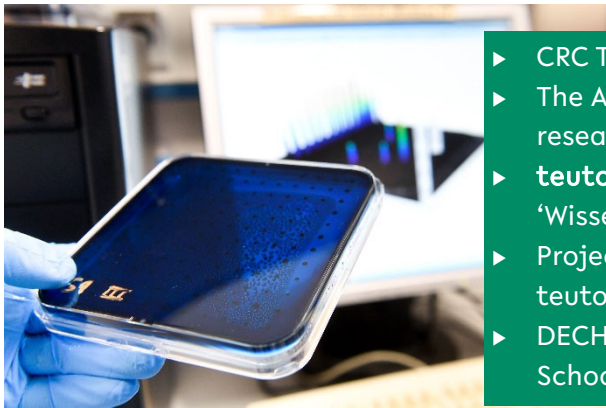


# CeBiTec – Quarterly

## Summer 2024



- ▶ CRC TRR175 enters the 3<sup>rd</sup> phase
- ▶ The Alexander von Humboldt Foundation funds the research stay of a Brazilian scientist at CeBiTec
- ▶ **teutolab** biotechnologie gets involved in the ‘Wissenswerkstadt’ in the centre of Bielefeld
- ▶ Project weeks for students in years seven to ten in the teutolab biotechnologie
- ▶ DECHEMA Zukunftsforum Biotechnologie Summer School 2024

### CRC TRR175 enters the 3rd phase



The [CRC TRR175](#) studies acclimation processes in plants. Acclimation is a complex process, requiring cellular reorchestration of metabolic and genetic activities after the onset of the [external stimulus](#). The plastid is considered a “hub of acclimation” serving as both a key sensor of and target for plant genetic, proteomic and metabolic adjustments. The CRC/Transregio links scientists in multiple locations who together bring a remarkable range of expertise in the genetics, molecular biology and biochemistry of chloroplasts, and their interactions with other cell compartments, to bear on the issue. Prof. Dr. Andrea Bräutigam joins the CRC TRR175 in area D (Data Mining and Modelling) with a project on decoding the input syntax of photosynthetic gene expression. Transcription factors act via

their binding motifs in proximal and distal promoter elements but their syntax is not known for photosynthesis nor for any pathway besides flowering at present. New sets of tools, i.e. machine learning-based gene regulatory network predictions or DNA affinity purity sequencing and new sets of FAIR data such as pangenomes, species genomes of decent quality and ever more RNA-Seq data sets enable new approaches to the old problem. An initial analysis not only suggest a large suite of transcription factors converging on a pathway but also single motifs like the G-box which act as integrators of activators and repressors for the regulation of gene expression.

Within this project, the Computational Biology group exploits new tools and public datasets to provide an inventory of transcription factors, their motifs, their affinity to their motifs, and the

positions of binding for photosynthetic gene expression during acclimation. Predictive models for promoter architecture are generated via machine learning and rational design, and tested in vivo.

(A. Bräutigam)

### **The Alexander von Humboldt Foundation is funding the stay of a Brazilian scientist at CeBiTec through a grant from the CAPES-Humboldt Research Program for Experienced Researchers.**

CeBiTec has long been engaged in the analysis of microbial communities from biogas plants. For such analyses, community DNA is deeply sequenced and the data sets obtained are analyzed bioinformatically. Using a so-called "binning" procedure, it is possible to characterize dominant microbial species using metagenomically assembled genomes (MAGs). CeBiTec's reputation is based on the close link between nucleic acid sequencing and corresponding bioinformatics solutions for sequence data. It is therefore not surprising that CeBiTec repeatedly receives requests for visiting scientists from abroad.



© F. Motteran

Such a request came from Prof. Dr. Fabrício Motteran from the Centro de Tecnologia e Geociências, Universidade Federal de Pernambuco (Recife, Brazil).

F. Motteran plans to analyse the microbial communities

of five Brazilian biogas fermentation approaches. He plans to sequence and analyze DNA samples from these five fermentation approaches at

CeBiTec. The project is entitled **"Taxonomic and functional gene analysis using bioinformatics tools in different microbial consortia from biorefinery processes in the production of biogas and value-added products"**. This project is of particular interest for the CeBiTec because the fermentation approaches utilize sugar cane residues, which have not been used in Germany to date. At the CeBiTec, A. Pühler and A. Schlüter from the "Genome Research of Industrial Microorganisms" working group and A. Sczyrba from the "Computational Metagenomics" group will be responsible for supporting the Brazilian guest.

Funding for the Brazilian guest's stay will be provided by the CAPES-Humboldt research program for experienced researchers. F. Motteran applied AvH foundation, supported by a letter from the CeBiTec supervisors. Following an international review process, the project was selected for funding. The approval can be considered as an honor for both the visiting scientist and the CeBiTec. F. Motteran will begin his research stay November 1<sup>st</sup> of this year. At the beginning of his stay, he will take part in a German language course organized by the AvH Foundation.

Before F. Motteran can start his experiments at the CeBiTec, an important hurdle has to be taken. Brazil has to state in an official document that the sequencing of DNA samples of five microbial communities of Brazilian fermentations can be carried out in Germany. Such a document is necessary according to the Nagoya Agreement. A common goal of the research project is of course the publication of the results obtained. As dealing with Nagoya issues is still new territory, it is not yet possible to make any statements about the timing and success of the approval process.

(A. Pühler)

## teutolab biotechnologie gets involved in the 'Wissenswerkstadt' in the centre of Bielefeld

For some time, a new project has been developed in the centre of Bielefeld: The so-called '[Wissenswerkstadt](#)' (studio for knowledge) is planned as an interface between science, business, culture, urban society and tourism. The building of the previous library of Bielefeld City has been extensively remodelled for the new concept of use.

Bielefeld University will be permanently present with hands-on booths of the **teutolabs**. The **teutolab** biotechnologie developed a simulated experiment to answer the research question, which effects different colours of light have on the growth of microalgae. The visitors can choose between darkness and red, blue or green light shining on microalgae in an Erlenmeyer flask. The rate of photosynthesis can be measured by the emerging oxygen, in this case simulated as more or less bubbles. The visitors will learn that plants and algae reflect green light and cannot be used for photosynthesis. Red and blue light are absorbed by the photopigments and the light energy is converted in chemical energy. The exhibit makes microalgae a subject of discussion, as they are broadly used in biotechnology. Visitors are invited to visit the CeBiTec and learn more about the course 'Photosynthesis in biotechnology' in the **teutolab** biotechnologie (see [CeBiTec-Newsletter 2024-I](#)).

In June, there was a get-together of all institutions that offer exhibits in the 'Wissenswerkstadt' to present their concepts. The 'Hochschule Bielefeld' (college of Bielefeld, Department of Engineering and Mathematics and Department of Design), and the 'Welthaus' (house of the World)

are involved as well. For more information, click [here](#) or refer to the [newspaper report](#).



The future exhibitions in the Wissenswerkstadt were presented by (from left) Gesa Fischer (Wissenswerkstadt), Marc-Oliver Schierenberg (HSBI), Roman Bezjak (HSBI), Tim Schubert (Bielefeld University), Kerstin Röllke (Bielefeld University), Beate Wolff and Lara Esther Bartels from Welthaus and Giovanni Fusarelli (Wissenswerkstadt). ©Wissenswerkstadt/Sarah Jonek

From September 6<sup>th</sup>, the 'Wissenswerkstadt' will be open to the public. The **teutolab** biotechnologie will participate in the opening weekend (September 6<sup>th</sup> to 8<sup>th</sup>) by offering a short hands-on experiment for the visitors.

(K. Röllke)

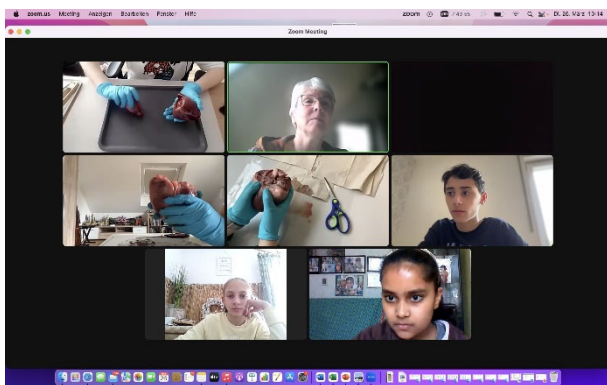
## Project weeks for students in years seven to ten in the teutolab biotechnologie

Just like last year, **teutolab** biotechnologie offered project weeks for students in years seven to ten in 2024. The course 'Medical research trip through the human body' was held during the Easter holidays from March 25<sup>th</sup> to 28<sup>th</sup> in an e-course and during the summer holidays from July 8<sup>th</sup> to 12<sup>th</sup> in the students' lab in the CeBiTec.

**zdi** Zukunft durch Innovation  
Nordrhein-Westfalen Both courses were financially supported by zdi ('future through innovation'), a joint offensive from the Federal Employment Agency and the

Ministry of Culture and Science in North Rhine-Westphalia.

The programme's goal is to support the next generation in the field of STEM (Science, Technology, Engineering and Mathematics). Students are given the chance to pursue their enthusiasm for MINT and to find out about MINT training and study programs. Following up on these goals, the **teutolab** biotechnologie developed a biomedical excursion week.



Easter holidays: Students dissecting a heart at home. ©**teutolab** biotechnologie

The adolescents learned about the theoretical background and experiments relating to nutrition and digestion as well as bacteria and viruses. Based on this, they dealt with the immune system, blood cells, blood circulation and the functionality of the heart. Further on, they experienced how diseased tissue can be diagnosed using microscopic examinations, learned about the DNA structure and extracted DNA from tissue by themselves.

During the whole week, the students got an insight into a biotechnological university laboratory - experimenting in the **teutolab** biotechnologie themselves or observing the lab work during a video conference and doing similar experiments at home. In conclusion, the students learned about research in the natural sciences

and were given an insight into the work of biologists, biotechnical assistants and biomedical scientists.



Summer holidays: Students dissecting a heart in the in the **teutolab** biotechnologie. ©**teutolab** biotechnologie

In the e-course promoted by the zdi center from the district Cologne, 20 students took part. The participants were from Cologne, Bonn, Duisburg and surrounding cities. The online format offered the chance to participate in the program in spite of living quite far away. For the face-to-face-course, 21 students living in Herford, Bielefeld, Werther, Steinhagen, Delbrück, and Bad Salzufflen travelled to the CeBiTec. The week was funded by the zdi centre from the district Herford. All students showed high interest and enthusiasm in operating the tools not known from school settings as well as critically embedding scientific facts in a context. We are looking forward to welcoming many students again in a few years at the CeBiTec students' academy and later on as students in the field of biology at Bielefeld University.

All students showed great interest and enthusiasm. We are sure to meet many students again in a few years at the CeBiTec students' academy and later on as students in the field of biology at Bielefeld University.

(K. Röllke)

## DECHEMA Zukunftsforum Biotechnologie Summer School 2024

In July 2024, a summer school webinar series was hosted by the DECHEMA **Zukunftsforum Biotechnologie** on current research topics in the field of biotechnology. The main goal of this forum is to identify current cross-cutting issues, identify new research trends and outline possible solutions. Eleven research groups across Germany presented their work on sustainability, biocatalysis and bioprocess development. The research group “Genome Engineering and Editing” of Johann Kufs (Bielefeld University) participated and demonstrated how the social amoeba *Dictyostelium discoideum* can be engineered to produce pharmaceutical substances and harnessed for the discovery of novel natural products.

Especially, the genetic manipulation of amoebae and the scale-up of amoeba-based processes are crucial for the discovery of still elusive compounds.

A digital lab tour gave participants insights into laboratory life and the general techniques applied for fermentation and downstream processing.



Arno Krieger (Genome Engineering and Editing) taking a sample from a bioreactor containing an amoeba culture.

© Team Medienpraxis Uni Bielefeld

(J. Kufs)

### Impressum

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