

double bond! At another place, the author shows H^+ as H. These occurrences are not rare and may be the result of poor editing or lack thereof. The book is appallingly typeset; with completely out-of-shape tetrahedral carbons and benzene rings. The diagrams manage to thoroughly confuse the reader between resonance and equilibrium structures. A copious number of disproportionate molecules, with a tertiary butyl group being smaller than H-atom or methyl group, are part of the book. The line structures add to some more confusion by not indicating the end-points as H-atoms, especially when the author discusses conformations and other important stereochemistry descriptions. On more than one occasion the alcohol groups are connected to the parent chain through a hydrogen atom and the oxygens become monovalent! Also, the author mixes up diastereomeric excesses with enantiomeric excesses.

The book costs Rs 570, which is almost similar to that of Indian editions of many standard organic chemistry books. The book definitely does not offer any price advantage for the reader nor does it make his organic chemistry concepts better. Also, there are no end-of-chapter questions. All said and done, the book is tailor-made to suit University and caters to the needs of an entrance exam for the students. The author is partially successful in his attempt of presenting a 'packaged' organic chemistry book, where it is convenient to find everything in one place. The indexing at the end of the book is exhaustive and well organized into sections, thereby making it easy for the readers to jump to the right page. With all these considerations in mind, the reviewers feel that this is just another book in the market and hope that subsequent 'editions' are indeed edited before publication.

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Medicinal and Pharmaceutical Chemistry. Harkishan Singh and V. K. Kapoor. Vallabh Prakashan, C-5, SMA Cooperative Industrial Estate, GT Karnal Road, Delhi 110 033. 2012. 1854 pp.

This book is now a well-accepted classic textbook for pharmacy students. Rapid scientific advances and continuous 'introduction' of new drugs are special feature of pharmaceutical sciences. It is creditable that the authors are regularly updating the text and this book is a thoroughly revised third edition (2012). Many important new advances in therapeutics are coming through biotechnology. It is an appropriate that the authors have added a chapter on 'biotechnologically derived drugs', introducing the students to the essentials of this fast-emerging new field of therapeutics. The other special features of the book include chapters on 'chemical naming and graphics of organic drugs' and 'International nonproprietary names (INN's)' (chapters 2 and 3). Knowledge of chemical naming is important, as it provides the key to the chemical structure and structural interconnectivity of drugs of different classes. This chapter also describes three-letter and one-letter symbols used for each amino acid in naming polypeptides which are not commonly available in chemistry books, but are much needed for pharmacy students. Similarly, the INNs are useful to know the 'medicinal' interconnectivity of drugs, and their therapeutic usage. These chapters would prove instructive and educative to the students. The next two chapters elaborate the basics of drug action, highlighting the physico-chemical features of drugs which determine their permeability across the membranes, and describe different types of chemical bonding which determines inter-molecular interactions in drug-receptor and enzyme-substrate interactions, and processes of pharmacokinetics and excretion of drugs, together abbreviated as ADME. With these basics of drug action well understood, the students will have a better comprehension of the action of various classes of drugs. The chapters that follow present a comprehensive overview of the design, structure-activity relationship studies and development of the different classes of drugs, with a focus on drugs official in Indian and the British Pharmacopoeia, also briefly describing the essentials of their commonly used syn-

thesis or methods of preparation and the pharmacopoeial specifications. The text ends with two appendices covering 'Glossary of medical terms' and 'glossary of terms used in medicinal chemistry'. This will be of great benefit not only to students, but general readers. With this coverage, the book will no doubt serve as an important resource for study of the subject.

There are a few omissions in the book, which if added would enhance its value: (a) A chapter on 'Drug design, QSAR and molecular modeling' should be included because these topics are now a part of the B Pharm and M Pharm syllabus throughout the country. (b) A chapter on 'traditional systems of medicine and medicinal chemistry', covering the contribution of 'natural products to medicinal chemistry'. One of India's important assets for healthcare has been the availability of the traditional systems of medicine, which are still largely practised. This chapter would provide the students with a good historical perspective, expose them to the science behind the traditional systems, and also help in integrating the use of modern and traditional systems of medicine, if necessary. (c) The coverage of 'synthetic antibacterials' should be largely expanded beyond the coverage in chapters on 'sulfonamides' and 'antimycobacterial agents'. India continues to be a big reservoir of infectious bacterial diseases, with the serious problem of drug resistance, and students must be fully exposed to these. It would be good to rename the chapter on 'quinolones and urinary tract antiseptics' to 'synthetic anti-bacterials'; the present title gives the wrong impression that quinolones are used mainly or only for urinary tract infections, while they have a much broader therapeutic coverage. This chapter must cover quinolones, oxazolidinones, nitrofurans and some less commonly used antibacterials like hexamine, and some more recently synthesized quinolone-oxazolidinone hybrids. Covering oxazolidinones is especially important as this is the only new class of antibacterials discovered and introduced in clinical use since the introduction of quinolones, with linezolid as a commonly used drug of this class. (d) The anti-tuberculosis drugs in chapter 37, 'antimycobacterial agents' are referred in the text as anti-tubercular drugs, which is not correct; tubercular pertains to tissue components resembling tubercles or nodules; the

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medical dictionary also states 'tubercular sometimes is incorrectly used as synonymous with tuberculous'.

There are a few corrections to be made in the book: (a) In chapter 2, from page 3 onwards, while listing the drugs belonging to different ring systems, the heading for the two columns is given for some tables and not for others, which leads to confusion in presentation. This needs to be presented uniformly. (b) There are some slips in chapter 47, 'Biotechnologically derived drugs'. On p. 790, thymine should be shifted from purine bases to pyrimidine bases; uridine should be corrected to deoxyuridine both in the nucleoside and nucleotide structures; in the nucleotide the phosphate is not commonly shown in the ionized form.

Let me end by saying that reading this book has been an enjoyable experience for me. Harkishan Singh the 'Pharmacy Historian' becomes visible at many points and makes the book a classic to read. How vitamins were rechristened to vitamins – as non-amines, I learnt from this book (p. 691). V. K. Kapoor an expert in graphics shows up all the time in his beautiful presentation of the structural formulae, which are like jewels for a book based on chemical structures.

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Annual Review of Cell and Developmental Biology, 2012. Randy Schekman, Larry S. B. Goldstein and Ruth Lehmann (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 28. xiii + 797 pp. Price: US\$ 94.

This volume has 27 reviews, most of which cover broad areas in cell and developmental biology while few are more specialized. A salient feature in almost all the reviews is the presence of excellent graphics that summarize important aspects of the review. This volume begins with reflections on the life and legacy of George Palade, who is considered as the father of cell biology. Palade together with his collaborators, made crucial contributions to the development

of cell biology. The article provides interesting insights into the career of Palade and his work on delineating the secretory pathway in eukaryotic cells.

Recent reports indicate that many metabolic enzymes self-assemble to form large intracellular bodies. Apart from reviewing how and why such structures are formed, O'Connell *et al.* also speculate on models for how these structures form and their functional roles. Excellent illustrations of some higher-order structures within cells give a better perspective of the problem. The review by Levy and Heald on the mechanism of intracellular scaling summarizes cell and organelle size relationships. It also dwells upon experimental approaches to the study of scaling. In the conclusion section, the authors outline how knowledge of intracellular scaling will help in understanding cell physiology and development.

A set of intracellular protein complexes that enable autocatalytic activation of inflammatory caspases is referred to as inflammasomes. Aspects of pathogen recognition, inflammasome composition, structure and various features of its activation are described in the review by Lamkanfi and Dixit. The illustrations give useful insights into the domain architecture of inflammasome components, structure and models for inflammasome activation. The figure on how virulence factors modulate inflammasome signalling is a succinct summary of the events. The authors hope the clinical translation of newer aspects could help in unearthing novel targets for therapies.

The fluid-mosaic model for the plasma membrane proposed by Singer and Nicolson in 1972, has been the starting point for research in membrane biology. Advances in this area over the years have led to a thorough understanding of plasma membrane structure not only as a scaffold, but also in signal transduction and membrane dynamics. These aspects are reviewed by Kusumi and co-workers. The authors outline a model for the plasma membrane as perceived today. The use of single-molecule spectroscopy in the study of membrane dynamics is described in detail.

The unfolded protein response refers to a network of intracellular signalling pathways that maintain protein folding capacity of the endoplasmic reticulum (ER) in eukaryotic cells. Korennykh and

Walter describe how unfolded proteins are detected in the lumen of ER. Control of the unfolded protein response by sensors is explained. The emphasis is on structural and mechanistic aspects of protein complexes involved in the process. Rizo and Südhof review the role of sec1/munc18 proteins in membrane fusion. Since structures of many of these proteins are known, their action in terms of structure is discussed extensively.

Clathrin has been extensively studied for a large number of years. Brodsky addresses clathrin function beyond conventional receptor-mediated endocytosis. The links between clathrin function and human health and disease are highlighted. Future issues related to newer aspects of function are discussed.

Hanson and Cashikar review the cellular function of multivesicular bodies (MVB), which are organelles in the endocytosis pathway. It covers aspects of how endosomal sorting complexes required for transport, contribute to MVB morphogenesis. The complex protein-protein interactions involving endosomal sorting complexes required for transport (ESCRT) are shown. The link to various human diseases such as cancer, as well as neurodegenerative diseases such as Alzheimer's and Parkinson's is discussed.

Cellular behaviour beyond homeostatic framework is reviewed by Fredolino and Tavazoie. Examples include predictive behaviour of *Escherichia coli* upon transition into host gastrointestinal tract and sequential stresses in *Saccharomyces cerevisiae* during wine-making. The review would be of interest to researchers who design and study cell-environment interactions. The references are annotated, which gives a good perspective to those who are unfamiliar with the area.

Lipid droplets (LD) are storage organelles in eukaryotic cells and perform functions other than passive lipid storage. Saka and Valdivia review the role of LD in immunity and host-pathogen interactions, and current status of LD research. The authors are of the opinion that LD cell biology and links with immune responses should lead to newer insights.

The second messenger bis-(3'-5)-cyclic dimeric guanosine monophosphate (c-di-GMP) is important for the control of different aspects of bacterial physiology. Three newly characterized c-di-GMP effector systems are reviewed by