Book Reviews

Synthetic Multivalent Molecules: Concepts and Biomedical Applications. By Seok-Ki Choi. Wiley-Interscience, Hoboken, NJ. 2004. xxvi + 418 pp. 16 × 24 cm. ISBN 0471563471. $99.95.

The study of synthetic multivalent molecules is a field relatively unfamiliar to most medicinal chemists. It has emerged over the past 15 years and is a concept that provides a strategy for designing ligands and drugs that influence biological systems potently and selectively. It is particularly focused on functional roles and unique and crucial activities at a level not readily achievable by monovalent molecules. The simplest example of "structural valency" is a divalent molecule (ligand). This may be represented as a molecule with two tethered (i.e., held together by an appropriate linker) identical copies of binding elements such as a ligand. Likewise, "functional valency" represents the number of tethered ligands that are functionally interactive. The basic thesis is to take a "monovalent molecule" and, via a linker, attach a number of these together to form a multivalent system that may have improved potency and selectivity when compared with the corresponding monovalent entity. The author has endeavored to provide both basic and advanced principles underlying multivalent interactions prevalent in biological systems and to include a systematic summary of experimentally tested case studies of multivalency. The concept applies to all areas of receptor interaction, from complex carbohydrates to proteins to GPCRs and vaccines.

The book is divided into five chapters. Chapter 1 introduces the concept of multivalent molecules and the mechanistic basis that accounts for the benefits of multivalent interaction and of the biological function displayed. Chapter 2 provides practical examples for biological targets in viral systems, and Chapters 3 and 4 focus on biological targets in bacterial and mammalian cells.

The organization of these chapters is similar in that they deal initially with design concept, synthesis, and biological activity. Chapter 5 addresses the various methodologies employed in the synthesis of multivalent molecules, including structure-based linker chemistry and combinatorial chemistry technologies.

Overall, the book is a fine attempt to provide in one volume all of the various aspects of this emerging field, and it presents a wealth of information on topics that are difficult to find elsewhere. The book is well organized, and it provides a wealth of reference material. However, it is not an "easy read", and as far as I could determine, none of the structures presented would fit the "rules of five" that are currently the guiding principles for most medicinal chemists. This is a worthwhile reference book for those scientists interested in new developments in the molecular interactions of a wide range of ligands and potential drugs.

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Introduction to Enzyme and Coenzyme Chemistry. Second Edition. By T. D. H. Bugg. Blackwell Publishing, Oxford, U.K. x + 304 pp. 17.5 × 24 cm. ISBN 1-4051-1452-5. $75.00.

In this book, the author sets out to explain enzymes and coenzymes from the perspective of organic chemistry. There are numerous chemical reaction schemes illustrating mechanisms of the catalyzed reactions.

The first 80 pages are given to introductory material: basics of protein structure, catalysis, kinetics, stereospecificity, transition states, and active sites. The next six chapters discuss major classes of enzymes: hydrolases, oxidases/reductases, carbon−carbon bond formers, addition/elimination enzymes, amino acid transformation enzymes, and isomerases. Finally, there are new chapters on radicals in enzyme catalysis and on nonenzymatic biocatalysts such as ribozymes and catalytic antibodies. Each chapter has an excellent list of further readings, arranged by topic. Most chapters also have a set of problems with answers provided in an appendix.

The figures were extensively revised from those of the previous edition. Pictures are now in two colors (red and black). These figures are still disappointing—the black portions utilize a range of gray scale, but the red is solid. It would seem that protein structures cry out for full color, but that might have priced the volume completely out of reach for many. The author generated all of the protein structure figures with RasMol (free software that runs on many kinds of computers), and Protein Data Bank codes are included for all of the structures. Presumably, the reader can simply download RasMol and the structure and have a full-color interactive figure at hand while reading the book.

The writing style is quite clear, making the book very suitable as an introductory text for students or to newcomers to the field. A pleasant aspect of the book is the inclusion of some history of enzyme and coenzyme discovery.

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