

## Comprehensive Biotechnology

Murray Moo-Young, Editor-in-Chief, Pergamon Press, Oxford, 1985, 4-volume set, \$995

### Volume 1—The Principles of Biotechnology: Scientific Fundamentals

Edited by Alan T. Bull and Howard Dalton, 688 pp.

Comprehensive Biotechnology is a four volume treatise that sets out to cover the principles, methods and application of biotechnology. This series predominantly reflects mainstream industrial biotechnology. Plant and medical biotechnology are considered briefly. Volume I addresses "Scientific Principles" in two sections: Biology/Genetics and Chemistry/Biochemistry. The introduction to microbes (plus animal and plant cells—Chap. 16) is succinctly presented in the first 50 pages. Even in this condensed manner (which is representative of the whole text), considerable detail is evident. Thus the engineer is introduced to such selective isolation tricks as the use of snakeskin as a bait. The microbiologist is once again reminded of the attributes of continuous culture for selection, while noting the consortial nature of the resultant population. An entire chapter addresses the importance of storing cultures. The limitations of the well-known storage method of "throw the culture in the back of the refrigerator" are clearly illustrated. The "care" of microbes is further addressed through Chapters 7–16. There is a balanced (bacterial/fungal) selection of topics on growth—modes, dynamics, stoichiometry, and effects of the environment. Additional chapters discuss such critical topics (often given short shrift) as microbial nutrition, design of fermentation media and the aging and death of microbes. The final chapter in the Biology section addresses mixed cultures. This is particularly timely, especially as most fermentation engineers tend to behave as monocultural ecologists, while practical systems such as waste treatment plants are somewhat more complex. Genetic methodologies, perhaps misplaced as early chapters 5 and 6, are succinct, current reviews.

The second section addresses chemical and biochemical fundamentals. It is comprised of a series of ten erudite essays of the physiology of the "industrial cell," plus four chapters elucidating enzymes from kinetics to evolution, and finally two key chapters on the regulatory aspects of metabolite synthesis. The chapters on fatty acid and metabolite biosynthesis, aromatic metabolism, photosynthesis and enzymes are replete with figures, diagrams and tables.

One can quibble with certain features of the text. For instance, including a diagrammatic outline of the interrelationships between the bacterial groups plus a few photographs of microbes would give the neophyte a better perspective of the microbial kingdom; the microscope appears to have fallen from favor in biotechnology. The discussions on genetics, though excellent, gloss over the structure of DNA and can perhaps leave the engineer in somewhat of a vacuum. There are occasional lapses such as the poor illustrative choice of transposon-like structures (p. 66), and statements such as "we have designed a medium for the expression of all clones of a genetically altered population" (p. 41) have little merit without further quantitative definition. However, these are quibbles.

The editorial/advisory board has exerted a strong influence on the text with resultant short focussed chapters of high quality. Duplication of material is essentially non-existent. Volume I of Comprehensive Biotechnology is an excellent balanced presentation of the principles of biotechnology and will indeed serve the intended audience from microbiologist to engineer. It is highly recommended. It is also suggested reading for the myopic British Government, which continues to cut university research programs; Volume I includes presentations by twenty-three British authors, and biotechnology is a rapidly advancing discipline which demands financial support.

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### Volume 2—The Principles of Biotechnology: Engineering Considerations

Edited by Arthur E. Humphrey and Charles L. Cooney, 632 pp.

Volume 2 of "Comprehensive Biotechnology" is addressed to chemical and biochemical engineers who require information on mass and energy balances, rates of such processes as fermentations, product recovery and feedstock pretreatment, and the equipment to carry out these processes. On the whole, the editors have achieved this goal.

This book is divided into two sections. Section 1 describes bioreactor design, operation, and control in thirteen chapters (229 pages); these include an excellent review of transport phenomena in bioprocesses, (primarily covering oxygen transfer in fermentors), stirred tank fermentor design and scale-up, tubular bioreactors and imperfectly mixed stirred tanks, non-mechanically agitated bioreactors with power input by liquid kinetic energy and by gas compression, dynamic modelling of fermentation systems, instrumentation and process control in bioreactors, data analysis, and cell and enzyme immobilization techniques. Section 2 has 24 chapters (358 pages) on upstream and downstream processing. Upstream operations include gas compression, air filtration, media sterilization, and heat management. Downstream operations include material handling, cell rupture, centrifugation, broth filtration, microfiltration and ultrafiltration, solvent extraction, aqueous two-phase extraction, ion exchange for antibiotics and proteins, molecular sieve chromatography, affinity chromatography, hydrophobic chromatography, HPLC, distillation, supercritical gas extraction, and electrodialysis.

Each chapter is written by one to three contributors, most of whom are well known experts in their fields. Therefore, this book will serve as an excellent reference for bioprocess engineers. With so many authors, however, the quality and depth of the articles is somewhat uneven. Occasionally material overlaps, for exam-