

35th Umbrella Symposium

16-18 May 2022, RWTH Aachen

Enterprise Integration Center, Campus Boulevard 55, Aachen



Welcome to the 35th Umbrella Symposium:

**Life Science and Engineering: Data Analytics,
Neuroscience and Multiscale Biomedical Engineering**

Scientific Coordinators:

Ute Habel, Department of Psychiatry, Psychotherapy and Psychosomatic,
RWTH Aachen University

Twan Lammers, Institute for Experimental Molecular Imaging, RWTH Aachen University

Sonja Grün, Institute of Neuroscience and Medicine, Forschungszentrum Jülich

Noam Ziv, Nano Biotechnology & Nanomedicine, Technion - Israel Institute of Technology



Welcome

Confronted with the war that is momentarily shattering Europe, we refuse to be disheartened and hold on to our belief that science is a formidable vehicle to bring people together from different backgrounds, across borders and with the aim to foster solutions, advances and breakthroughs for a better world tomorrow. That is why we, at RWTH Aachen University, are all very happy to host this year's Umbrella Symposium on Life Science and Engineering and we welcome you wholeheartedly.

The Umbrella cooperation between RWTH Aachen University, Forschungszentrum Jülich and Technion - Israel Institute of Technology, established in 1983, reflects a strategic partnership aiming to foster excellent high-impact research and technology cooperations to a mutual benefit between strong partners. The annual symposium is a highlight within these ambitions.

The hope that this personal meeting will help overcome the dire experience of the Covid Pandemic, which made in-person symposia impossible, makes us all the happier to host you in Aachen this year. The second reason for us being excited about our symposium is its topic. Strengthening Life Science and Engineering has become a major focus of the excellence strategy of our university. Equally, the cooperation with the Forschungszentrum Jülich is a strong pillar of the excellence strategy reflected in the Jülich Aachen Research Alliance (JARA), which has taken RWTH Aachen's research profile to a new level.

The available computing power and the development of artificial intelligence methods have made remarkable progress in the recent years, and promote the hierarchical and predictive simulation of complex systems. Developments in engineering and technological advances have led to new diagnostic and therapeutic options. Our symposium is an excellent chance to bring researchers from these different fields together in Aachen, to exchange expertise, ideas and future questions with the aim of stimulating and initiating collaborations across borders. We believe in the potential of convergence of disciplines to address complex problems and we want to facilitate a platform for creativity, disruptive ideas and innovations.

Finally, we are delighted that we can be here together today, because the cooperation with excellent (international) partners is not only reflected in the subtitle of our excellence strategy "Knowledge, impact, networks", but also lies at the core of our internationalization strategy. As we tackle the global challenges of our century, we need strong networks and reliable high-profile partners.

May this symposium be the next milestone in our deep-rooted and long-standing cooperation. On behalf of the organizing team, I would like to wish all of you very inspiring professional and personal exchanges, and an uplifting experience despite the difficult times we are currently in as a global community.



Univ.-Prof. Dr. rer. nat. Dr. h. c. mult.
Ulrich Rüdiger
Rector
RWTH Aachen University



Univ.-Prof. Dr. rer. soc.
Ute Habel
Vice-Rector for International Affairs
RWTH Aachen University

Scientific Program

Monday, May 16, 2022 08:45 - 12:30		
Foyer	08:45-09:00	Welcome Coffee
Room 1	09:00-09:20	Opening / welcome address Ulrich Rüdiger , Rector, RWTH Aachen University Koby Rubinstein , Executive Vice President for Research, Technion - Israel Institute of Technology Frauke Melchior , Member of the Board of Directors, Forschungszentrum Jülich Welcome by the Organising Team
	09:20-09:40	Award Ceremony / Laudations Koby Rubinstein , Technion - Israel Institute of Technology Klaus Mathiak , RWTH Aachen University Rudolf Merkel , Forschungszentrum Jülich
	09:40-10:40	Awardee lectures Assaf Zinger , Technion - Israel Institute of Technology: „mRNA Encapsulating Biomimetic Nanoparticles for Treating Rare Pediatric Diseases“ Gabriela Figueroa Miranda , Forschungszentrum Jülich: „Multi-target electrochemical aptamer-based biosensors for accurate disease diagnosis“ David Mehler , RWTH Aachen University: „Brain-Computer-Interfaces for Depression: Towards Personalized Neurofeedback Treatment in Psychiatry“
Foyer/Atrium	10:40-11:10	Group Picture & Coffee break
Room 1	Session 1: Data analytics - Data driven approaches Chair: Klaus Mathiak	
	11:10-12:10	Sonja Grün , Forschungszentrum Jülich: „Precise spike patterns in cortical activity“ Marisa Nordt , RWTH Aachen University: „Longitudinal development of distributed responses in ventral temporal cortex in children is linked to behavior“ Dvir Aran , Technion - Israel Institute of Technology: „Research in the data-rich biomedical era to advance precision medicine“
	12:10-12:30	DISCUSSION

Scientific Program

Monday, May 16, 2022 11.30- 21:30		
Room 4	11:30-13:00	Heads of Delegation Meeting
Foyer	12:30-13:30	Lunch
Room 1	Session 2: Data analytics: Ex vivo medicine Chair: Fabian Kiessling	
	13:30-14:30	Peter Boor , RWTH Aachen University: „AI-driven digital transformation of pathology“ Amit Zeisel , Technion - Israel Institute of Technology: „Murine sex and strain dimorphism revealed by staining free brain-wide cell counting“ Timo Dickscheid , Forschungszentrum Jülich: „Analyzing cortical microstructure in high-throughput scans of human brain sections“
	14:30-14:50	DISCUSSION
Atrium	14:50-15:00	Coffee break
Atrium	15:00-16:00	Speed Dating: Funding & Best Practice Moderation: Twan Lammers , RWTH Aachen University Conversation. Exchange. Success.
Room 1	Session 3: Data analytics - In vivo neuroscience and medicine Chair: Dvir Aran, Technion - Israel Institute of Technology	
	16:00-17:00	Michael Denker , Forschungszentrum Jülich: „Designing rigorous multi-scale analysis and validation workflows for neural activity data“ Joachim Behar , Technion - Israel Institute of Technology: “Digital biomarkers and deep learning for physiological time series analysis” Wil van der Aalst , RWTH Aachen University: „Execution Management Powered By Process Mining“
	17:00-17:20	DISCUSSION
Foyer	17:30	Gathering and Transfer Hotel Aquis Grana, City of Aachen
Ratskeller Markt	19:00-21:30	Dinner for invited participants

Scientific Program

Tuesday, May 17, 2022 08:45 - 13:00		
Foyer	08:45-09:00	Welcome Coffee
Room 1	Session 4: Nano-engineering Chair: Twan Lammers, RWTH Aachen University	
	09:00-10:00	Roger Molto Pallares , RWTH Aachen University: „Engineering f-element chemistry at the nanoscale for bio-inspired applications“ Amit Meller , Technion - Israel Institute of Technology: „Solid-state nanopore devices for plasmonic-enhanced electro-optical sensing of biomolecules“ Regina Dittmann , Forschungszentrum Jülich: „Redox-based memristive devices for neuro-inspired computing“
	10:00-10:20	DISCUSSION
Foyer	10:20-10:40	Coffee break
Room 1	Session 5: Multiscale - Nanomedicine Chair: Amit Meller, Technion - Israel Institute of Technology	
	10:40-11:40	Assaf Zinger , Technion - Israel Institute of Technology: „From Drug Delivery To Cell Communication- Targeting Diseased Tissues The Cell Way“ Yang Shi , RWTH Aachen University: „Engineering multiscale polymer biomaterials for cancer treatment: nanomedicine and beyond“ Giulia Rossetti , Forschungszentrum Jülich: „Biophysics and data science approaches towards Central Nervous System translational medicine“
	11:40-12:00	DISCUSSION
Foyer	12:00-13:00	Lunch

Scientific Program

Tuesday, May 17, 2022 13:00 - 21:30		
Room 1	Session 6: Multiscale - Micro-engineering Chair: Paolo Carloni, Forschungszentrum Jülich	
	13:00-14:00	Rudolf Merkel , Forschungszentrum Jülich: „Response of cells to cyclic strain of physiological amplitudes“ Ramez Daniel , Technion - Israel Institute of Technology: „Synthetic computation in living cells for bio-sensing applications“ Rafael Kramann , RWTH Aachen University: „Single cell and spatial profiling of kidney and cardiovascular disease“
	14:00-14:20	DISCUSSION
Foyer	14:20-14:50	Coffee break
Room 1	Session 7: Multiscale - Bio-engineering Chair: Holger Jahr, RWTH Aachen University	
	14:50-15:50	Francesca Santoro , Forschungszentrum Jülich: „In vitro neurohybrid platforms“ Arielle Fischer , Technion - Israel Institute of Technology: „Lab on a Wearable: Analyzing Musculoskeletal Pathologies with Wearable Sensors“ Alicia Fernandez Colino , RWTH Aachen University: „Biohybrid implants for cardiovascular tissue engineering: the synthetic world meets the biological universe“
	15:50-16:10	DISCUSSION
Foyer	16:10	Gathering
Forckenbeckstraße 55	16:30-17:30	CBMS Tour (with registration) Guided by Fabian Kiessling and Laura De Laporte followed by Transfer Hotel Aquis Grana, City of Aachen
Pippin Hubertusstraße 43 Aachen	19:00-21:30	Dinner for invited participants

Scientific Program

Wednesday, May 18, 2022 08:45 - 13:00		
Foyer	08:45-09:00	Welcome Coffee
Room 1	Session 8: Neuroscience - Engineering and the brain Chair: Markus Diesmann, Forschungszentrum Jülich	
	09:00-10:00	Emre Neftci , Forschungszentrum Jülich: „Engineering Brain-Inspired Learning Algorithms and Hardware“ Shahar Kvatinsky , Technion - Israel Institute of Technology: „Memristive Neuromorphic Computing“ Thomas Frodl , RWTH Aachen University: „Convergence of Engineering and Psychiatry: Advancing Transfer“
	10:00-10:20	DISCUSSION
Foyer	10:20-10:40	Coffee break
Room 1	Session 9: Multiscale - Molecular and Cellular Imaging Chair: Mark Spehr, RWTH Aachen	
	10:40-11:40	Simon Musall , Forschungszentrum Jülich: „Cortexwide imaging of excitatory cell-types during perceptual decision-making“ Shai Berlin , Technion - Israel Institute of Technology: „A novel polycistronic method tailored for engineering split probes“ Angelika Lampert , RWTH Aachen University: „Personalized translational pain research“
	11:40-12:00	DISCUSSION
Room 1	12:00-12:20	Closing remarks Joachim Mayer , Rector's Delegate for Cooperation with the Technion - Israel Institute of Technology, RWTH Aachen University
Foyer	12:20-13:00	Lunch
Foyer	13:00	Gathering and Transfer to the airport and Hotel Aquis Grana, City of Aachen

Umbrella Awardees

Assaf Zinger

Dr. Assaf Zinger is an Assistant Professor in the Chemical Engineering department at Technion- Israel Institute of Technology, an Adjunct Assistant Professor in the Cardiovascular Sciences and Neurosurgery departments at Houston Methodist Academic Institute, TX, USA and a member of the Global Young Academy. Leveraging his interdisciplinary scientific skills, Assaf has already developed several nanotechnologies using multiple drug delivery systems and is now trying to translate these findings into clinically relevant therapies in the fields of rare pediatric diseases, cancer, and brain injuries.

Assaf's research strategy is to utilize specific cellular biomarkers into nanoparticles while retaining the versatility of these nanoparticles to load and release drugs with various chemical properties (e.g., hydrophilic, amphiphilic, and lipophilic) and deliver a wide range of therapeutic cargos such as mRNA and siRNA, proteins, and small molecules.

Dr. Zinger strongly believes that the quality of someone's research is not defined by their religion, their gender, or the color of their skin and that a strong lab needs a heterogeneous population of students that will lead to a fruitful thinking group.



Assaf Zinger

Wolfson Department of Chemical Engineering
Technion - Israel Institute of Technology, Haifa, Israel

Umbrella Awardees

Gabriela Figueroa Miranda

Dr. Gabriela Figueroa Miranda, originally from Mexico, studied biochemical engineering at the Tecnológico de Estudios Superiores de Ecatepec (TESE) in Mexico. She completed her first MSc. in biomedical research at the University of Santiago de Compostela (USC) in Spain and a second MSc. in biomedical engineering at FH Aachen University of Applied Sciences in Germany. Recently, she graduated from her doctoral engineering studies at RWTH Aachen University, performing her research doctoral thesis at Forschungszentrum Jülich.

She was awarded a DAAD-CONACYT scholarship to complete her doctoral studies and awarded magna cum laude for her doctoral thesis entitled "Development of electrochemical aptasensors for the highly sensitive, selective, and discriminatory detection of malaria biomarkers". She has five first author papers and six co-author publications in the field of biosensors published in different recognized journals such as Sensors and Actuators B, Biosensors & Bioelectronics, Nanoscale, ACS Sensors, Bioelectrochemistry, Analytical Biochemistry, and ChemElectroChem. Her research interest and expertise are focused on the fabrication of electrochemical biosensors, implementing aptamers as biorecognition molecules for detection of chronic and infectious diseases.



Gabriela Figueroa Miranda

Institute of Biological Information Processing, Bioelectronics (IBI-3)
Forschungszentrum Jülich

Umbrella Awardees

David Mehler

Dr. David Mehler recently joined Uniklinik RWTH Aachen as a Junior Principal Investigator fellow to start a research group on clinical applications of non-invasive neurotechnology. He has completed his medical doctorate research at University College London, received his PhD in clinical neuroimaging and fMRI neurofeedback training at Cardiff University and a degree in Medicine at University of Münster.

His research focuses on brain-computer-interfaces designed for non-invasive neurofeedback training which allow patients to learn regulating their own brain activity. Neurofeedback training has shown high therapeutic promise in alleviating symptoms in major neurological diseases (e.g., Parkinson's disease) and psychiatric disorders including depression. His own line of research combines experimental studies, meta-analytics and large-scale open science collaborations with international consortia. His work includes one of the first randomised clinical trials for fMRI neurofeedback training in depressed patients and the first systematic review of the field. His contributions to open science research practices have informed best practice recommendations for neurofeedback research and were featured in Nature, Nature Human Behaviour and the Scientific American.



David Mehler

Department Of Psychiatry, Psychotherapy And Psychosomatics
RWTH Aachen University

List of Participants

Technion- Israel Institute of Technology

Dvir Aran
Joachim Behar
Shai Berlin
Ramez Daniel
Arielle Fischer
Koby Rubinstein
Shahar Kvatinsky
Amit Meller
Amit Zeisel
Assaf Zinger

Forschungszentrum Jülich

Paolo Carloni
Michael Denker
Markus Diesmann
Timo Dickscheid
Regina Dittmann
Sonja Grün
Rudolf Merkel
Frauke Melchior
Gabriela Figueroa Miranda
Simon Musall
Emre Neftci
Giulia Rossetti
Francesca Santoro

RWTH Aachen University

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Laura De Laporte
Thomas Frodl
Ute Habel
Holger Jahr
Fabian Kiessling
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Twan Lammers
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Photo: Martin Braun

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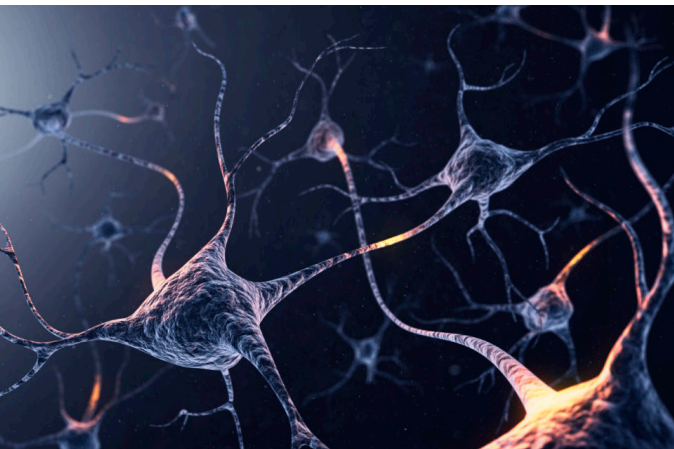
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Live stream of the 35th Umbrella Symposium via Zoom:

<https://zoom.us/j/91923147085?pwd=VDVheGxPV21CMIRIWW5ISWdYNIFTQT09>
Meeting-ID: 919 2314 7085 | Password: Umbrella35

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