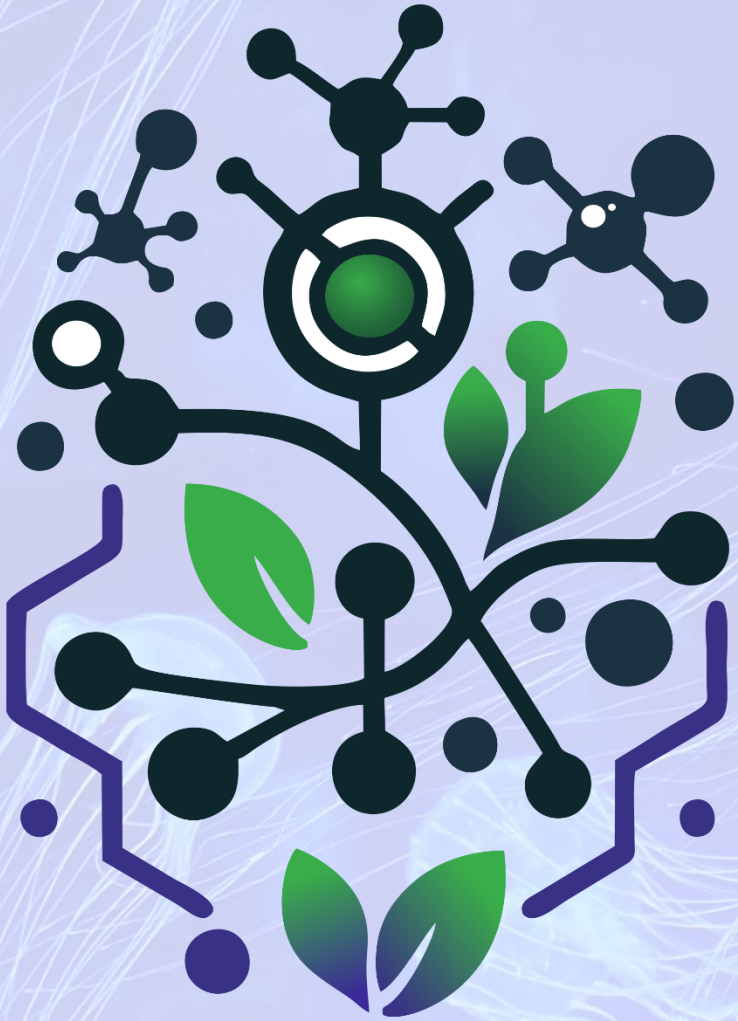

NATURAL SCIENCE
BALTIC CONFERENCE

20-21.04.2024

Event report

nsbc.ug.edu.pl

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Prologue

Dear Colleagues,

On behalf of Student's Science Club for Chemistry at the University of Gdańsk, the Student's Science Club for Chemistry, the Students' Self-Government Council of the Faculty of Chemistry, Center of Student and Doctoral activity and the Doctoral Council of the Doctoral School of Natural Sciences of the University of Gdansk I extend my heartfelt appreciation to everyone who attended the Natural Science Baltic Conference which is a continuation of the Baltic Chemistry Conference.

Our esteemed event united bright minds from across the globe in the fields of chemistry, biomedical chemistry, biochemistry, environmental protection, and ecology. The insightful lectures delivered by Dr Manuel Banzhaf from the University of Newcastle and Dr Joanna Drzeżdżon from University of Gdańsk, set a high bar for the scientific exchange and created a vibrant atmosphere of innovation.

We express our gratitude to our patrons for their generosity and support, which was instrumental in creating an enriching platform for all our participants.

The conference not only facilitated the presentation of ground breaking research but also fostered international collaborations and professional relationships. It is our hope that the insights gained and connections made during this conference will continue to inspire and influence your work.

As we reflect on the success of the Natural Science Baltic Conference, let's revisit the abstracts enclosed in this book and continue the discussions that were started. Each one represents the dedication, passion, and innovation of our global scientific community.

Thank you once again for your engagement and contributions to the success of this event. Here's to the advancement of science and to future collaborations.

Until we meet again at the next Natural Science Baltic Conference!

On behalf of the organisers of Natural Science Baltic Conference

MSc Mateusz A. Baluk

President of the Doctoral Council

of the School of Natural Sciences of the University of Gdańsk

The Baltic Sea:

Europe's Unique Body of Water

The Baltic Sea, often simply called the Baltic, is a unique body of water with a range of distinctive features and environmental conditions. Located in Northern Europe, it stretches from the western shores of Denmark to the eastern edges of Russia and is bordered by nine countries: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, and Sweden.

Spanning approximately 1,600 kilometers (990 miles) in length, the Baltic Sea covers an area of about 377,000 square kilometers (146,000 square miles), making it one of the largest brackish inland seas by area in the world. Its average depth is 55 meters, with the deepest point being the Landsort Deep near Sweden, reaching 459 meters (1,506 feet).

One of the most intriguing aspects of the Baltic Sea is its brackish nature. Unlike most marine environments, the Baltic Sea has a low salinity level. This is due to its semi-enclosed nature, limited water exchange with the North Sea, and significant freshwater input from numerous rivers. The salinity level varies across the Baltic but averages about 0.8% at the surface, much lower than the average salinity of ocean waters, which is typically around 3.5%.

The low salinity, combined with the colder climate of Northern Europe, creates a unique ecosystem. Various species adapted to these specific conditions inhabit the Baltic Sea. The Baltic herring and cod are particularly notable, having been vital to the region's fishing industry for centuries. The sea is also an important resting and breeding ground for many bird species, and its coastal regions host diverse flora and fauna.

Economically, the Baltic Sea is crucial for the surrounding countries. It has been a vital trade route for hundreds of years, linking major ports such as Kiel, Riga, Stockholm, and Gdansk. The sea provides valuable resources, including fish and, more recently, offshore wind energy.

Scientifically, the Baltic Sea is a significant focus of research due to its unique properties. It offers valuable insights into marine biology, oceanography, and environmental science. Its sensitivity to environmental changes makes it a key indicator of climate change. Topics like eutrophication, plastic pollution, and the impact of human activity on marine ecosystems are critical areas of study in the Baltic region.

However, the Baltic Sea faces substantial environmental challenges. Its limited water exchange with other bodies of water, coupled with industrial and agricultural runoff, has led to severe eutrophication problems. This process involves an excess of nutrients causing harmful algal blooms and subsequent oxygen depletion in the water, endangering marine life.

In conclusion, the Baltic Sea is a uniquely brackish marine environment with rich ecological diversity and significant economic and scientific value. Its unique characteristics make it an interesting subject for various scientific studies. At the same time, it is under considerable environmental stress, underscoring the need for sustainable practices and ongoing research to address and mitigate these challenges.

Author: Mateusz A. Baluk

About the conference

The Natural Science Baltic Conference was a continuation of the Baltic Chemistry Conference, which boasted great popularity. The Natural Science Baltic Conference was an online international conference for students and postgraduates that aimed to enhance the scientific potential of young scientists. The conference was completely free for speakers and passive participants. During NSBC, young speakers from different countries (students, doctoral students and young scientists) presented the results of their research or a problem on popular science topics. During the conference, members of the Scientific Committee evaluated individual presentations and posters to award the best ones.

Due to its interdisciplinary nature, the conference was divided into three panels related to different scientific fields: chemistry, biology and physics panel. In chemistry panel, we hosted speakers in the fields of chemical sciences, environmental sciences, ecology and nanotechnology. In biology panel we hosted speakers in the field of biological sciences, biotechnology. Last, but not least in physics panel, we hosted speakers in the fields of physical and matehmatical science.

HIGH INTERNATIONALITY

Poland, Italy, Hungary, Spain, United Kingdom, India and Portugal.

HIGH ATTENDANCE

There were 147 participants from 28 different research centers from around the world – in 7 different countries.

HIGH PARTICIPATION

During the conference, speakers presented a total of 89 presentations and posters

Organising committee

The Baltic Chemistry Conference was organised by an agreement of four organisations from the University of Gdansk - the Student's Science Club for Chemistry, the Students' Self-Government Council of the Faculty of Chemistry, Center of Student and Doctoral activity and the Doctoral Council of the Doctoral School of Natural Sciences of the University of Gdansk.

The Organising Committee is composed of:

MSc Mateusz A. Baluk as chairman of graphic & advertising

MSc Daria Łada as chairwoman of registration and contact

MSc Dominika Kapuścińska as chairwoman of science

MSc Damian Makowski as chairman of administration

Dawid Strzelecki as chairman of contacts & sponsors

Aleksandra Kontz as chairwoman of the conference proceedings

MSc Adrianna Kosiróg-Ceynowa

MSc Aneta Szulc

MSc Łukasz Arcimowicz

MSc Magdalena Żabińska

MSc Dominik Walczak

MSc Ewelina Wysocka

MSc Tomasz Młynik

MSc Wojciech Wesołowski

MSc Kamil Klimkowski

Natalia Wyźlic

Bartosz Chojnacki

Michał Rolka

Jakub Donat

Krzysztof Polaczek

Scientific committee

Prof. Henry Pinto

Yachay Tech University, ECUA

Henry Pinto obtained his Ph.D. in Physics in Condensed Matter Physics and Quantum Mechanical Simulations at the Department of Physics at the National University of Ireland in Cork and Tyndall National Institute, Ireland, in 2006. During his PhD studies, he won the BOC Postgraduate Bursary Award for his research. Throughout his scientific career, Dr. Pinto has been doing research in world-class centers like Aalto University, Finland; Nagoya University, Japan; and Liverpool University, UK. From 2010 until 2016, Dr. Pinto was a Research Professor in the Interdisciplinary Center for Nanotoxicity at Jackson State University, USA. Since 2016, Dr. Pinto has been a professor at the School of Physical Sciences and Nanotechnology at Yachay Tech University and the head of the CompNano Group. Dr. Pinto's main scientific interests are condensed matter physics and computational materials science. His main research topics include electronic structure calculations, magnetism and strongly correlated systems, mineral and metal-oxide surfaces and interfaces, polymers and metal/polymer interfaces, scanning tunneling microscopy simulations, nanomanipulation, molecular electronics, point defects, and high-performance computing.

Prof. Katarzyna Wiktorska

Warsaw University of Life Science, PL

I am professor at the Department of Physics and Biophysics at the Institute of Biology, Warsaw University of Life Science – SGGW. Formerly, I worked at the National Medicines Institute and was president and co-founder of OncoBoost sp. z o.o, a company dedicated to finding new pharmacological solutions for cancer prevention and therapy. My research focuses on innovative pharmacological solutions, particularly for breast cancer, involving natural compounds and their combinations with drugs. My expertise lies in confocal microscopy that I applty to explore the cancer treatment mechanisms such as the intracellular dynamics of drugs and their interactions with the xenobiotic metabolism system through Nrf2-dependent pathways.

Prof. Anna Aksmann

University of Gdansk, PL

Plant physiologist, researcher and academic teacher, Head of Department of Plant Experimental Biology and Biotechnology and Leader of Laboratory of Plant Physiology and Toxicology at University of Gdansk. For years focused on the toxic impact of anthropogenic contaminants on plant organisms, especially green microalgae. Current research mainly concerns the phytotoxicity of pharmaceuticals from the group of non-steroidal anti-inflammatory drugs, such as diclofenac, naproxen, nabumetone, ibuprofen, and flufenamic acid.

Dr Dawid Zych

University of Opole, PL

Dr. Dawid Zych is a chemist and educator, currently serving as an adjunct at the University of Opole, Faculty of Chemistry. Specialising in the synthesis and exploration of materials with a focus on substituted pyrene and terpyridine structures, Dr. Zych's research is dedicated to unravelling the complex relationships between structural modifications and the resulting optical, electrochemical, and thermal properties. Beyond the laboratory, his passion for chemistry extends to actively promoting education among pupils and students, providing not only scientific insight but also a historical perspective, thereby breaking the stereotype of chemistry as an inaccessible science.

Dr Maria Kochaniec

Gdańsk University of Technology, PL

Maria Kochaniec received her Ph.D. degree from the Gdansk University of Technology, Poland, in 2018. Maria conducted research in Poland and abroad (Germany, United Kingdom and South Korea) to gain experience in scientific and R&D projects thus creating a bridge between Academia&Industry. She is currently an Assistant Professor at Warsaw University of Technology, Poland. She is interested in the batteries systems through design of novel and innovative electrode materials, including but not limited to carbonaceous framework received from biomass processing, and their further catalytic applications for green energy conversion, and storage devices. Her recent research is being conducted through the CELISE (celise.unican.es) project, which is within the European Union's Horizon 2020 research and innovation program, Marie Skłodowska-Curie Actions – RISE. ORCID: 0000-0002-2124-5774

Dr Katarzyna Węgrzyn

University of Gdansk, PL

I am an assistant professor at the Intercollegiate Faculty of Biotechnology at the University of Gdansk and the Medical University of Gdansk. I hold a degree in biotechnology. My research focuses on the structure and function of nucleoprotein complexes, particularly during the DNA replication process and the metabolism of extrachromosomal elements (plasmids) in bacterial cells. I employ techniques such as surface plasmon resonance, microscale thermophoresis, and biolayer interferometry to investigate protein-protein, protein-DNA, and protein-ligand interactions.

Dr Anna Pancielejko

University of Gdańsk, PL

Dr Anna Pancielejko received her PhD (2022) degree from Gdansk University of Technology. Currently, she works as a postdoctoral fellow (2022–2024) at the University of Gdansk. Her research interests include developing photoactive nanomaterials such as oxides, perovskites, and metal-organic frameworks for energy and environmental applications.

Dr Aamod Desai

University of St Andrews, UK

Dr Aamod Desai completed his PhD from IISER, Pune (India) and is currently working as a postdoctoral research fellow at the University of St Andrews (UK). Apart from the core training as material chemist in metal-organic frameworks (MOFs), he has worked in the field of electrode materials for rechargeable battery technologies, such as Li-ion and Na-ion batteries.

Dr Monika Hejna

Polish Academy of Sciences, PL

Monika Hejna received a PhD degree in Veterinary and Animal Science from the University of Milan, Italy, in 2021. During her PhD worked as a visiting scholar at the University of California, Davis, where she carried out the research on plant-based strategies of controlling antibiotics input in swine farming. To continue her postdoctoral research, M. Hejna moved to the University of Gdańsk, Poland. In 2022, she joined the PASIFIC Programme at the Institute of Genetics and Animal Biotechnology of the Polish Academy of Sciences.

I am looking forward for further indications.

Dr Magdalena Miodyńska

University of Gdańsk, PL

Dr Magdalena Miodyńska is a researcher in the Department of Environmental Technologies at the Faculty of Chemistry, University of Gdańsk, Poland. She specializes in the synthesis, characterization, and photocatalytic studies of nanomaterials, including typical semiconductors, composites, quantum dots, COFs (Covalent-Organic Frameworks) and MOFs (Metal-Organic Frameworks).

Dr Maria Madej

Jagiellonian University, PL

Maria Madej is a PhD researcher in Department of Analytical Chemistry at the Faculty of Chemistry, Jagiellonian University in Kraków, Poland. She received her PhD degree in 2021. Her research is related to the development of voltammetric (bio)sensors intended for the determination of antidepressants in environmental and biological samples. She focuses especially on searching of new materials for the modification of solid electrodes, including zeolites, metal-organic frameworks or polymers deposited in cold plasma reactors.

Prof. Marcin Marciniak

University of Gdansk, PL

I am a mathematician working at the Institute of Theoretical Physics and Astrophysics at the University of Gdansk. I am the head of the Division of Mathematical Methods of Physics. My specialty is mathematical physics, more specifically the application of functional analysis and operator algebra theory to quantum mechanics and quantum information theory. In addition, I am involved in a project to develop a model of sea waves in the surroundings of wind farms. This model is based on stochastic differential equations and the application of AI.

Dr Małgorzata Kapusta

University of Gdansk, PL

I am a plant embryologist, currently working as an assistant professor at the Bioimaging Laboratory of the University of Gdańsk. My research focuses on visualizing the dynamics of the cytoskeleton and cell wall architecture during gametophyte development, especially in geophytes and aquatic plants. My current research also focuses on the protection of endangered species of Baltic dunes and lobelia lakes typical of northern Poland.

Dr Agata Kućko

Warsaw University of Life Science, PL

I am an Associate Professor in the Department of Plant Physiology (WULS-SGGW, Poland). My teaching activity is related to different aspects of plant physiology and ecophysiology. During my research, I focus on phytohormonal mechanisms of organ abscission in plants with special emphasis on economically important species. I am also interested in how crops react to abiotic stimuli.

Dr Wojciech Siwek

International Centre for Cancer Vaccine Science, University of Gdańsk, PL

I am an assistant professor and a Marie Skłodowska-Curie fellow at the International Centre for Cancer Vaccine Science, University of Gdańsk (PL). I hold a master's degree in biotechnology from the University of Warsaw and a PhD in biochemistry from the International Institute of Molecular and Cell Biology in Warsaw (PL). After that, I trained at the Gulbenkian Institute (PT), University of Oxford (UK) and Harvard Medical School (USA). I specialize in biomedical research with a focus on gene regulation and epigenetics. I am fascinated by how cells remember previous environmental states. I am keen to translate this research into the clinic.

My professional core values are excellence and integrity with kindness, respect and an open mind.

Dr Wojciech Snoch

University of Gdansk, PL and BAG3 Research Foundation

My research topic is focused mainly on myofibrillar myopathy type 6 (MFM6). I am currently working on patient-derived fibroblasts to establish a cell model of the disorder, provide a better description of the phenotype and check whether natural potential autophagy stimulators can rescue the cells. I received my PhD in chemistry at the Polish Academy of Sciences (ICSC PAS). During the studies managed two main projects for NSC and NRDC. In my research I am trying to combine both chemical and biological approaches and methods. Privately I love singing, dancing Brazilian Zouk and contemporary, walking in the forest and making wooden constructions.

Dr Emilia Gontarek-Castro

University of Gdańsk, PL

Dr inż. Emilia Gontarek-Castro received her PhD degree in 2022 from Gdansk University of Technology. Since October 2022, she has worked at the University of Gdansk. She gained international experience in research laboratories in Italy, Mexico and Turkey. Her expertise lies in the field of membrane technology, particularly in membrane fabrication and characterization and its application in water desalination.

Dr Elżbieta Adamska

University of Gdańsk, PL

Dr Elżbieta Adamska (https://orcid.org/0000-0003-1115-1894) obtained a Master's Degree in 2017 and Ph.D in 2022 at the Department of Analytical Chemistry at the Faculty of Chemistry of the University of Gdańsk. Her research interests are related to the synthesis of nanoparticles with optical properties that have potential applications in the study of percutaneous permeability. She is the author and co-author of 20 scientific and popular science publications and 90 presentations at national and international conferences.

Dr Dawid Wnuk

Jagiellonian University, PL

I am an assistant professor at the Department of Cell Biology at the Jagiellonian University. I work on the broadly understood biology of normal and cancer cells. I study the processes of tissue fibrosis and the role of plant-derived compounds in inhibiting cell signaling pathways responsible for inducing phenotypic changes in cells (EMT, FMT) accompanying fibrosis.

Special Guests

Dr Manuel Banzhaf

(University of Newcastle, AU)

Dr Manuel Banzhaf works at the Bioscience Institute at the Newcastle University. His research explores the use of high-throughput approaches to phenotype pathogens. Those methods allow him to study a) the bacterial cell envelope, a cellular compartment harbouring many determinants and processes related to antimicrobial resistance; b) how differences in DNA sequence result in phenotypic variability of pathogens to improve antimicrobial treatment regimens.

Dr Joanna Drzeżdżon

(University of Gdańsk, PL)

Dr Joanna Drzeżdżon is an assistant professor at the Department of Environmental Technology, Faculty of Chemistry, University of Gdańsk. Her scientific interests focus on olefin polymerization catalysts, self-healing polymers, including the application of "green chemistry" principles. She has published more than 60 academic papers in international journals, as well as 2 patents.

Opening lecture by Dr Manuel Banzhaf

Title: „Using systems microbiology to combat infectious disease"

Abstract: At this research seminar I will present how we can use arrayed and pooled bacterial libraries to systematically dissect complex bacterial processes such as antimicrobial resistance or the bacterial cell envelope biogenesis. The first part of the talk will be very conceptual explaining you the basis of chemical genomics and other phenotyping approaches we routinely employ in the Banzhaf lab with the goal to showcase how those methods may help you to answer your specific research questions. In the second part of my talk I will present what we learned from profiling two P. aeruginosa single-gene deletion libraries (in the clinically relevant strains, PA01 and PA14) in over 200 chemical and environmental stresses and how we currently expand this platform to other single deletion libraries of bacterial pathogens (K. pneumoniae, Vibrio cholerae, Mycobacterium bovis BCG, etc.) and libraries of sequenced clinical isolates.

Opening lecture by Dr Joanna Drzeżdżon

Title: „Self-healing polymers – synthesis, application and future research directions”

Abstract: Among polymer materials, a remarkable group consists of self-healing polymers. These are materials with the ability to regenerate after mechanical damage or other types of injuries. Self-healing polymers are innovative materials in the market, which are mostly still in the research phase. They are materials capable of repairing minor damages autonomously, without the need for external intervention. Self-healing polymers find applications in various fields such as automotive industry, medicine, aviation, electronics, chemical industry, construction, and others.

Patrons of the conference

We would like to thank sincerely our patrons, thanks to their support our conference has become known in the international scientific world.