

Editorial



Dear CHIMIA readers,

this issue of CHIMIA presents contributions by selected invited speakers at the international conference Biotrans 2009, which takes place 5–9 July in Bern, Switzerland. The Biotrans biannual conference series was established in 1993 and the ninth conference will draw over 500 participants worldwide from industry and academia to discuss their latest results in biocatalysis, also known as ‘white biotechnology’. These scientists are developing and applying enzymes and microorganisms to carry out selective chemical transformations. Biocatalysis is deeply interdisciplinary, spanning from microbiology and molecular biology to synthetic chemistry and process engineering.

Biocatalysis has far reaching industrial applications, with many processes running on scales up to millions of tonnes per year, in particular for foods (vitamins, amino acids, sugars, natural flavours), synthetic intermediates (enantioselective transformations), biodegradable polymers, biofuels and environmental bioremediation. Biocatalytic processes win because they are cheaper to operate than classical processes, generate less waste, deliver cleaner products or simply products that are not accessible otherwise.

In the first paper, **J. C. Lewis and Frances H. Arnold** from Caltech, USA, discuss how to optimize the bacterial cytochrome P450 BM3, an enzyme that catalyzes the hydroxylation and epoxidation of hydrocarbons, using methods of directed evolution. In this Darwin anniversary year, directed evolution shows that Darwin’s ideas are not just theories but a working principle that one can use to carry out experiments. Directed evolution is further highlighted in the contribution by **K. Roderer and Peter Kast** from ETH Zürich, Switzerland, focusing on the study of chorismate mutases and touching on fundamental aspects of biocatalysis.

The contribution by **Chi-Huey Wong** from Academia Sinica, Taipei, Taiwan and Scripps Research Institute, La Jolla, USA, one of the early pioneers in the field, presents another frontline of research in biocatalysis, namely the use of enzymes for the synthesis of glycoproteins, a critical development for the field of protein therapeutics. Glycosyl transferases appear as particularly selective and potent agents to prepare and attach complex carbohydrates to proteins in combination with synthetic ligation methods.

Karen T. Robins, et al. from Lonza introduce a historical perspective to the field by showing the impact that biotechnology has had on their company over the years, and what challenges and promises can be foreseen for the future. One critical factor is the need for enzymes carrying out new types of biotransformations. An important biotransformation at Lonza, introduced by Andreas Kiener, was the use of a nitrilase enzyme in the manufacture of niacin. Nitrilases and nitrile hydratases are further discussed by **Mei-Xiang Wang** from the Chinese Academy of Science, Beijing, China, who exposes a broad palette of highly enantioselective reactions developed in his laboratory based on these enzymes.

A current research trend in biocatalysis is to go beyond single enzymes to exploit multistep enzymatic transformations, including entire biosynthetic pathways for natural products. The contributions by **C. J. Thibodeaux and Hung-wen Liu** from the University of Texas, USA, and **Ludger Wessjohann et al.** from the Leibniz Institute of Plant Biochemistry Halle and University of Halle, Germany, present ongoing research efforts in the understanding, manipulation and use of isoprenoid biosynthetic pathways, which may facilitate the access to complex bioactive molecules.

The closing contribution by **M. Bechtold and Sven Panke** from ETH Zürich, Switzerland, discusses the impact of process engineering in the efficiency of biotransformations carried out on an industrial scale, in particular the concept of *in situ* product removal that allows one to widen the spectrum of enzymatic reaction types by overcoming product inhibition and shift equilibrium position of reactions.

The strength of biocatalysis lies in its highly enthusiastic scientists and its many industrial applications contributing to a sustainable future. I hope that this special issue of CHIMIA will contribute to broaden the recognition of this interdisciplinary research field and the opportunities it offers to strengthen ties between academia and industry.

Prof. Jean-Louis Reymond
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Chairman Biotrans 2009

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