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Book reviews

Kevin J. Yarema (Ed.), Handbook of Carbohydrate Engineering, CRC Press, Taylor and Francis Group, Boca Raton, FL, USA 2005 (xxiii + 904 pp., £115.00, ISBN 1-57444-472-7)

Built from the association of monosaccharide units into linear or branched biopolymers, carbohydrates are essential components of living cells. The enormous structural diversity of carbohydrates makes their study a vast and daunting enterprise requiring the integration of many scientific disciplines. Carbohydrate engineering refers to the study of carbohydrates and their biosynthetic processes for the amelioration of their existing applications and the search of novel ones. Aspects of basic biology, synthetic chemistry, enzymology, modeling and complex instrumentation are involved in carbohydrate production. Theoretical and technical knowledge covering all these areas is necessary to overcome the challenging complexity of carbohydrates and their glycosylation processes as well as widen the scope of their potential utilisations. Current application areas of carbohydrates engineering comprise biomedicine, environmental remediation, food technology and agriculture.

The *Handbook of Carbohydrate Engineering* aims both at giving carbohydrate engineers an overview of the tools available and at detailing more technical information for specialists of the field. The 29 chapters contributed by 77 international experts cover a broad range of subjects, from glycosylation mechanisms in mammalian, insect, bacterial or plant cells to the exploitation of cell metabolism for the production of carbohydrates with desired properties. Cell-free enzymatic methods for oligosaccharide preparation and traditional chemical synthesis are also discussed, along with the increasingly popular semi-synthetic techniques that combine the use of organic chemistry with recombinant enzymes and nucleotide sugar donors. Methods for isolation, purification and characterization of carbohydrates are described, including two-dimension gel electrophoresis, HPLC analysis, nuclear magnetic resonance and mass spectrometry. Although environmental, agricultural or industrial applications are discussed, many chapters focus on the role of carbohydrates in health and disease and their consequent importance in biomedicine (antibody and tissue engineering, vaccine development, drug and gene delivery). Biological functions of various carbohydrates are reviewed; mammalian glycoproteins and their N-linked oligosaccharides are thoroughly detailed, along with sialic acid and glycolipids.

Well-illustrated and documented, this volume covers many aspects of interest for current and future research methodologies. Because it provides background information for the characterization and synthesis of carbohydrates it can be recommended to non-specialised readers. Experts of the glycobiology field can also pore over the mine of results collected from chemists, biologists and chemical engineers and investigate further the issues discussed using the references listed at the end of every chapter. In other words, this book should soon find its place in every carbohydrate engineering laboratory.

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Susanne Brakmann and Andreas Schwienhorst, editors. Evolutionary Methods in Biotechnology (2004, Wiley-VCH Verlag GmbH, Weinheim, Germany) (xiii+214pp., ISBN 3-527-30799-0 (€129.00))

During the past decade, bioscience laboratories have benefited from a new range of methods originating from the Darwin evolution principles. The evolutionary approach has enabled scientists to quickly identify molecules with the desired properties, thus obtaining results where other methods had failed. *Evolutionary Methods in Biotechnology* reviews the evolutionary-based tools nowadays available in this interdisciplinary research area. Designed as an inspirational starting point for scientists to develop their own variations around the methodologies discussed, this textbook provides a collection of detailed protocols with a strong orientation towards practical matters. Written in a simple yet accurate style, it can be easily read by all laboratory staff, from students and technicians to senior specialists.

The 13 chapters have been arranged to reflect the steps of a standard evolution-directed experiment. After an introductory chapter, chapter 2 focuses on the methods available to generate molecular diversity and build mutant libraries. It particularly discusses mutagenesis PCR and mutator strain passage. Chapters 3 and 4 deal with in vitro recombination and describe