

CeBiTec – Quarterly

Summer 2023



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Karl-Josef Dietz elected as member of Leopoldina



Prof. Dr.
Karl-Josef
Dietz
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The National Academy of Science Leopoldina has elected Prof. Dr. Karl-Josef Dietz as its new member in April 2023. According to the statutes of the Leopoldina the election honours scientific excellence. The Leopoldina is dedicated to foster and expand national and international cooperation in science along the tradition „For the benefit of mankind and nature“. The Leopoldina is the oldest science academy of the world that was active without interruption and was founded 360 years ago.

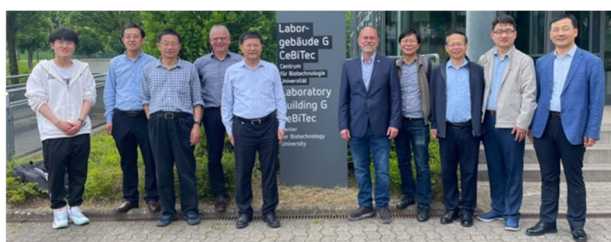
Karl-Josef Dietz is heading the research unit Biochemistry and Physiology of Plants in the Faculty of Biology at Bielefeld University and is member of the CeBiTec. His research deals with stress sensing, signal transduction and response elicitation in a changing environment. The main focus of his group is given to the redox regulatory network of the cell as mediator and player in plant stress perception and acclimatization, the role of oxylipins, i.e. oxidized derivatives of polyunsaturated fatty acids, in stress signaling and in the emerging topic of combinatorial stress impact.



(K.-J. Dietz)

Delegation of Beijing University of Chemical Technology visited CeBiTec

On May 22nd, 2023, a delegation from Beijing University of Chemical Technology (BUCT) visited the CeBiTec. Olaf Kruse and Volker Wendisch welcomed the Chinese delegation led by the president of BUCT, Prof. Tianwei TAN. The delegates had an insight into CeBiTec's technology platforms in a guided tour with Jörn Kalinowski. In his CeBiTec Colloquium lecture, Prof. TAN discussed Green Bio-manufacturing as a new industrial mode and provided insight into examples of industrial biotechnology developed at BUCT.



Chinese delegation from BUCT, CeBiTec scientific director and deputy in front of the CeBiTec building.

© V.F. Wendisch

The delegates from BUCT met again with Volker Wendisch during the 8th International Conference on Biorefinery and Biomanufacturing, ICB 2023, held from July 23rd to 27th, 2023, in Athens, Greece. Volker Wendisch's plenary lecture on "Synthetic and systems metabolic engineering of *Corynebacterium glutamicum* for bioprocesses: a focus on nitrogen" opened the conference.

(V.F. Wendisch)

Gene set at the grapevine *Rpv12* downy mildew resistance locus resolved at haplotype/allele level



© W. Halpape

Grapevine (*Vitis vinifera* L.) is an important part of agronomy and European culture. However, viticulture is threatened by pathogens, including *Plasmopara viticola*, the oomycete causing the downy mildew disease. Current grapevine breeding aims at developing new cultivars with increased resilience to this and other pathogens to reduce the mandatory applications of protective chemicals.



In a cooperation project between the Julius-Kühn Institute for Grapevine Breeding Geilweilerhof

and the CeBiTec, the downy mildew resistance locus *Rpv12* originating from wild *Vitis amurensis* was studied. In the grapevine breeding line and *Rpv12* carrier Gf.-99-03, the resistance-conferring *Rpv12* allele is present in heterozygous state. The Gf.-99-03 genome was sequenced using trio binning, a method that allows to separate long reads from an F1 by using Illumina reads from both parents. Both haplotypes of Gf.-99-03 were independently assembled from PacBio long reads contributed by MPIPZ. Comparative analyses of the two haplotypes, one conferring resistance and one conferring sensitivity to *P. viticola*, indicate that two gene clusters are involved in resis-

tance at the complex *Rpv12* locus. One cluster corresponds to a set of genes typically involved in pathogen perception and activation of defense response pathways, the second cluster contains *ACCELERATED CELL DEATH-like* genes mediating a hypersensitive response at the site of pathogen attack. We complemented our comparative genomics approach by a comprehensive study of differentially expressed genes during the resistance response. Since successful grapevine breeding is strongly facilitated if inheritance of functionally relevant resistance genes can be followed by molecular markers, closely linked molecular markers were developed.

CITATION:

Frommer B, Müllner S, Holtgräwe D, Viehöver P, Huettel B, Töpfer R, Weisshaar B and Zyprian E (2023) Phased grapevine genome sequence of an *Rpv12* carrier for biotechnological exploration of resistance to *Plasmopara viticola*. *Front. Plant Sci.* 14:1180982. [doi: 10.3389/fpls.2023.1180982](https://doi.org/10.3389/fpls.2023.1180982)

(E. Zyprian, B. Frommer & B. Weisshaar)

***teutolab*-biotechnologie participates in the BMBF-project ‘Out-of-school student labs as a place for teacher training in the digital world’**

Out-of-school student labs are well known for offering adolescents the opportunity to do experiments with authentic lab equipment. This fosters their interest in science as well as their understanding of topics from the school

curriculum. Furthermore, out-of-school student labs can be helpful for the education of trainee teachers at university. They can teach small groups of pupils in a special learning environment together with supervisors from university. The *teutolab*-biotechnologie has been involved in biology teacher training for several years.

Now, we will focus on a new goal in the out-of-school student lab: Fully trained teachers from schools in East-Westphalia shall get the chance to improve their digital media competence. The *teutolab*-biotechnologie is planning to train teachers in software-supported genetic and phylogenetic analyses.

In a first step, teachers conduct the digital workshop ‘[Evolution of the corona virus](#)’, which was already awarded ‘[Experiment of the year](#)’ by the Federal Association of Student Laboratories in Germany in 2022. By the use of the software MEGA (Molecular Evolutionary Genetic Analysis), the teachers will find out how SARS-CoV-2 possibly originated, how it changed genetically and how the genetic information can be used (diagnostic PCR, relevance for vaccine development). Secondly, teachers will attend to a workshop in the *teutolab*-biotechnologie in the CeBiTec with their biology classes. This course combines the ‘Evolution of the corona virus’ program with practical genetics like PCR and gel electrophoresis. The teachers can function as an instructor as far as they like. Also, the teachers will be provided with further training in the use of MEGA. In a third step, teachers will develop their own teaching unit by using MEGA for dif-

ferent topics. In this way, the teachers shall be supported especially in the development of the technical component of their professionalisation. The technical, pedagogical, content knowledge (TPACK) will be evaluated by a questionnaire before and after the training course.

Research of the *teutolab*-biotechnologie is part of the BMBF-project 'Out-of-school student labs as a place for teacher training in the digital world' ([LFB-Labs-digital](#)) in co-



operation with seven further out-of-school student labs and nine universities. The project started in April 2023 and is planned for a duration of three years.

(K. Röllke)

The CeBiTec hosted 22 senior class students to deal with laboratory medicine

About 2000 pupils per year visit the *teutolab*-biotechnologie together with their teachers and carry out experiments for a practical application of their school curriculum. But even during school holidays, the out-of-school student lab is busy as well, as there are lots of students with special interest in science that would like to do more lab work.

The program of the *teutolab*-biotechnologie in the summer holidays started with the project week 'laboratory medicine' for senior class students. It was open for adolescents from all over North Rhine-Westphalia, as they could stay

overnight in the youth hostel in Bielefeld. 22 students took the chance and used laboratory medical methods and carried out research on issues relating to lactose intolerance and the coronavirus SARS-CoV-2.



Senior students in the CeBiTec *teutolab*, participating in the project week 'laboratory medicine'

© C. Wellmann

In the first part, the students learned about the function of lactase, the consequences of an absence of this enzyme from the body and the distribution of lactose intolerance around the world. To visualize and quantify enzyme activity, the students performed experiments with ONPG (*ortho*-Nitrophenyl- β -galactoside) as a colorimetric substrate analogon for lactose, enabling photometric measurements. By analyzing the data, they determined typical parameters for enzyme kinetics like V_{max} and K_m .

In addition, the students did research on factors influencing enzyme activity in the manner of open experimentation: They developed their own questions, planned and conducted the experiments, drew conclusions and presented their experiments to each other.

In the second part, students dealt with

questions concerning the coronavirus SARS-CoV-2. When, where and how did the coronavirus SARS-CoV-2 originate? How did it evolve?



Selection of laboratory techniques learned by the students in the project week ‘laboratory medicine’

© K. Röhlke

Why are mutations in the S gene under particular scrutiny? How does real-time PCR diagnostics work? The students were introduced to the software MEGA (Molecular Evolutionary Genetic Analysis) and compared different types of the Corona virus by alignments and created phylogenetic trees to understand the evolution of SARS-CoV-2.

Further on, they applied methods to detect infections with the Coronavirus like PCR and ELISA test – of course just with simulated samples. Before that, they learned to create primers for the PCR.

The week was closed by the presentation of photo collages and video sequences the students had developed during the week. The *teutolab*-biotechnologie published the fancy products on [Instagram](#).

The *teutolab*-biotechnologie thanks the



wonderful students for their dedication and [experiMINT](#) e.V. Bielefeld, carrying the center of zdi (Future through innovation), for the financial support of the project week.

In the summer holidays, two further offers at the interface between biology and medicine will follow. We will report about the ‘Medical research journey through the body’ and the ‘10. CeBiTec-Schüler*innen-Akademie’ in the next CeBiTec-Quarterly.

(K. Röhlke)



Impressum

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