Universität Bielefeld

CeBiTec
Center for Biotechnology

CeBiTec – Quarterly

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In this Issue

Continuation of the CeBiTec for further eight years

The CeBiTec Board is delighted to learn that the *Rektorat* of Bielefeld University decided on November 17, 2015, to continue with the Center for Biotechnology as a Central Scientific Institution for a further period of eight years. This decision follows a recommendation of the Commission for Research and Young Researchers and the Senate of the university, based on the evaluation of the CeBiTec by an international reviewer panel. The continuation is accompanied by a strategical reorientation and re-structuring of the scientific scope of the CeBiTec. Research activities and Graduate Schools are now embedded into two science areas, "Large Scale Genomics and Big Data Bioinformatics" and "Metabolic Engineering of Unicellular Systems for Bioproduction". This reorganization of the CeBiTec will foster its role as a central communication platform and a "think tank" of the university with respect to initiatives and activities with a dedicated biotechnological perspective.

Team Bielefeld-CeBiTec clears prizes at iGEM – Cell-free Biosensor for water contaminants impresses jury

On November 28, 2015, ten Bielefeld Master's degree students were rewarded for their hard work in the laboratory over the past six months. At the iGEM (International Genetically Engineered Machine Competition) in Boston, USA, the team cleared various prizes for their project "Cell-free sticks – it works on paper". The title is a pun as their biosensor literally works on paper discs. The students impressed the expert jury with their project to detect water contaminants such as date rape drugs or heavy metals with a biosensor based on cell-free protein synthesis (CFPS). In total the team was rewarded with four prizes for Best Environmental Project, Best Integrated Human Practices, Best Composite DNA Part and Best Presentation. Furthermore the iGEM safety committee gave a security commendation for the team's outstanding work on biosecurity issues and was nominated in four other categories. "Half a year ago I couldn't think of the

enormous potential a group of students could have. At the moment we can hardly grasp our success!" said Ursela Barteczko, member of the team. The iGEM Competition, which started out as an internal competition at the Massachusetts Institute of Technology (MIT), is growing bigger each year so that the venue has moved to the larger Hynes Convention Center. Teams from Bielefeld University have been participating for six years.

The iGEM team of 2015 comprised ten students enrolled in the Masters programmes Molecular Biotechnology, Molecular Cell Biology and Genome-Based Systems Biology. The goal was to build a paper-based test strip for fast and easy detection of water contaminants, like heavy metals or date rape drugs. The biosensor is based on extracts from *E. coli* cells bound to paper discs. The cell extract is rehydrated by the sample to be tested, which also carries the fluorescence reporter construct. Binding of the analyte releases a specific repressor and leads to expression of the fluorescence reporter protein. To prove the functionality and universal use of the biosensor, heavy metals and date rape drugs were chosen as relevant target analytes. To detect and analyse the biosensor's fluorescence output signal a smartphone App was also programmed by the team. The smartphone is put onto a black box harbouring the paper with the analyte and filters for flash and camera which care for the proper excitation and emission wavelength. In this way, the system is generic and might as well be used with many different reporter systems or even in the lab for routine fluorescence measurements. The system developed by team Bielefeld-CeBiTec and its success in the iGEM competition underline the strong position of Bielefeld University in education and research in the Life Sciences and create pleasant anticipation for the team of 2016.

The team Bielefeld-CeBiTec on stage at the iGEM World Jamboree in Boston, USA. From left to right (front row) Alexander Gräwe, Uyen Linh Ho; (back row) Manuel Wittchen (supervisor), Melissa Kracht, Gila Drews, Marta Eva Jackowski, Luzia Buchholz, Anna Dreyer, Janina Lüders, Ursela Barteczko, Tobias Vornholt and Tore Bleckwehl (supervisor).

Novel EU-funded project: Virus-X – Viral Metagenomics for Innovation Value

Biological sequence diversity is nowhere as apparent as in the vast sequence space of viral genomes. The Virus-X project will specifically explore the outer realms of this diversity by targeting the virosphere of selected microbial ecosystems and investigate the encoded functional variety of viral gene products. The project is driven by the expected large innovation value and unique properties of viral proteins, previously demonstrated by the many virally derived DNA and RNA processing enzymes used in biotechnology.

Concomitantly, the project aims at advancing our understanding of important aspects of ecology in terms of viral diversity, ecosystem dynamics and virus-host interplay. Last but not least, due to the inherent challenges in gene annotation, functional assignments and other virus-specific technical obstacles of viral metagenomics, the Virus-X project specifically addresses these challenges using innovative measures in all parts of the discovery and analysis pipeline, from sampling difficult extreme biotopes, through sequencing and innovative bioinformatics to efficient production of enzymes for molecular biotechnology. Virus-X will advance the metagenomic tool-box significantly and our capabilities for future exploitation of viral biological diversity, the largest unexplored genetic reservoir on Earth.

Design of a consortium T-shirt.

The Virus-X consortium comprises partners from 15 research institutions located in eight different European countries, among them 5 industrial partners. It is coordinated by one of these industrial partners (Dr. Arnthor Aevarson (Prokazyme ehf, Iceland). The CeBiTec partners are Prof. Dr. Jörn Kalinowski (Microbial Genomics and Biotechnology, PI) and Dr. Alexander Sczyrba (Computational Metagenomics, co-PI). Whereas the Sczyrba group will be involved in development of bioinformatics tools and viral metagenome analysis, the Kalinowski group will perform metagenome sequencing and expression of biotechnologically relevant proteins in bacterial and yeast organisms.

A new BEML-funded cooperative project addressing investigation of microbial communities residing in production-scale biogas plants

The German Federal Ministry of Food and Agriculture (BMEL) extended funding of the Biogas Monitoring Program within the program Renewable Resources. The new project addresses analysis of microbiological processes within production-scale biogas plants. The principal investigators Prof. Dr. Alfred Pühler und Dr. Andreas Schlüter of the CeBiTec cooperate with partners from the Leibniz Institute for Agricultural Engineering Potsdam-Bornim and the Otto-von-Guericke University in Magdeburg to analyse the complex and dynamic microbial biogas consortia responsible for anaerobic degradation of organic biomass to biogas within agricultural biogas plants.

Within the new project, the CeBiTec research group will be involved in monitoring of biogas plants in Germany regarding their performance, functioning, process stability, economy and microbiology. The impact of abiotic process parameters on structure and development of the microbial biogas consortia and their metabolic features will be investigated. For this approach, the CeBiTec Technology Platforms for Genomics and Bioinformatics will be accessed to perform high-throughput metagenome sequencing and corresponding data interpretation by means of advanced bioinformatics methods. It is expected that the project will provide a better understanding on how process management strategies affect microbial biogas communities. Obtained results will be integrated into optimization strategies for improving the biotechnology of biogas production from renewable resources.




The German Network for Bioinformatics Infrastructure received support from the Scientific Advisory Board

At the end of November 2015, the German Network for Bioinformatics Infrastructure (de.NBI) organized a plenary meeting in Berlin with the goal to present the de.NBI achievements to their Scientific Advisory Board (SAB). This presentation was rather successful and the SAB report stated that following the fast establishment of the network de.NBI should now focus on further developments like its integration as a national node in ELIXIR, a Europe-wide network for bioinformatics infrastructure, and starting a de.NBI-cloud to improve the compute power within the network. CeBiTec representatives of the Bielefeld-Gießen Resource Center for Microbial Bioinformatics (BiGi) as well as from the de.NBI administration office took part.

Left to right: Prof. Dr. Ron Appel (SIB, Lausanne), Prof. Dr. Ivo Hofacker (Universität Wien), Dr. Reinhard Schneider (Université de Luxembourg), Prof. Dr. Janet Thornton (EMBL-EBI, Hinxton), Prof. Dr. Alfred Pühler (CeBiTec) and Prof. Dr. Andreas Tauch (CeBiTec).

Lab2Venture plus – A new project for enthusiastic students at the teutolab-biotechnology

After the successful performance of the project Lab2Venture in 2013, the teutolab-biotechnology was chosen again out of many competitors to take part in the follow-up project called Lab2Venture plus in 2015. Ten science labs all over Germany attend the project. Enthusiastic teenagers in cooperation with their contract partners do research in science labs and create solutions on real questions of companies. So they become acquainted with research methods in the field of MINT subjects (*Mathematik, Informatik, Naturwissenschaften und Technik;* Mathematics, computer science, natural science and technology) and entrepreneurial spirit. They can improve personal competences like self-sufficiency, problem solving, teamwork, and communication and can experience job orientation. The project is promoted by the *Deutsche Kinder- und Jugendstiftung* (dkjs; German children and youth foundation), *Bundesverband der Schülerlabore* (LeLa; federal association of school laboratories) and Fraunhofer Institute for Chemical Technology (ICT).

On September 17, 2015, the project at the teutolab-biotechnology started: Three groups of A-level-students from the *Oberstufenkolleg Bielefeld* and the *Evangelisches Gymnasium Werther* will do research on different biotechnological questions: At the Kick-off Meeting at the CeBiTec different companies presented their fields of activities and special

problems or questions to the interested students, tutors and representatives of the supporters. With the Kick-off Meeting on September 17, 2015, the cooperation of the partners started and a first introduction to project management was given to the students. The projects have to be finished until the end of the term in summer 2016.

The CeBiTec offers its fourth full day training for high school teachers in Synthetic Biology/Biotechnology

For the fourth time, a full day education for high school teachers in Synthetic Biology/Biotechnology was held at the CeBiTec on October 23, 2015. The event is jointly organized by the CeBiTec members Honorary Prof. Dr. Walter Arnold, Prof. Dr. Alfred Pühler and Dr. Werner Selbitschka as well as Dr. Wolfgang Diekmann of the District Council Detmold. The teacher training series is closely intertwined with the Students Academy week annually held at the CeBiTec since the year 2012 (see also CeBiTec-Quarterly Autumn 2015). The call for the full day training published by the District Council Detmold was directed to biology teachers of more than 100 secondary schools located in the district Ostwestfalen-Lippe (Northrhine-Westfalia). With 43 teachers attending, the course was fully booked out.

The technological aspects of the course addressed the state-of-the-art methods in the fields of proteomics and metabolomics as well as the bioinformatics challenges in the procession of huge data sets. Lectures to provide an overview over modern biotechnology dealt with (i) industrial biotechnology, (ii) modern plant breeding, (iii) industrial production of pharmaceuticals, as well as (iv) synthetic biology. Finally, a discussion about the revolutionary CRISPR/CAS technology completed the training day. The topics were presented by the CeBiTec members Dr. Martin Sagasser (Genome Research), Dr. Thomas Patschkowski (Proteome and Metabolome Research), Prof. Dr. Thomas Noll (Cell Culture Technology), Prof. Dr. Alfred Pühler (Senior Research Group Genomics of Industrial Microorganisms), Prof. Dr. Jörn Kalinowski (Technology Platform Genomics) and Dr. Stefan Albaum (Bioinformatics Resource Facility). Last-but-not-least, Timo Wolf of the CLIB Graduate School contributed to the event.

The feedback of the participants was positive, the topics presented were considered as extremely relevant for up-to-date teaching purposes. The teachers as well as the District Council Detmold expressed their strong interest in the continuing offer of training days by the CeBiTec on an annual basis.

Upcoming Events

- January 26, 2016 | CeBiTec building, room G2-104
  CLIB-Graduate Cluster "Industrial Biotechnology" Bielefeld Spring Retreat
- July 04–06, 2016 | Center for interdisciplinary Research (ZiF), Bielefeld University
  11th CeBiTec Symposium – Microbial Genomics and Metabolomics in Human Health and Disease
- August 29–30, 2016 | Evangelische Akademie Loccum
  3rd CeBiTec Retreat
- September 25–28, 2016 | Center for interdisciplinary Research (ZiF), Bielefeld University
  6th International CeBiTec Research Conference – Advances in Industrial Biotechnology

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