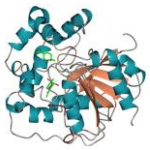

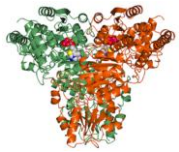

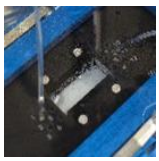

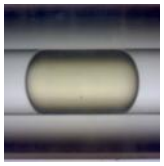

ESAB Webinar

Biocatalysis and Functional Genomics

June 27th 2025

05.00-07.00 Pacific Daylight Time (PDT)
06.00-08.00 Mountain Daylight Time (MDT)
07.00-09.00 Central Daylight Time (CDT)
08.00-10.00 Eastern Daylight Time (EDT)
09.00-11.00 Brasília Time (BRT)
13.00-15.00 British Summer Time (BST
14.00-16.00 Central European Summer Time (CEST)
15.00-17.00 Eastern European Summer Time (EEST)
17.30-19.30 India Standard Time (IST)
19.00-21.00 Indochina Time (ICT)
20.00-22.00 China Standard Time (CST)
21.00-23.00 Japan Standard Time (JST)

Chairs: Jennifer Littlechild (University of Exeter)
Roland Wohlgemuth (Lodz University of Technology)

PROGRAMME

14.00 CEST **Prof. Dr. Alexander Probst, Research Center One Health Ruhr of the Research Alliance Ruhr, University of Duisburg-Essen, Germany, & Joint Genome Institute, Lawrence Berkeley National Laboratory, USA**

Metagenomics coming of age: Of biosensors, environmental stressors, and ecophysiology

Environmental genomics has revolutionized our understanding of Earth's biosphere, particularly by studying microbes that cannot be cultivated under laboratory conditions. These microbes include bacteria, archaea, viruses but also small Eukarya that all contribute to the so-called microbiome of an ecosystem. In this talk I review the advent of genome-resolved metagenomics, its current perspective and challenges by displaying explicit examples of applications. I will take the audience on a journey encompassing river sediment microbiomes and their response to the Anthropocene, marine sediment analyses for hydrocarbon prospecting and environmental protection, and the deep subsurface, where microbes live tens to thousands of meters below our feet. I will also highlight new methods in metagenomics which include virusFISH, correlative microscopy, and long-read sequencing via Oxford Nanopore Technology. In sum, this talk will provide an overview of past and novel techniques in environmental genomics and showcase several applications thereof.

14.30 CEST **Prof. Dr. Verena Siewers, Division of Systems and Synthetic Biology, Department of Life Sciences, Chalmers University of Technology, SE-412 96, Gothenburg, Sweden, & Novo Nordisk Foundation Center for Biosustainability, Technical University of Denmark, DK-2800, Kgs. Lyngby, Denmark**

***In vivo* hypermutation systems for metabolic engineering**

Saccharomyces cerevisiae has been engineered to produce a plethora of industrially relevant compounds including biofuels, chemicals, nutraceuticals and pharmaceuticals. Introduced heterologous pathways can however suffer from low enzyme activity or specificity. In such cases, directed evolution is often employed to improve enzyme properties. Traditionally, this comprises iterative rounds of gene diversification *in vitro*, transformation, selection or screening and isolation of improved variants, which can be time consuming. In the past years, several methods that allow for targeted mutagenesis *in vivo* - and thus continuous directed evolution - have been developed. Here, two systems based on Cas9 variants will be presented: yEvolvR, where a Cas9 nickase directs an error-prone DNA polymerase to its designated target site, and the employment of nucleobase deaminases coupled to a deactivated Cas9. The latter was employed to improve performance of a heterologous transporter in *S. cerevisiae*.

15.00 CEST **Prof. Dr. Nils-Kåre Birkeland, Department of Biological Sciences, University of Bergen, Bergen, Norway**

Insights into thermophilic breakdown of feather keratin by *Fervidobacterium*

Keratin is a resilient structural protein found in hair, feathers, and wool, notable for its resistance to degradation due to extensive disulfide and hydrogen bonding. Feather keratin, a major byproduct of the poultry industry, presents significant challenges for disposal and recycling, as traditional methods yield low-value products and are often environmentally unsustainable.

Certain microbes, including thermophilic anaerobes from the *Fervidobacterium* genus, can degrade keratin under high-temperature conditions. In this study, we evaluated multiple *Fervidobacterium* strains for keratinolytic activity. Three efficient strains, *F. pennivorans* T, *Fervidobacterium pennivorans* GSH, and *Fervidobacterium islandicum* H-21 were selected for detailed multi-omics analysis. Comparative transcriptomic and proteomic profiling revealed significant upregulation of enzymes potentially involved in keratin degradation, including oxidoreductases, peptidases, and ABC transporters. Notably, metallopeptidases (families M3, M20, M42, M55) and serine peptidases (S8) were upregulated. Two S8 peptidases were overexpressed in *E. coli* and structurally characterized by X-ray crystallography or AlphaFold modelling. Both showed biochemical activity against β-keratin from feathers.

To enhance keratin degradation, additional enzymes targeting disulfide bonds and pyroglutamate residues were identified, cloned, and expressed. These enzymes, combined into cocktails with metagenomic thermostable proteases, significantly improved feather degradation, supporting a sustainable biotechnological approach. Breakdown products are now being analyzed by mass spectrometry for bioactive peptides with potential use in cosmetic and nutraceutical industries. Structural insights, including a solved pyroglutamyl carboxypeptidase-inhibitor complex and AlphaFold-modeled enzymes, further our understanding of the underlying biocatalytic mechanisms.

This work advances the development of microbial and enzymatic solutions for valorizing feather waste, contributing to circular bioeconomy goals.

Reference
Rubén Javier-López, Mélodie Kielbasa, Jean Armengaud, Nils-Kåre Birkeland, Transcriptomic and proteomic insights into feather keratin degradation by *Fervidobacterium*. Frontiers in Microbiology, 16 (2025). https://doi.org/10.3389/fmicb.2025.1509937.

15.30 CEST **Prof. Dr. Amy Fraley, Eléonore Moore, Fabian Willenborg**
Institute of Pharmaceutical Sciences, Department of Chemistry and Applied Biosciences, Eidgenössische Technische Hochschule (ETH) Zürich, CH-8093 Zürich, Switzerland

Marine symbionts as a source for chemical diversification

Marine microbial communities are a wellspring of complex biochemical transformations, with discovery fueled by the ever-expanding development of biotechnological methodologies. Meta-omic strateges - from genome-based studies to enzymology and molecular level investigations - have shed light on the involvement of microbial dark matter in the biosynthesis of therapeutic metabolites. Here, we will traverse the marine symbiont world, highlighting our efforts to shed light on new microbial chemistry, and its redesign for new-to-nature chemical diversification. Our focus will be on megasynthases, which act in an assembly line-like fashion to furnish complex anticancer molecules. While the native producers remain uncultivated, we have heterologously expressed components of the pathways and made strides towards the sustainable production of the final bioactive molecules. A key pathway currently under investigation in our lab is that for the anticancer tetrahydroisoquinoline (THIQ)-containing ET-743 which is a marketed drug used to treat soft tissue sarcoma. ET-743 is part of a diverse family of compounds characterized by a di-THIQ core, however it is the only member to be marketed as an approved drug. Due to low yields from the current production methods, we aim to develop a bio-based production system for ET-743 to increase yields and allow for facile access to therapeutically relevant analogs. In this regard, the biosynthetic development falls into three categories: i.) early-stage modification of precursors, ii.) THIQ core formation, and iii.) late-stage diversification. Across the THIQ family, the early-stage modification of the tyrosine precursor is consistent, and we have validated enzymatic reactions catalyzing both C- and O-methylation, as well as hydroxylation by a unique class of heme proteins. The formation of the THIQ core depends on a non-ribosomal peptide synthetase that catalyzes two iterative Pictet-Spengler reactions combining the modified tyrosine residues with cysteine and facilitating subsequent late-stage C-S bond formation. This reconfigured THIQ then undergoes a final Pictet-Spengler reaction to incorporate an additional modified tyrosine and build the characteristic tri-THIQ scaffold of ET-743. We envision that these newly characterized enzymes will pave the way toward a biotechnology platform for the sustainable production of the anticancer therapeutic ET-743 and its previously inaccessible analogs.

16.00 CEST N.N.

ABOUT THE SPEAKERS

Dr. Alexander Josef Probst is Full professor/Research Professor (W3) in Environmental Metagenomics since 2022 at the Research Center One Health Ruhr of the Research Alliance Ruhr, University of Duisburg-Essen (UDE) in Germany.

Education

2011-2014 Dr. rer. nat. (summa cum laude), University of Regensburg, DE
2004-2010 Study of Biology, Diploma in Biology (M.Sc. equivalent), University of Regensburg, with distinction (grade: A+)
2003-2004 Study of Chemistry, University of Regensburg

Work experience

since 2024 Affiliate Scientist, Joint Genome Institute, Lawrence Berkeley National Laboratory, USA
since 2022 Full Professor / Research Professor (W3) for Environmental Metagenomics, Research Center One Health Ruhr of the Research Alliance Ruhr, University of Duisburg-Essen (UDE), DE
2018-2022 Associate Professor (W2) for Aquatic Microbial Ecology, UDE, DE
2017-2018 Substitute Professor (W2) for Aquatic Microbial Ecology, UDE, DE
2014-2017 PostDoc with Prof. Dr. Jill Banfield, UC Berkeley, USA
2010-2014 Bioinformatics scientist at Second Genome Inc., USA
2010 Research Associate Graduate Fellow, Caltech, JPL, NASA, USA
2010 Research Associate Graduate Fellow, Lawrence Berkeley National Laboratory, USA
2009 Graduand, EADS Astrium Space Transportation, DE
2007 Independent Advisor (internship), Caltech, JPL, NASA, USA

Current positions and activities in academia

since 2024 Member of the scientific advisory board of the DOE Joint Genome Institute, USA
since 2024 Member of the scientific advisory board of the UFZ Leipzig (Helmholtz), Germany
since 2023 Speaker of the Water Graduate School, UDE
since 2022 Founding co-director of the research building Active Sites, UDE
since 2022 Member of the faculty council, Department of Chemistry, UDE
since 2021 Representative for Research Data Management, Department of Chemistry, UDE
since 2021 Member of the scientific advisory board of the German Society for General and Applied Microbiology (VAAM)
since 2021 Speaker/co-speaker (alternating) of the section Environmental Microbiology of the VAAM
since 2020 Laison Lecturer of the German National Academic Foundation
since 2020 Member/ substitute member of the Diversity Commission, UDE

Honors and awards

2024 Highly Cited Researcher, Clarivate, Web of Science
2024 CSP New investigator recipient by Joint Genome Institute
2023 Highly Cited Researcher, Clarivate, Web of Science
2023 ERC Synergy Award, European Research Council (11.5 Mio Euro)
2021 Teaching award by the Faculty of Chemistry, UDE
2020 Science Award by the VAAM (German Society for Microbiology)
2017 NRW Return award (1.25 Mio Euro)
2016 Hirzebruch PhD award (2nd best PhD thesis in the German Academic Scholarship Foundation across math, engineering and natural sciences)
2016 University award by the city of Regensburg
2015 PhD award by the VAAM (German Society for Microbiology)
2014 PhD award, University of Regensburg
2007-2014 Scholar of the German Academic Scholarship Foundation, basic studies and PhD studies

ABOUT THE SPEAKERS

Ad hoc reviewer
Funding agencies: DFG, German Science Foundation | European Research Council (ERC) | FWF, Der Wissenschaftsfonds, Austria | ANR, Agence Nationale de la Recherche, France | NSF, National Science Foundation, USA | NWO, Dutch Research Council, The Netherlands | and others
Journals: Nature | Science | Cell | Nature Microbiology | Science Advances | Nature Communications | The ISME Journal | Environmental Microbiology |mSphere | mBio | and others

Dr. Verena Siewers is a Research Professor at Chalmers University of Technology in Gothenburg, Sweden. She joined Chalmers after obtaining a PhD from the University of Münster (Germany) in 2004 and a postdoctoral period at the Technical University of Denmark. Her lab is interested in the development and exploitation of synthetic and systems biology tools to engineer yeast cells for a vast variety of applications. Such applications include cell factories for the sustainable production of food ingredients, agrochemicals, biofuels, pharmaceuticals, or nutraceuticals as well as synthetic cell consortia that can be used for novel food production or tissue engineering.

Dr. Nils-Kåre Birkeland graduated with an M. phil. degree in Microbiology from the University of Bergen (Norway) and received his Dr. philos. degree in microbial genetics from the University of Oslo (Norway) in 1992. From 1996 he has been a full Professor of Microbiology at the University of Bergen. His main research areas during the last 25 years have been extremophiles and microbial biotechnology. He has isolated and described a number of novel taxa of extremophiles and analyzed the molecular mechanisms for high-temperature adaptations, methane oxidation and microbial diversity in extreme environments. He has coordinated many international research projects and higher education networks with a focus on extremophiles and their biotechnological potential.

ABOUT THE SPEAKERS

Amy Fraley received her BSc in Chemistry at Millersville University of Pennsylvania in 2014. She then earned her PhD in Medicinal Chemistry in 2019 from the University of Michigan College of Pharmacy working in the laboratories of Prof. David Sherman and Prof. Janet Smith where she studied fungal indole alkaloid biosynthesis and enzymology. She then moved to the ETH Zürich Institute of Microbiology for postdoctoral studies in the laboratory of Prof. Jörn Piel, with a focus on the biosynthesis of anticancer polyketides by marine symbiotic bacteria. In January 2024, she became the Assistant Professor of Medicinal Chemistry in the Institute of Pharmaceutical Sciences and the Department of Chemistry and Applied Biosciences at ETH Zürich. Inspired by the molecular complexity found in nature, her research group is developing and applying new bio-based methods for sustainable chemistry.

NEXT ESAB WEBINARS

ESAB aims to promote the development of Applied Biocatalysis and takes initiatives in areas of growing scientific & industrial interest in the field. If you missed a previous ESAB Webinar and if you would like to know more about it, you can still attend it, as ESAB Webinars from 2021 till now are available on the ESAB Digital Science and Technology Platform on the subscription basis.
Schedule and topics of the next ESAB Webinars:

25th July 2025 10.00-12.00 CEST	Joint ESAB-SKB Webinar on Biocatalysis and Molecular Medicine, organized by Roland Wohlgemuth, Jennifer Littlechild and Thomas Sauter
29th August 2025 14.00-16.00 CEST	Joint STRENDA-ESAB Webinar organized by Peter Halling, Carsten Kettner, Roland Wohlgemuth and Working Group Standardization
26th September 2025 10.00-12.00 CEST	Biotransformations in Glycobiology, organized by Vladimir Kren and Pavla Bojarova

- **17th International Symposium on Biocatalysis & Biotransformations, BIOTRANS 2025, Basel, 29th June – 3rd July 2025, Switzerland**
  https://www.biotrans2025.com/

ESAB General Assembly, 2nd July 2025, 15.30-16.30 h CEST, on-site at BIOTRANS 2025, Basel, Switzerland, and online

ESAB membership is open worldwide to scientists interested in biocatalysis and its applications.
Personal membership is free. You are cordially invited to join ESAB by completing the membership application form online *via*
https://esabweb.org/appl.html
Institutional membership is very much welcome and has been established as a new membership category. Academic, governmental, research and other public Institutions as well as private companies based inside or outside Europe and whose activities are related to the field of applied biocatalysis, are welcome to apply for Institutional Membership. You are cordially invited to join ESAB by completing the membership application online *via*
https://esabweb.org/Membership/Application+form+for+institutional+membership.html
ESAB has been founded in 1980 and has the mission of promoting the development of Applied Biocatalysis throughout Europe. The aims of ESAB are to promote initiatives in areas of growing scientific and industrial interest of importance within the field of Applied Biocatalysis.

- **14th International Conference on Protein Stabilization, ProtStab, 21st-24th September 2025, Timisoara, Romania**
  https://protstab2025.upt.ro/

Abstract submission deadline for oral presentations: 30th June 2025
Abstract submission deadline for poster presentations: 20th July 2025

Innovative approaches to enhance protein stability: from bioinformatics and molecular modeling to industrial applications, medical therapies, and biotechnological solutions

3RD ESAB DIGITAL CONFERENCE 24TH-26TH NOVEMBER 2025

In its 3rd year is the ESAB Congress 2025 – the digital alternative to the traditional in-person congress for presenting your scientific results and technical developments efficiently and interactively! ESAB is a pioneer in digital knowledge sharing and our innovative technical platform offers Lectures via the ZOOM system for interactive participation, efficient communication with authors through chat or video conferencing, digital poster stands with the ability to integrate media content such as videos or podcasts.

The previous second edition of the ESAB Digital Congress on Applied Catalysis took place on 25th-27th November 2024 and has been a great and inspiring global meeting place and a sustainable way for discussing recent research advances and new directions within the global scientific community. This unique event featured an exceptional program of cutting-edge science, world-class plenary talks, and interactive sessions that made it a must-attend for anyone working in biocatalysis, enzyme engineering, and related fields. All talks have been recorded and can be seen by the participants on the ESAB Digital Science and Technology Platform. The Scientific Committee thanks again very much all Plenary Speakers, Keynote Speakers, Invited Speakers, Poster Presenters and all Participants of the exciting 2nd edition of the E-Congress! ESAB is very happy to continue this Global Forum for Shaping our Common Future and it is our great pleasure to invite you to the 3rd ESAB Digital Congress on 24th-26th November 2025.

We look forward to welcoming you on 24th-26th November 2025 to an exciting 3rd ESAB Digital Congress, which is the ideal sustainable way for connecting the biocatalysis community worldwide and to discuss advances with a global audience. The Scientific Committee and the Organization Committee welcome you to an exciting 2025 E-Congress and we are looking forward to receive your abstract for a lecture or a poster presentation until 30th June 2025.ESAB Members benefit from a reduced price for the congress ticket (see below).

Congress Ticket	**Category**	**Price (€)**
Regular	ESAB Member	250,- (plus 19% VAT)
Regular	Non-member	350,- (plus 19% VAT)
Student	ESAB Member	150,- (plus 19% VAT)
Student	Non-member	250,- (plus 19% VAT)

All tickets include 3-day-entrance to all lectures in all rooms of the Virtual Congress Palace. Furthermore, they include an access to all recordings of the ESAB Congress 2025 at the ESAB Digital Platform

https://esabweb.org/2025_congress.html