Universität Bielefeld

CeBiTec
Center for Biotechnology

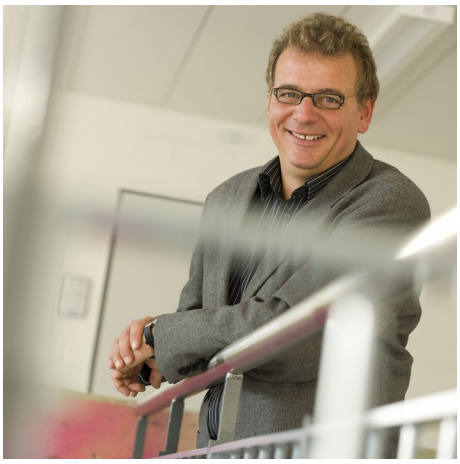
# CeBiTec – Quarterly

## *Summer 2015*

## In this Issue



## Greeting by the new Scientific Director of the CeBiTec



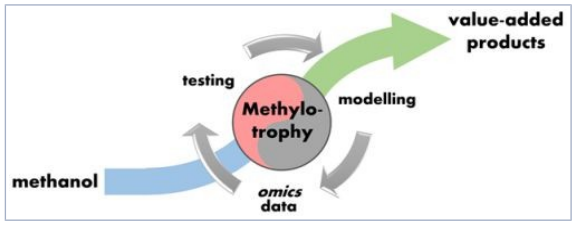
At its meeting on April 20, 2015, the Executive Board of the CeBiTec elected me as the new scientific director. I want to use this opportunity to express gratefulness to the CeBiTec Board and the Rector of Bielefeld University for their endorsement. This is also the moment to thank cordially my predecessor Prof. Dr. Thomas Noll for his great commitment and for his successful work over the last four years. Fortunately, Thomas Noll continues as deputy director of the CeBiTec.

Over the last 17 years since its foundation in 1998, the CeBiTec has evolved into a renowned central research facility at Bielefeld University with high national and international visibility and reputation. It is now important to further strengthen the role of CeBiTec as the central biotechnological research site at Bielefeld University. The CeBiTec however, will also have to cope with major challenges due to dwindling resources in the following years. Because of this, participation of the CeBiTec in future research initiatives of the natural science and bioinformatics faculties at Bielefeld University is highly desirable and will be a major aspect of an interdisciplinary and innovative strategy plan for the future. The CeBiTec should also remain as a central platform for biotechnology activities at the Bielefeld University and thereby continue to support and perform innovative biotechnology-based research and education in close cooperation with the participating faculties.

## MetApp: a new ERASysApp project on systems biology of bacterial methylotrophy for biotechnological products from methanol

Prof. Dr. Volker F. Wendisch (CeBiTec and Faculty of Biology) is principal investigator (PI) in MetApp together with Prof. Dr. Julia Vorholt (ETH Zurich, Switzerland), Prof. Dr. Jean-Charles Portais (Toulouse, France) and Prof. Dr. Trygve Brautaset (Trondheim, Norway), who coordinates this project. MetApp was funded (about 1.5 million €) in the first joint transnational call on "Transforming Systems Biology Knowledge into Applications" ERASysApp. All MetApp PIs, scientists and PhD students met in Zurich from June 16 to 17, 2015.

The project MetApp aims to develop the first application of a differential concept of systems biology to bacterial methylotrophy in order to gain systems-level understanding of evolutionary alternatives of a key metabolic trait, and to use this insight for methanol-based production of sought-after chemicals.




Methylotrophy, the ability of microorganisms to use methanol as their sole source of carbon and energy for growth, bears the potential to build value from methanol through production of special, fine, bulk, and fuel chemicals. Methanol is abundant and regarded as highly attractive non-feed raw material in microbial fermentation. Nature evolved different solutions to harness methanol for the purpose of energy generation and biomass formation. These are reflected best by the two facultative methylotrophic model bacteria *Methylobacterium extorquens* and *Bacillus methanolicus*. *M. extorquens* is a mesophilic Gram-negative bacterium that shows flexible carbon source utilization of several one-carbon compounds and possesses the serine cycle and ethylmalonyl-CoA pathway for carbon assimilation. It is intensely pigmented due to production of carotenoids. *B. methanolicus* is a thermophilic Gram-positive which possesses the ribulose monophosphate cycle as key pathway and is the first example of plasmid-dependent methylotrophy. *B. methanolicus* is a natural overproducer of amino acids, a trait that will be further exploited in the MetApp project.

MetApp encompasses genome-scale modelling, quantitative multi-Omics and high-throughput genetic analysis, tests of orthogonality, data management, and model refinement and abstraction to deduce and experimentally evaluate strategies for methanol-based production of sought-after chemicals.

https://www.erasysapp.eu/calls/funded-projects/1st-call

## BarBac: a novel bilateral cooperative research project with a South African partner on Genetic barcoding of industrially important plant growth promoting strains of Bacillus

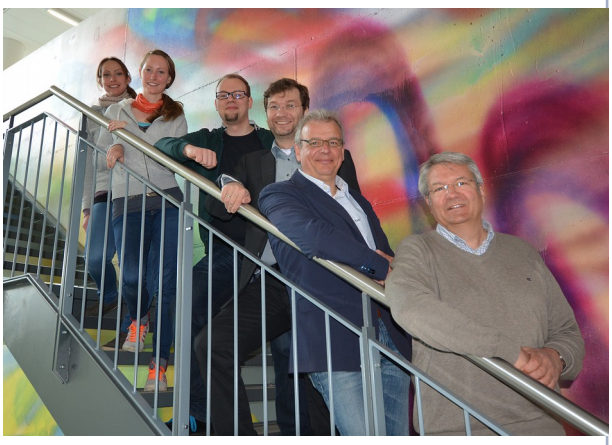
The project is a cooperation between CeBiTec (principal investigator (PI) apl. Prof. Dr. Jörn Kalinowski) and the University of Pretoria, South Africa (PI: Dr. Oleg Reva, Department of Biochemistry). It is funded by the BMBF (German Federal Ministry of Education and Science) and started in May 2015. The proposed project aims at making full use of recent advances in genomics of plant growth promoting (PGPR) bacteria. A paradigm of plant growth promoting by bacteria is application of organisms of the *Bacillus subtilis–B. amyloliquefaciens* group. Abilities to colonize the rhizosphere and inner tissues of plants and to protect the plants against fungal and bacterial pathogens are peculiar characteristics of these bacteria. However, little is known

about the genetic background of activity of biotechnological strains that makes it difficult to predict efficacy of agricultural products in field conditions and to carry out quality control of the stock material for these products. The major objective therefore is to develop genetic barcodes to enable identification and tracking down of the biotechnological strains in natural environments. The project deliveries will be the scientific knowledge and state-of-the-art technologies which will facilitate the development of new processes for improving crop yield while reducing the impact of chemicals in the environment. It therefore addresses the challenge to nurturing the development of existing bio-industries and could lead to the creation of new plant growth-promoting products applicable in Sub-Saharan Africa.

## DiControl: a new BMBF-funded cooperative project addressing soil disease suppressiveness for improved soil health and sustainable plant production

Within the BonaRes (Soil as a Sustainable Resource for the Bioeconomy) initiative of the BMBF (German Federal Ministry of Education and Science), the CeBiTec (principal investigators Prof. Dr. Alfred Pühler and Dr. Andreas Schlüter) now cooperates with partners from the Leibniz-Institute of Vegetable and Ornamental Crops (IGZ), Anhalt University of Applied Sciences (AUAS), Julius Kühn Institute (JKI), University Hohenheim (UH), German Research Center for Environmental Health (Helmholtz Center Munich) and the European Center for Sustainability Research (ECS, Friedrichshafen). The DiControl (Disease Control) project addresses implications of soil management practices and application of biocontrol strains on soil disease suppressiveness for improved soil health and sustainable plant production. Maintaining soil health and fertility during intensification of agricultural production to cover the demands of food and energy supply of a growing world population, is one of the major challenges in agriculture. Soil microorganisms, soil type, agricultural management and plant genotype play a critical role as determinants of soil quality in maintaining soil functions and productivity. The ability of soils to suppress plant pathogens is a characteristic of soil quality and health, which is mediated to a large extent by soil microorganisms. The DiControl approach is focused on the impact of farming strategies on the soil microbiome and its functions in terms of soil suppressiveness of plant pathogens. The CeBiTec contributes with high-throughput soil metagenome and metatranscriptome sequencing as well as taxonomic and functional profiling of microbial soil communities from metagenome sequence data by means of advanced bioinformatics methods. The project will provide a better understanding on how soil management strategies and application of biocontrol strains can improve soil suppressiveness regarding disease control with the aim to improve sustainable plant production and soil health.

## New collaborative research project on Artificial Photosynthesis



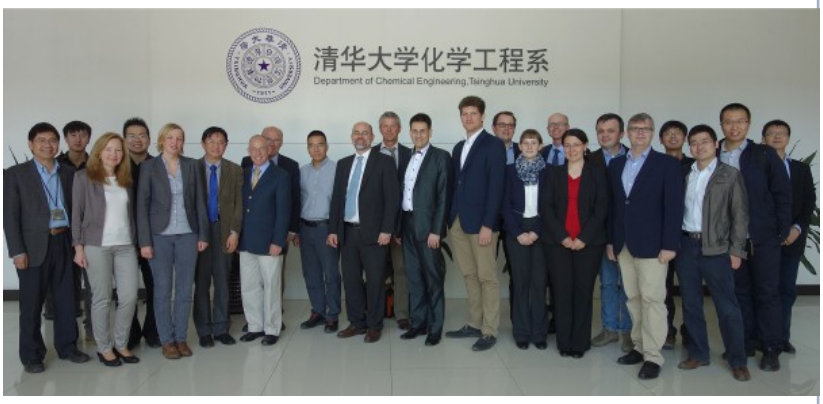
Three research groups from the faculties of Physics, Chemistry and Biology at Bielefeld University have been awarded an interdisciplinary collaborative research project by the BMBF (German Federal Ministry of Education and Science) on the development of an artificial leaf for the sustainable bioenergy production from sunlight. Research will be partly conducted at the CeBiTec as part of a larger BMBF-Cluster activity coordinated at the Max-Planck institute for Chemical Energy Conversion in Mülheim/Ruhr.

Plants and algae are able to convert photon energy from sunlight into applicable chemical energy, a process scientists worldwide intend to understand in order to create a blueprint from this process and to eventually transfer this knowledge into

industrial application. In this context the biologist Prof. Dr. Olaf Kruse, the chemist Prof. Dr. Thorsten Glaser and the physicist Prof. Dr. Andreas Hütten intend to develop new methods and devices for the efficient conversion of sun light energy into electricity and hydrogen combining biological light harvesting devices from microalgae with artificial catalysts and new semiconductor nanomaterials. The major goal in this project, funded over a period of four year by the BMBF with 0.9 million €, is to provide a technical basis for the future development of an artificial leaf.

## Miscellaneous

Prof. Dr. Volker F. Wendisch represented CeBiTec and its research activities on the CLIB2021 Delegation to China. Twenty delegates representing CLIB2021 members from industry, SMEs, investors, BMBF (German Federal Ministry of Education and Science, Project Management Jülich – PtJ) as funding organization and academia participated in the BMBF-funded travel to Beijing, Tianjin, Qingdao, Nanjing and Wuxi from April 18 to 26, 2015. The delegates participated in focused scientific meetings with typically around 100 Chinese participants. In the capital, Tsinghua University (see photo) and the Beijing University of Chemical Technology received the delegation, while Nanjing Technical University was visited in the former southern capital of China. Full day meetings were also held at the institutes of the Chinese Academy of Sciences (CAS) at Tianjin (Tianjin Institute of Industrial Biotechnology, TIB) and Qingdao (Qingdao Institute of Bioenergy and Bioprocess Technology, QIBEBT). In addition, technology parks and large centers such as the Wuxi Research Institute of Applied Technologies of Tsinghua, the Jiangsu Center of International Technology Transfer in Nanjing, the National Science Park of Jiangnan University in Wuxi, the Sino-German Ecopark and the National HighTech Industrial Development Zone in Qingdao revealed how (bio)technology transfer including IP protection is promoted in China. Biotech companies such as the Vland Biotech Group showed their R&D and production facilities. Possible scientific collaborations and partnering with CeBiTec's Technology Platforms were discussed.




## Upcoming Events

- August 20–21, 2015 | Evangelische Akademie Loccum
  CeBiTec Retreat
- September 20–23, 2015 | Center for interdisciplinary Research (ZiF), Bielefeld University
  5th International CeBiTec Research Conference – Drug Conjugates for Directed Therapy

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Universität Bielefeld (p 3)
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