
Foreword

In 1974, when Prof. Christian Wandrey was working on the final stages of his PhD thesis on heterogeneous catalysis at the Institute for Technical Chemistry at the Technical University of Hannover, Prof. Dr. Karl Schügerl, at that time director of the institute, suggested that he should work on biocatalysis as the topic for his habilitation since enzymes seemed to be better catalysts than precious metals. We met on a memorable summer afternoon in 1974 at an autobahn service area between Hannover and Brunswick to discuss a project proposal and I was expected to contribute the necessary biochemical support. My first thought was to formulate a somewhat negative reply but, in the course of the discussion, the quantitative reaction engineering approach seemed to me to be an interesting and promising approach. So for three decades, a lasting fruitful scientific cooperation in the field of biocatalysis began. The first visible success was the development of the enzyme-membrane reactor (together with Degussa) for a technical process. These years were a time of intensive work with the enthusiastic commitment of all participants. However, at the same time, it was a great pleasure and Prof. Wandrey and I were awarded the Technology Transfer Prize by the German Research Ministry.

With the choice of the topic for his habilitation, Prof. Wandrey's career in the field of biotechnology started. The work with enzymes and enzyme reactors has been continuous up to now, with changing focuses and group leaders as the following chapters will show. In addition, there were other additional focuses. So, after Prof. Wandrey had moved to the Research Center at Jülich in the 1980s, the anaerobic production of biogas was worked on intensively for some time. Technical chemists succeeded in introducing strictly anaerobic bacteria such as *Methanosarcina barkerii* into continuous cultures and in examining these cultures in pilot reactors for the reduction of different defined waste-products. These first attempts were also applied in the industry and were awarded the Phillipp Morris prize in 1987. From the 1990s, the activities of Prof. Wandrey shifted to the aerobic production of high value products like amino acids or proteins by means of microbial processes or animal cell cultures. These topics are still relevant.

To guarantee the necessary expertise and to remain competitive at an international level, networks and long-term cooperation are still needed in research work today. Jülich was a particularly convenient location, where – together

with Prof. Hermann Sahm and other scientists at the Institute of Biotechnology 1 – common interests in the production of amino acids, metabolic flux analysis and modeling could be followed. The support within the scope of the BMBF-project “Biocatalysis” as well as the BioRegio competition and co-operation with industry were helpful and encouraging. New challenges arise today in the development and the use of “designer bugs” for sustainable production or biological oxidation and reduction processes.

At a very early stage in Jülich, he started to study the production of monoclonal antibodies by means of animal cell cultures. At that time, nobody could foresee that pharmaceutical substances based on antibodies would become, as it is today, an ever growing field of industrial biotechnology. This decision made by Prof. Wandrey also helped my research group, which was involved with the isolation and purification of proteins, by giving us access to this kind of product and represented the basis of our studies on moving bed adsorption and mass transport in porous materials. I am very happy that after my retirement these activities are still being carried out at the Institute of Biotechnology 2, in order to maintain and expand this know-how. The cell culture group deals, in addition to protein production – another highly relevant topic – with the expansion of somatic cells.

For me the common denominator of all work and interests of Prof. Wandrey seemed to be always the reaction engineering approach to identify the limiting steps for speed or selectivity and to process modelling. By simulation, a great deal of process optimization can be speeded up as well as rational scale up and robust processes can be easily achieved. Naturally the efforts to extend and make useable the basic knowledge for a detailed understanding of all the process steps is also part of his interests.

After his 60th birthday, Prof. Wandrey is still facing five years of active and fruitful research work. The younger scientists who have come from this research group will have to meet future challenges – their contributions to this special volume show that they are well equipped for these tasks. Finally I would like to congratulate Prof. Wandrey heartily on the impressive successes which have led to many honors. I will remember the pleasant and inspiring co-operation over so many years and I am eagerly looking forward to new and exciting results which will be presented by his research group.

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