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Book Reviews

Cell Culture Models of Biological Barriers. *In-Vitro* Test Systems for Drug Absorption and Delivery. Claus-Michael Lehr, Ed. Taylor & Francis Inc., New York, NY. www.tandf.co.uk, 2002. 427 pp. $120.00.

This volume is intended to provide a resource for the pharmaceutical scientist who is not necessarily an expert in cell culture techniques to understand how to establish cell culture models of barrier tissues and to analyze data obtained from such models. Given the increasing cost, duration, and complexity of drug absorption and targeting studies conducted in animal models, pharmaceutical scientists are increasingly relying on a host of cell culture models that are able to recapitulate the absorptive and metabolic properties found in the intact organ. Although advantageous in many ways, these models also exhibit a number of limitations relative to whole animal or tissue explant models, topics that are extensively addressed in this volume. Moreover, issues related to standardization, high-throughput applications, and regulatory acceptance are also detailed, features particularly valuable for the pharmaceutical scientist that are often neglected in publications directed to a more biological audience. The volume is divided into three sections: Part I considers general features of epithelial cell and tissue culture, Part 2 describes different models for epithelial and endothelial barriers relevant to drug delivery, and Part 3 details emerging technologies and tools for evaluation barrier function and transport properties. Highlights and a few criticisms of this generally well-written and useful compendium are described below.

The initial chapter, by Lee Campbell and Mark Gumbleton, provides a nice overview of the organization and constituents of cells with particular details regarding membrane composition and biochemistry and the definitions of primary versus cultured cells. These authors also provide an additional practical analysis regarding enrichment/synchronization of cells in different states of the cell cycle, an issue directly relevant to analysis of pharmaceutical agents that may affect particular steps of the cell cycle. The importance of maintenance of a differentiated phenotype, introduced here, is extended in the second chapter by Eisenblätter and coworkers, which discusses the major constituents of culture medium and extracellular matrix within the context of maintenance of distinct differentiated phenotypes. Eisenblätter and coworkers illustrate the importance of paying attention to the finer points of media composition by comparing and contrasting the essential components of medium responsible for maintaining a differentiated phenotype in culture for cells responsible for maintaining the blood–brain barrier (endothelial cells) and the blood–cerebrospinal barrier (epithelial cells). Subsequent chapters by Kwang-Jin Kim and Josef Tukker describe the characterization of epithelial bioelectric and transport properties, respectively. Another valuable chapter in Part 1 by Laurie Withington that is of particular relevance to the industrial scientist analyzes the utility of high-throughput epithelial cell culture systems for screening drug intestinal permeability, focusing on the human intestinal epithelial cell line, Caco-2. Although I found the first section of the book generally useful and accessible, there were some gaps in the information presented that, if included, would have made this section more accessible to scientists not as versed in cell biology. For instance, a volume on cell culture of barrier tissue models might logically be expected to start with a more physiological introduction to the organization of cells in barrier tissue, including orientation of absorptive (apical) and interstitial (basolateral) surfaces (with diagrams included), the organization of junctional components within cells, the mechanisms of transport into, through and between cells, and so on. This would serve to get all readers on the same page and provide a framework for the subsequent chapters. Although much of this information is sprinkled throughout Part I, it is not consolidated in a single initial chapter, which would have been useful particularly for the nonbiologist approaching this volume.

Part 2 provides a series of detailed evaluations of the application of different cell culture systems, derived both from cultured cell lines and primary cell cultures. These chapters comprise the most valuable stand-alone feature of the volume, providing a series of primers that include potential applications and practical guidelines for conducting transport studies in a variety of models. The epithelial barrier models considered include cell culture and excised tissue models of intestinal, alveolar and bronchial, nasal, buccal, dermal, corneal and conjunctival epithelium. Additionally, various cell line and culture models are introduced which reconstitute blood-brain barrier transport properties, with additional chapters devoted to models of blood-retinal and blood-placental barriers. Most of these chapters provide a thorough analysis of the physiological properties of the barrier tissue, sample protocols for generation and maintenance of the culture, important quality control issues and sample analysis protocols. Together these chapters provide invaluable information for the pharmaceutical scientist interested in drug transport through a particular barrier tissue or in evaluation of the limitations and advantages associated with drug transport in a variety of barrier tissues.

Part 3 addresses issues related to analysis of transport through barrier tissue, using new computational and imaging tools. The chapter by Michael Bolger and coworkers provides an accessible yet state-of-the-art discussion of the advantages and limitations of current methods used for computational prediction of drug absorption. The remainder of Part 3 is devoted to applications of imaging methods to biological barriers, including chapters on confocal and multiphoton fluorescence microscopy, scanning or atomic force microscopy and fluorescence correlation microscopy. The chapter on atomic force microscopy is particularly useful as an introduction to this technique, blending principles and applications nicely for the nonexpert. Although sufficient in terms of basic information, the chapter on confocal and multiphoton microscopy was somewhat limited regarding the discussion of applications and troubleshooting, especially since these techniques are already currently applied to barrier tissue models in many laboratories.

In general, the chapters throughout the volume are fairly well integrated. In some cases, however, information is reiterated in different forms throughout the book; for instance, many chapters are initiated by a similar paragraph or two discussing the organization and function of epithelial tight junctions. This is useful for the reader who wants to select a few key chapters to address a discrete research problem in the laboratory and needs to be reminded of these features. However, it is redundant for readers who wish to use the entire volume as a crash course in barrier cell culture. A few chapters sprinkled throughout the book also indicate disproportionate importance of topics relative to other areas in the field that were un- or underrepresented in the volume. For instance, a short chapter by Josef Tukker considers the mechanisms responsible for transport in barrier tissues, including paracellular, transcellular, carrier-mediated, active transport, and receptor-mediated transport processes. Yet, an entire chapter by Michael Wirth and colleagues is devoted to the cellular binding and uptake of bioadhesive lectins. Although interesting and relevant to the subfield of bioadhesive drug delivery, it seems inappropriate to provide equal billing of this topic next to a chapter considering all other mechanisms of transport for biological molecules across barrier tissues. To more appropriately relate these topics to the overall area of drug targeting in barrier tissue, additional chapters on up-and-coming strategies for drug targeting of other types of macromolecules or using other transport pathways would have been more appropriate.

Overall, the major strengths of this volume lie in the comprehensive description of different culture models of biological barriers (Part 2), with additional value added by the useful but certainly not comprehensive sections detailing cell culture principles and analysis of transport properties in Parts 1 and 3, respectively. This volume will meet its stated goal of serving as a valuable resource for pharmaceutical scientists engaged in aspects of drug transport research who need to evaluate transport properties (in practice or on paper) in one or more of the physiological systems listed here and would like to extend their area of expertise into the cell culture arena.

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Platelet Glycoprotein IIb/IIIa Inhibitors in Cardiovascular Disease. Second Edn. A. Michael Lincoff, Ed. Humana Press, Totowa, NJ. www.humanapress.com. 2003. 476 pp. $149.50.

Thrombosis is a critical component to survival. Uncontrolled blood loss from damaged vessels is the basis for several horrific genetic diseases known generically as hemophilia. A much larger concern, in terms of affected individuals and impact on health services, is the opposite—an overly active progression of thrombosis in vessels unrelated to bleeding. Cardiovascular disease, with its root cause of vessels occluded by thrombi, is one of the current leading causes of morbidity and mortality. It seems strange that one of the most basic functions of the body, critical for its survival, can also wreak such havoc. What has become clear in the last several decades, from a wide range of inter-related studies, is that the events of thrombosis are poised to occur and that many factors can initiate a cascade of biochemical and physical events that results in the formation of a blood clot. From a teleological perspective, this makes sense; bleeding events are unanticipated and must be dealt with immediately for survival. There appear to be a wide range of stimuli can activate the events of thrombi formation but relatively few systems in place to keep the activation of clot formation in check—poising the events of thrombi formation at the edge of activation. Thus, the events of unwanted thrombi formation can be considered as a loss of balance in a system already positioned to fall in the direction of activation.

One blood component, the platelet, acts in a central, leading role on the stage of thrombi formation. It is this anuclear cell fragment derived from megakaryocytes that is affected by and acts to affect soluble and cellular components that regulate blood clot formation. Signals that stimulate events of clot formation induce the expression of a protein complex known as IIb/IIIa on the surface of platelets. Platelet aggregation then ensues through the binding of the IIb/IIIa complex to a large assortment of proteins that include fibrinogen, von Willebrand factor, fibronectin, vitronectin, and thrombospondin. These various factors are expressed on the surfaces of cells exposed through tissue damage or released at sites of trauma. Thus, the IIb/IIIa complex appears to play a central role in thrombotic function of platelets and thus should be an ideal site of therapeutic intervention. Here is where the recent book entitled *Platelet Glycoprotein IIb/IIIa Inhibitors in Cardiovascular Disease* enters the discussion. This book, edited by A. Michael Lincoff, presents a series of excellent chapters, written by respected experts, on essentially every aspect of thought pertaining to IIb/IIIa biology. The book is organized to take the reader through a series of introductory chapters that provide the basis for subsequent chapters on development and clinical testing of IIb/IIIa antagonists.

This text is a second edition; the first was published in 1999. This second editions is actually what it is claimed to be in the preface: a compilation that represents the "state of the art" in this field. There is little that I see lacking in this text. It represents a complete package of recent data and current thought on therapeutic approaches that target IIb/IIIa function. Even to someone who does not work in this field, it is obvious that this text provides a single source for information on the current status and thought on IIb/IIIa antagonists. As a compiled source for so much information it was easy to compare clinical trial approaches and outcomes as well as to identify future applications for the use of IIb/IIIa antagonists and methods to deal with unwanted side-effects associated with their use.

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Cardiac Drug Development Guide. Michael K. Pugsley, Ed. Humana Press, Totowa, NJ. www.humanapress.com. 2003. 431 pp. $150.00.

When I was asked to review this book I thought the book would discuss the development of cardiac drugs, from preclinical to clinical, reviewing the regulatory aspects, go/no-go decision points, design of clinical trials, etc. That is not what this book is about. This book might have been more accurately titled something like *Progress in Basic and Clinical Science in Cardiac Pharmacology* as the focus of the book is the current state of molecular biology, physiology, biochemistry, and clinical aspects of cardiac drugs.

The book is broken into four sections, an introduction, a section on novel molecular targets, a section on functional endpoints for evaluating drug effect, and then clinical aspects. All total there are 20 chapters from 37 different authors. The chapters were mostly well written and organized. I felt, however, some notable material was missing. Given the emphasis that regulatory authorities are currently placing on prolonged QT (a measure of the time interval from the start of cardiac depolarization to the end repolarization) intervals I would have expected something on this topic. There was one chapter devoted to long QT syndrome, but the focus was on the genetics of the disorder. Related to this would have been material on including electrocardiograms in clinical trials; when should over-reads be performed, how should blinding be done, etc. I also found it disconcerting that there was no attempt to integrate the material into the drug development process. For example, of all the biochemical mediators of ventricular arrhythmias listed in Chapter 11, should any of these be used as a safety marker in clinical trials? And if so, how often should they be measured? How the advances presented in the book can actually be used in cardiac drug development, specifically clinical drug development, is barely touched upon. Application of the advances to drug development would be a welcome feature. This book would be useful for basic pharmacologists in the area of cardiac drugs. This book may also be of interest to a clinician wishing to learn more about the basic science and state of the art in cardiac drug pharmacology. Addressing how to apply the advances in cardiac pharmacology to drug development would have broadened the appeal of this text.

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Generation of cDNA Libraries. Methods and Protocols. Shao-Yao Ying, Ed. (Methods in Molecular Biology, Volume 221). Humana Press, Totowa, NJ. www.humanapress.com. 2003. 335 pp. $99.50.

This book provides a wide variety of detailed methods for the generation of complete and full-length cDNA libraries. The topics include the basics of generating cDNA libraries, amplification of 5′- and 3~-ends of cDNA, construction of cDNA library, quality assessment of cDNA library, the future use of cDNA library in basic research and clinical application. Each chapter focuses on one specific topic and covers background information, step-by-step protocols and operational tips. Most of the chapters have a schematic figure to illustrate the principle and the procedure, which makes the book easy to read. The authors are experts, that have developed or routinely performed the methodologies. The information covered by this book is advanced. This book can serve as a useful reference for laboratories, that are involved in gene expression, gene regulation and general molecular biology.

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Crystal Design: Structure and Function. Gautam R. Desiraju, Ed. (Perspectives in Supramolecular Chemistry, Volume 7). John Wiley & Sons, West Sussex, England, www.wiley.com. 2003. 408 pp. $265.00.

As one can expect from the title, this book is about establishing connections between crystal structures of molecules and their functions. In the book, a crystal structure is considered not as a simple aggregate of unit cells, but as a supramolecular entity. Interactions existing within a crystal structure are analyzed in the perspective of a network. The corresponding crystal properties are not only based on the unit cell structure, but also based on the supramolecular entity, especially the network of various interactions. This book strengthens our understanding on crystal polymorphism and provides a bridge between solid-state chemistry and molecular crystal engineering. Thus, it is useful not only for material engineers, but also for scientists in the field of pharmaceutical product development.

Hydrogen bonding plays a very important role in some crystal materials, and it also has been used in crystal design. Chapter 1 reviews several types of hydrogen bonding in inorganic crystals, and discusses a few examples of crystal design utilizing hydrogen bonding. Chapter 2 reviews hydrogen bonding between amidic type NH and carbonyl type O atoms, as well as their effects on molecular recognition and self-assembly between amines and alcohols. it is noted that, in proteins and polypeptides, the hydrogen bonding is important in the biologically relevant assemblies. Chapter 3 introduces how small molecules form supramolecular capsules based on hydrogen bonding interactions, and emphasizes that the approach is based on self-assembly rather than covalent bonding interactions.

Chapters 4–7 describe how to design one-, two-, and three-dimensional crystal structures base on different approaches and to achieve different properties. Chapter 4 introduces crystal supramolecular structures built from tectons, molecules capable of mutual recognition. Several frequently used recognition types have been briefly illustrated, such as recognition between complementary tectons, recognition of a guest molecule by a host receptor. Chapter 5 reviews two-dimensional crystal networks formed by polymers together with transition metal atoms. Chapter 6 introduces organic-inorganic hybrid materials, and their crystal structure design. Chapter 7 reviews self-assembly of some magnetic materials,

and the use of crystal design for achieving desired molecular magnetism, a supramolecular property. Even though these chapters are not relevant to pharmaceutical R&D, they are still interesting topics to read about.

Crystal polymorphism has been a hot research area in the pharmaceutical field, and widely studied from different angles. Chapter 8 describes how different aggregation processes of molecular units via recognition step induce crystal polymorphism. This chapter also reviews definitions on polymorphism, different polymorph transformation mechanisms, methods of inducing polymorphs (such as seeding, heteromolecular seeding, desolvation and mechanical stress), and methods of crystal polymorphism investigation. Overall, this is a challenging book to read, and the pharmaceutical scientists dealing with polymorphism will certainly enjoy this book.

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Protecting America's Health. The FDA, Business, and One Hundred Years of Regulation. Philip J. Hilts. Alfred A. Knopf, New York, NY. www.aaknopf.com. 2003. 394 pp. $26.95.

A History of Nonprescription Product Regulation. W. Steven Pray. Pharmaceutical Products Press, Binghamton, NY. www.HaworthPress.com. 2003. 279 pp. $39.95.

Two days before the Thanksgiving Day in November 2003, Congress sent President Bush historic Medicare legislation that introduces a new prescription drug benefit and a controversial provision that private firms can sell health insurance coverage to 40 million Medicare beneficiaries. These free market-style changes can be viewed as a greater degree of privatization by the proponents, but as a giveaway to insurers and prescription drug manufacturers by the opponents of the bill. The opponents are quick to point out that, under the new bill, the government will not be able to bargain with the prescription drug makers, prescription drugs cannot be reimported into the United States from Canada, and the competition by the generic manufacturers against the prescription drug makers will remain weak. The bill, at least on the surface, appears to be written for the interests of selected groups over others. There must be many stories on how the final bill was drafted, and it will take time to hear all of them. Whatever the stories may be, the politics behind the Medicare Bill may not be any different from those on other previous legislations.

The two books, *Protecting America's Health (America's Health)* and *A History of Nonprescription Product Regulation (Nonprescription Product)* provide detailed accounts on how the regulation on drug safety and efficacy has been developed and how the current FDA has become an institution guarding the safety of the public. *Nonprescription Product* focuses on chronological accounts of all federal regulations on nonprescription drugs, and reading this book first makes it easier to follow all the tales and anecdotes described in *America's Health,* which describes the evolution of the FDA through the struggles and triumphs of the FDA commissioners exposed to different political environments.

There has been few landmark legislation in the history of the food and drug regulation, and they are: the 1906 Pure Food and Drug Act, which established the inspection and approval process before marketing for ensuring safety and preventing fraud; the 1938 Federal Food, Drug, and Cosmetic Act requiring scientific proof of safety prior to marketing, thus, providing the framework for the drug development process; and the 1962 Kefauver-Harris Amendments, which required proof of safety and effectiveness consisting of "adequate and well-controlled" scientific experiments conducted by "experts qualified by scientific training." In retrospect, passing such laws should have been supported unanimously regardless of political orientation for the good of the public, but the laws were not passed until innocent people died unnecessarily causing the public outcry. The Congress acted swiftly for the 1938 Act only after disastrous incidents, such as many deaths and injuries by dangerous weight-loss products containing dinitrophenol and by the elixir of sulfanilamide containing 72% diethylene glycol. The Kefauver Bill could not have been passed if there were no thalidomide and other drug disasters. Most politicians did not act unless there was a catastrophic event that made the public outrageous enough to endanger their political career. Fortunately, there were always a few good men who pushed the bills to protect the public from unsafe and fraudulent foods and drugs.

The books introduce a large number of individuals whose dedication and sacrifices have pivotal to the establishment of the FDA as the symbol of safety. *America's Health* starts with a story on Dr. Harvey Washington Wiley who once was a professor at Purdue University in Indiana before becoming a creator of the FDA, the first regulatory agency. He also conducted the first significant clinical study, although very rudimentary, to study the effects of commonly used food preservatives on people. Senator Estes Kefauver worked assiduously to make sure that the safety and efficacy of drugs had to be evaluated by scientifically trained experts and not by empirical evidence. Dr. James Goddard persuaded the drug industry to submit the new drug applications that contain the most conclusive data proving safety and efficacy of new drugs. Dr. Arthur Hull Hayes, Jr. took a stand to preserve scientific standards by refusing political pressure by the Reagan administration which tried to eliminate the requirement that a drug be tested to ensure the claims made by its maker and to eliminate prior tests of effectiveness. Dr. Robert Temple who has been guiding the scientific drug testing in the United States and interpreting the maze of the data to make sure that the tested drugs are safe and effective. Dr. Samuel Broder and Hiroaki Mitsuya at the National Cancer Institute who were instrumental in finding AZT for treating AIDS. Dr. David Kessler who pursued a public health mission in the face of fire from formidable special interests.

America's Health also describes a price fixing scandal that exposed for the first time the profit drug manufacturers were taking over the production cost. The investigation led by Senator Estes Kefauver in the late 1950s found that the drug prices were high, sometimes more than 100 times the cost of making drugs, and that prices in the United State were much higher than those of the same drugs in other countries despite the additional cost of transportation. Exactly the same con-

cerns and criticisms exist five decades later. The drug industry may have to do a better job in explaining the high prices of new drugs. It is not enough to simply argue that drugs are not overpriced, but very cheap, because they are saving human lives.

America's Health is very successful in describing delicate political maneuvers between the two political parties on the legislation as well as appointing the FDA commissioners. In general, the conservatives who are on the side of promoting business (meaning special interest groups) object any regulation. To the conservatives, regulation, regardless of its type or apparent usefulness, costs society money and business liberties by turning more power over to the centralized national bureaucracy, the FDA. Even for those who are sympathetic to this view, it is still very puzzling why the conservatives, such as Newt Gingrich, tried to dismantle the FDA and abolish the scientific standard essential for the safety and efficacy of drugs. Protecting the dietary supplement business by shielding it away from the FDA control is one thing, but trying to take away the FDA's power to fully review and approve products is something utterly difficult to understand. *America's Health* is full of stories describing how special interest groups exercise their power in the background, and why certain politicians take strange positions, deviating from the common senses.

The most important message of the books is that any decisions on approval (or disapproval) of new drugs have to be drawn based on sound data produced by scientists and regulators even if it takes time to produce them. Even with life-threatening illness, which makes haste decisions unavoidable, following the well-established scientific steps to prove the safety and efficacy of new drugs is the best approach to introduce new drugs. This notion is best supported by many examples on developing drugs for AIDS as described in *America's Health*. The credibility of the drug industry in fact relies on the FDA's reputed toughness. Scientific data brings the drug industry and the FDA together to introduce safe life-saving drugs to the public. *America's Health* concludes that the FDA is, at least for now, the best hope we have for maintaining the high standards of safety and effectiveness of drugs, and I could not agree more.

The current era in medicine can be described as the pharmaceutical era, since that is the chief way of treating disease now. As professionals in the pharmaceutical field who work on the safety and efficacy of drugs, it is important to understand how the current FDA has become an institution as the guardian of the public health. The two books are highly recommended to improve our understanding on how the regulations on drugs have been formulated and enforced. The two books are not only informative but also highly entertaining.

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Principles of Polymer Systems. Fifth Edn. Ferdinand Rodriguez, Claude Cohen, Christopher K. Ober, and Lynden A. Archer, Eds. Taylor & Francis, New York, NY. www.tandf.co.uk. 2003. 760 pp. $99.95.

In 1980, Lord Todd, a former president of the Royal Society, commented, "I am inclined to think that the development of polymerization is perhaps the biggest thing chemistry has done, where it has had the biggest effect on everyday life." And yet, only 60 years earlier, Hermann Staudinger was advised to "leave the concept of large molecules well alone: organic molecules with a molecular weight above 5,000 do not exist." How times have changed! There can be no denying that polymers are ubiquitous in today's "material" world, and for modern science graduates it is essential to know something of the fundamental concepts of polymer systems and their numerous applications. *Principles of Polymer Systems* provides an integrated and comprehensive overview of the fundamental concepts and applications of polymers aimed largely at a postgraduate audience.

The book is presented in seventeen well-defined chapters having the following headings: introduction; basic structures of polymers; physical states and transitions; polymer formation; polymerization processes; molecular weight of polymers; viscous flow; mechanical flow at small deformations; ultimate properties; some general properties of polymer systems; degradation and stabilization of polymer systems; fabrication processes; extrusion and molding; recycling and resource recovery; carbon chain polymers; heterochain polymers; and analysis and identification of polymers Each chapter contains a number of example questions and solutions which might be particularly useful to academics for examination questions and workshops/tutorials. At the end of each chapter, a series of further problems (but no solutions) are presented. Several new sections have been included in this fifth edition of the book, including rheometry, coatings and adhesives, and applications of polymers to medicines, although, like the rest of the book, the emphasis is largely on engineering aspects of polymers. For example, the rather short seven-page section on the applications of polymers to medicines primarily focuses on the fabrication of bulk polymers for hip prosthetics, vascular grafts and sutures, with controlled drug delivery systems and tissue engineering getting only a cursory mention. Given the considerable growth in high value polymers and their application in a range of disciplines, it would have been useful to see more detailed sections on areas such as biological polymers, liquid crystalline polymers, polymer-drug conjugates, tissue engineering etc. In general, the presentation of text and figures in the book is high - the quality of figures describing the various polymer fabrication processes (Chapter 13) is particularly good. However, some of the figures depicting chemical structures, although accurate, are rather poorly (or at least hastily) presented insomuch that they display many of the presentation flaws associated with early versions of chemical drawing packages.

On the whole, this text provides a useful reference source for most aspects of polymer science, and will no doubt find its way onto the bookshelves of many postgraduates, academics and industrialists working with polymer systems. Although engineering perspectives on polymer systems are emphasized throughout the book, the fundamental information provided within the first eleven chapters will be applicable and useful to anyone with an interest in polymers.

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Encyclopedia of Polymer Science and Technology, Third Edn. Herman F. Mark, Ed. John Wiley & Sons, Hoboken, NJ. www.wiley.com. 2003. Volumes 5-8, Part 2 (of the 12 volume set). $1400.00.
Volume 5. Acoustic Properties to Cyclopentadiene and Dicyclopentadiene. 776 pp.
Volume 6. Degradation to Magnetic Polymers. 735 pp.
Volume 7. Metal-Containing Polymers to Rigid-Rod Polymers. 752 pp.
Volume 8. Semicrystalline Polymers to Ziegler-Natta Catalysts. 712 pp.

This is the second part of the 12-volume set, and the topics of the encyclopedia start in an alphabetical order again, as if this part is independent from the previous part. This is understandable, since new polymers and topics emerge continuously in the polymer science and technology. As in the first part of the series, each topic was discussed in detail by the experts in the field. The topics covered in the second part of *Encyclopedia* are classified as listed below.

Polymers: amorphous polymers, butadiene polymers, butyl rubber, cellulose, cellulose ethers, cellulose fibers (regenerated), collagen, cotton, cyclopentadiene and dicyclopentadiene, ethylene copolymers, ethylene-propylene elastomers, gelatin, isocyanate-derived polymers, phenolic resins, polyanhydrides, polyacrylates, polycarbonates, polycarbosilanes, polyesters (thermoplastic), polyimides, poly(*p*-phenylenevinylene), polyphosphazenes, polysilanes, semicrystalline polymers, vinyl acetal polymers, vinyl alcohol polymers, vinyl chloride polymers, graft copolymers.

Polymers with specific properties: barrier polymers, biodegradable polymers (medical applications), conductive polymer composites, elastomers (thermoplastic), electrically active polymers, environmentally degradable polymers, ferroelectric liquid crystalline elastomers, fibers (elastomeric), gene delivery polymers, ionomers, magnetic polymers, metal-containing polymers, molecularly imprinted polymers, polyelectrolytes, polymeric drugs, rigid-rod polymers, superabsorbent polymers.

Polymerization: anionic polymerization, bulk and solution polymerizations reactors, carbocationic polymerization, heterophase polymerization, initiators (free radical), living radical polymerization, metallocene catalysts, microemulsion polymerization, structural representation of polymers, Ziegler-Natta catalysts.

Excipients: antioxidants, heat stabilizers, silane coupling agents, UV stabilizers.

Processing methods: cellular materials (plastic foams), coating methods (powder technology), films (manufacture), flash devolatilization, microcellular plastics, recycling (plastics), thermoforming, urethane coating.

Properties: acoustic properties, adsorption, biomolecules at interfaces, degradation, fatigue, miscibility, morphology, optical properties, protein folding, smart materials (microgels), statistical thermodynamics.

Instrumentation: dielectric relaxation, impact resistance, Langmuir-Blodgett film, lithographic resists, molecular modeling, synchrotron radiation, test methods, vibrational spectroscopy, X-ray microscopy.

Applications: combinatorial methods for polymer science, controlled release technology, nomenclature.

Topics in *Encyclopedia* were chosen to make sure that a certain subject was covered fully for scientists in different disciplines who may use different terminologies. For example, the topic of polymer degradation, which is by the way very relevant to drug delivery, was handled in three chapters of "biodegradable polymers (medical applications)," "environmentally degradable polymers," and "degradation." Another example is the topic on porous material handled in two different chapters of "cellular materials" and "microcellular plastics." Some topics were described in extreme detail while others were very brief. The chapter on heterophase polymerization is 118-page long, while the chapter on statistical thermodynamics is only 8-page long. Regardless of the extent of coverage of a topic, each chapter provides background for immediate grasp on the topic and further expansion through the provided references.

Encyclopedia contains new topics, such as combinatorial methods for polymer science. Controlling chemistry, morphology, and surface topography at the micro- and nanoscales requires synthesis and processing of multicomponent mixtures, composites, and thin films, which are inherently complex. Combinatorial methods use combinatorial synthesis, high throughput screening, and informatics to rapidly develop new complex polymeric systems over large numbers of variable combinations. *Encyclopedia* also contains new chapters dedicated to the drug delivery technology, such as the chapters of "controlled release technology," "gene delivery polymers," and "polymeric drugs." Since the drug delivery technology exploits various polymer properties, sharing the information on drug delivery technology with pure polymer chemists would make them to think of applications in addition to pure polymer science. It is also new to have a chapter on "protein folding," since it is a topic that has traditionally been handled in biochemistry books.

Encyclopedia is undoubtedly an invaluable source of information on polymer science and technology for scientists in various disciplines, and I only hope that it becomes widely available despite its hefty price.

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Surfactants and Polymers in Drug Delivery. Martin Malmstein. Marcel Dekker, New York, NY. www.dekker.com. 2002. 348 pp. $165.00.

Surfactants and polymers have been used in drug delivery for decades. Their recent applications in delivery of new classes of drugs, such as genes and proteins, and in alternative delivery routes have significantly improved our understanding on their action in drug delivery vehicles. This book captures the latest developments of surfactants and polymers in the drug delivery area as well as the experiences and knowledge that the author has encountered in the field. It is the latter that allows the critical issues to be presented clearly and

directly, making the book stimulating. The book is divided into 11 chapters, with the first three chapters focusing on the basics of surfactants and polymers. Building from the basics, the next three chapters describe the applications of surfactants and polymers in different dose forms, such as microemulsions, emulsions, aerosols foams, solutions, and gels. The topics on the degradation of surfactants and polymers, and the formulation technologies appropriately serve as the concluding chapters of the book.

Each chapter is well structured, usually beginning with the fundamentals and ending with the applications or implications of the topic. I like the inclusion of the techniques that are used for characterizing different kinds of systems (such as micelles and liposomes), even though the descriptions are rather brief. The chapters are also tightly woven between each other, as readers are often prompted to recap materials that have already been cited in the earlier chapters. This minimizes repetition and thus weariness to the reader. The fluidity of the book has been further enhanced by citing the references at the figure legends, rather than in the body of the text. This certainly drives the reader to continue on with the text rather than flipping to the reference list. This could have been improved further if the figures could be printed on the same page as their citation, within the text. Where appropriate, the author has also included the 'rules of thumb', which is certainly helpful to the novice, as well as those who have forgotten the major issues relating to surfactants and polymers in drug delivery. Readers who are fond of descriptive physical pharmaceutics will certainly enjoy this book. The book however, would be a disappointment to those readers who are more readily appeased through mathematical descriptions.

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Pharmaceutical Excipients 2003. Raymond C. Rowe, Paul J. Sheskey and Paul J. Weller, Eds. Pharmaceutical Press, Grayslake, IL. www.pharmpress.com. 2003. CD-ROM (electronic version of the Handbook of Pharmaceutical Excipients, Fourth Edn). $299.95.

Pharmaceutical excipients are increasingly recognized as integral parts of a pharmaceutical product rather than simply as inert or inactive ingredients. A detailed knowledge about excipients, not only their physical and chemical properties but also their handling, safety and regulatory status is essential for pharmaceutical scientists. Pharmaceutical scientists and professionals that are involved in formulation, drug delivery, pharmacology, toxicology and regulatory affairs are extremely interested in a thorough understanding of the compositions of a drug product to ensure safety, efficacy, patient comfort and compliance, as well as product elegance to achieve market acceptance. With the growing number of innovations in the area of pharmaceutical formulations and drug delivery technologies that now include delivery of an impressive number of biopharmaceutical therapeutics as well, the number and type of pharmaceutical excipients are increasing rapidly. Therefore, the value of comprehensive, systematic and summarized information about pharmaceutical excipients is quite evident.

Pharmaceutical Excipients 2003 is the electronic version of the Handbook of Pharmaceutical Excipients, 4th edition. The present version contains 250 monographs authored by experts in the field. This is very impressive. However, I am very surprised that monographs for critical excipients, such as poly(lactide-co-glycolide) (PLG) and protamine sulphate, are missing. Both of the above excipients represent important ingredients in approved pharmaceutical products. Their inclusion no doubt would have strengthened the book. Nonetheless, this book is the most comprehensive among the books, electronic or otherwise, with monographs of pharmaceutical excipients. *Pharmaceutical Excipients 2003* made significant attempts to collect and present essential data on the physical properties of excipients in a systematic and uniform fashion. The book emphasizes the presentation of critical properties in a consistent format rather than attempting to present an exhaustive review on the excipients. This works very well for the readers because it is very helpful in gathering information about an excipient and in comparing among excipients easily.

In general the electronic version is very easy to install and the program is easy to launch. However, the internet interface during application launch could be further improved. The readers will find the monographs easy to read mainly because their layout is uniform, and the information is kept short and organized in a systematic way. Moreover, I find the "Suppliers" tab in the program extremely useful. The navigation interface between the suppliers and trade names of the products they supply is very user-friendly. This is clearly a very attractive feature of the electronic version.

Scientists in pharmaceutical industry, in pharmaceutical contract research organizations, as well as graduate students in pharmaceutics will find the book *Pharmaceutical Excipients 2003* invaluable in their pharmaceutical product development and research. The excipient information is very helpful in writing the Chemistry, Manufacturing and Control (CMC) section of regulatory documents. I believe all Pharmaceutical and Biopharmaceutical companies as well as contract research companies that serve Biopharmaceutical industry would benefit from using this book.

(Editor's note: The publisher plans to release a new update of the CD version in March 2004).

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A Guide to Pharmaceutical Particulate Science. Timothy M. Crowder, Anthony J. Hickey, Margaret D. Louey, Norman Orr. CRC Press, Boca Raton, FL. www.crcpress.com. 2003. 241 pp. $239.95.

The late Norman Orr, a highly talented and insightful industrial pharmaceutical scientist, to whom this book is ded-

icated, considered that "powder technology is the foundation of dosage form design" and "particle engineering is the future of efficient, reproducible, and effective drug delivery". Few would disagree that particulate science, on which powder technology and particle engineering are based, plays an essential role in current pharmaceutical development. Whereas many texts focus on the science of particles and powders and/or on its pharmaceutical applications, this book is intended to highlight some basic principles and their practical applications. In 205 text pages, this book achieves these objectives admirably. The combined abilities and expertise of the authors, in the areas of pharmaceutics, pharmaceutical technology, powder physics, and clinical pharmacy, are important elements in determining the success of this book.

As is appropriate, the initial Chapters 1 and 2 provide an introduction and overview of particulate systems, their manufacture and characterization. Inevitably, in a book of this brevity, many topics in these introductory chapters receive only cursory treatment, leaving the reader with a wish for additional knowledge, which, fortunately, the references provide. Chapter 3 treats powder sampling, a truly crucial topic of special interest to Norman Orr, while Chapter 4 covers particle size descriptors and statistics. Chapters 6 and 7 treat particle imaging, particle size measurements, and their instrumental analysis. The book explains the reasons for the differences between the measured particle sizes obtained by different instruments and emphasizes the need for a match between the nature of particle sizing data and its application. The major connections to the pharmaceutical sciences are established in Chapter 5, which focuses on the properties of constituent particles, Chapter 8, which focuses on the relationship between particle size and the behavior of powders, and Chapter 9, which focuses on the clinical aspects of particulate drug delivery systems. Chapter 8 briefly discusses the important process of compaction of powders to form tablets. A useful Conclusion section summarizes each chapter. Finally, Chapter 10 summarizes the book's main conclusions, discusses *in vitro-in vivo* correlations, and draws together the key topics. Considering its brevity, the book treats the various topics adequately and in a logical sequence. The references are extensive and provide the reader with valuable guidance to the relevant literature, especially in the pharmaceutical sciences.

Reflecting some professional bias, this reviewer would have appreciated more references to the seminal literature, especially in the introductory chapters. The additional references would likely have added an additional page, but would have enhanced the book. This reviewer would also have appreciated some sections on nanoparticles, their preparation, properties, therapeutic potential, and the relationships to larger, more conventional particles. The book could then consist of about 250 text pages in all, still not especially long. The literary style and technical presentation of the book are particularly praiseworthy and maintain the reader's interest. While recognizing individual preferences, this book provides an excellent foundation for a didactic course in particulate science or powder technology, such as in graduate programs in pharmaceutics. The book will likewise be valuable to scientists who are eager to acquire basic knowledge of particulate science in pharmaceutics. However, to find favor among students, this small volume would need to be less costly.

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Books Received

Analysis

Rapid Microbiological Methods in the Pharmaceutical Industry. Martin C. Easter, Ed. CRC Press, Boca Raton, FL. www.crcpress.com. 2003. 277 pp. $239.95.

(From Preface) "The stimulus for the creation of this book was a rash of interest in alternative and rapid methods that offered enhanced detection capabilities. However, these methods raised a number of questions, such as how do we validate new methods, would they be accepted by the pharmacopoeias, and most important, how would the regulators respond?"

Sample Preparation Techniques in Analytical Chemistry. Somenath Mitra, Ed. John Wiley & Sons, Hoboken, NJ. www.wiley.com. 2003. 458 pp. $89.95.

(From Preface) "Sample preparation is important in all aspects of chemical, biological, materials, and surface analysis. Notable among recent developments are faster, greener extraction methods and microextraction techniques. Sample preparation has evolved to be a separate discipline within the analytical/measurement sciences. The first section of the book describes various extraction and enrichment approaches. The second section is dedicated to preparation for nucleic acid analysis. The third section deals with sample preparation techniques used in microscopy, spectroscopy, and surface-enhanced Raman."

Sensors in Household Appliances. Guido Tschulena and Andreas Lahrmann, Eds. (Sensors Applications, Volume 5, J. Hesse, J. W. Gardner, W. Gopel, Series Eds.) Wiley-VCH, Germany. www.wiley-vch.de. 2003. 287 pp. $235.00.

Computational Chemistry Using the PC, Third Edition. Donald W. Rogers. John Wiley & Sons, Hoboken, NJ. www.wiley.com. 2003. 349 pp. $69.95.

Biomaterials

Materials Inspired by Biology. James L. Thomas, Kristi L. Kiick, Laurie A. Gower, Eds. (Materials Research Society Symposium Proceedings Vol. 774). Materials Research Society, Warrendale, PA. www.mrs.org. 2003. 254 pp. $92.00.

(From Preface) "The continued interest in this field is strongly motivated by the fact that the nanoscale and microscale organization found in biological materials often leads to exceptional macroscopic materials properties; the

ability to mimic these structures should lead to new synthetic materials with similarly remarkable behavior in both biomedical and materials arenas. Recognition of the complexity inherent in many biological systems has led to categories such as self-assembled, hierarchical, or templated materials."

Bioinspired Nanoscale Hybrid Systems. Ulrich Simon, Guenter Schmid, Seunghun Hong, Stephan J. Stranick, Steven M. Arrivo, Eds. (Materials Research Society Symposium Proceedings Vol. 735). Materials Research Society, Warrendale, PA. www.mrs.org. 2003. 194 pp. $92.00.

The papers in this book are arranged into four overlapping categories: Arrays, Essays and Diagnostics; Mineralization, Implants and Surfaces; Biomaterials; and Particles.

Drug Discovery

Fundamentals of Medicinal Chemistry. Gareth Thomas. John Wiley & Sons, Hoboken, NJ. www.wiley.com. 2003. 285 pp. $30.00.

(From Preface) "This book is written for second, and subsequent year undergraduates studying for degrees in medicinal chemistry, pharmaceutical chemistry, pharmacy, pharmacology and other related degrees. The approach to medicinal chemistry is kept as simple as possible. The text is supported by a set of questions at the end of each chapter. Answers, sometimes in the form of references to sections of the book, are listed separately."

Model Organisms in Drug Discovery. Pamela M. Carroll and Kevin Fitzgerald, Eds. John Wiley & Sons, Hoboken, NJ. www.wiley.com. 2004. 288 pp. $135.00.

(From Cover Page) "Advances in bioinformatics, proteomics, automation technologies and their application to model organism systems now occur on an industrial scale. The integration of model systems into the drug discovery process, the speed of the tools, and the in vivo validation data that these models can provide, will clearly help definition of disease biology and high-quality target validation. Enhanced target selection will lead to the more efficacious and less toxic therapeutic compounds of the future."

Molecular Biology

Cytokine Protocols. Marc De Ley, Ed. Humana press, Totowa, NJ. www.humanapress.com. 2003. 240 pp. $99.50.

(From Preface) "The regulatory activity of cytokines in such processes as differentiation, apoptosis, angiogenesis, and wound healing has now been demonstrated. Cytokines comprise a group of small proteins (5-20 kDa), active in the nano- or picomolar concentration range, and eliciting specific effects in neighboring cells. In order to understand the production and action of cytokines, experimental protocols at the DNA, RNA, protein, and (molecular) cell biological level are needed. This volume describes a number of such protocols for specific cytokines, but most of them are broadly applicable and readily adaptable."

Encyclopedic Dictionary of Genetics, Genomics, and Proteomics. Second Edn. George P. Rédei. John Wiley & Sons, Hoboken, NJ. www.wiley.com. 2003. 1379 pp. $179.00.

(From Preface) "In contrast to big encyclopedias, in this work relatively few entries exceed a couple of thousand words, making it much faster to find the specific concept or term of interest. A new feature is the predominantly current, over 7,000 text references to journal articles. Their bibliographies may help to locate additional key and classical papers. The General References at the end includes about 2,000 books. I have greatly expanded the cross-references among the entries because the users found this feature extremely useful."

The Science and Ethics of Engineering the Human Germ Line: Mendel's Maze. Jon W. Gordon. John Wiley & Sons, Hoboken, NJ. www.wiley.com. 2003. 286 pp. $47.50.

(Chapter 1) "I am certain that the information essential for attaining the level of understanding of human genetic engineering needed to cogently evaluate each new scientific and medical breakthroughs, as it brings such procedures ever closer to technical feasibility, can be attained, and it is the purpose of this book to provide that understanding."

Pharmaceutical Science

Pharmaceutical Statistics. Practical and Clinical Applications. Fourth Ed. Sanford Bolton and Charles Bon. (Drugs and the Pharmaceutical Sciences, Volume 135). Marcel Dekker, Inc., New York, NY. www.dekker.com. 2003. 755 pp. $195.00.

Handbook of Drug Interactions. A Clinical and Forensic Guide. Ashraf Mozayani and Lionel P. Raymon, Eds. Humana Press, Totowa, NJ. www.humanapress.com. 2003. 663 pp. $149.50.

(From Preface) "Combining drugs may cause pharmacokinetic and/or pharmacodynamic interactions. Pharmacokinetic mechanisms of interaction include alterations of absorption, distribution, biotransformation, or elimination. Pharmacokinetic interactions in general result in an altered concentration of active drug or metabolite in the body, modifying the expected therapeutic response. Pharmacodynamic interactions involve additive, potentiating, synergistic, or antagonistic effects at the level of receptors. Even less understood are interactions at the level of nucleic acids which can change the levels of expression of key proteins in target tissues. This book addresses both types of drug interactions, emphasizing explanations when possible, and careful review of the general pharmacology."

Safety Pharmacology in Pharmaceutical Development and Approval. Shayne C. Gad. CRC Press, Boca Raton, FL. www.crcpress.com. 2004. 189 pp. $149.95.

(From Preface) "Safety pharmacology is the evaluation and study of the pharmacological effects of a potential drug that are unrelated to the desired therapeutic effect. – General/safety pharmacology has been an emerging discipline in which unanticipated effects of new drug candidates on major organ function (i.e., secondary pharmacological effects) are critically assessed in a variety of animal models. Pharmacovigilance is product- rather than utilization-oriented and quite invisible in clinical medicine. This is regrettable because up to 50% of adverse drug reactions are dose dependent and thus preventable. This book details regulatory requirements, provides comprehensive information on study designs, and covers both the required battery of studies and the supplemental, follow-up battery."

Polymers

Modern Polyesters: Chemistry and Technology of Polyesters and Copolyesters. John Scheirs and Timothy E. Long, Eds. (Wiley Series in Polymer Science) John Wiley & Sons, Hoboken, NJ. www.wiley.com. 2003 750 pp. $230.00.

(From Preface) "Mankind has been using natural polyesters since ancient times. Polyesters are in wide spread in our modern life. The future direction of polyester R&D efforts is likely to involve further progress in polyester synthesis, new blending technology and the use of advanced functional additives such as nanoclay reinforcements, reactive impact modifiers, anti-hydrolysis agents, and chain extenders. This book provides the reader with comprehensive information about polyester resins with an emphasis on their structure-property relationships. The latest advances in polyesters are described along with current and emerging application areas."

Regulatory

Interpharm Master Keyword Guide: 21 CFR Regulations of the U.S. Food and Drug Administration. 2002-2003 Edn. Revised as of April 1, 2002. Interpharm/CRC, Boca Raton, FL. www.crcpress.com. 2003. 727 pp. $199.95.

The British National Formulary. 45th Edn. the British Medical Association and the Royal Pharmaceutical Society of Great Britain. United Kingdom. www.bnf.org or www.pharmpress.com. 2003. 834 pp. $29.95 for a paperback & $115.00 for a CD-ROM.

The British National Formulary. 46th Edn. the British Medical Association and the Royal Pharmaceutical Society of Great Britain. United Kingdom. www.bnf.org or www.pharmpress.com. 2003. 836 pp. $29.95 (paperback).

Teaching

Promoting Civility in Pharmacy Education. Bruce A. Berger, Ed. Pharmaceutical Products Press (Haworth Press, Inc.), Binghamton, NY. www.HawarthPress.com. 2003. 122 pp. $19.95 (soft), $34.95 (hard).

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