Universität Bielefeld

CeBiTec
Center for Biotechnology

CeBiTec – Quarterly

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In this Issue

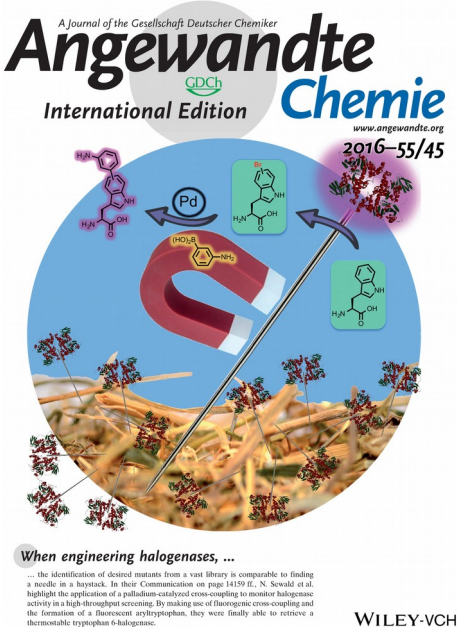
Politics meets science

The CeBiTec is regarded as one of the outstanding scientific centers for biotechnology in Germany. Members of the party Christian Democratic Union of Germany (CDU) from Bielefeld expressed an interest to learn more about the CeBiTec and on February 1, 2017, 70 party members followed an invitation of scientific director Prof. Dr. Olaf Kruse to visit the institute. Prof. Dr. Jörn Kalinowski and Prof. Dr. Olaf Kruse presented background information on the organization and scientific research performed at the CeBiTec within the context of today's national and international landscape of life-science and biotechnology R&D. Guided tours offered the visitors an opportunity to gain insight into the possibilities that a state of the art research institute provides. During the event, the member of the state parliament of North Rhine-Westphalia (NRW), Ralf Nettelstroth (MdL), pointed out the importance of an adequate funding from the state of NRW to strengthen the research and innovation of Bielefeld Universities.

(from left to right) Michael Weber (CDU), Prof. Dr. Olaf Kruse (CeBiTec), Ralf Nettelstroth (CDU), Bernd Henrichsmeier (CDU).

Finding the needle in a haystack – Development of a High-Throughput Assay to Determine Halogenase Activity

Halogenating enzymes increasingly attract attention for biocatalytic C-H functionalization. Despite the importance for synthetic chemistry, selective introduction of halogens using conventional approaches often remains challenging, whereas biocatalysis offers excellent catalyst-controlled selectivity simply by utilizing molecular oxygen and halide



salts as stoichiometric agents. The application of flavin-dependent halogenases is hampered by severe limitations, mainly low activity, insufficient stability and narrow substrate profile. The workgroup Organic and Bioorganic Chemistry headed by Prof. Dr. Norbert Sewald focused on enhancing the synthetic utility of biohalogenation by making use of directed evolution. However, finding improved enzyme variants by means of high-throughput screening is often similar to the well-known search for the needle in a haystack. Therefore, Suzuki-Miyaura cross-coupling was established as a quantitative halogenase assay based on the formation of a fluorescent aryltryptophan. The technique was optimized for an application in *E. coli* crude lysate without intermediary purification steps. Quantitative formation of halotryptophans could be monitored with high specificity by facile fluorescence screening in microtiter plate format. This novel screening was exploited to engineer a thermostable tryptophan 6-halogenase. Libraries were constructed by epPCR and selected for improved thermal resistance simply using fluorogenic cross-coupling. This methodology led to an enzyme variant with substantially increased thermal stability and 2.5-fold improved activity. Hence, high-throughput cross-coupling provides a novel tool for halogenase engineering. This technique paves the way towards simplified engineering of halogenases giving rise to sustainable approaches of C–H functionalization.

English: C. Schnepel, H. Minges, M. Frese, N. Sewald, Angew. Chem. Int. Ed. 2016, 55, 14159–14163.
German: C. Schnepel, H. Minges, M. Frese, N. Sewald, Angew. Chem. 2016, 128, 14365–14369.

A new project addressing self fertility in grasses – SelfieGras

The Genome Research group of Prof. Dr. Bernd Weisshaar got funded a project part by the Federal Ministry of Food and Agriculture (BMEL) program *Pflanzenzüchtung zur Ressourceneffizienz*. The new project is coordinated by the breeding company DSV – Deutsche Saatveredelung AG (Lippstadt, Germany) and involves academic researchers from Switzerland (Prof. Dr. Bruno Studer, ETH Zürich) as well as associated partners from the UK (Dr. Daniel Thorogood, Aberystwyth University) and the USA (Dr. Thomas Lübberstedt, Iowa State University). The objective of SelfieGras is the establishment of hybrid breeding in perennial ryegrass (*Lolium perenne*). This grass is outcrossing (self incompatible), produces a high yield and is tolerant to heavy grazing, making it an important pasture and forage plant for domesticated livestock like cattle, swine and horses. Selected seed mixes are used extensively for sports pitches (winter sports, golf course). While establishment of hybrid breeding in *L. perenne* is the final goal, one required step on the way is to establish self-fertilisation. This will be achieved by basic research addressing self fertility (SF) sources that are available as mutants, by investigating the mechanisms of SF, and by development of molecular tools for efficient use of SF sources in breeding. The contribution from the group of Prof. Weisshaar is genetic mapping and identification of causal genes in selected SF sources by pool sequencing of high-resolution mapping populations (Mapping By Sequencing, MBS) and the development of DNA markers in the identified genes/genome regions. Detailed knowledge about the SF mechanisms will favour the breeding of high-yielding forage grass hybrid varieties, which will be available in the future as a perennial alternative to the existing species used for biogas contributing to an efficient and environmentally friendly use of resources in agriculture.

7th International CeBiTec Research conference Bielefeld 2017

The 7th International CeBiTec Research Conference on Advances in Industrial Biotechnology will be held from September 24 to 27, 2017, at Bielefeld University. The topic of this year's conference will be "Prospects and challenges for the development of algal biotechnology". The focus of the conference will be fundamental and applied research topics in the field of algal biology and biotechnology, including strategies to optimize the production process for chemicals, exploitation of genome sequence information, systems biology, and the application of synthetic biology to optimize existing processes and develop new ones. Distinguished invited speakers from academia and industry will present current prospects, and short talks – selected from the submitted abstracts – will complete the oral presentation section. In addition, participants will have the opportunity to present their work during poster sessions and discuss current progress with leading national and international experts in the field. The conference will be held at the Center for Interdisciplinary Research (ZiF), Methoden 1, 33615 Bielefeld, Germany. Early bird registration is possible until May 05, 2017, for discount fees.
Further information is available at: http://www.cebitec.uni-bielefeld.de/algal-biotech-2017

Miscellaneous

The visiting professor from Kyungsung University, Busan, South Korea, Prof. Dr. Jin-Ho Lee, who joined the Faculty of Biology and the CeBiTec for one year and his host Prof. Dr. Volker F. Wendisch have received a two year travel grant from the Federal Ministry of Education and Research (BMBF) and the National Research Foundation of Korea (NRF) for developing a biotechnological process for the food additive coenzyme Q10. Only seven projects were selected and the CoQ10 project was the only biology project selected. Prof. Lee and Prof. Wendisch are looking forward to continuing their South Korean-German collaboration and will exchange PhD students between the labs for short visits.

Upcoming Events

- June 12, 2017 | Center for Interdisciplinary Research (ZiF), Bielefeld University
  CeBiTec Distinguished Lecture – Prof. Dr. Dierk Scheel (Leibniz-Institut fürPflanzenbiochemie, Halle (Saale))
- July 24–28, 2017 | CeBiTec building
  6th CeBiTec Students Academy – Synthetic Biology/Biotechnology
- September 11–12, 2017 | Landwirtschaftszentrum Haus Düsse, Bad Sassendorf
  4th CeBiTec Retreat
- September 24–27, 2017 | Center for Interdisciplinary Research (ZiF), Bielefeld University
  7th International CeBiTec Research Conference – Advances in Industrial Biotechnology: Prospects and challenges for the development of algal biotechnology
- October 23–25, 2017 | Center for Interdisciplinary Research (ZiF), Bielefeld University
  de.NBI Symposium – The Collaboration of the de.NBI and ELIXIR Networks
- March 19–21, 2018 | Center for Interdisciplinary Research (ZiF), Bielefeld University
  12th CeBiTec Symposium – Big Data in Medicine and Biotechnology
- further events are announced on the CeBiTec web page

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Angew. Chem. Int. Ed. 2016, 55, 14159–14163 (p 2);
CeBiTec (all others)