



Dear Colleagues and Friends,

we once again met in beautiful Rytro for the Annual Conference of the Polish Society for Biomaterials. It was already the 32nd conference, and we have a lot to be proud of - our long-lasting tradition and growing community of PSB conference delegates!

The meeting in numbers: over 130 participants from 7 countries, 115 submitted abstracts, 3 Plenary Lectures, 1 Keynote, 26 podium presentations within 6 sessions, 84 posters, 11 Rapid-Fire presentations, and finally 4 sponsors and exhibitors.

This year's conference was dedicated to the memory of the PSB founder - Dr. Emil Staszów. We started the conference by reminiscing about his achievements and their importance for the Polish Society of Biomaterials existence and legacy.

We were amazingly proud to have excellent Plenary and Keynote Lecturers: – **Prof. Joachim Kohn** started the conference with the opening lecture on "Biomaterials Research in Anticipation of Future Global Health Emergencies", and on the next day he discussed "Novel Carriers Used in Topical Drug Delivery Systems"; **Prof. Aldo Boccaccini** shared his perspective on "Ion Releasing Bioactive Materials: Overview of Well-Known and Less Common Ions with Biological Activity for Tissue Regeneration", **Prof. Werner E. G. Müller** talked about "Physiological Inorganic Polymer - Polyphosphate: the Key Driver of Bio-medical Regeneration Processes", and **Prof. Gary L. Bowlin** introduced the topic of "Mechanical Characterization of Near Field Electrospun Wind Angles for Bioresorbable Vascular Grafts".

The winner of the Best Poster and Rapid-Fire Competition was Iwona Pudelko-Prażuch from the AGH University of Krakow. She received the prize sponsored by the [CeCert](#) company. Kudos to all our sponsors!

Finally, as always, we had an interesting social program with some regional traditions, a stunning-views excursion (Dunajec River Rafting Tour with beautiful weather on demand), morning swims, and fit-all-tastes dancing and singing (your input here was amazing!).

We are thrilled to organize another event for you and with you!

Thank you!

Your Organizing Committee

Elżbieta Pamuła

Barbara Szaraniec

Katarzyna Trała

Patrycja Domalik-Pyzik



POLISH SOCIETY FOR BIOMATERIALS

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ORGANIZING COMMITTEE

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Barbara Szaraniec - Secretary
Katarzyna Trała - Secretary of the Engineering of Biomaterials Journal
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This year's conference of the Polish Society for Biomaterials was dedicated to the memory of Doctor Emil Staszaków – Founder of the Polish Society for Biomaterials, its first President and Honorary Member, the Initiator of the Engineering of Biomaterials Journal, a wonderful individual, our Friend.

Dr. Emil Staszaków, MD, passed away on May 24, 2023. He was an outstanding surgeon and orthopaedist, a pioneer in the use of carbon biomaterials in reconstructive musculoskeletal surgery. He worked, among other places, at the Stefan Żeromski Hospital in Krakow, cared for generations of athletes in the Wisła Sports Society in Krakow, and was the founder and head of the Orthopedic and Trauma Department at the Gabriel Narutowicz Hospital in Krakow. Since the late 1980s, he was actively involved in research on the development of new carbon biomaterials, conducted at the AGH University of Krakow, and notably, he applied them with great success in clinical practice.

Dr. Emil Staszaków was the driving force behind the establishment of the Polish Society for Biomaterials, an organization that brought together scientists, doctors, and entrepreneurs involved in the broad field of biomaterials. During the VI Conference on “Carbon and Ceramic Biomaterials” in Rytro in 1995, he organized the founding meeting and subsequently ensured the registration of the Polish Society for Biomaterials. During the first General Assembly of the PSB Members, held on May 18, 1996, he was unanimously elected as its President, a position he held continuously until 2013. The Society owes him also the tradition of the Krakow Christmas Eve Dinners, organized annually in December after the General Assembly of Members. For many years they have been, and still are, a wonderful way of integrating the PSB community and an excellent opportunity for closer, less formal interactions and the exchange of experiences and opinions.

The core, the scaffold, and the heart of the Polish Society for Biomaterials and all its activities are anchored to Doctor Emil Staszaków. His ability to bring together representatives from various fields involved in biomaterials in Poland was unsurpassed.

Dr. Emil Staszaków will be remembered for his optimism, dedication, visionary ideas and concepts, and his effective pursuit of set goals. A wonderful human being, always ready to help others. We are forever grateful for all of the lessons he taught us and will cherish his memory.

Scientific & Organizing Committee

32nd Annual Conference ‘Biomaterials in Medicine and Veterinary Medicine’

12-15 October 2023, Rytro, Poland



General Information

The **Conferences on Biomaterials in Medicine and Veterinary Medicine** are held every year and address both fundamentals and clinical applications of carbon, metals, polymers, ceramics and composite biomaterials. Their aim is to present the latest results of scientific research as well as to exchange ideas, knowledge and experience of scientists, researchers and clinicians in the field of biomaterials.

The topics to be covered during the Conference include, but are not limited to:

- Smart biomaterials
- Surface modification and functionalization
- Advanced manufacturing
- Antimicrobial surfaces and materials
- Biointerfaces
- Bioimaging and biosensing
- Tissue engineering / Regenerative medicine
- Drug and gene delivery
- Cell encapsulation and delivery
- Stem cells
- Cancer therapy
- Bone and cartilage
- Neural regeneration
- Cardiovascular applications
- Biomechanics and micromechanics
- Clinical trials
- Translation and commercialization



ABSTRACTS

All participants intend to contribute oral and/or poster presentations were requested to prepare one-page abstract in English, which was published in conference materials (non-reviewed special edition of the "Engineering of Biomaterials,, Journal). Each author might submit maximum two abstracts (one for oral and one for poster or two for poster presentations). Abstract submission was only possible during registration via our online system. Only abstracts from individuals who have paid the registration fee were published.

We have accepted total number of 115 abstracts.

FULL PAPERS

We invited all participants to send full papers for publication in a regular issue of the "Engineering of Biomaterials" Journal (peer-reviewed, included in Index Copernicus Journals Master List, with the Polish Ministry of Science and Higher Education scoring – 40 points).

ORAL AND POSTER PRESENTATIONS

We had 3 plenary lectures, 1 keynote presentation, 26 oral presentations , 84 poster presentations, and 11 rapid fire presentations within the Best Poster Competition.



Prof. Joachim Kohn

Opening Lecture: Biomaterials Research in Anticipation of Future Global Health Emergencies

Plenary Lecture: Novel Carriers Used in Topical Drug Delivery Systems (Bożena Michniak-Kohn & Joachim Kohn)

Distinguished Professor Emeritus at Rutgers University, New Jersey, USA

President, International Union of Societies for Biomaterials Science and Engineering

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Joachim Kohn, PhD, FBSE is a national leader in the field of biomaterials science. As founding director of the New Jersey Center for Biomaterials (NJCBM) for 22 years and as Head of the Laboratory for Biomaterials Research at Rutgers, Prof. Kohn has made seminal contributions to the design and commercialization of new biomaterials for regenerative medicine, tissue engineering and drug delivery. He pioneered the use of combinatorial and computational methods for the optimization of polymer properties for use in medical implants (including a coronary stent and an antimicrobial device to prevent infections in pacemaker patients). These implants are being used by over one million patients and are currently

approved in 46 countries. As a translational scientist, Prof Kohn has 78 issued US Patents on novel biomaterials and seven companies have licensed his technologies. He is the scientific founder of three spin-off companies. Dr. Kohn retired from Rutgers in 2020 and remains active in research, entrepreneurship and the biomaterials community. He was elected President of the International Union of Societies for Biomaterials Science and Engineering in 2020.

Selected Recent Honors and Awards

- 2022 Recipient of the Award for Distinguished Contribution in Advancement of Biomaterials Science, given by the Japanese Society for Biomaterials
- 2022 Recipient of the International Award by the European Society for Biomaterials
- 2020 Recipient of the National Award in Applied Polymer Science by the American Chemical Society
- 2019 Recipient of the 2019 Society for Biomaterials Founders Award for life-time achievements in biomaterials science
- 2018 Recipient of the 2018 Healthcare Heroes Award for outstanding contributions to the advancement of biomaterials-based therapies
- 2017 Recipient of the 2017 Thomas Alva Edison Patent Award for best patent in biomaterials in New Jersey presented by the Research and Development Council of New Jersey
- 2013 Inducted as Fellow of the USA National Academy of Inventors



Prof. Aldo Boccaccini

Plenary Lecture: Ion Releasing Bioactive Materials: Overview of Well-Known and Less Common Ions with Biological

Activity for Tissue Regeneration

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Aldo R. Boccaccini is a Professor of Materials Science (Biomaterials) and Head of the Institute of Biomaterials at the University of Erlangen-Nuremberg, Germany. He is a visiting professor at Imperial College London, UK. Boccaccini has an Engineering degree from Instituto Balseiro, Argentina (1987) and a Doctorate in Engineering Sciences (Dr.-Ing.) from RWTH Aachen University, Germany (1994). He had post-doctoral appointments at the School of Metallurgy and Materials, University of Birmingham, UK (1994-1996), and at the Institute for Mechanics and Materials, University of California, San Diego, USA (1996-1997). He completed the Habilitation in Materials Technology at Ilmenau University of Technology, Germany in 2001.

The research activities of Prof. Boccaccini are in the field of ceramics, glasses and composites for biomedical, functional and/or structural applications with a focus on bioactive materials, scaffolds for tissue engineering, biofabrication and antibacterial coatings. He has been a visiting professor at different universities around the world and has given more than 150 presentations at international conferences (as keynote, invited and plenary speaker). Boccaccini has published more than 1000 scientific papers and 25 book chapters. He has co-edited 8 books. His work has been cited more than 61,000 times (h-index = 107, Scopus®, h-index = 123, Google Scholar®) and he was included in the “Highly Cited Researchers” lists in 2014 and 2018 (Clarivate Analytics). He has been the editor-in-chief of the journal *Materials Letters* since 2010. Boccaccini is a Fellow of four major materials science/technology learning societies, namely: American Ceramic Society, Institute of Materials, Minerals and Mining (UK), European Ceramic Society, and Society of Glass Technology (UK). Prof. Boccaccini has received multiple awards and honors, including the Materials Prize of the German Materials Society (2015), the Turner Award of International Commission on Glass (2016) and Friedberg Lecture Award (2016) of American Ceramic Society. Boccaccini is also an elected member of the World Academy of Ceramics, the National Academy of Engineering and Applied Sciences of Germany (acatech) and fellow of the European Academy of Sciences (EurAsc). He was conferred the degree of Honorary Doctor of Philosophy at Åbo Akademi University (ÅAU), Turku, Finland. He is the scientific coordinator of the Network of Argentinean Scientists in Germany. Boccaccini currently serves as vice-president of the Federation of European Materials Societies (FEMS). He has been a member of the Council of the European Society for Biomaterials (ESB) since 2015. He is currently the vice-president of ESB.



Prof. Werner E. G. Müller

Plenary Lecture: Physiological Inorganic Polymer – Polyphosphate: the Key Driver of Bio-medical Regeneration Processes

ERC Advanced Grant Investigator

Institute for Physiological Chemistry

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Werner E.G. Müller is a professor at the University Medical Center of Mainz. The main focus of his research work is the enzyme-catalyzed formation of regeneratively active biomolecules, in particular inorganic (bio)materials. His current research interest is in the development of “smart” (nano)biomaterials for bone, cartilage and chronic wound healing. Recently, his group focuses on the mechanism of the antiviral action of polyphosphate, including its effect on SARS-CoV-2. The last ground groundbreaking finding was their discovery that polyphosphate is the key morphogenetic polymer, driving any regeneration process in the human body. Before this the group isolated for the first time the

Herpes simplex virus DNA polymerase together with Prof. D. Falke (University Medical Center of Mainz), and brought a first antiviral drug against this enzyme to the market. Furthermore, he and his group disclosed the key enzymes of bone formation and biosilica biomineralization. For his work in the field of inorganic biomaterials and their medical applications, he received the ERC Advanced Investigator Grant and three ERC-PoC Grants. His achievements in transferring scientific results for the benefit of society have been acknowledged with the highest social award in Germany (Federal Cross of Merit, First class).

Research fields:

- Molecular mechanism of biomineralization processes;
- Development of novel applications of the enzymes/proteins involved in biomineral formation in nanobiotechnology and nanomedicine;
- Regenerative Medicine: Development of novel strategies for bone and cartilage repair, wound healing, and 3D printing of tissue/scaffold materials/implants;
- Antiviral compounds (HIV-1 and other viruses), HIV-1 Tat-TAR interaction and interferon 2-5A system.

Project coordination Coordinator of numerous international (EU) and national projects, among them the German Center of Excellence “BIOTECmarin”, the EU FP7 projects “BlueGenics” and “Bio-Scaffolds” as well as the ERC Advanced Investigator grant project “BIOSILICA” and 3 ERC Proof-of-Concept projects “Si-Bone-PoC”, “MorphoVES-PoC” und “ArthroDUR”. Honors, awards Several awards, including Max-Bürger Award (1980), Institute Ruder Boškovic-Medal in Gold Zagreb (1986), Kani-Medal of the Foundation for Promotion of Cancer Res. Tokyo (1986), Res. Award from “International Human Frontier Science Program” (1996), Spiridon Brusina Medal from the Croatian Society of Geneticists (2005), Friendship Award, the P.R. China's highest award for foreign experts (2012). 2010 Honorary Professor of the Chinese Academy of Sciences; 2012 Guest professor at Tsinghua Univ. Beijing; 2013 President of IMBA (Intern. Marine Biotechnology Ass.); 2018 Doctor honoris causa (Dr. h.c.; University of Pula, Croatia). Member of Academies: Croatian Academy of Science and Arts (1996), Belarus Medical Academy (1998), Akademie gemeinnütziger Wissenschaften/Erfurt [Senat] (1990). Publications: >1200 peer reviewed publications [Hirsch index: 89 (ISI Web of Knowledge); 109 (Google)].



Prof. Gary Bowlin

Keynote Lecture: **Mechanical Characterization of Near Field Electrospun Wound Angles for Bioresorbable Vascular Grafts**

Professor & Herbert Herff Chair of Excellence

Director, Tissue Template Engineering and Regeneration Laboratory

Fellow, National Academy of Inventors and AIMBE

Department of Biomedical Engineering

The University of Memphis

Joint Univ. of Memphis-UTHSC-Memphis Biomedical Engineering Program

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Gary L. Bowlin is a Professor and Herbert Herff Chair of Excellence at The University of Memphis in the Department of Biomedical Engineering. Dr. Bowlin's collaborative and pioneering research focuses on the application of electrospun templates for tissue regenerative applications. Dr. Bowlin's laboratory has published extensively with over 155 peer-reviewed manuscripts. Google Scholar data shows his group's published works have been cited over 23,200 times (H-index of 66). Dr. Bowlin has been granted 17 U.S. Patents and over 250 foreign patents. These patents have helped to start five different companies and several commercially available and regulatory agencies cleared products.

The latest company, Sweetbio, Inc., is Memphis based and commercializing a honey-based wound healing dressing, APIS®. He is a Fellow in the National Academy of Inventors and American Institute for Medical and Biological Engineering. In addition, he is the Inaugural and current President of the International Society for Biomedical Polymers and Polymeric Biomaterials and Treasurer for the International Society for Applied Cardiovascular Biology.



CeCert.

CeCert is a dynamically developing certification and notified body offering its services in certification: management systems, medical devices, training, supplier audits. In 2019, we were entered on the list of authorized ERCA partners in the field of audit training, and from 2020 we have been accredited by the Polish Center for Accreditation for the QMS PN-EN ISO 9001: 2015-10 and MDMS PN-EN ISO 13485: 2016-04 programs. In October 2021, the Minister of Health authorized CeCert in the field of in-vitro diagnostic medical devices and appointed it as a notified body. On January 3, 2022, we were assigned the number of a notified body - 2934. We are currently trying to obtain notification in the scope of Regulation 2017/745 regarding medical devices.



DevGoMed was created utilizing cooperation of experienced specialists in the field of design, research and implementation into clinical practice of innovative biomaterials and advanced medical devices, including implants. A wide range of assistance in the medical technologies development, DevGoMed relies on experts' many years experience in:

- planning and supervising the medical technology development
- risk management of a medical device along its life cycle
- managing R&D projects
- preclinical and clinical evaluation of medical devices
- implementing a quality management system for the production of a medical device in accordance with ISO 13485
- preparation of technical documentation of products to obtain the CE mark
- post-market surveillance of medical devices



POLBIONICA is a biotech company established by the Foundation on Research and Development of Science to commercialise 3D bionic pancreas research and thinks boldly about the future.

The application of the bionic pancreas in clinical practice will revolutionise the treatment of diabetes and become one of the greatest medical successes of the 21st century. Concerning the growing number of patients with type I diabetes and the limitations of available treatments, functional 3D bioprinting is a viable option to overcome the problem of organ shortage and will also reduce the number of complications associated with surgery and the use of long-term immunosuppression after transplantation.

In late 2020, we completed the preclinical phase of 3D bionic pancreas research; we are developing very promising results and we are also preparing for the clinical phase. While working on the 3D bionic pancreas bioprinting project, we created proprietary products crucial for the 3D bioprinting development. These include customised bio inks, a bioreactor, and innovative bioprinting methods.



Foundation of Cardiac Surgery Development in Zabrze (FRK) was set up in 1991 in order to introduce the latest methods and techniques of rescuing human life into clinical practice, to support cardiac surgery and related fields, to support health protection and promotion activities. The Foundation's activity is in conformity with the Quality Management System as per ISO 9001:2015 in terms of research and implementation works, and training activity. The Medical Device Manufacturing Plant is a certified manufacturer of elements of heart prostheses. acc. to ISO 13485. The Heart Prosthesis Institute, as a sub-cell of the Foundation of Cardiac Surgery Development, is responsible for R&D work, especially for mechanical heart support and biocompatibility tests. The research area also includes planning and performing in-vitro and in-vivo biological biocompatibility tests of raw materials, biomaterials, and medical devices in the scope of the PN EN ISO 10993 standard.