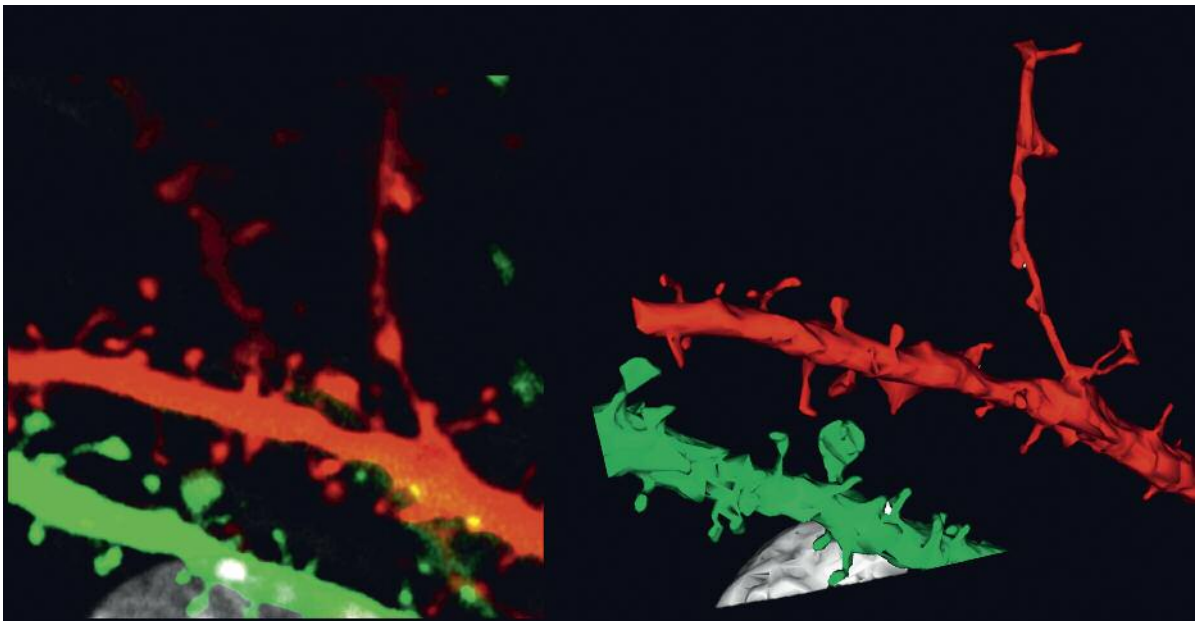
• The role of dentate gyrus of the hippocampus in alcohol seeking.
We use the tools of molecular biology and chemogenetic approach to test the role of dentate gyrus and its projections in the regulation of alcohol seeking.



Dendrites of CA1 area of the hippocampus in Thy1-GFP mouse.



3D reconstruction of CA1 dendrite from electron microscopy.



Correlative 3D light-electron microscopy.

Selected publications: Havekes R., Park A.J., Tudor J.C., Luczak V.G., Hansen R.T., Ferri S.L., Bruinenberg V.M., Poplawski S.G., Day J.P., Aton S.J., Radwańska K., Meerlo P., Houslay M.D., Baillie G.S., Abel T. (2016) Sleep deprivation causes memory deficits by negatively impacting neuronal connectivity in hippocampal area CA1. Elife, doi: 10.7554/eLife.13424.

Stefaniuk M., Beroun A., Lebitko T., Markina O., Leski S., Meyza K., Grzywacz A., Samochowiec J., Samochowiec A., Radwańska K., Kaczmarek L. (2016) Matrix Metalloproteinase-9 and Synaptic Plasticity in the Central Amygdala in Control of Alcohol-Seeking Behavior. Biol Psychiatry. doi: 10.1016/j.biopsych.2016.12.026.

Łukasiewicz K., Robacha M., Bożycki Ł., Radwańska K. and Czajkowski R. (2016) Simultaneous two-photon in vivo imaging of synaptic inputs and postsynaptic targets in the mouse retrosplenial cortex. J Vis Exp, doi: 10.3791/53528.

Mijakowska Z., Łukasiewicz K., Ziółkowska M., Lipiński M., Trąbczyńska A., Matuszek Ż., Łęski S., Radwańska K. (2015) Autophosphorylation of alpha isoform of calcium/calmodulin-dependent kinase II regulates alcohol addiction-related behaviors. Addict Biol, doi: 10.1111/adb.12327.

Radwańska K., Schenatto-Pereira G., Ziółkowska M., Łukasiewicz K., Giese K.P. (2015) Mapping fear memory consolidation and extinction--specific expression of JunB. Neurobiol Learn Mem, 125:106-12.

Head:
Rafał Czajkowski

Degrees:
1998 MSc, Department of Biology, University of Warsaw
2004 PhD, Nencki Institute of Experimental Biology, PAS

Research trainings:
2004-2009 Postdoctoral research at Department of Neurobiology, (Silva lab), University of California, Los Angeles, USA
2009-2012 Postdoctoral research at Centre for the Biology of Memory, Norwegian University of Science and Technology, (Witter lab), Trondheim, Norway

Professional employments:
2015-present Head of the Laboratory of Spatial Memory, Nencki Institute of Experimental Biology
2013-2015 Research Associate, Nencki Institute of Experimental Biology, PAS

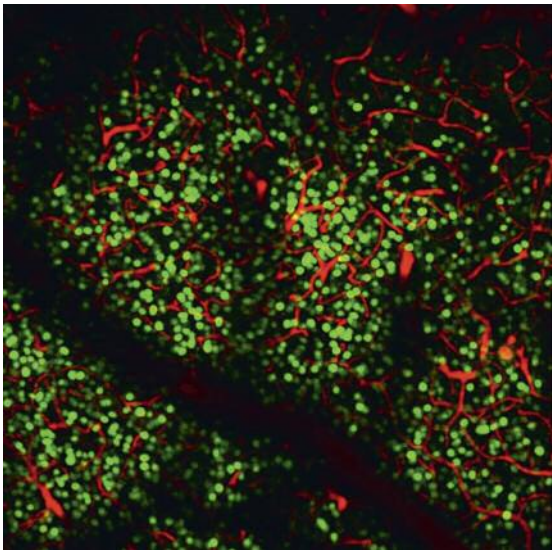
Honors and fellowships:
2005 Prime Minister Award for the PhD dissertation
2002-2003 Scholarship of the Foundation for Polish Science

Staff: Edyta Balcerek (PhD student), Monika Falińska, Adam Hamed, Piotr Maj (PhD student), Justyna Sobich (PhD student)

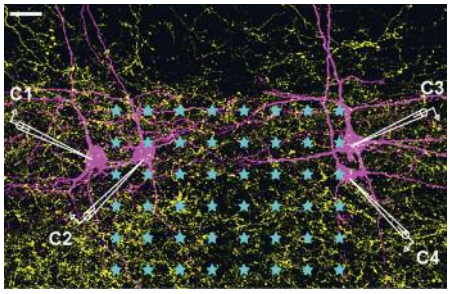
Laboratory of Spatial Memory

Research profile:
The ability to recognize, remember and utilize the knowledge about the external environment is one of the most fascinating adaptive features in the animal kingdom. The development of such capability is fueled by evolutionary progress in the complexity of brain structure and function. This includes the emergence of specialized brain structures responsible for multiple aspects of spatial memory, and their ability to undergo plastic changes that allow for flexible adaptation to the changing elements of the environment. Spatial memory is necessary for independent functioning of humans, its defects lead to deep functional disability. In all mammals the central structure involved in spatial memory is the hippocampus. Certain cortical structures that connect directly or indirectly to hippocampus also participate in these processes. They gather information from other brain areas, filter and synchronize it. The interactions between brain structures responsible for spatial memory allow optimal selection of navigation strategy and provide balance between exploration of novel areas and the exploiting of already learned places. The importance of cortical structures in encoding and storage of spatial memory has been acknowledged only recently and its role has not yet been fully explained. It is therefore necessary to create an overall model that would describe the functioning of the entire system and explain how the interactions between different areas, layers or neuronal populations produce a coherent output that is manifested by successful behavior. Understanding of such complex system is possible with the use of animal models.

Current research activities:
- Behavioral studies on the involvement of retrosplenial cortex in the process of encoding and retrieval of spatial memory
- Optogenetic investigation of functional relationship between activity of retrosplenial cortex and hippocampus
- Imaging and recording of neuronal circuits necessary for formation of specific memory trace in retrosplenial cortex.

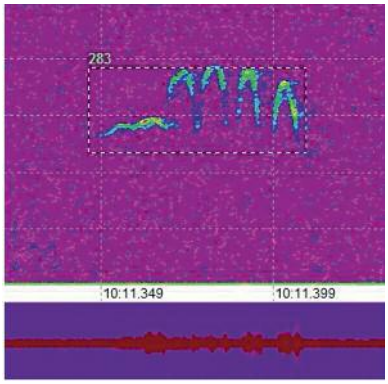


Two photon in vivo imaging of FosGFP reporter expression in mouse brain

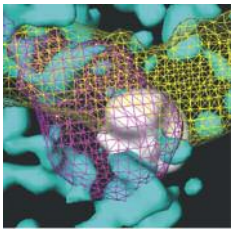


Optogenetic stimulation of presynaptic terminals and patch clamp recording from postsynaptic neurons in layer V of medial entorhinal cortex

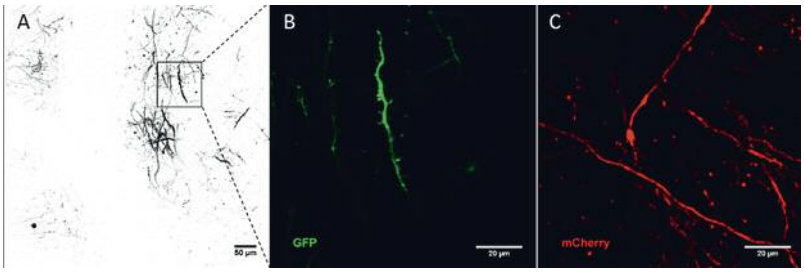
Reconstruction of pyramidal neuron in layer V of medial entorhinal cortex.



Appetitive ultrasonic vocalizations during goal directed spatial navigation in rat.



Reconstruction of synaptic connection between retrosplenial cortex and medial entorhinal cortex.



In vivo two photon imaging of presynaptic terminals and postsynaptic spines in mouse

Selected publications: Łukasiewicz K., Robacha M., Bożycki, Ł., Radwańska K., Czajkowski R. (2016) Simultaneous two-photon in vivo imaging of synaptic inputs and postsynaptic targets in the mouse retrosplenial cortex. J Vis Exp,13:109.

Czajkowski R., Balaji J., Wiltgen B., Rogerson T., Guzman Karlsson M., Barth A.L., Trachtenberg J.T., Silva A.J. (2014) Encoding and storage of spatial information in the retrosplenial cortex. Proc Natl Acad Sci, 111:8661-6.

Czajkowski R., Sugar J., Zhang S.J., Couey J.J., Ye J., Witter M.P. (2013) Superficially projecting principal neurons in layer V of medial entorhinal cortex in the rat receive excitatory retrosplenial input. J Neurosci, 33:15779-92.

Couey J.J., Witoelar A., Zhang S.J., Zheng K., Ye J., Dunn B., Czajkowski R., Moser M.B., Moser E.I., Roudi Y., Witter M.P. (2013) Recurrent inhibitory circuitry as a mechanism for grid formation. Nat Neurosci, 16:318-24.

Laboratory of Animal Models
Laboratory of Brain Imaging
Laboratory of Molecular Neurobiology
Laboratory of Imaging Tissue Structure and Function
Laboratory of Preclinical Studies of Higher Standard
Laboratory of Bioinformatics

Head:
Witold Konopka

The aim of the Neurobiology Center is to conduct broadly understood research and development in the area of neurobiology and nervous system diseases, the goal of which is to introduce novel diagnostic methods and therapies onto the market. The functional model of the CN as an open, international research centre is based on the world-renowned European Molecular Biology Laboratory, the EMBL. The motive force and basal source of funding for the Center consist of the scientific activities of leading international research teams in Neurobiology, with documented achievements and the highest growth potential. This also includes collaboration with advanced commercial entities, thereby making novel therapies and diagnostics widely available. The CN R&D efforts support the current research objectives of the Institute, but first and foremost concentrate on actively supporting interdisciplinary research programs in national and international scientific consortia and collaboration with industry.

The Neurobiology Center consists of six laboratories:

Laboratory of Animal Models – generates and studies animal models, mainly transgenic mice and rats. The major focus is on testing the impact of genetic manipulations on animal metabolism and behavior. The facility is a fully equipped state-of-the-art laboratory specialized in the production of genetically modified animals, followed by a complex analysis of such models.

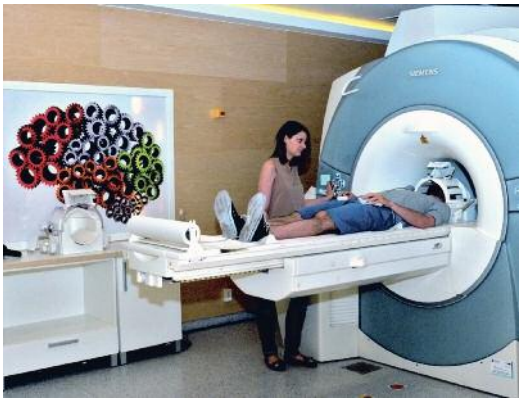
Laboratory of Brain Imaging – is focused on providing high quality brain imaging using multiple magnetic resonance methods for research ranging from neuropsychology, through clinical studies, to pharmacological studies.

Laboratory of Molecular Neurobiology – is focused on identification and functional analysis of signaling pathways, transcriptional and epigenetic mechanisms controlling gene expression in microglia and tumor cells under disease-relevant conditions, using chromatin immunoprecipitation, transcriptomics, next generation sequencing and bioinformatics techniques.

Laboratory of Imaging Tissue Structure and Function – is dedicated to the study of architecture and dynamics of biological structure at several levels of organization, ranging from imaging of subcellular structures to animal organs in vivo. To this end, a range of optical and electron imaging modalities are provided to collaborating scientists.

Laboratory of Preclinical Testing of Higher Standards – serve as a competence centre in translation of discoveries from basic neuroscience to clinical trials. The lab offers expertise in designing, performing and analyzing preclinical tests involving pharmacodynamic, pharmacokinetic, and toxicology assays of potential novel biologically active compounds and therapeutic strategies against human diseases, mainly neurodegenerative disorders.

Laboratory of Bioinformatics – provides world-class bioinformatics support to experimental groups at the Nencki Institute. The strategy is to focus on areas of Bioinformatics related to Systems Biology. The main area of interest is Regulatory Genomics: i.e. transcription and its genome-wide regulation, at cis-regulatory, epigenetic, and chromatin structure level.



Head:
Witold Konopka

Degrees:
2006 PhD, Nencki Institute of Experimental Biology, PAS
2000 MSc, Faculty of Biology and Environmental Protection, University of Silesia, Katowice, Poland

Research trainings:
2006-2012 Postdoctoral training, Molecular Biology of the Cell I, German Cancer Research Center (DKFZ), Heidelberg, Germany
2001-2006 PhD studies, Laboratory of Molecular Neurobiology, Department of Molecular and Cellular Neurobiology, Nencki Institute of Experimental Biology, PAS
1995-2000 Master degree studies, Faculty of Biology and Environmental Protection, University of Silesia, Katowice, Poland

Professional employments:
2016-present Head of The Neurobiology Center, Nencki Institute of Experimental Biology, PAS
2014-present Deputy Director, Nencki Institute of Experimental Biology, PAS
2012-present Head of The Laboratory of Animal Models, Nencki Institute of Experimental Biology, PAS
2006-2012 Postdoctoral Fellow Molecular Biology of the Cell I, German Cancer Research Center (DKFZ),Heidelberg, Germany
2000 Laboratory of Stress Cellular Genes, Department of Tumour Biology, Institute of Oncology, Gliwice, Poland

Honors and fellowships:
2003 BRAINS Fellowship – Centre for Biotechnology, Turku, Finland
2002 International SfN Travel Fellowship, SfN 32nd Annual Meeting, Orlando, USA
1999 Centre of International Mobility (CIMO) Scholarship, Department of Physiology, Institute of Medicine, Turku University, Turku, Finland

Staff: Paweł Boguszewski, Joanna Chilczuk, Natalia Chwin (PhD student), Karolina Hajdukiewicz (PhD student), Artur Janusz (PhD student), Anna Kiryk-Jaśkiewicz, Agata Klejman, Paulina Koza, , Andrzej Wieteska, Małgorzata Wieteska, Tomasz Włodarczyk, Bartosz Zglinicki (PhD student)

Laboratory of Animal Models

Research profile:
The Laboratory of Animal Models focuses on generation and analysis of animal models. Our main goal is to determine the effects of genetic modifications on cognitive functions, behavior and metabolism. The laboratory is well equipped with instruments necessary for the production of genetically modified animals. In addition, the laboratory serves as a "core-facility", providing services for the production of genetically modified animals, cryopreservation of sperm and embryos and viral vector technology.

We offer service for scientific and commercial entities:
• The production of transgenic mice and rats models together with genotyping and cryopreservation service. Transgenic mice and rats are produced by the standard method of "microinjection" and using lentiviral vectors
• The production of viral vectors (LV and AAV vectors) and genetic modification by stereotactic injections of lentiviral vector or AAV into various structures of the brain e.g. hippocampus, amygdala, hypothalamus etc
• Long-term metabolic studies. Metabolic cages enable continuous, long-term (several weeks) measuring parameters such as indirect calorimetry, XYZ physical activity, food and water intake and body weight
• The set of behavioral tests enabling the behavioral characterization of an animal. We perform the motor skills tests, exploratory tests, learning and memory tests using traditional instrumental conditioning (fear conditioning or operant conditioning) as well as automatic IntelliCages where mice are tested in social groups with limited influence of the experimenter

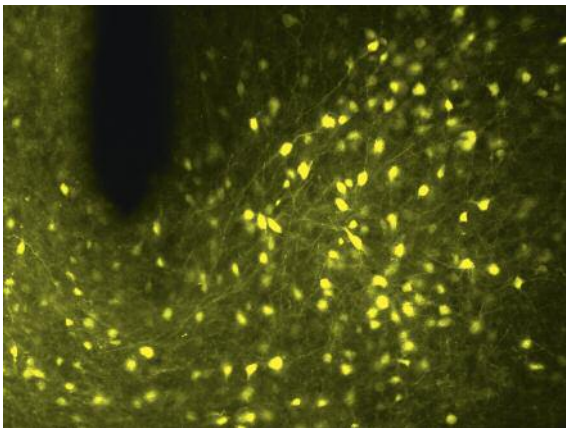
Current research activities:

Current studies are focused on defining activity dependent gene expression in neurons, local synaptic plasticity, microRNA function in neurons and adipose tissue. Ultimately, all introduced genetic manipulation into animals aim to show their influence on the behavior and metabolism of the whole organism.

In particular we study:

- Identity of cell subpopulation in the hypothalamus which is crucial for development of the obesity phenotype following microRNA loss in the forebrain of transgenic mutants (Vinnikov et al., 2014)
- The role of microRNAs in synaptic plasticity of neurons involved in the formation of the memory trace. We are looking for microRNAs involved in the regulation of the PI3K-Akt-mTOR pathway e.g. miR-103/107. We have recently shown that loss of all microRNAs enhances memory formation in mice (Konopka et al., 2010)
- The role of microRNAs in the cells of peripheral tissues involved in metabolism e.g. adipose tissue. We are focusing on investigating microRNAs induced during calorie restriction and their impact on subsequent motivation of animals to food seeking
- The role of CREB/CREM/ATF pathway disruption in adult neurogenesis of the ICER II overexpressing rat model. Disturbed neurogenesis may play a role in behavioral strategies of rats in the Morris Water Maze test
- Altered composition of synaptic proteins in TDP-43 transgenic rat model that shows enhancement in memory processing. TDP-43, a multifunctional RNA processing protein has been recognized as a hallmark of a range of neurodegenerative disorders.

Laboratory of Animal Models



Fluorescently labeled neurons
in the arcuate nucleus of the hypothalamus

Mouse in metabolic cage

Selected publications: Was H., Barszcz K., Czarnecka J., Kowalczyk A., Bernas T., Użarowska E., Koza P., Klejman A., Piwocka K., Kamińska B., Sikora E. (2017) Bafilomycin A1 triggers proliferative potential of senescent cancer cells in vitro and in NOD/SCID mice. Oncotarget. 8(6):9303-9322.

Stefaniuk M., Gualda EJ., Pawlowska M., Legutko D., Matryba P., Konopka W., Owczarek D., Wawrzyniak M., Loza-Alvarez P., Kaczmarek L. (2016) Light-sheet microscopy imaging of a whole cleared rat brain with Thy1-GFP transgene. Sci Rep. 6:28209.

Puścian A., Łęski S., Kasprowicz G., Winiarski M., Borowska J., Nikolaev T., Boguszewski P.M., Lipp H.P., Knapska E. (2016) Eco-HAB as a fully automated and ecologically relevant assessment of social impairments in mouse models of autism. Elife, doi: 10.7554/eLife.19532.

Vinnikov I.A., Hajdukiewicz K., Reymann J., Beneke J., Czajkowski R., Roth L.C., Novak M., Roller A., Dörner N., Starkuviene V., Theis F.J., Erfle H., Schütz G., Grinevich V., Konopka W. (2014) Hypothalamic miR-103 protects from hyperphagic obesity in mice. J Neurosci, 34(32):10659-74.

Kiryk A., Sowodniok K., Kreiner G., Rodriguez-Parkitna J., Sönmez A., Górkiewicz T., Bierhoff H., Wawrzyniak M., Janusz A.K., Liss B., Konopka W., Schütz G., Kaczmarek L., Parlato R. (2013) Impaired rRNA synthesis triggers homeostatic responses in hippocampal neurons. Front Cell Neurosci, 7:207.

Head:
Artur Marchewka

Degrees:

2009 PhD in Biology, Laboratory of Psychophysiology, Nencki Institute of Experimental Biology, PAS

2004 MSc in Psychology, Department of Psychology, University of Warsaw

Research trainings:

2014-2015 Mentoring Program, Foundation for Polish Science – Centre hospitalier universitaire vaudois (CHUV), University of Lausanne, Switzerland

2010-2011 Post-doctoral training, Laboratoire de recherche en neuro-imagerie (LREN), Département des Neurosciences Cliniques – Centre hospitalier universitaire vaudois (CHUV), University of Lausanne, Switzerland

2007 Research training, Leibnitz Institute for Neurobiology, Non-invasive brain imaging, Magdeburg, Germany

2006 Research training, Functional Imaging Laboratory, University College London, UK

Professional employments:

2014-present Head of the Laboratory of Brain Imaging, Nencki Institute of Experimental Biology, PAS

2012-2014 Assistant professor Laboratory of Brain Imaging, Nencki Institute of Experimental Biology, PAS

2011-2012 Assistant professor – Department of Psychology, University of Warsaw

Honors and fellowships:

2015 Nomination and election to the board of The uropean Society for Cognitive and Affective Neuroscience (ESCAN)

2013-2015 The Minister of Science and Higher Education Stipend for Distinguished Young Researcher

2012 Stefan Leder Award granted annually by the Scientific Committee of the Institute of Psychiatry and Neurology for the best research paper in the field of psychology and social sciences

2012 Jerzy Konorski Award granted annually by Polish Neuroscience Society and Neurobiology Committee PAN for the best research paper in the field of neurobiology

Staff: Anna Antosz (PhD student), Anna Banaszkiewicz (PhD student), Michał Bola, Dawid Droździel, Bartosz Kossowski, Monika Kulesza (PhD student), Jacek Matuszewski (PhD student), Monika Riegel (PhD student), Marta Rodziewicz, Michał Szczepanik (PhD student), Jan Szczepiński (PhD student), Małgorzata Wierzba (PhD student), Marek Wypych

Laboratory of Brain Imaging

Research profile:

Laboratory of Brain Imaging (LOBI) is one of the core facilities at the Neurobiology Center. LOBI provides access to state-of-the-art research support and technologies for internal and external scientists. Technologies used at LOBI include: magnetic resonance imaging (MRI), spectroscopy (MRS), electroencephalography (EEG - including EEG-fMRI simultaneous recordings), transcranial magnetic stimulation (TMS) and computational image analysis.

Research at LOBI has made fundamental contributions to the understanding of the neural processes responsible for cross-modal neuroplasticity in healthy and deaf people, neuronal mechanisms of consciousness, processing of emotionally charged information in healthy and subclinical populations as well as analytic approaches for multisite MRI data of developmental and neurological disorders.

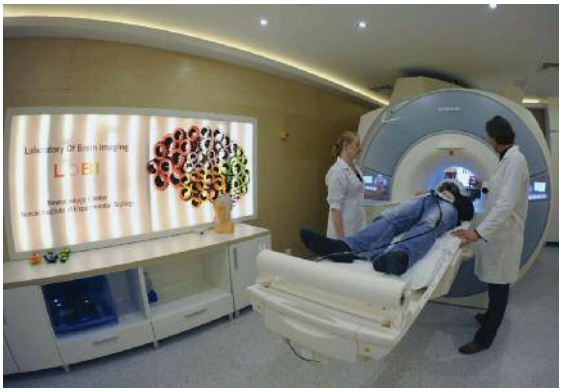
Additionally, LOBI develops standardized databases of stimuli to facilitate highly controlled experimental research on emotion and cognition - Nencki Affective Picture System (1356 images) and Nencki Affective Word datasets (2902 Polish words). Stimuli in both datasets are characterized in terms of emotional valence, arousal, as well as basic emotion intensities. The NAPS and NAWL databases are freely accessible to the scientific community (http://exp.lobi.nencki.gov.pl/dnaps).

More information can be found on the web page: http://lobi.nencki.gov.pl/

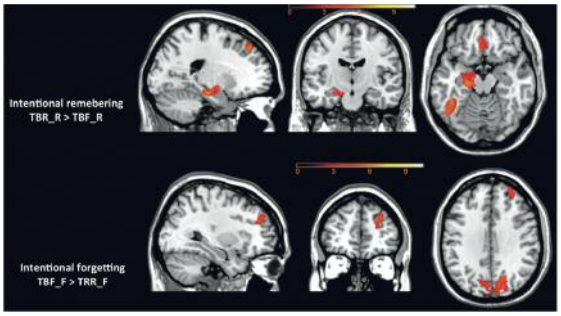
Current research activities:

• Brain plasticity in language acquisition. The aim of the project is to reveal a multimodal brain network for speech and print in a second language. Adopting a longitudinal design, we test learners of foreign languages, sign language and Braille reading. Besides distinguishing which structures of the language-processing network are multimodal and which are not, we plan to examine the dynamic changes in the brain morphology and function associated with linguistic learning.

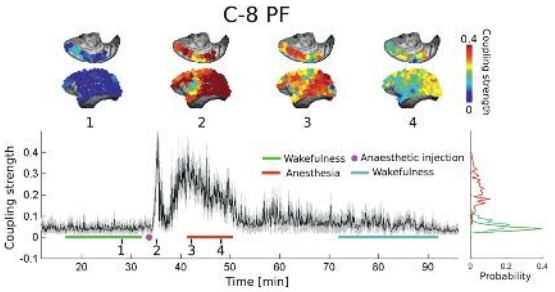
• Neuronal mechanisms of consciousness. We develop two lines, first we study how brain activity differs between unconscious (e.g. sleep, anesthesia) and conscious states. Second, we try to address which mechanisms allow external stimuli to gain access to our subjective "stream of consciousness".
• Neural correlates of procrastination. Using cognitive tasks in emotional contexts during fMRI experiments we try to get neuronal-level insight into mechanisms of this self-regulatory failure.
• Influence of emotions of long-term and associative memory
• Directed forgetting of emotionally charge material using NAWL
• Neural markers of dyslexia.



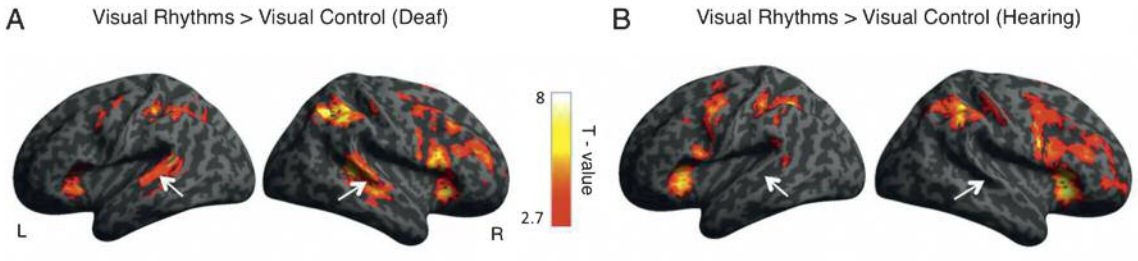
MR room



The effect of intentional remembering and intentional forgetting



Functional coupling of gamma-band oscillations during conscious (wakefulness) and unconscious (propofol anesthesia) states in electrocorticography (ECoG) data recorded from a macaque monkey. During anesthesia we observed excessive correlations of gamma-band activity among brain areas (increase in coupling strength). This indicates that during loss of consciousness all brain areas activate and deactivate together.



Visual rhythms presented in the central visual field activated the auditory cortex in deaf subjects.
(A and B) Activations induced by visual rhythms relative to regular visual stimulation in deaf subjects (A) and hearing subjects (B). The auditory cortex is indicated by white arrows.

Selected publications: Gola M., Wordecha M., Sescousse G., Lew-Starowicz M., Kossowski B., Wypych M., Makeig S., Potenza M.N., Marchewka A. (2017) Can pornography be addictive? An fMRI study of men seeking treatment for problematic pornography use. Neuropsychopharmacology, doi:10.1038/npp.2017.78.

Bola Ł., Zimmermann M., Mostowski P., Jednoróg K., Marchewka A., Rutkowski P., Szwed M. (2017) Task-specific reorganization of the auditory cortex in deaf humans. Proc Natl Acad Sci USA, 114(4): E600-E609.

Płoński P., Gradkowski W., Altarelli I., Monzalvo K., van Ermingen-Marbach M., Grande M., Heim S., Marchewka A., Bogorodzki P., Ramus F., Jednoróg K. (2017) Multi-parameter machine learning approach to the neuroanatomical basis of developmental dyslexia. Human Brain Mapp, 38(2): 900-908.

Michałowski J.M., Matuszewski J., Droździel D., Koziejowski W., Rynkiewicz A., Jednoróg K., Marchewka A. (2016) Neural response patterns in spider, blood-injection-injury and social fearful individuals: new insights from a simultaneous EEG/ECG–fMRI study. Brain Imaging Behav, doi:10.1007/s11682-016-9557.

Marchewka A., Kherif F., Krueger G., Grabowska A., Frąckowiak R., Dragański B. (2014) Influence of magnetic field strength and image registration strategy on voxel-based morphometry in a study of Alzheimer's disease. Human Brain Mapp, 35(5): 1865-1874.

Head:
Bożena Kamińska-Kaczmarek

Degrees:
2003 Professor, nomination by the President of the Republic of Poland
1997 DSc Habl, Nencki Institute of Experimental Biology, PAS
1991 PhD in Biochemistry, University of Warsaw
1985 MSc, University of Warsaw

Research trainings:
2001-2002 Visiting scientist, Brain Research Institute, UCLA, USA
1994-1996 Postdoctoral training, McGill University, Montreal, Canada

Professional employments:
2013-present Head of the Laboratory of Molecular Neurobiology, Nencki Institute of Experimental Biology, PAS
1997-2013 Head of the Laboratory of Transcription Regulation, Nencki Institute of Experimental Biology, PAS
1994-1996 Postdoctoral researcher, Dept. Psychology, McGill University, Montreal, Canada
1985-1997 Assistant, Laboratory of Biosynthetic Processes, Nencki Institute of Experimental Biology, PAS

Honors and fellowships:
2016-present Corresponding member of the Polish Academy of Sciences (elected)
2014 Polish Academy of Sciences Biology Division Award for scientific achievements
2004 Foundation for Polish Science SCHOLAR GRANT
1998 Prime Minister Award for the best habilitation
Member of the Editorial Boards: Glia, Journal of Neuroscience Research; International Journal of Developmental Neuroscience, International Journal of Clinical and Experimental Pathology. Published 120 publications in PUBMED journals, and 6 book chapters; 3500 citations, H-index = 34.

Staff: Iwona Ciechomska, Bartosz Czapski, Aleksandra Ellert-Miklaszewska, Bartłomiej Gielniewski, Anna Gieryng, Beata Kaza, Sylwia Król, Marta Maleszewska, Jakub Mieczkowski, Natalia Ochocka (PhD student), Maria Pasierbińska, Paulina Pilanc, Katarzyna Poleszak, Wenson D Rajan (PhD student), Karolina Stępniak (PhD student), Kacper Walentynowicz (PhD student), Paulina Wiechecka, Bartosz Wojtaś, Kamil Wojnicki

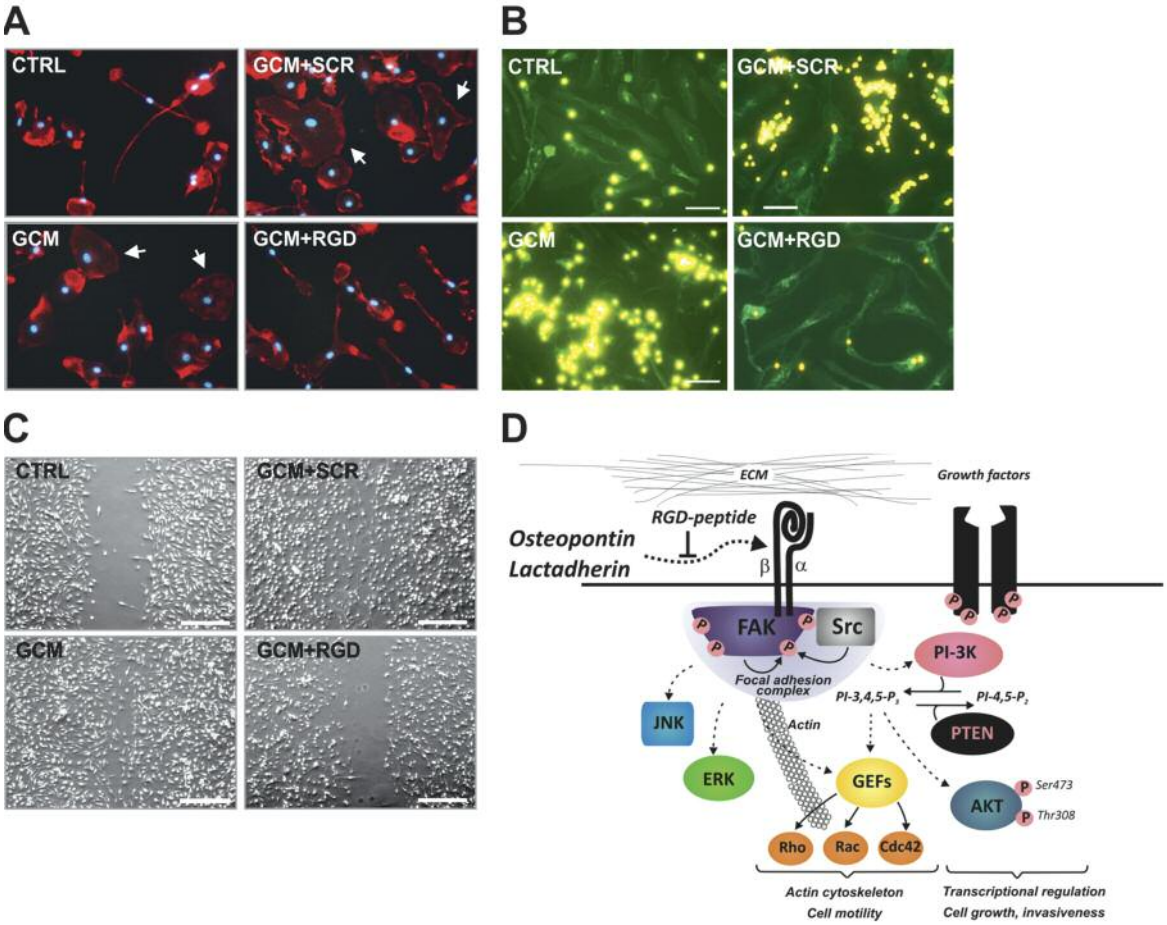
Laboratory of Molecular Neurobiology

Research profile:
We study molecular and cellular mechanisms that regulate innate immune cell recruitment into neoplastic tissue, and the subsequent regulation of those cells exert on cancer cells. We are interested in: a role of innate immune cells in regulating tissue remodeling, angiogenesis, immune suppression and cancer development, analyses of clinical samples obtained from patients with cancer, development of novel compounds to modulate immune response in tumours. We have identified several factors responsible for the protumorigenic activity of microglia and we are developing RNAi or short interfering peptide-based technologies to inhibit tumour growth. Another long-term goal of our research program is to gain mechanistic insights into the functions of histone covalent modifications and mechanisms of transcription regulation underlying pathogenesis of brain tumours. Using next generation sequencing, we search for novel genomic alterations in epigenetic enzymes, chromatin modifiers and factors influencing chromatin structure in brain tumours. Using ATAC-seq, chromatin immunoprecipitation, NGS sequencing and bioinformatics, we map open chromatin, transcription factor binding sites and epigenetic modifications in gliomas and 3-D spheres cultures enriched in cancer stem cells. Our long-term goal is to translate basic observations made in the animal models, toward rational design of novel therapeutics which aim will be to block and/or alter rate-limiting events critical for tumor growth or recurrence in humans.

Current research activities:
We study heterogeneity and roles of immune infiltrates in brain tumours and brain ischemia models using RNA sequencing and functional analyses. We dissect transcriptomic profiles and roles of selected transcription factors and epigenetic modifications

in the protumorigenic reprogramming of microglia *in vitro*. Using ATAC-seq, chromatin immunoprecipitation, NGS sequencing and bioinformatics, we map open chromatin, DNA methylation profiles, transcription factor binding sites and epigenetic modifications in gliomas of different grades to develop brain specific gene regulatory regions. We characterize gene regulatory network operating in cancer stem cells in patient derived glioma sphere cultures. These experimental studies are conducted in parallel with evaluation of representative human cancer specimens to affirm that mechanisms revealed in the experimental setting represent fundamental features of cancer development in humans.

Current projects involve screening for epigenetic enzyme inhibitors, development of RNAi and small interfering peptide-based molecules against signalling factors driving the protumorigenic reprogramming of microglia. In collaboration with small companies we perform preclinical testing of various inhibitors targeting immune response related proteins, epigenetic enzymes, signalling molecules in rat and mice models of gliomas. As part of the Polish Glioma Network we established a biobank composed of 220 glioma DNA/RNA samples.



A synthetic 7-aa RGD peptide blocks glioma-microglia communication

A. Phalloidin-TRIC staining shows that the RGD peptide prevented F-actin reorganization in microglia (indicated with arrows).

B. RGD, but not the SCR peptide, completely reduced the GCM-induced phagocytosis determined 24 h post-treatment.

C. Pre-incubation of microglia with 500 μM RGD, but not with the SCR peptide, reduced the GCM-stimulated motility of microglia. Migrating cells were visualized by phase-contrast microscopy.

D. Graphical representation of signalling pathways underlying glioma-microglia communication (Ellert-Miklaszewska et al., Oncogene 2016).

Selected publications: Gieryng A., Pszczółkowska D., Walentynowicz K.A., Rajan W.D., Kamińska B. (2016) Immune microenvironment of gliomas. Lab Inves, doi: 10.1038/labinvest.2017.19.

Ellert-Miklaszewska A., Wiśniewski P., Kijewska M., Gajdanowicz P., Pszczółkowska D., Przanowski P., Dąbrowski M., Maleszewska M., Kamińska B. (2016) Tumour-processed osteopontin and lactadherin drive the protumorigenic reprogramming of microglia and glioma progression. Oncogene, 35(50):6366-6377.

Kijewska M., Kocyk M., Kloss M., Stępniak K., Korwek Z., Polakowska R., Dąbrowski M., Gieryng A., Wojtas B., Ciechomska I.A., Kamińska B. (2016) The embryonic type of SPP1 transcriptional regulation is re-activated in glioblastoma. Oncotarget doi: 10.18632/oncotarget.14092.

Ciechomska I.A., Przanowski P., Jackl J., Wojtas B., Kamińska B. (2016) BIX01294, an inhibitor of histone methyltransferase, induces autophagy-dependent differentiation of glioma stem-like cells. Sci. Rep. 6:38723.

Mieczkowski J., Kocyk M., Nauman P., Gabrusiewicz K., Sielska M., Przanowski P., Maleszewska M., Rajan W.D., Pszczółkowska D., Tykocki T., Grajkowska W., Kotulska K., Roszkowski M., Kostkiewicz B., Kaminska B. (2015) Down-regulation of IKKβ expression in glioma-infiltrating microglia/macrophages is associated with defective inflammatory/immune gene responses in glioblastoma. Oncotarget, 6(32):33077-90.

Head:
Tytus Bernaś

Degrees:
2003 PhD in Biophysics, Jagiellonian University, Poland
1996 MSc in Biology, Jagiellonian University, Poland

Research trainings:
2008-2011 Post-doctoral research fellow (UE FP7 Marie Curie),The Royal College of Surgeons (RCSI), Dublin, Ireland
2004-2006 Post-doctoral research fellow, The Purdue University, West Lafayette, USA
1997-2001 PhD course in biophysics, Department of Biophysics, Biochemistry and Biotechnology Jagiellonian University, Krakow, Poland

Professional employments:
2012-present Head of the Laboratory of Imaging Tissue Structure and Function, Nencki Institute of Experimental Biology
2007-2011 Assistant professor at the Department of Biophysics, Biochemistry and Biotechnology Jagiellonian University, Krakow, Poland
2003-2008 Assistant professor at the Department of Plant Anatomy and Cytology, University of Silesia, Katowice, Poland
2002-2003 Research assistant position at the Department of Plant Anatomy and Cytology, University of Silesia, Katowice, Poland.
1996-1997 Research assistant at the Institute of Molecular Biology, Jagiellonian University, Krakow, Poland

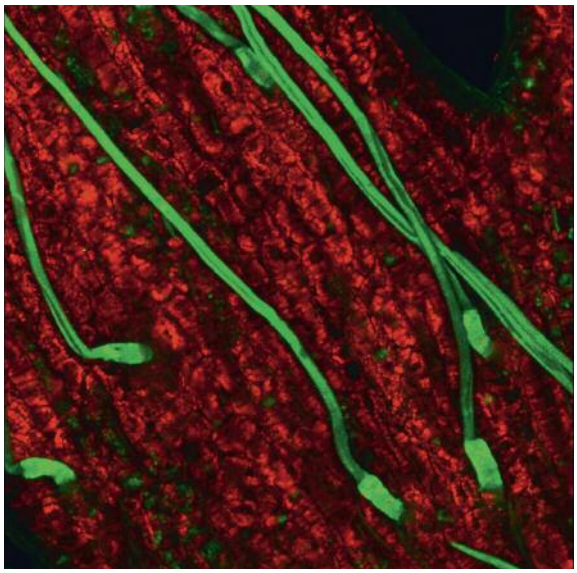
Staff: Małgorzata Całka, Miguel Angel Lermo Jimenez (PhD student), Maciej Krupa (PhD student), Natalia Nowak, Błażej Ruszczycki, Hanna Sas-Nowosielska, Małgorzata Śliwińska, Artur Wolny

Laboratory of Imaging Tissue Structure and Function

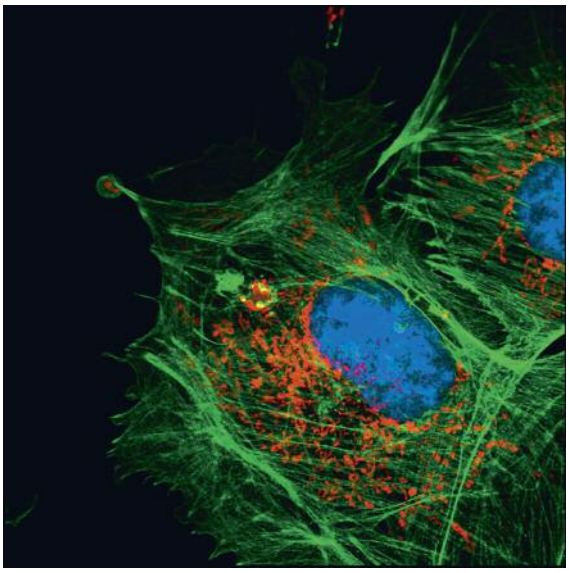
Research profile:
The Laboratory was established in 2012 as a core facility providing a spectrum of microscopic techniques dedicated to functional and structural studies of biological samples. It is equipped with optical and electron microscopes enabling application of various imaging methods including time-lapse, multi-dimensional (confocal, multiphoton, deconvolution), time-resolved (fluorescence lifetime and fluorescence correlation spectroscopy), multispectral and high-resolution (STORM, EM, ISM) microscopy of live and fixed material. These studies are supported by image analysis and visualization algorithms, developed by the group to derive quantitative results from obtained data. Since its foundation, the Laboratory has provided equipment and expertise to support a wide range of research projects concerning e.g. neuron architecture in physiological and pathological processes, cell motility, structure and dynamics of cell membranes and analysis of protein dynamics and interaction in living cells.

Moreover, the laboratory runs its own scientific projects, focused, mainly, on the structure and dynamics of cell nucleus in DNA replication and repair, and during cell migration.

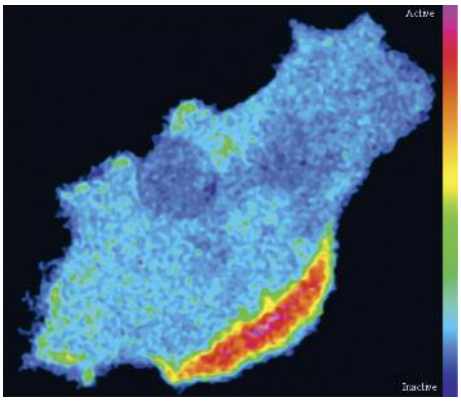
Current research activities:
Analysis of replication factories as dynamic nuclear bodies, specialized in DNA replication. Particularly, their spatial distribution, dynamics and interactions of replication proteins, (PCNA, CAF1 and HP1beta).
- Validation of new fluorescent probes for microscopy-based biological assays
- Development of algorithms for quantitative microscopy
- Relationship between activation of the signaling pathway P2Y2-Go-Rac1, physical properties of the cell nucleus and the motility of glioma cells.



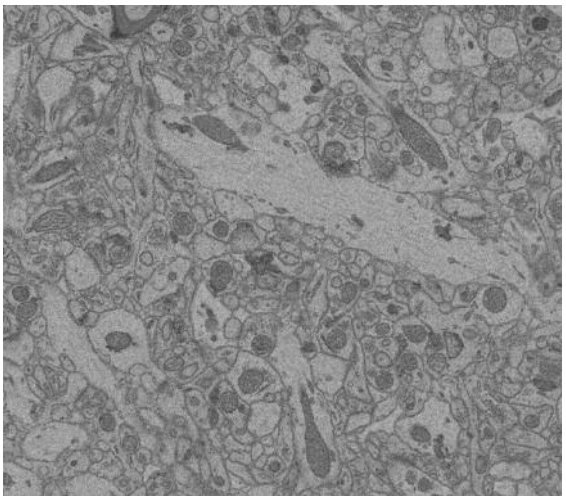
Confocal image of leaf tissue from common yerrow (Achillea millefolium). Autofluorescence.



High resolution image of fluorescently stained BPAE cells. Cytosceleton (Actin), Mitochondria (Mitotracker), Chromatin (DAPI)



Rac1 activity in living glioblastoma cells visualised using FRET (Förster Resonance Energy Transfer)-based biosensor. Active; Inactive



Electron microscopy image of mouse brain section

Dendrite 3D reconstruction from electron microscopy image stack obtained using 3View microscope with marked synapses.

Selected publications: Rybak P., Hoang A., Bujnowicz L., Bernas T., Berniak K., Zarebski M., Darzynkiewicz Z., Dobrucki J. (2016) Low level phosphorylation of histone H2AX on serine 139 (γH2AX) is not associated with DNA double-strand breaks. Oncotarget, doi: 10.18632/oncotarget.10411.

Campos Y., Qiu X., Gomero E., Wakefield R., Horner L., Brutkowski W., Young-Goo Han, Solecki D., Frase S., Bongiovanni A. & A. d'Azzo. (2016) Alix-mediated assembly of the actomyosin–tight junction polarity complex preserves epithelial polarity and epithelial barrier. Nat Commun, 7: 11876.

Sas-Nowosieska H., Bernaś T. (2016) Spatial relationship between chromosomal domains in diploid and autotetraploid Arabidopsis thaliana nuclei. Nucleus, 7(2): 216-31.

Bernaś T., Brutkowski W., Zarębski M., Dobrucki J. (2014) Spatial heterogeneity of dynamics of H1 linker histone. Eur Biophys J, 43 (6): 287-300.

L. Ramapathiran, Bernaś T., F. Walter, L. Williams, H. Düssmann, CG. Concannon and J.H. Prehn (2014) Single-cell imaging of the heat-shock response in colon cancer cells suggests that magnitude and length rather than time of onset determines resistance to apoptosis. J Cell Sci, 127: 609-619.

Head:
Urszula Wojda

Degrees:
2013 Professor of Biological Sciences, nomination by President of the Republic of Poland
2004 DSc Habil, Nencki Institute of Experimental Biology, PAS
1996 PhD in Biochemistry, Nencki Institute of Experimental Biology, PAS
2010 Postgraduate Diploma in Management, Warsaw Medical University/ Warsaw School of Economics
1987 MSc in Molecular Biology, Faculty of Biology, University of Warsaw

Research trainings:
1996-2001 Postdoc, Bioorganic Chemistry Lab., NIDDK, National Institutes of Health, USA
1991 Visiting PhD student, Department of Biophysics, Pasteur University, Strasbourg, France

Professional employments:
2015-present Head of the Laboratory of Preclinical Studies of Higher Standard, Nencki Institute of Experimental Biology, PAS
2002-2012 Associated Professor, Deputy Head, Lab. of Neurodegeneration, International Institute of Molecular and Cell Biology, Warsaw

Honors and fellowships:
2017 EU Horizon2020 Novel Ideas for Radically New Technologies FETOPEN GRANT
2015-present Member of the Management Board of the Polish Biochemical Society
2014 President of the international conference BIO2014 in Warsaw (900 participants)
2013-present Polish expert in the Management Board of EU JPND, the largest international organization for funding research in neurodegeneration
Fellowships: Fogarty International Center, FEBS Member of the Editorial Boards: Journal of Alzheimer's disease, Journal of Applied Genetics

Staff: Małgorzata Cira, Marek Gryzik, Iga Lachowicz, Katarzyna Laskowska-Kaszub (PhD student), Siranjeevi Nagaraj (PhD student), Anna Mietelska-Porowska, Anna Piotrowska, Angelika Więckowska (PhD student), Joanna Wojsiat (PhD student), Małgorzata Wydrych, Katarzyna Żółtowska

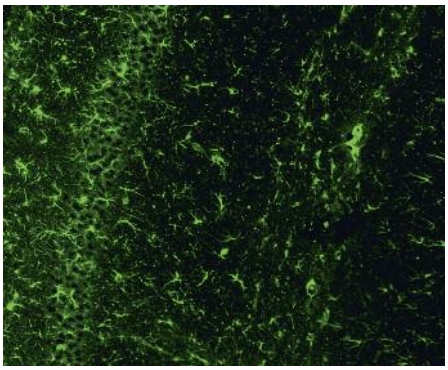
Laboratory of Preclinical Studies of Higher Standard

Research profile:
Core facility with its own research program launched in 2014 at the Nencki Neurobiology Center within the framework of the Centre for Preclinical Research and Technology (CePT). The laboratory conducts its own basic research on the early molecular mechanisms of neurodegenerative diseases aiming at identifying novel drug targets and biomarkers.

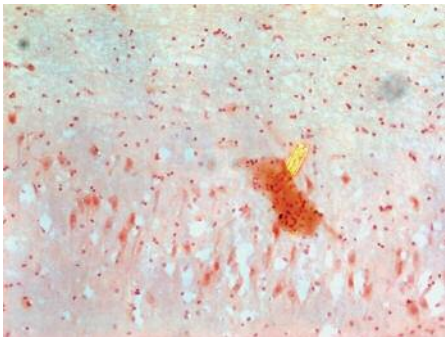
As a core facility, the laboratory performs comprehensive preclinical tests of potential new therapeutic strategies for diseases of the nervous system, as well as cancer, for internal and external customers or collaborating partners (research institutes, biotech and pharma companies) from Poland and from abroad. The laboratory consists of a group of stations with modern apparatus that enables preclinical tests in cell cultures in vitro and in animal models in vivo in accordance with the principles of Good Laboratory Practice (GLP) and a higher standard.

Current research activities:
- Search for blood-based early biomarkers of Alzheimer's disease (AD) by identifying systemic molecular changes in progression of the pathology: profiling microRNAs and proteins in blood cells and blood plasma from AD patients.
- Investigating the role of oxidative stress, aberrant cell cycle regulation and apoptosis in AD pathogenesis; focus on the involvement of the p53-p21 signaling pathway
- Analysis of the involvement of familial Alzheimer's disease associated mutated Presenilin1 in cellular responses to oxidative stress

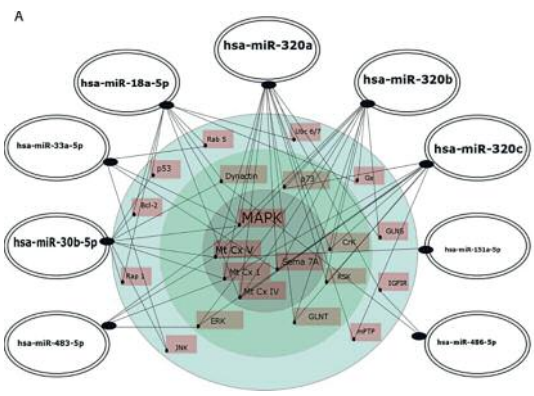
- Developing cellular models of Alzheimer's disease: in vitro cultures of fibroblasts and lymphocytes from AD patients and of human AD neurons derived from reprogrammed fibroblasts
- Developing novel mouse models of sporadic Alzheimer's disease
- Correlation study of AD biomarkers in human blood and in the blood of AD mouse models (model validation)
- Disorders of Ca2+ signaling proteins in AD
- Preclinical evaluation of novel potential anticancer therapeutics: mechanisms of cellular activity, pharmacokinetics, activity in mouse xenotransplantation cancer models.



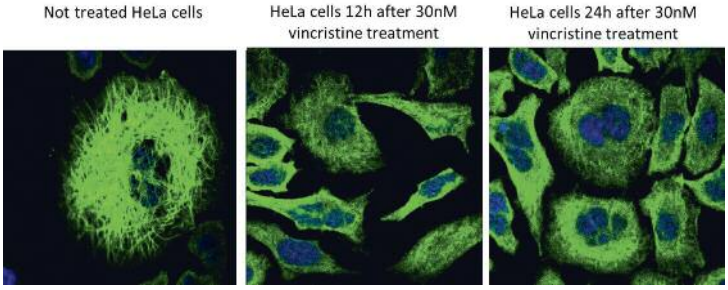
Immunofluorescent staining of GFAP protein in C57BL6 mouse brain after systemic lipopolysaccharide (LPS) injection. Microphotograph demonstrates astrocytes in mouse hippocampus assessed using fluorescence microscope (not published). Magnification x10.



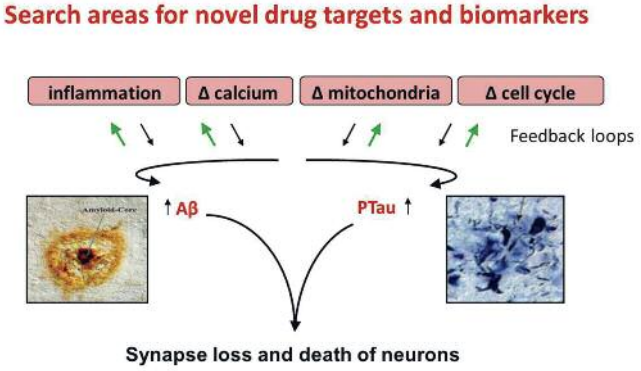
Congo Red histochemical staining of human brain tissue from Sporadic Alzheimer Disease (SAD) patients confirmed the presence of amyloid senile plaques in the hippocampus as a characteristic neuropathological hallmark of late stage of Alzheimer's disease assessed using light microscope (not published). Magnification 10x.



Regulatory network of 9 miRNAs as a novel Alzheimer's disease candidate biomarkers and their putative cellular effectors reflect AD complex pathomechanism including cell cycle deregulation, altered p53 signaling, and alterations in mitochondria (cover of the Oncotarget journal highlighting research results of our group - Fig. 4a) (Nagaraj S. et al. Oncotarget. 2017 Mar 7;8(10):16122-16143).



Microphotographs demonstrate that vincristine (chemotherapy medication used to treat a number of types of cancer) acts by blocking tubulin polymerization and evokes mitotic catastrophe in cells arrested in G2/M phase of the cell cycle. Microtubules were labelled with Alexa Fluor-488 conjugated anti-tubulin antibody (green fluorescence) and were analysed by confocal microscopy. Magnification x63.



Early molecular alterations in Alzheimer's disease preceding amyloid and tau pathology as search areas for novel drug targets and biomarkers.

Selected publications: Nagaraj S., Laskowska-Kaszub K., Dębski K.J., Wojsiat J., Dąbrowski M., Gabryelewicz T., Kuźnicki J., Wojda U. (2017) Profile of 6 microRNA in blood plasma distinguish early stage Alzheimer's disease patients from non-demented subjects. Oncotarget, doi: 10.18632/oncotarget.15109. The article featured on the cover for issue 10 (Vol 8).

Mietelska-Porowska A., Wojda U. (2017) T Lymphocytes and Inflammatory Mediators in the Interplay between Brain and Blood in Alzheimer's Disease: Potential Pools of New Biomarkers. Journal Immunology Research, ID 4626540, https://doi.org/10.1155/2017/4626540.

Wojsiat J., Laskowska-Kaszub K., Alquézar C., Białopiotrowicz E., Esteras N., Zdioruk M., Martin-Requero A., Wojda U. (2016) Familial Alzheimer's Disease Lymphocytes Respond Differently Than Sporadic Cells to Oxidative Stress: Upregulated p53-p21 Signaling Linked with Presenilin 1 Mutants. Mol Neurobiol, doi:10.1007/s12035-016-0105-y.

Wojda U. (2016) Alzheimer's Disease lymphocytes: potential for biomarkers? Biomark Med. 10(1):1-4.

Wojsiat J., Prandelli C., Laskowska-Kaszub K., Martín-Requero A., Wojda U. (2015) Oxidative stress and aberrant cell cycle in Alzheimer's disease lymphocytes: diagnostic prospects. J Alzheimers Dis, 46(2):329-50.

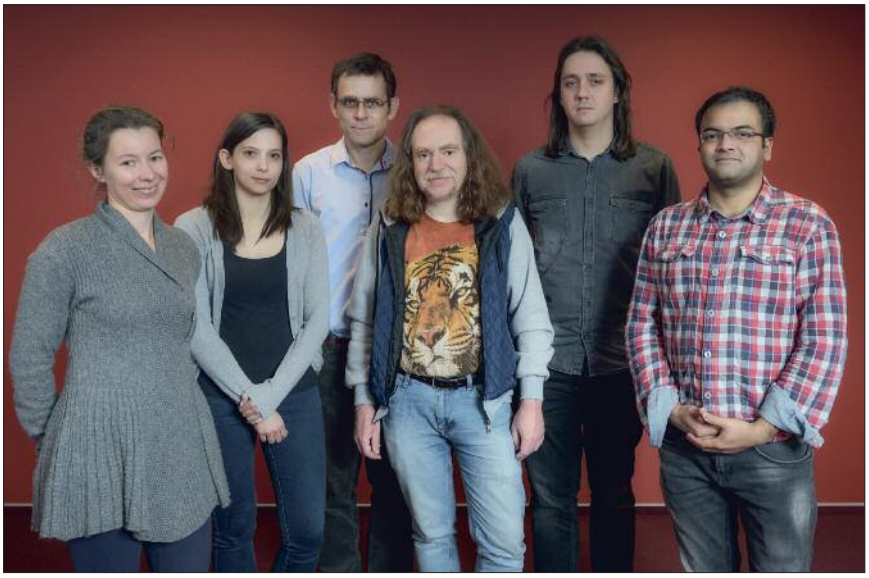
Head:
Michał Dąbrowski

Degrees:
2012 DSc, Nencki Institute of Experimental Biology
1998 PhD, Medical University of Warsaw
1994 MD, Medical University of Warsaw

Research trainings:
2014 Science Infrastructure Management Support (Poland, USA, Germany; IBM, Fraunhofer-Gesellschaft, TUDresden, MPI-CBG)

Professional employments:
2014-present Head of the Laboratory of Bioinformatics, Nencki Institute of Experimental Biology, PAS
2003-2014 Associate professor, Nencki Institute of Experimental Biology, PAS
2000-2003 Postdoc, Katholieke Universiteit Leuven, Belgium
1998-2000 Specialist Hospital in Kościerzyna

Honors and fellowships:
2014 Award for outstanding scientific achievements of The Division II of the Polish Academy of Sciences for the year 2014 (awarded to the team headed by Bożena Kamińska)
2010 Jerzy Konorski Award (awarded for the paper by Marta B. Wiśniewska et al.)
2004 Marie-Curie European Reintegration Grant
2001 Marie-Curie European Fellowship
1998 Honours for the PhD dissertation



Staff: Agata Charzyńska, Aleksandra Cabaj (PhD student), Adam Jarmuła, Jan Ludwiczak (PhD student), Shamba Sankar Mondal (PhD student)

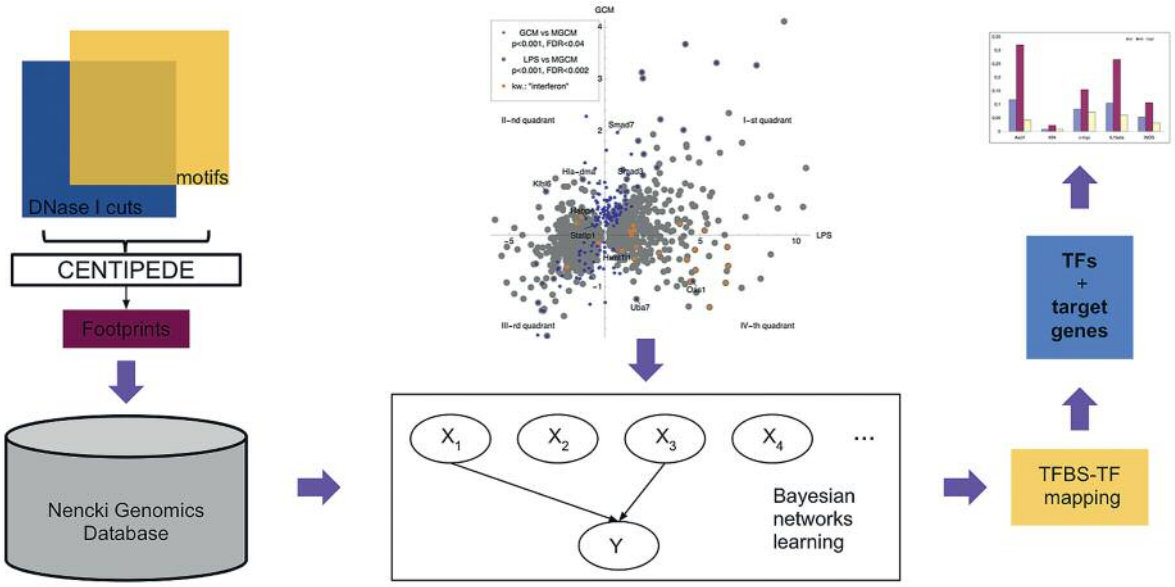
Laboratory of Bioinformatics

Research profile:
The mission of our laboratory is to provide world-class bioinformatics support to experimental groups at the Nencki Institute. Our strategy is to focus on the areas of Bioinformatics related to Systems Biology and to foster collaboration.

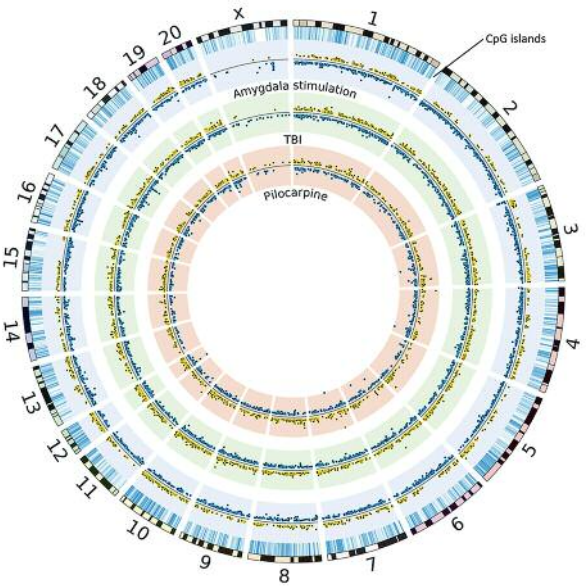
Our main focus of interest is Regulatory Genomics: i.e. transcription and its genome-wide regulation at cis-regulatory, epigenetic and structural level.

As a core laboratory, we also provide support for high-throughput methods (microarrays, next-generation sequencing and mass spectrometry), in a wide context of Systems Biology. Our expertise includes integration of genomic, epigenomic and expression data using database, statistical and machine learning tools, as well as molecular modeling and molecular dynamics, to address biologically motivated questions, in particular in the context of mammalian cell biology and neurobiology. The main form of our activity are collaborative projects with experimental groups, in which we are responsible for the bioinformatics part.

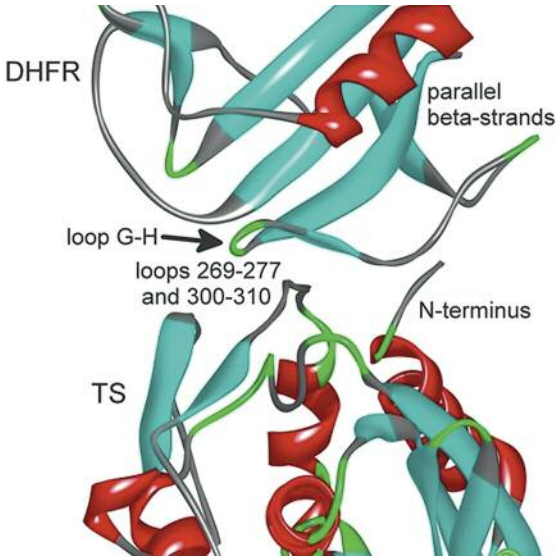
Current research activities:
- Application of DNase I-seq to identify transcription factors participating in alternative microglia activation in response to factors secreted by glioma
- Mutations in regulatory regions of epigenetic genes in gliomas
- Molecular mechanisms of HIF switch in human endothelium
- Regulation of transcription of genes from the Grainyhead-like family in human cells, in the context of cancer
- Crystal structures and molecular docking in the search for nematode-specific inhibitors of thymidylate synthase
- Evaluating the influence of C-termini on the motion and interaction between two motor domains and stack in the Ncd protein, by molecular modeling
- Evaluation of the human thymidylate synthase – dihydrofolate reductase complex as a novel target for anticancer drugs.



Overview of our DNase-seq study of microglia activation.



Comparison of MBD3 binding in three experimental models of epilepsy (in collaboration with Laboratory of Epileptogenesis, Nencki Institute).



Molecular model of the complex between human dihydrofolate reductase (DHFR) and thymidylate synthase (TS) in closer view.

Selected publications: Nagaraj S., Laskowska-Kaszub K., Dębski K.J., Wojsiat J., Dąbrowski M., Gabryelewicz T., Kuźnicki J., Wojda U. (2017) Profile of 6 microRNA in blood plasma distinguish early stage Alzheimer's disease patients from non-demented subjects. Oncotarget, doi: 10.18632/oncotarget.15109.

Ellert-Miklaszewska A., Wiśniewski P., Kijewska M., Gajdanowicz P., Pszczółkowska D., Przanowski P., Dąbrowski M., Maleszewska M., Kamińska B. (2016) Tumour-processed osteopontin and lactadherin drive the protumorigenic reprogramming of microglia and glioma progression. Oncogene, 35(50): 6366-6377.

Bednarczyk J., Dębski K.J., Bot A.M., Łukasiuk K. (2016) MBD3 expression and DNA binding patterns are altered in a rat model of temporal lobe epilepsy. Sci Rep, 6: 33736.

Antosiewicz A., Jarmuła A., Przybylska D., Mosieniak G., Szczepanowska J., Kowalkowska A., Rode W., Cieśla J. (2016) Human dihydrofolate reductase and thymidylate synthase form a complex in vitro and co-localize in normal and cancer cells. J Biomol Struct Dyn, 5: 1-17.

Dąbrowski M., Dojer N., Krystkowiak I., Kamińska B., Wilczyński B. (2015) Optimally choosing PWM motif databases and sequence scanning approaches based on ChIP-seq data. BMC Bioinformatics, 16: 140.

HYDROBIOLOGICAL STATION
OF THE NENCKI INSTITUTE
- MIKOLAJKI

Hydrobiological Station – Mikołajki

www.mikolajki.nencki.gov.pl

Head:
Tomasz Janecki

Degrees:

2006 PhD in Biology, Chemoreception and respiration of selected invertebrates from Admiralty Bay (Antarctica), University of Warsaw

1995 MSc in Biology, Changing in zooplankton community in Lake Wirbel (Greate Masurian Lakes, north-eastern Poland) after removing of fiches, University of Warsaw

Professional employments:

2015-present Head of The Hydrobiological Station – Mikołajki, Nencki Institute of Experimental Biology, PAS

2012-2015 Technical Manager of the Project LIFE 11NAT/PL/000431 entitled "Active protection of endangered species and habitats in the Natura 2000 „Ostoja Wigierska"

2014-2015 Assistant Project Manager EOG entitled: "Impatiens glandulifera - an invasive species of foreign origin - inventory, spread, control methods"

2011-2015 Wigry National Park, Research-Educational Lab

2006-2011 Deputy Head of Department of Antarctic Biology, PAS

2003-2005 Chief of Logistic of Department of Antarctic Biology, PAS

1997-2011 Department of Antarctic Biology, PAS

1995-1996 Department of Hydrobiology, Faculty of Biology, University of Warsaw

Honors and fellowships:

2016, 2017 Member of Russians High-latitude Arctic Expeditions

2003-2011 The representative of Poland in COMNAP: the Council of Managers of National Antarctic Program

2002 Ministry of Foreign Affairs, member of Secretariat of XXV ATCM

1997-2010 Member of six Polish Antarctic Expeditions (3 times leader of expedition) and two expeditions to Spitsbergen

Scientific Staff: Jolanta Ejsmont-Karabin, Assoc. Prof. (senior scientist)
Technical Staff: Piotr Białogrzywy, Józef Gołaś, Paweł Parzych, Irena Sawicka, Piotr Stomski, Agata Warmus

Hydrobiological Station – Mikołajki

Range of activities:

The Hydrobiological Station in Mikołajki, belonging to the Nencki Institute of Experimental Biology, Polish Academy of Sciences, for more than 60 years has provided opportunities to study and research for scientists of various specialties (both environmental and laboratory) from domestic and foreign scientific institutions. The Station offers access to 300 sq m laboratory space (Laboratory of Molecular Biology, Laboratory of Bioimagining, Microscopic Room, Wet Laboratory, Environmental Laboratory) equipped with specialist apparatus and several field samplers.

The Station also serves as a teaching facility for students/PhD-students who are held here fieldwork, student internships and placements.

Research profile:

- ecology of zooplankton (Rotifera, Cladocera)
- invertebrates of aquatic microhabitats
- ecophysiology of small bottom crustaceans (metabolism, respiration)
- chemoreception in aquatic environment (food signals, alarm substances etc.).

Current research activities:

The occurrence strategies, succession and biodiversity of teams Monogononta (Rotifera) in aquatic ecosystems and microhabitats

- epizoon of malakofauna (Rotifera)
- the combined effect of the interaction of many factors regulating species richness and composition of the Cladocera.

Educational activities:

At the Station there are also numerous educational events organized including workshops, seminars, lessons, shows, scientific festivals, theme days, meetings with travellers, screenings, exhibitions etc. which popularize the wider biology and knowledge about our world, addressing to the local community, especially pupils of primary and secondary schools and also teachers and seniors from the University of Third Age.

General view of the Station from the air (photo: M. Slusarczyk)

Main building of the Station

Reports session of PhD students of the Neurobiology Center of the Nencki Institute

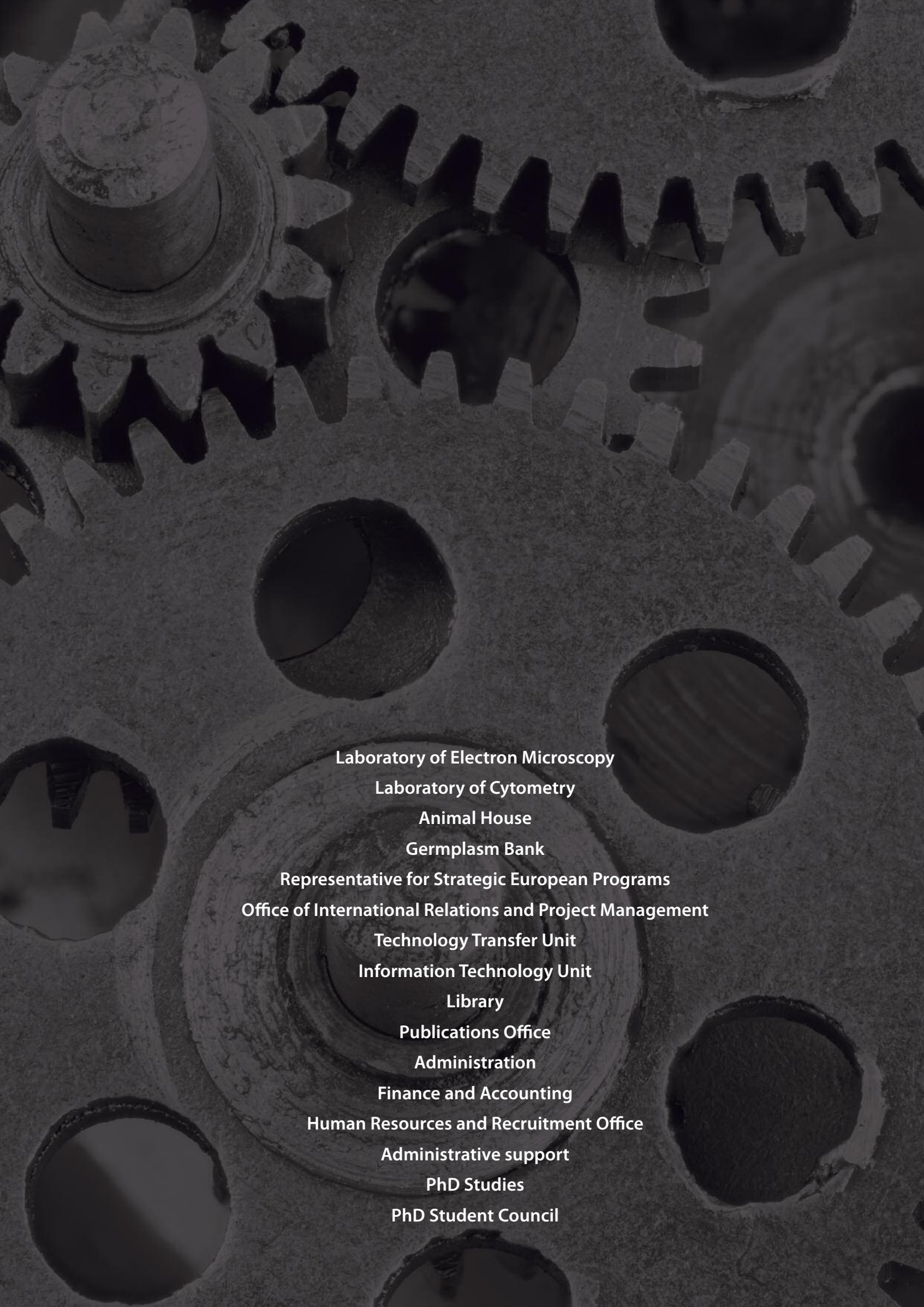
Selected publications: Bielańska-Grajner I., Ejsmont-Karabin J., Radwan S. (2015) Rotifers. Rotifera Monogononta Freshwater Fauna of Poland, vol. 32, Wydawnictwo Uniwersytetu Łódzkiego.

Czarnołęski M., Ejsmont-Karabin J., Angilletta Jr Michael J., Kozłowski J. (2015) Colder rotifers grow larger but only in oxygenated waters; Ecosphere 6(9):164.

Jekatierynczuk-Rudczyk E., Zieliński P., Grabowska M., Ejsmont-Karabin J., Karpowicz M., Więcko A. (2014). The trophic status ofSuwałki Landscape Park lakes based on selected parameters (NE Poland). Environmental Monitoring and Assessment, DOI: 10.1007/s10661-014-3763-0.

Dzialowsky A.R., Rzepecki M., Kostrzewska-Szlakowska I., Kalinowska K., Palash A., Lennon J.T. (2014) Are the abiotic and biotic characteristics of aquatic mesocosmos representative if in situ conditions?; Journal of Limnology 73: 603-612.

Kalinowska K., Ejsmont-Karabin J., Rzepecki M., Kostrzewska-Szlakowska I., Feniova I.Y, Palash A., Dzialowski A.R. (2014) Impacts of large-bodied crustaceans on the microbial loop Hydrobiologia; DOI 10.1007/s10750-014-2066-3.



Laboratory of Electron Microscopy

Laboratory of Cytometry

Animal House

Germplasm Bank

Representative for Strategic European Programs

Office of International Relations and Project Management

Technology Transfer Unit

Information Technology Unit

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Publications Office

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Administrative support

PhD Studies

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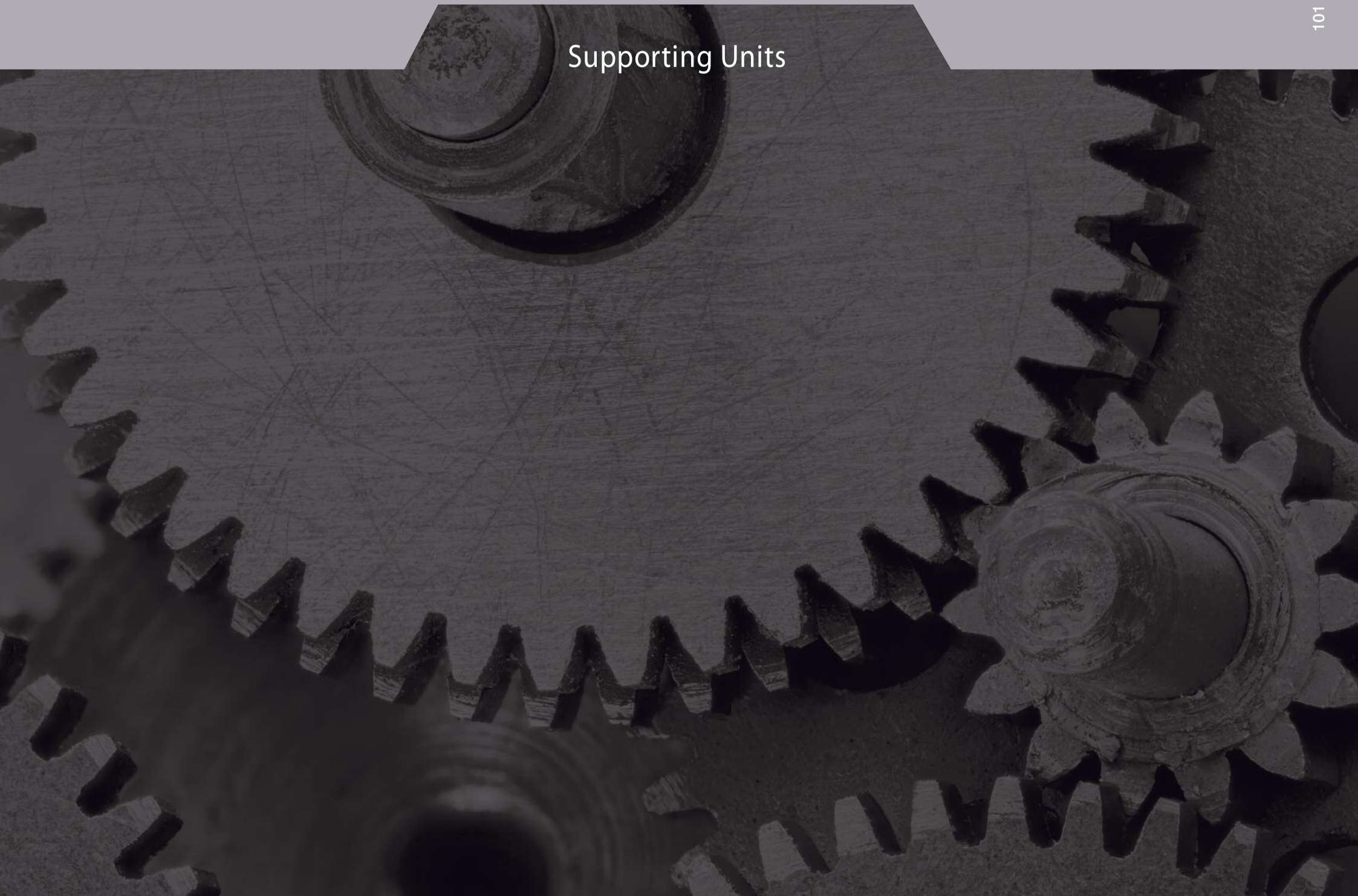
Supporting Units



Laboratory of Electron Microscopy

Head: Elżbieta Wyroba

Staff: Henryk Bilski, Szymon Suski

The Laboratory – established in 1973 – provides expertise/assistance in electron microscopy studies: qualitative/quantitative X-ray microanalysis and elements mapping, 3D imaging/ reconstruction and ultrastructural analysis up to magnification of x1.66. The continuous efforts have been undertaken to enable new methods in electron microscopy to be introduced.The following equipment is available: electron microscopes (JEOL Co., Japan): JEM 1400 (2008) with energy-dispersive full range X-ray microanalysis system (EDS INCA Energy TEM, Oxford Instruments, UK), tomographic holder and 11 Megapixel TEM Camera MORADA G2 (EMSIS GmbH, Germany); JEM 1200EX (1986); scanning electron microscope JSM S1 (1973). Annually ~20 000 digital images are taken in electron microscopes and ~600 EDS spectra collected resulting in 2400 pages of reports.Other equipment such as: Ultramicrotomes (LKB, Sweden), Critical point drying system (Polaron,UK), Vacuum evaporator (JEOL Co., Japan), and Cryoultramicrotome (Leica, Austria) is available. Lab provides services in the procedure of mild drying of the biological samples in liquid CO_2 (critical point drying), coating of the biological samples and carbon evaporation of the specimen grids for transmission electron microscopy and microanalysis. Laboratory is involved in the collaborative projects with scientists from all over the country and abroad. Many public education and dissemination activities were undertaken: lectures, hands-on workshops and practical training.

Laboratory of Cytometry

Head: Katarzyna Piwocka

Staff: Łukasz Bugajski, Agata Kowalczyk

Research profile:
The Laboratory of Cytometry has been established in 2010 as a competence centre and core-facility. Our priority is to provide the state-of-the-art flow cytometry service, high quality expertize and training for in-house and outside investigators. Our goal is to introduce advanced flow cytometry applications and increase employment of modern flow cytometry as part of the multidisciplinary studies. We propagate high quality flow cytometry standards, either in the experimental work as well as data interpretation. We actively participate in the ISAC (International Society for Advancement of Cytometry) initiatives to increase our know-how and collaborate with experts.

Current activities:

- involvement in the research and innovative projects, based on the high-tech flow cytometry applications
- expertize in cell sorting, including sorting of rare cell populations and single cells
- expertize and assistance in designing and planning experiments, development of protocols, performing experiments and data analysis
- collaboration with the R&D and pharmaceutical companies in preclinical and clinical studies
- education - training, organization of courses and workshops in basic and advanced flow cytometry

Equipment:
Flow cytometer BD FACSCalibur (488 nm and 633 nm lasers)
Flow cytometer BD FACSLSR Fortessa Analyser (355 nm, 405 nm, 488 nm and 640 nm lasers)
Cell sorter BD FACSAria II (405 nm, 488 nm and 635 nm lasers)
Capillary Flow Cytometer Merck GUAVA easyCYTE 8HT (488 nm and 640 nm lasers).

Animal House

Head: Aleksandra Bartelik

Designated Veterinarian: Anna Kalinowska
Staff: Daria Figa, Katarzyna Jaślan, Beniamin Kaszlikowski, Julia Kaźmierska, Małgorzata Kielak, Iwona Małecka-Tepicht, Krzysztof Młodawski, Marta Nowak, Aleksandra Piotrowska, Zuzanna Sipak, Wojciech Wiśniewski, Marek Żyliński

The Animal House at the Nencki Institute obeys the legislation in force and is registered at the District Veterinary Surgeon in Warsaw.

The Animal House maintains two seperate units: one for breeding purposes and the other for husbandry service, both for animals geneticaly modified and wild type strains. The main objective of the facility is to provide scientists with the highest level of maintenance standards and research opportunities in the field of laboratory animal science in order to perform studies on their chosen animal models.

The most common animal models are mice (Mus musculus) including 60 transgenic lines, rats (Rattus norvegicus) with at 10 transgenic lines and grey short-tailed opposum (Monodelphis domestica).

Veterinarian provides routine health monitoring according to FELASA recommendation as well as managing eradication and prevention programs and performing practical guidance of veterinary skills required in daily scientific work.

Additional responsibility of veterinarian is management of restricted drugs, collecting samples and administering a suitable treatment.

The Animal House provides animals for research conducted in the laboratories at Nencki Institute and in cooperation with other Scientific Institutions and companies conducting pre-clinical research.

All experiments are carried out with the consent of the First Local Ethical Commission based in Warsaw.

Germplasm Bank

Cryopreservation service of mouse and rat gametes is available at the Nencki Institute since 2013. The Laboratory of Animal Models offers freezing and long term storage of rodent sperm and embryos, accessible for scientific as well as commercial R&D institutions.

Gametes banking is nowadays widely considered as a standard procedure introduced to preserve valuable transgenic lines. It is recommended as an insurance in cases of disease or contamination outbreaks, breeding cessation or genetic drift. Cryopreservation is an efficient way to save space and reduce colony maintenance costs, especially regarding low demand lines. Storage of the frozen gametes facilitates the distribution of transgenic strains between researchers and facilitates quick and effective revival of animals in SPF (specific pathogen free) conditions.

Embryo cryopreservation is commonly considered the 'gold standard' for preserving valuable rodent lines.

Representative for Strategic European Programs

Maciej Nałęcz

Professor Maciej Nałęcz is the Director's Designated Representative for Strategic European Programs from 1 May 2016, after coming back from UNESCO. His duties focus on supporting Director's actions towards participation of the Nencki Institute in European programs in research, education and innovation that strategically suit the Institute's interests, and on initiation of international scientific projects in all fields of the Nencki Institute activities.

Prof. Nałęcz is associated with the Nencki Institute from 1976. Full Professor from 1994, he was for 11 years the Director of the Institute (1990-2001). Specialized in biochemistry, he is author or co-author of over 140 various publications (71 with IF). MN has been awarded several distinctions (e.g. Knight and Officer Crosses of Polonia Restituta), membership of the Polish Academy of Sciences and Arts (PAU) and of the European Academy of Sciences and Humanities, and has received the honorary doctorate from the University of Artois (Lille, France). He held several positions in international science organizations (e.g. Chairman of the FEBS Fellowships Committee, 2001-2010). During 2001-2016 MN was working in UNESCO in Paris, first as Director of Basic and Engineering Sciences Division (2001-2010), later as Director for Science Policy and Capacity Building of the Natural Sciences Sector of UNESCO. He created and led the International Basic Sciences Program (IBSP), coordinated several International Years of the UN (e.g. physics - 2005, chemistry – 2011, crystallography – 2014, and Light – 2015), led the involvement of UNESCO in creation of the International Licht Synchrotron Centre "SESAME" in Jordan, and coordinated UNESCO collaboration with l'OREAL in the "For Women in Science" Programme.

Office of International Relations and Project Management

Head: Anna Sadlik-Paskalec

Staff: Joanna Kalka-Krakowska, Joanna Piasecka, Marta Rucińska, Urszula Rybak

The Nencki Institute relations with foreign institutions and external funding bodies are handled by the Office of International Relations and Project Management (OIRPM).

- OIRPM facilitates all formal and organizational aspects of international relations, including organization of international conferences and workshops, supporting scientific exchange programmes, managing organizational, legal, and financial aspects of hosting foreign visitors and aiding Institute employees in their missions abroad.
- OIRPM assists Nencki scientists in applying for external funding from national and international sources and monitors the financial and administrative aspects of submitted proposals and on-going projects. It also provides information about the existing funding opportunities within the EU Framework Programmes and other international initiatives as well as European Funds at the national and regional level.
- OIRPM employees act in the capacity of project managers for large and complex projects financed from external funds, such as the multi-partner consortia in EU Operational or Framework Programmes. The Office acts as a liaison with the European Commission and with the coordinators and funding agencies for large scale investment and R&D projects.
- OIRPM staff actively participate in recruitment, counselling and career advancement of international students, post-doctoral fellows and international scientists.

The Office Head reports to the Deputy Director for Scientific Research and/or directly to the Institute Director.

Technology Transfer Unit

Anna Bieńkowska

Responsible for stimulating innovation and overseeing technology transfer at the Institute. Popularizes the good practices of knowledge commercialization process among employees and PhD students of the Institute. Helps in writing grants applications for innovative projects funding. Supports intellectual property (IP) protection and management. Supports and oversees preparation and submission of invention disclosures. Supervises the patent protection process conducted at the Institute in consultation with the Patent Attorney. Performs the initial evaluation and rating of the commercial potential of projects. Acts as first contact points for Institute scientist and industry partners. Initiates technology transfer process. Supports the inventors in preparation of a professional pitch presentation for the product developed in the Institute. Participates in negotiations for project commercialization. Provides technology brokerage services by searching for industrial partners to enter R&D project as well as with external entities interested in the project implementation commercialization. Participates in creation of cooperation and commercialization agreements.

Information Technology Unit

Head: Mirosław Sikora

Staff: Marcin Karpezo, Arkadiusz Kilijański, Agnieszka Kowaluk, Maciej Maszewski, Anna Mirgos, Justyna Osmulska, Piotr Redel

Main IT Unit Activities

Planning, deploying and supporting the Institute's networking infrastructure. The Nencki Institute local area network (LAN) is based on the Cisco Nexus 7000 Series Switch, which constitutes the network core. Cisco Catalyst 2960 devices are used for access switching. They are interconnected with 2*1 Gb/s fibre optics (Gigabit Ethernet). Connection to wide-area Internet (10Gb/s) is secured by a firewall.

Managing the data center infrastructure.

The infrastructure is based on the Cisco Unified Computing System (UCS), VMware vSphere software, EMC and NetApp storage systems. The Cisco UCS architecture includes a 10 Gigabit Ethernet network, x86 blade servers and a management system. The network is based on the Cisco Unified Fabric concept, in which 10 Gigabit Ethernet is used for all types of transmissions (Ethernet and Fibre Channel, using the Fiber Channel over Ethernet standard). 70 virtual servers are implemented on seven physical servers.

Deploying, supporting and administering the Institute servers, NAS and SAN storage systems.

Providing front line IT support to staff of the Institute in all aspects of computer operations (Helpdesk system).

Additional Activities:

- providing digital imaging and printing facilities
- developing and coding content for WWW servers
- supervising implementation of databases application software in the Institute's Accounting Department
- predicting and planning for the Institute's future hardware and software needs.

Library

Head: Jan Bienias

Staff: Maja Brzozowska, Monika Małecka-Krawczyk, Mariusz Pasznik

The Library of the Nencki Institute of Experimental Biology was founded together with the Institute in 1918 and was situated in the building at the Śniadeckich St. in Warsaw, Hydrobiological Station Wigry, Sea Station in Hel, Biological Station in Pińsk. During World War II the main collections were destroyed by the German authorities. In the years 1945-1954 the library with the Institute was located in Łódź.

The collection now has about 75000 volumes of books and periodicals, and CDs, microfilms, old prints, etc. The profile of the collection is connected with following scientific fields: cell biology, molecular biology, biochemistry, ethology, neurobiology and psychophysiology.

The library offers access to many databases: Web of Science, PubMed, Scopus, Bioone, Ebscohost, CogNet, PsycArticles, and to periodicals from publishers: Springer, Elsevier, Wiley, Karger, ACS, and other journals subscribed to by the library.

The librarians prepare the annual „List of the Institute employees' publications".

Since 2011 Nencki Institute Library participates in creation of Digital Repository of Scientific Institutes. The Project: Digital Repository of Scientific Institutes POIG.02.03.02-00-043/10 is being implemented owing to funds from European Regional Development Fund, The Innovative Economy Operational Programme, Objective 2 (http://rcin.org.pl/dlibra).

More information: **http://biblioteka.nencki.gov.pl**

Publications Office

Head: Wioletta Joanna Waleszczyk

Associate Editors: Grzegorz Czapski, Ruzanna Djavadian, Jacek Jaworski, Monika Liguz-Lęcznar
Managing Editor: Anna Dudzik/Michał Rolecki

The Nencki Institute and Polish Neuroscience Society jointly publish the quarterly journal Acta Neurobiologiae Experimentalis (ANE).

Acta Neurobiologiae Experimentalis is a continuation of Acta Biologiae Experimentalis, a quarterly founded in 1928 as the main Polish journal publishing original articles in the broad area of experimental biology. In 1970 the name was changed for the present and the scope was redirected towards behavior, neuroanatomy, neurophysiology and neuropsychology. The first Editor of the changed title was Professor Jerzy Konorski.

Today Acta Neurobiologiae Experimentalis is a fully peer-reviewed quarterly with an international Board of Editors and an Impact Factor of 1.708 (for 2015). Its scope covers broad aspects of neurobiology and neuropathology, including genetics, biochemistry, molecular and cellular neurobiology of the nervous system, electrophysiology and fMRI, functional and comparative neuroanatomy, development and evolution of the nervous system, behavior, brain modeling and also its aging and pathology. ANE publishes original research reports, theoretical papers, reviews, short communications and descriptions of new methods.

ANE has its own electronic submission and processing of manuscripts system available at www.ane.pl. An open access electronic version of the journal in PDF format is at www.ane.pl. They are linked to specific titles in PubMed, to be downloaded for free. We provide free access to full text PDFs from all articles published in ANE since 1970.

Administration

Head: Anna Jachner – Miśkiewicz

Staff: Łukasz Chudoba, Barbara Chylińska, Dawid Ciechowicz, Iwona Czaplarska, Wiktor Czechowski, Zbigniew Engelbrecht, Zbigniew Gajewski, Krzysztof Grącki, Grzegorz Janusik, Dariusz Kałużyński, Jacek Krejner, Marek Mańkowski, Edyta Momot, Wiesław Mróz, Monika Napierała, Robert Nowak, Joanna Rawa-Rębkowska, Renata Rubin, Ryszard Senk, Dominik Siemiński, Miłosz Sierniewski, Elżbieta Stefaniuk, Michał Stępień, Henryk Warzywoda, Tadeusz Wiśniewski, Władysław Zarudzki

The Administration ensures daily service of the whole Institute which are fulfilled by several offices. The **Secretary's Office** receives, registers and distributes internal and external correspondence and courier shipments. It registers and keeps original Director's decisions and orders. It publishes on the Institute's website requests for proposals from suppliers and services providers. The **Institute Archives** collects, keeps and registers materials delivered by the Institute units. The **Public Procurement, Public Contract Awarding Committee** organizes and documents public contract awarding procedures regarding the selection of suppliers and service providers according to the Public Procurement Law. The **Administration Office** deals with matters related to the everyday life of the Institute, it registers and grants authorization to premises in the buildings, registers fixed assets, carries out stocktaking, manages cars, ensures order and cleanliness inside and outside the building, supervises the work of security and cleaning services, supports the organization of meetings and conferences if needed. The **Procurement Office** is responsible for comprehensive purchases of any kind and waste management; drafts and electronically archives agreements for supplies and services below the threshold specified in the Public Procurement Law. The **Technical Office** ensures undisturbed functioning of the buildings and laboratories; prepares investor cost of renovations, monitors the condition of the equipment and devices.

Finance and Accounting

Head: Hanna Michalska

Staff: Małgorzata Chmiel, Dorota Chylińska-Krzemińska, Aleksandra Dżoleva, Magdalena Lewandowska, Iwona Marchewka, Krystyna Piechowska, Anna Rasztęborska, Teresa Skórzyńska, Sylwia Szulc, Renata Szymańczak, Justyna Tutaj-Śledziewska

The Finance and Accounting Office of the Nencki Institute is responsible for organizing the financial and accounting affairs at the Institute. The Office provides a wide range of comprehensive financial management support and assures financial stability and optimal use of public resources for scientific research and post-graduate education. In accordance with the Institute Statutes, the Finance and Accounting Office is responsible for preparation of annual financial statements and reports for the Polish Academy of Sciences subject to an external audit by a certified auditor.

The Finance and Accounting Office continuously upgrades the competence of its staff through training and education to stay up to date with the changes in accounting best practice and tax regulations. The Finance and Accounting Office supervises financial reporting of all externally funded grants and contracts executed by Institute researchers and PhD students. In this capacity, the Finance and Accounting . Office works closely with the Office of International Relations and Project Management which is responsible for administrative management of grants and contracts. Such comprehensive support and financial monitoring enables the Institute researchers to successfully compete in many calls for proposals from national and international funding bodies and to efficiently execute the funded projects. The Head of the Office – Chief Financial Officer reports directly to the Director of the Institute.

Human Resources and Recruitment Office

Head: Urszula Dziewulska

Staff: Katarzyna Gardocka, Magdalena Jóźwik, Agata Karwowska, Elwira Kocyła, Ewa Leśniczuk, Anna Wasik

The Human Resources and Recruitment Office (HR) is responsible for managing and maintaining employee relations. As well as being responsible for the hiring and firing procedure, its duties include contracting job references, administering employee benefits, dealing with complaints, managing attendance issues, coordinating science popularization projects and day-to-day operations of the institute.

The HR office provides the recruitment of professional employees and PhD students in close collaboration with other department members to fulfill the hiring procedure, collect relevant CV's and organize job interviews. The HR office is also responsible for organizing health, medical and life insurance throughout the workplace. The HR Office arranges and implements any plans relating to pension schemes or employee benefits. It is also responsible for the administrative services for foreigners and supporting them in the integration process. The Head of Office reports directly to the Director of the Institute.

Administrative support

Secretary
to the Director
of the Institute
Beata Kuźniarska

Secretary
to the Administrative
Director
Elżbieta Stefaniuk

Secretary
to the Scientific
Council
Agata Karwowska

Secretary
to the PhD Studies
Katarzyna Gardocka

PhD Studies

Head: Daniel K. Wójcik

The Nencki Institute has a long history of training young scientists and awarding PhD degrees, but its PhD program was formally established in the spring semester of 2001. At the end of 2016 there were 185 PhD students enrolled in the program. The main subject areas of the curriculum are Neurobiology, and Biochemistry with Molecular and Cell Biology. The program includes courses in philosophy, statistics, neuroanatomy, and soft skills.

English proficiency is a pre-requisite for enrollment in the program, further language training is available to all doctoral students. During the 4-year program each student is required to work on research in a field directly related to his/her PhD thesis. All students must attend a series of mandatory lectures as well as participate in the Departmental Seminars. All students participate in international workshops and conferences, and report periodically to their supervisors on the progress of their research. At the end of each academic year students present the main results from a given year to their colleagues and faculty from the Department.

Students have their representative at the Scientific Board with a vote right and PhD Students Council represents them within the Institute and outside, Students also play a major role in many science popularization events organized through the year.

PhD Student Council

Head: Joanna Czarnecka

PhD Student Council Delegates: Svitlana Antoniuk, Ryszard Cetnarski, Joanna Czarnecka, Marcin Herok, Barbara Juraszek, Ilona Kotlewska-Waś, Patrycja Kruk, Bernadeta Michalska, Michał Niziołek, Karolina Stępniak, Kacper Walentynowicz

The Council was formed in 2005 in accordance with the Institute's Regulations of the Student Council of the Nencki Institute of Experimental Biology.

The main purpose of the Council is to intermediate between the Institute's authorities and students.

- We represent students in the Institute and outside
- We monitor whether the students' rights are respected
- We foster fair treatment and implement new regulations to improve students' experience during their PhD studies
- Council Delegates attend the Institute Collegium and the Science Council meetings – we have a direct impact on the PhD Programme.

Throughout the years, we have accomplished a lot; we created the "Pipeta" student club, provided free ISIC cards to every student, co-organised and co-hosted many events promoting science and the Institute (Brain Week, Science Picnic, Festival of Science). We try to engage all PhD students in the social events fostering integration and exchange of ideas (Freshers' Integration, Meetings of the Biocentrum Ochota PhD students, Journal Club, Table Tennis Tournament). The Council helps prepare promotional materials for the Nencki Institute (roll-ups, magnets, notebooks, posters, etc.).

The PhD Questionnaire is carried out every year to assess students' experience and quality of their time at the Nencki Institute. The PhD Student Council also participates in the PhD Student Conference at the Institute which is organised every two years.

Popularization of Science

Coordinator: Anna Wasik

One of the most important missions the scientists have to fulfill is the popularization of science. This sphere of the Nencki Institute activity is directed mainly to the younger generation. Sharing the information of the latest scientific developments and knowledge with children and young people is not only extremely important but also a satisfying activity of the Institute.

The Nencki Institute for many years has been involved in the organization of lectures and workshops during the Warsaw Science Festival and the Brain Awareness Week. Symposium for Biology Teachers, organized together with BioCentrum Science Education, collects listeners who not only have the opportunity to become acquainted with the latest achievements of science, but also to meet the authors of biology handbooks.

Invariably, very popular are the activities organized for highly talented young people promoted by the Polish Children's Fund. The Institute also organizes meetings with prospective graduate students and schoolchildren in the framework of the Open Days. Science Picnic of Polish Radio and the Copernicus Science Centre, an open-air event in which the Nencki Institute has participated from the very beginning, is addressed to the inhabitants of Warsaw and the surrounding area, who have a chance to see novelties and scientific curiosities.

The popularization of science gives the chance to both children and adults, for raising the level of their knowledge and direct contact with prominent scientists. The activities of the Nencki Institute of Experimental Biology PAS in the promotion and popularization of science was awarded the title of "Popularizer of science 2013" in the Competition organized by PAP Science & Scholarship in Poland and the Ministry of Science and Higher Education.

Scientific Picnic of Polish Radio and the Copernicus Science Centre

Brain Awareness Week at the Nencki Institute

Science Festival

Open Day at the Nencki Institute

Directory

Phone (+ 48 22) 58 92 ... (plus phone no. ext)

Fax (+ 48 22) 822 53 42

e-mail: …@nencki.gov.pl

Surname and name	phone no ext	e-mail	room no
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Antoniuk Svitlana	147	s.antoniuk	203
Antosz Anna	549	a.antosz	B008CN
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Bojko Agnieszka	260	a.bojko	213
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Hydrobiological Station in Mikolajki

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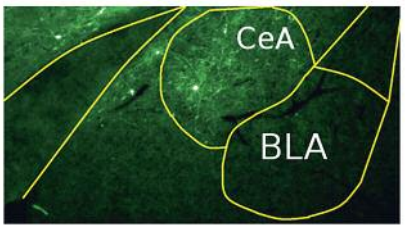
Ewelina Knapska

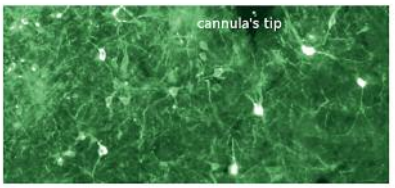
ERC Starting Grant Functional connectomics of the amygdala in social interactions of different valence

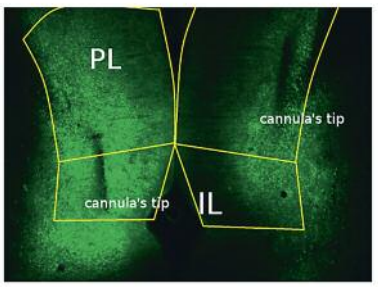
The ERC Starting Grant "Functional connectomics of the amygdala in social interactions of different valence" aims at understanding how the brain controls socially transferred emotions. Whereas social interactions and their effects on the emotional state of an individual are relatively well described at the behavioral level, much less is known about neural mechanisms involved in these very complex phenomena, especially in the amygdala, a key structure processing emotions in the brain. The main goal of the project consists in answering two questions: whether there exist – within the amygdala – different neuronal circuits mediating social interactions of different valence (of positive or negative affective significance) and whether circuits controlling social and non-social emotions differ, in other words, whether there is something like a specialized social brain.

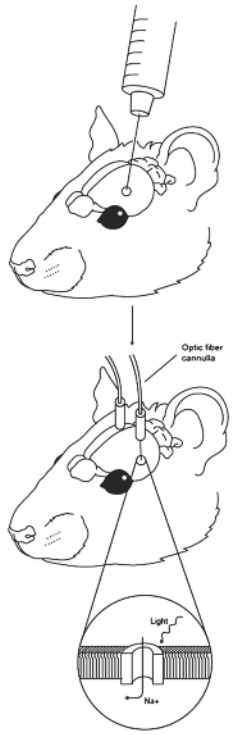
"To be infected with emotions is regarded as a basic form of empathy, with human consequences when it is disrupted," Dr. Knapska explains. Identifying the social brain and its workings could help explain dysfunctions in social interactions in people with autism or suffering from psychopathy.

The project will last 5 years and with a budget over 1.3 million euro it will facilitate hiring researchers and PhD students, as well as the acquisition of necessary materials and services.









Light-sensitive proteins enable control of genetically defined neural circuits in a spatiotemporal-specific manner

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European Research Council
Established by the European Commission

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Horizon 2020
European Union funding
for Research & Innovation

Bio4Med: International Doctoral Programme in Biological Bases of Human Diseases

Marie Sklodowska-Curie COFUND grant to create the International PhD Studies in the frame of the project named "Bio4Med: International Doctoral Programme in Biological Bases of Human Diseases"

The major aim of Bio4Med (Biology for Medicine) programme is to provide unique, international, inter-disciplinary and intersectoral doctoral training for Early Stage Researchers (ESRs) in the domain of biological bases of human diseases. To achieve this goal it combines 22 leading research groups at the Nencki Institute and their scientific partners from world--class laboratories located in EU Member States, Switzerland, Ukraine, Japan, Canada and US.

The research programme includes basic science PhD-projects focused on molecular basis of neurodegeneration, neurological disorders, cancer and metabolic diseases. All supervising researchers engaged in the Bio4Med are at the international forefront of biomedical research and have experience in PhD student supervision. Our programme fosters young researchers' career development and employability by addressing the following objectives:

- to offer excellent training in modern biology and endow ESRs with unique scientific knowledge, and experience in cutting-edge experimental techniques;
- to enhance research-oriented and transferable skills of ESRs;
- to promote scientific mobility via international, inter-disciplinary and inter-sectoral collaboration.

The objectives of Bio4Med are being delivered through activities encompassing practical laboratory training, hands-on workshops, lectures corresponding to the theoretical aspects of doctoral projects, research-oriented generic skills courses, transferrable skills courses, progress talks and meetings. The training programme itself, focusing on medically important issues, will make ESRs highly attractive to commercial enterprises, particularly in biotechnology and pharmaceutical sectors.

Duration: 60 months (1 May 2015 – 30 April 2020)

Bio4Med Project Officer mid-term visit

nencki institute of experimental biology

Bio4Med

European Commission

Horizon 2020
European Union funding
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1. **Nencki Institute of Experimental Biology, Polish Academy of Sciences**
2. International Institute of Molecular and Cell Biology
3. Mossakowski Medical Research Centre, Polish Academy of Sciences
4. Institute of Biochemistry and Biophysics, Polish Academy of Sciences
5. Nalecz Institute of Biocybernetics and Biomedical Engineering, Polish Academy of Sciences
6. Institute of Fundamental Technological Research, Polish Academy of Sciences
7. Faculty of Pharmacy, Medical University of Warsaw
8. Clinical Hospital, Medical University of Warsaw
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15. Faculty of Mathematics, Informatics, and Mechanics, University of Warsaw
16. Interdisciplinary Centre for Mathematical and Computational Modelling, University of Warsaw
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