

Preface

Metabolic and Cellular Engineering, although as yet only at a beginning, promises huge advances in all fields of the life sciences. The main aim of this book is to introduce students and research workers into this exciting new endeavor. To show a complete picture of the subject, we introduce the main techniques available in the field, in order to point out their power, facilitate their mastery, interpret the achievements already published, and challenge our readers with new problems.

Our own research interests have led us to the elaboration of a wider view on the emergent field of Metabolic Engineering. Thus, here we review the field in order to give a state-of-the-art account. However, in doing this we have selected examples, experiments, and puzzles that, in our opinion, accurately reflect the main advances, achievements, and unsolved problems. So a perspective for the field has also emerged. This book also pretends to be useful to those experimentalists and theoreticians who wish to project themselves into a field that offers great challenges, either experimental or theoretical, for massive integration of the available information.

Until 1960s, metabolic regulation was mainly investigated in isolated and cell-free systems. At present, biotechnology mainly deals with intact cells, and we therefore need to understand how enzymatic reactions behave and are regulated inside the cell. From this standpoint, major limitations arise from the lack of understanding of the behavior of metabolic networks. More precisely; on the one hand, geneticists and molecular biologists produce schemes to explain regulation of gene expression, e.g. by DNA-binding proteins, and on the other hand knowledge of the functioning of metabolic pathways is in some cases fairly complete. However, the link between these two aspects is poorly understood.

Metabolic and Cellular Engineering emphasizes the microorganism (e.g. enzyme function, transport, regulation) and its modification to improve cellular activities, through the use of recombinant DNA. Nevertheless, we assume that the level of performance of the recombinant cells thereby obtained must be evaluated within the context of a specific biotransformation. Thus **Metabolic and Cellular Engineering** is bred of a powerful alliance of two disciplines: Genetics-

Molecular Biology and Quantitative Biochemistry and Physiology. Both are driven by continuous refinement of basic understanding of metabolism, physiology, cellular biology (growth, division, differentiation), and the development of new mathematical modeling techniques.

We hope that, even if our aim is minimally attained, then those who have read the book will feel stimulated enough to engage in the field to themselves make new contributions.

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