Preface

This special volume "Tools and Applications of Biochemical Engineering Science" is dedicated to Professor Wolf-Dieter Deckwer on the occasion of his 60th birthday. It was a great pleasure for me to act together with Professor Karl Schügerl as volume editor and to present here a collection of 11 outstanding review articles written mainly by former students, associates, colleagues and friends of Wolf-Dieter Deckwer.

The title of this special volume well reflects the research interests and scientific pursuit of Wolf-Dieter Deckwer during his more than 20 years' work in the area of biochemical engineering, particularly during the last 15 years when he was the head of the Biochemical Engineering Division of GBF (German National Research Center for Biotechnology). He has decisively pushed the development not only of "software tools" ranging from analytical means and mathematical models for monitoring and understanding cellular processes to gene expression systems for designing microorganisms, but also of "hardware tools" such as computer control systems, bioreaction and separation devices for effectively producing a variety of bioproducts on semi-production scale. New developments in some of these important tools in biochemical engineering are reviewed in articles included in this volume. Wolf-Dieter Deckwer was among the leading biochemical engineers who timely pointed out the necessity of applying these tools in an integrated manner for bioprocess development. By establishing "Integrated Bioprocess Development" as one of the GBF main research topics as early as 1990 he also actively promoted this idea. Such an integrated approach for bioprocess optimization and development is exemplified in several articles in this volume as well.

Wolf-Dieter Deckwer is not only a leader and organizer in biochemical engineering research. First of all, he is a successful scientist and has made significant contributions to many areas of chemical and biochemical engineering. He is well-known as a "(bio)reactor man". In fact, many of his works on transport phenomena and reaction kinetics in bubble columns have become classics in this field. Over the years, part of his interests has shifted to the fascinating kinetic and dynamic phenomena in the smallest bioreactor, the microorganism. He is also a "downstream man". He and his associates have made contributions to protein purification and hydrocyclone cell separation in recent years. He is also a "biodegradation man". The beauty of microorganisms to produce nothing but CO_2 and water, as he once said, fascinates him. Among others, he and his coworkers, in particular Rolf-Joachim Müller, have successfully de-

signed biodegradable plastics to help the organisms to realize this beauty and, of course, also to help our environment to keep its beauty. Here, I have mentioned only a few of the scientific achievements of Wolf-Dieter Deckwer. Prof. Karl Schügerl has listed more in his laudation for this special volume. The scientific work of Wolf-Dieter Deckwer is also well documented in his more than 370 scientific publications.

Perhaps less well documented are the achievements of Wolf-Dieter Deckwer as a very respected teacher during his 25- years' career as a professor at the University of Hannover, the University of Oldenburg and the Technical University of Braunschweig. More than one hundred PhD students from all around the world and perhaps even more diploma students have worked under his supervision. I had the good fortune to be one of his first PhD students at GBF and have benefited a great deal from his broad experience, sharp scientific instinct, clear judgment, challenging questions and at times also his criticism. His demand and enthusiasm for understanding and interpreting biological phenomena in meaningful physical models and by numbers may not be always comfortable for the students but are always helpful and fruitful, according to my experience. To achieve this goal or perhaps to reach a compromise he often spent the whole morning or afternoon in very detailed discussions with his students and coworkers. Such discussions were sometimes disrupted or postponed due to many inevitable commission sessions or other administration duties, more frequently as his Division of Biochemical Engineering at the GBF expanded (temporarily more than one hundred people). He is now been freed of many of these duties and has more time for his students and his research. I believe it will be an excellent time for his students and associates.

As a close and long-year coworker of Wolf-Dieter Deckwer, I know that he is enthusiatic about many research opportunities of biochemical engineering in the post-genome era. He has set out to join the efforts for developing new tools and methods to dig into the huge amount of biological information and to explore its use in biochemical engineering. I wish him every success in this new endeavor. I also hope that the reader of this special volume will get some impression of the tools and applications of biochemical engineering already achieved or presently under active development. For this, I would like to thank all the authors and reviewers of the articles. Thanks are also to Professor Thomas Scheper who has supported the idea of this special volume from the very beginning and given much help throughout the whole process. Last but not least, I thank Dr. Marion Hertel and Mrs. Ulrike Kreusel from the Springer-Verlag who have made this special volume a reality.

Braunschweig, May 2001 An-Ping Zeng