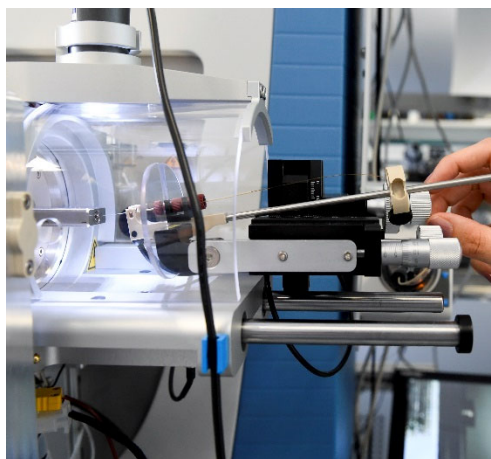


# CeBiTec – Quarterly

## Autumn 2024



- ▶ Dr Sebastian Gergel received biocatalysis award from the German Chemical Society
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### Dr Sebastian Gergel received biocatalysis award from the German Chemical Society



Photo: © S. Gergel

The German Chemical Society (GDCh) awarded Dr Sebastian Gergel the [GDCh Prize for biocatalysis](#). The award ceremony took place on September 12th as part of the

annual meeting of the GDCh Sustainable Chemistry Division in Mülheim an der Ruhr.

Dr Sebastian Gergel completed his doctorate in the working group of J.-Prof Dr Stephan Hammer and graduated with summa cum laude.

In his doctorate, Sebastian Gergel combined mechanistic understanding of organic reactions with methods of protein engineering, as well as application in organic synthesis.

He used directed evolution to develop enzymes for biocatalytic Wacker oxidation. Sebastian Gergel showed that chemoselectivity in a chemical reaction can be generated by controlling the dynamics of reactive intermediates. After successfully designing such enzymes, he was able to use them in regioselective or regio- and enantioselective Wacker oxidation.

The GDCh awards the prize every two years to an outstanding dissertation in the field of biocatalysis.

(S. Hammer)

## Climate-friendly baking wheat: New research project at CeBiTec on sustainability

The joint project MAGIC-KlimaBack, which began in September this year, aims to develop wheat varieties with high baking quality and reduced nitrogen requirements. Wheat with good nitrogen use efficiency requires less energy-intensive fertiliser and thus also reduces the release of NO<sub>x</sub> emissions, which are particularly harmful to climate. Five partners are combining their expertise in breeding, analytics and modelling: CeBiTec at Bielefeld University, the Max Rubner Institute, the Julius Kühn Institute, Martin Luther University Halle-Wittenberg and KWS Saat SE.

The Federal Minister of Agriculture, Cem Özdemir, presented the funding certificates to the project partners in September. 'We need creative solutions in the fight against the climate crisis, which is already making cultivation and harvesting more difficult. One contribution to climate protection is to reduce the use of nitrogen fertilisers when growing baking wheat, but of course, the good baking quality must not suffer,' said the minister.



Federal Minister of Agriculture Cem Özdemir presented the funding certificates for the MAGIC-KlimaBack project to Prof Dr Romy Schmidt-Schippers (centre) and Prof Dr Karsten Niehaus (right) from CeBiTec at Bielefeld University. Photo: © BMEL

Protein-efficient varieties are those that exhibit good baking quality despite having a relatively low protein content. Until now, high baking quality in wheat has been associated primarily with a high protein content in grains. However, in the preliminary work, individual varieties were identified that offer high baking quality despite having a relatively low protein content. These so-called 'correlation breakers' are now the focus of research.

The wheat genome is very complex, comprising around 17 billion base pairs and more than 100,000 genes. In order to work well with the genotype chosen for this project, the work at CeBiTec begins with a cDNA sequencing from developing wheat grains. This part of the project is supported by the NGS unit of the Core Facility 'Omics' (under construction) headed by Tobias Busche. The Oxford Nanopore Technology sequencing technique allows particularly long transcripts to be sequenced 'in one piece' in order to distinguish the isoforms of wheat storage proteins. Among these proteins, those that determine baking quality should be found. The pattern of these proteins is determined using the proteome analysis established at CeBiTec by nano-LC-ESI-Orbitrap mass spectrometry. As an alternative to protein-based biomarkers for baking quality, the metabolome of the flour is also investigated. Gas chromatography coupled with sensitive mass spectrometry, established by Marcus Persicke (Head of the proteome/ metabolome unit) as part of the 'Omics' core facility, is used for this purpose. The aim of this work is to generate molecular markers for breeding. These will then be used by the industrial partner to develop new, sustainable wheat varieties.

The University of Bielefeld, together with the Max Rubner Institute, is responsible for analysing the proteins and metabolites in wheat flour. The Martin Luther University Halle-Wittenberg is providing a novel winter wheat population and evaluating the collected data using AI programmes. The company KWS Saat, headquartered in Einbeck, is conducting large-scale field trials for the project and producing seeds under conventional and organic conditions in the same environment. The Julius Kühn Institute in Quedlinburg is evaluating the greenhouse gas reduction potential of new protein-efficient wheat varieties using agroecosystem models. The composition of the team ensures translational research: ‘From bench to fields’.



Bundesministerium für Ernährung und Landwirtschaft

The MAGIC-KlimaBack project started on 1 September 2024 and will run

until December 2027. The project is funded by the Federal Ministry of Food and Agriculture with 1,127,913 euros as part of the research and innovation programme „Climate Protection in Agriculture” („Klimaschutz in der Landwirtschaft“).



In the MAGIC-KlimaBack project, a winter wheat population (left) is amongst others used to identify protein-based biomarkers and metabolites (centre) that enable high baking quality with low fertiliser use (right). Responsible for these omics analyses is the CeBiTec. © R. Schmidt-Schippers

(R. Schmidt-Schippers)

## GCB 2024 in Bielefeld: Celebrating Bioinformatics Research and Services

This year’s German Conference on Bioinformatics (GCB) was hosted at Bielefeld University from September 30 to October 2. It was co-organized by Dechema e.V. and local bioinformatics groups. The program committee chairs were Prof Dr Robert Heyer and Prof Dr Alexander Schönhuth, while the organizing committee was led by Prof Dr Alexander Sczyrba and Prof Dr Jens Stoye.



Photo: © R. Wittler

We were pleased to see strong interest from participants, with more than 280 registrations and 173 abstract submissions. The seven workshops, offered by both internal and external contributors, were also well received, attracting 150 participants in total.

We were fortunate to have several renowned keynote speakers, including Bas Dutilh (Jena University), Caroline Friedel (LMU Munich), Tim Hubbard (ELIXIR Cambridgeshire), Johannes Köster (University of Duisburg-Essen), Luca Pinello (Harvard Medical School), and Lara Urban (Technical University of Munich). The contributed talks covered a diverse range of topics, such as deep learning, omics, modeling, medicine, microbiome research, and algorithm development.

The number of poster submissions exceeded our expectations, with more than 150 posters displayed throughout the conference, sparking lively discussions during breaks. The poster prize, chosen through an online vote, was awarded to Alexander Dietrich (TU Munich) and co-authors for their contribution, "Benchmarking second-generation methods for cell-type deconvolution of transcriptomic data."

A highlight of the "Fachgruppe Bioinformatik" session was the award of the PhD prize to Mhaned Oubounyt who presented his PhD project "Computational methods for single-cell network biology analysis."

We thank Dechema e.V., the German Network for Bioinformatics (de.NBI), the Bielefeld Institute for Bioinformatics-Infrastructure (BIBI), the Center for Biotechnology (CeBiTec), the Deutsche Forschungsgemeinschaft (DFG), the Fachgruppe Bioinformatik (FaBi), Gesellschaft für Biochemie und Molekularbiologie (GBM) e.V., and Forschungszentrum Jülich GmbH for their financial support. Special thanks go to our dedicated colleagues, whose efforts made GCB 2024 memorable not only for its atmospheric conference dinner but also for an overall successful event.

GCB will be hosted next year in Düsseldorf (September 22-24, 2025) and probably return to Bielefeld in 2034.

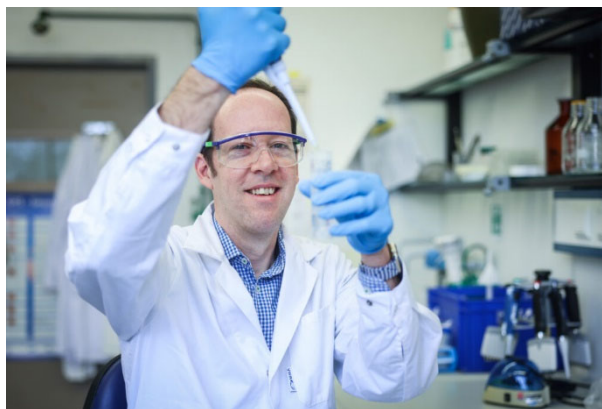
Conference website: <https://gcb2024.de>

(R. Wittler)

## **Hoffman group publishes study on the genetic impact of hunting in northern elephant seals in 'Nature Ecology and Evolution'**

A new international study has revealed the genetic impact of hunting in northern elephant seals. It shows that this species narrowly escaped extinction by hunting, resulting in lasting genetic effects in the present population. Fifteen German, British and US researchers from seven universities and four research institutions collaborated for this study led by Bielefeld University.

At the start of the 20th century, northern elephant seals were on the brink of being wiped out by hunting. 'Genetic analyses suggest that the population was likely reduced to fewer than 25 animals at that time,' explains new CeBiTec member Professor Dr Joseph Hoffman, lead author of the study and head of the Evolutionary Population Genetics group at Bielefeld University.



Professor Dr Joseph Hoffman from Bielefeld University led the international study on the genetic history of northern elephant seals. © Bielefeld University/Sarah Jonek

Such drastic population declines can squeeze out a species' genetic diversity, increasing the risk of inbreeding and threatening its survival. The population of northern elephant seals has since recovered to around 225,000 individuals. The



study examines how this near-extinction event impacted the species' genetic diversity and health.



The northern elephant seals have recovered over decades from extreme hunting, but still carry genetic traces of it. © Universität Bielefeld/Martin Stoffel

For their analyses, the researchers combined genetic data, health records, modelling of population sizes and genetic simulations. Their findings suggest that the severe population decline led to the loss of many beneficial and harmful genes from the northern elephant seal's gene pool. This pattern was not observed in the closely related southern elephant seal, which did not experience such a drastic decline.

'The highly reduced genetic diversity, including the loss of beneficial gene copies, may impair the ability of northern elephant seals to cope with future environmental changes, including those caused by anthropogenic climate change, changes to the species' habitat, or even natural threats such as disease outbreaks,' warns Professor Dr Kanchon K. Dasmahapatra from the Uni-

versity of York, UK, who is the senior author of the study.

All individuals of a species carry some harmful mutations, though their effects are usually hidden. However, inbred individuals may face health issues as these mutations become exposed. 'We looked at several key health traits in these seals, including body weight, blubber thickness and disease susceptibility. To our surprise, we found no signs of health problems related to inbreeding,' Joseph Hoffman says. 'We believe the severe population decline may have eliminated many harmful mutations. 'Our study illustrates how a species' unique population history shapes its genetic diversity,' says Dasmahapatra. The findings offer important insights for species conservation and ecosystem management. Hoffman adds: 'Our research underscores the importance of understanding a species' history when planning conservation strategies. Each species responds differently to threats, so individualized approaches are essential.'

(Bielefeld University [news blog article](#) with slight modifications)

### **10<sup>th</sup> CeBiTec Retreat held at Haus Düsse**

The 10th CeBiTec Retreat took place from September 26 to 27, 2024 at Haus Düsse, the seat of the Landwirtschaftskammer NRW (Chamber of Agriculture of North Rhine-Westphalia), in Bad Sassendorf. Forty-four participants attended to the two-day meeting with 24 excellent scientific talks covering a wide array of topics from both research fields of the CeBiTec. Talks were presented by 13 distinct CeBiTec research groups, providing a broad and exhaustive overview of the

research activities currently ongoing in the CeBiTec.



Participants of the 10<sup>th</sup> CeBiTec Retreat in front of the main entrance of *Haus Düsse*. © P. Peters-Wendisch

Especially for PhD students, the CeBiTec Retreat represents an excellent surrounding to present their thesis results in front of an expert audience, sparking fruitful discussions with CeBiTec PIs and colleagues at the Thursday night get-together with cold drinks and salty snacks.

As one of the highlights, the Technical Faculty member Prof Dr Daniel Merkle gave an intriguing introduction into his research on algorithmic cheminformatics. Next year's retreat is already scheduled and will be held from August 28 to 29, 2025 at *Haus Düsse*.

(L. Wobbe)

## 11<sup>th</sup> CeBiTec Student Academy during the summer holidays

During the last week of summer holidays, 15 senior class students dealt with biomedical issues at the 11<sup>th</sup> CeBiTec Student Academy.

The Osthusenrich Foundation sponsors the event to support young people who are particularly interested in science. The 16 to 20-year-old students stated in their application letters that they would like to use the academy to refine their

career plans. Many are planning to study biology, biotechnology, biomedicine or medicine. It is an important goal of the CeBiTec student academies to support young people in taking the right career decisions.



Prof Dr Jörn Kalinowski, Claudia Holle from the Osthusenrich-Stiftung, Prof Dr Norbert Grotjohann, Rubina Rothenstein, and Nieke Sütfelt at the opening of the 11<sup>th</sup> CeBiTec Student Academy. Photo: © teutolab biotechnologie

In the programme hosted by Prof Dr Alfred Pühler, Prof Dr Jörn Kalinowski and Prof Dr Norbert Grotjohann, the participants learned about microbiological techniques required for the detection of bacteria. They gained insights into histological tumour diagnostics, the method of nanopore sequencing and the subsequent bioinformatic analysis of sequencing data. Furthermore, they carried out phylogenetic analyses on the origin of SARS-CoV-2 and its evolution. The experiments were supervised by staff from the teutolab biotechnology (Head Prof Dr Norbert Grotjohann) and the Proteome and Metabolome Research Group (Head Prof Dr Karsten Niehaus), and the Microbial Genomics Working Group (Head Prof Dr Jörn Kalinowski).

Lectures on medical genomics (Prof Dr Jörn Kalinowski), industrial biotechnology (Dr Florian Meyer), microscopic histopathology (Prof Dr Karsten Niehaus), algae biotechnology (Dr Jan Mussnug) and the production of pharmaceu-

ticals (Dr Heino Büntemeyer) provided further input on biotechnology and biomedicine. Dr Robert Kulis-Horn, Team Leader of the Krone Laboratory Study Centre Bad Salzungen, gave insights into laboratory medicine. Study programmes in the fields of biology, biotechnology and medicine were also presented (Dr Johann Kufs, Dr Martin Sagasser, Dr Hanna Bednarz).

In conclusion, the event was very well received by the students, who stated, that they enjoyed the programme, including the socialising events in the evening and the overnight stay at the youth hostel in Bielefeld. Based on past experiences, it is quite likely that we will meet some of them again as university students in the CeBiTec.

(K. Röhlke)

#### Impressum

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