Universität Bielefeld

CeBiTec
Center for Biotechnology

CeBiTec – Quarterly

Spring 2014

In this Issue

New, CeBiTec – Newsletter

This is the first issue of the CeBiTec Newsletter reporting about actual developments, talks, conferences, further events, and news at the Center for Biotechnology at Bielefeld University. The newsletter will be published quarterly on the CeBiTec homepage for download and will be distributed by email.

The administration office for the BMBF programme German Network for Bioinformatics Infrastructure started work at the CeBiTec

The Federal Ministry of Education and Research (BMBF, *Bundesministerium für Bildung und Forschung*) launched a programme with the title 'German Network for Bioinformatics Infrastructure (de.NBI)' equipped with a financial background of 22 Mio. EURO. The new network will provide bioinformatics services and will ensure the efficient use of pioneering technologies in all areas of life science research. In the meantime an international group of reviewers identified six so-called service centers and one data management as well as four data resource nodes. The CeBiTec was extremely successful and could place a joint project together with Gießen University (see also next article)

amongst the six service centers. In addition, the de.NBI administration office including the coordinator was also placed at the CeBiTec. The administration center is headed by apl. Prof. Dr. A. Tauch and supported by the scientific secretary Dr. T. Dammann-Kalinowski. Prof. Dr. A.Pühler was appointed by the BMBF to act as a coordinator for the de.NBI programme. At the moment, a general concept for establishing the network is developed. The service activities of the network are scheduled to start October 1, 2014.

Bioinformatics Resource Center of Microbial Genome Research relevant for Biotechnology and Medicine

BiGi
Microbial Bioinformatics

One step further! Together with Prof. Dr. Alexander Goesmann from Gießen University, Prof. Dr. Jens Stoye, Prof. Dr. Bernd Weisshaar, Dr. Stefan Albaum, and Dr. Alexander Sczyrba from the CeBiTec have taken the first hurdle and been invited to participate in the German Network for Bioinformatics (de.NBI) – a recent call from the Federal Ministry of Education and Research (BMBF, *Bundesministerium für Bildung und Forschung*). The dramatic drop in consumer costs for DNA sequencing is revolutionizing genomics research in general, and specifically in the fields of biotechnology and medicine. DNA sequencing of microbial genomes and metagenomes of their habitats is generating data at a hitherto unforeseen pace. The real bottleneck that prevents realization of the full potential of the different *-omics* technologies is not the data generation itself, but the subsequent data analysis. To address this looming bottleneck, the BiGi Bioinformatics Resource Center combines bioinformatics expertise and facilities at Bielefeld and Gießen Universities as required in the field of microbial genome research. If granted, the upcoming center will provide high-performance computing services supporting different levels of user competence as well as a repository of reusable workflows suitable also for cloud computing. Further aims are the development of tools for large-scale comparative (meta)genomics and for post-genomics data integration and exploration. As part of de.NBI, the center will contribute to standardization efforts for data interchangeability and software interoperability, and finally, will provide support and user training to the life science community.

Sugar beet genome sequence published in Nature

A team of scientists from the Centre for Genomic Regulation (CRG) in Barcelona (group Himmelbauer), the CeBiTec (group Weisshaar), other academic partners, and breeding companies has sequenced and analysed the sugar beet genome and published their findings in Nature [1]. Sugar beet (*Beta vulgaris* ssp. *vulgaris*) is an important crop in Europe and in the US and accounts for ~30% of the yearly global sugar production. Compared to other plants sugar beet is a very young crop species. Breeding started at the end of the 18th century, following the discovery that its tap roots accumulate sugar which is chemically identically to the one extracted from sugar cane. The sequence of the sugar beet genome is the first in a group of flowering plants called Caryophyllales. This group comprises 11,500 species and includes economically important plants, like spinach or quinoa, and other interesting species like carnivorous or desert plants. Due to its taxonomic position, the sugar beet genome sequence will be an important cornerstone of future studies involving plants. 27,421 protein-coding genes were discovered in sugar beet, more than are encoded in the human genome. Some gene families like transcription factors and resistance genes were analysed by CeBiTec scientists in more detail. These gene families encompass less members than in many other sequenced flowering plants but revealed beet-specific gene family expansions and gene losses. The aim of the follow

up project AnnoBeet [2] is to further improve and functionally annotate the sugar beet genome sequence. The knowledge gained will not only increase breeding efficiency but also offers opportunities for improved production of food and biomass e.g. for generating energy in form of bioethanol and biogas.

1. Dohm JC, Minoche AE, Holtgräwe D, Capella Gutiérrez S, Zakrzewski F, Tafer H, Rupp O, Rosleff Sörensen T, Stracke R, Reinhardt R, Goesmann A, Kraft T, Schulz B, Stadler PF, Schmidt T, Gabaldón T, Lehrach H, Weisshaar B, Himmelbauer H (2014). The genome of the recently domesticated crop plant sugar beet (*Beta vulgaris*). Nature 505:546–549.
2. Partners: Bielefeld University, CeBiTec, MPI for Molecular Genetics, Berlin, KWS Saat AG, Einbeck, Strube Research, Söllingen, Syngenta Seeds GmbH, Bad Salzuflen, Technical University, Dresden, Centre for Genomic Regulation, Barcelona.

An environmental bacterial taxon with a large and distinct metabolic repertoire

Two CeBiTec researchers, Prof. Dr. Jörn Kalinowski and Dr. Christian Rückert (Technology Platform Genomics) were partners in a study recently published in *Nature*. In this study, a new bacterial phylum was described, members of which are symbionts of marine sponges and produce a plethora of secondary metabolites with potential medical applications. This is what *Nature* wrote in an editorial:
"A group of microbes that may aid the discovery of a range of new types of drug candidates are identified in *Nature* this week (Nature. 2014 Feb 6;506(7486):58-62. doi: 10.1038/nature12959. Epub 2014 Jan 29.). Members of a newly described bacterial genus called *'Entotheonella'* are shown to be the sources of the rich array of natural products found in a marine sponge. These microbes represent a novel 'biochemically talented' group that offers new possibilities for the production of biomedically important natural products and for ecological studies. Natural products from other microorganisms have been developed into drugs for treating cancer or targeting infectious agents. Sponges have an important role in drug discovery as they produce exceptionally diverse natural products. Jörn Piel (ETH Zurich, Switzerland) and colleagues identify some of the producers of the chemical compounds found in the marine sponge *Theonella swinhoei*. Analysis of two members of the candidate genus *'Entotheonella'* eveals genetic signatures associated with the production of many of bioactive compounds detected in *T. swinhoei*. *'Entotheonella'* have been discovered in other sponges too, which hints at an important role for these bacteria in the chemistry of their hosts. The authors assign the bacteria to a new candidate phylum called 'Tectomicrobia' (from the Latin word *tegere*: to hide, to protect), a name that reflects their uncultured status and capability to produce bioactive compounds that are probably used as a chemical defence. Cultivated bacteria are the source of many drugs and drug candidates; therefore, as yet unculturable bacteria are thought to be an untapped treasure trove of novel compounds, as is suggested in this study."

Full day education for high school teachers in Synthetic Biology/Biotechnology

A full day education for high school teachers in Synthetic Biology/Biotechnology was held for the second time at the CeBiTec on January 10, 2014. The teacher education series which is organized by Honorary Prof. Dr. Walter Arnold, Prof. Dr. Alfred Pühler, and Dr. Werner Selbitschka from the CeBiTec together with the District Council Detmold (*Bezirksregierung Detmold*) since 2012, is closely intertwined with a Students Academy week held at the CeBiTec. The Students Academy is directed towards gifted and talented pupils within Ostwestfalen-Lippe of Northrhine-Westfalia (NRW). It is designed for students one year before finishing their Abitur, the general qualification for university entrance. The full day education was offered for teachers who had contributed to the Students Academy week by writing recommendation letters.
The CeBiTec's activity is a timely contribution to the advanced training of teachers. Notably, the field of Synthetic Biology will be newly integrated in the core curriculum for Biology SII at NRW's Grammar and Integrated Schools, respectively. The lectures referred to various aspects of biotechnology and addressed (i) industrial biotechnology, (ii) modern

plant breeding, (iii) industrial production of pharmaceuticals, as well as (iv) synthetic biology. Moreover, newest developments in *-omics* technologies and the bioinformatics procession of huge data sets were explored. Finally, the CeBiTec's successful activities in the field of the iGEM (Genetically Engineered Machines) competition were demonstrated. The topics were presented by lecturers of the Faculty of Biology and the Technical Faculty.

Annual Retreat CLIB-Graduate Cluster 2014

This year's CLIB-Graduate Cluster Annual Retreat took place from February 12 to 14, 2014, in Lünen (North Rhine-Westphalia, Germany). At this event doctorates and faculty members from the Graduate Cluster get together to update each other about their current research. For this reason each PhD student was asked to present a poster and students in their 3rd year to give a 30 minutes oral presentation. All together approximately 120 people met to discuss their scientific work and to enable an interdisciplinary cross talk between PhD students and faculty members. This year the CLIB-Forum Biosimilars (February 13, 2014) was integrated in the annual retreat in order to enable intensified communication between the students and faculty members of Graduate Cluster and industry.

CLIB-Graduate Cluster Symposium

The CLIB GC Symposium, which was initiated last year as an annual forum for the discussion on topics from the intersection of science and society, took place for the second time on March 18, 2014, at the CeBiTec. This year's Symposium was titled 'Emerging Concepts of Pharmaceutical Research Funding: For a More Sustainable Society' and was again organised by students of the CLIB-Graduate Cluster. It raised the controversial issue of financing the development of treatments for neglected and poverty related diseases. The invited experts from industry, NGOs, academia and independent institutions presented the benefits and drawbacks of the current patent-based model of pharmaceutical research funding. Over 40 participants followed the round of presentations given by Dr. med. Gisela Schott (Drug Commission of the German Medical Association, Berlin), Dr. Valentin Beck (Strukturanreize für Globale Gesundheit e.V, Institute of Philosophy at Freie Universität Berlin), Dr. Christiane Fischer (German Ethics Council / MEZIS e.V. / BUKO Pharma, Hamm), Dr. Harald Zimmer (vfa Association of Research based Pharmaceutical Companies, Berlin), and Prof. Dr. Jan Raaijmakers (GlaxoSmithKline / Utrecht University / Top Institute Pharma, Leiden, Netherlands) was followed by a panel discussion wherein speakers exchanged their opinions on how to improve the existing research funding model by applying alternative financing systems. The speakers agreed that the current system favours

research on pharmaceuticals which sale assures financial gratification for companies. There is a need for solutions which will encourage the pharmaceutical industry to focus their activities on development of drugs for neglected diseases.

Distinguished Lecture by Prof. Dr. Cathie R. Martin, John Innes Centre, Norwich

On the invitation of Prof. Dr. Bernd Weisshaar, Prof. Dr. Cathie R. Martin from the John Innes Centre, Department of Metabolic Biology, Norwich (UK) could be won for the CeBiTec Distinguished Lecture Series. On February 3, 2014, Prof. Martin gave a talk entitled 'How can plant scientists contribute to human health?' In the plenary hall of the Center for Interdisciplinary Research of Bielefeld University she reported about her work on regulation and manipulation of polyphenolic bioactives in tomatoes. Her presentation inspired a vivid discussion on the use of plant breeding and metabolic engineering to design crops and food that are good for consumers.

Two guests from Amsterdam in the Colloquium

Prof. Dr. Ronald Koes and Dr. Francesca Quattrocchio, both from the Amsterdam Institute for Molecules, Medicines and Systems, VU University Amsterdam (the Netherlands), visited the CeBiTec by invitation of Prof. Dr. Bernd Weisshaar. On March 21, 2014, they gave two talks in the CeBiTec Colloquium. After Prof. Koes' introduction with the provocative title 'The color of a flower: really only a boring pathway for anthocyanin pigments and three transcription factors?' Dr. Quattrocchio presented her results on 'Mechanisms of hyperacidification and vacuoles biogenesis in plant cells'. Well attended for a Friday afternoon, both presentations lead to lively discussions and resulted in good ideas for further collaborative projects.

Miscellaneous

On February 13, 2014, Dr. Jens Schneider received the prize of the *Westfälisch-Lippische Universitätsgesellschaft* (WLUG) for the best PhD work in biology 2013. In his dissertation in the group of Prof. Dr. Volker F. Wendisch, Dr. Jens Schneider characterized diamine metabolism of the biotechnologically relevant *Corynebacterium glutamicum*. His ground-breaking work enabled construction and optimization of diamine producing strains. The developed strategies and strains can be used for the sustainable bioproduction of diamines, which find application in the polyamide and coatings industries.

Prof. Dr. Volker F. Wendisch reported as invited speaker to the 5th International Symposium of Innovative BioProduction held January 29–30, 2014, at Kobe University Centennial Hall, Kobe, Japan, to highlight cutting-edge advances in the fields of Bioproduction on Engineering Microbial Cell Factories to enable flexible feedstock concept and new bioproducts. http://www.org.kobe-u.ac.jp/bioproduction/en/symposium/5th.html

In January 2014 a cooperation agreement has been concluded between the North German Center of Microbial Genomics (*Norddeutschen Zentrum für Mikrobielle Genomforschung – NZMG*) and the CeBiTec for the purpose of promoting cooperation in research, teaching and further training.

Prof. Dr. Alfred Pühler contributed to a publication offering some of the research highlights and scientific achievements emerging from German universities, schools of applied sciences, and academies of art and music. On behalf of the German Academic Exchange Service (DAAD) and the German Rectors' Conference (HRK) his work on microorganisms producing methane for power generation has been selected. The bilingual (German and English) publication is available under http://www.gate-germany.de/galaxis.

Upcoming Events

- April 3–4, 2014 | Center for interdisciplinary Research (ZiF), Bielefeld University
  9th CeBiTec Symposium: Molecular Biotechnology
- July 7–11, 2014 | CeBiTec building, Bielefeld University
  3rd CeBiTec-Schülerakademie
- September 21–24, 2014 | Center for interdisciplinary Research (ZiF), Bielefeld University
  ICRC 2014 – International CeBiTec Research Conference: Advances in Industrial Biotechnology – Prospects and challenges for the development of algal biotechnology
- September 28–October 1, 2014 | Bielefeld University
  GCB 2014 – German Conference on Bioinformatics

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Photos
Thomas Kraft/Syngenta (p 2)
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Dr. Jens Schneider (p 5 middle)
CeBiTec (all others)