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Book Reviews

Genomes, 2nd Ed., Terrance A. Brown, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012, http://www.wiley.com, 2002, xxvii, 572 pp., illustrations, $97.50.

Some fields of science seem to make slow, steady progress over a long period of time and then suddenly advance with such speed that the experimental approaches and research strategies seem to be completely revolutionized. Lately, the growth rate of our understanding of the functioning of genes has accelerated to what appears to be nearly the speed of light. A wide range of events, some related and some serendipitous, have recently driven this turbocharged area of science to expand and change so quickly and in so many new directions that an entirely new vocabulary has been required to better describe its complexities and nuances. Not so many years ago, genetics defined the field of science that described the composition of genetic material, how it carried information related to a specific cellular function, and the mechanisms for the distribution and expression of that genetic material after reproduction. Now, however, the discovery and development of a number of new cellular and molecular research techniques plus the establishment of a whole spectrum of new analytical methods, some automated and extremely rapid, have provided the high-octane fuel to drive genetics into a new realm currently known as genomics. Entire genomes can now be rapidly sequenced using these tools; individual genes can be more clearly understood. Soon, a complete description of their roles and interactions will be possible. It is not that the field of genetics has become a fatality; classic genetic experiments are still a standard and critical component in this area of science. Instead, current methods augment previous knowledge, allowing for a more extensive application of the outcomes of genetic research. To better describe and organize the information associated with this increased breadth of knowledge, a new vocabulary has evolved.

Just a few years ago, a book by Terence A. Brown entitled *Genomes* was published. It was a timely publication that brought the various areas of genomics into focus for students. The second edition of this text has recently been released. *Genomes*, the second edition, is a marvelous text. The book is still targeted at the undergraduate level student for the introduction of this field. It is laid out in a very logical fashion; first defining the components that make up the field of genomics and then describing each of these areas and how they relate to one another. The book is thus broad in the areas it describes—genomes, transcriptomes, and proteomes; each of these areas could easily be expanded into individual textbooks. There are plenty of definitions and excellent illustrations essential for an introductory textbook. The numerous techniques and procedures involved in the analysis and characterization of genes and gene function are clearly described and highlighted. Comparisons are made between the genomes of a wide variety of species that provide the reader with a more overall picture of genomics and the possible means by which genes developed and genomes evolved. Such information has implications in so many fields—ecology, evolution, population biology, comparative biology, etc. The reader is also guided wonderfully through the text with desired leaning outcomes, study questions, key terms, and additional references for each chapter. I could not think of a topic that was not covered and covered well by this text. In a time where the outcomes obtained from sequencing the human genome are surely to become more and more important, providing a critical step in the translation of new discoveries into therapeutic applications, this text is an essential cornerstone of information for any student.

Typically, a second edition for a text that covers an entire field might come out 6 to 8 years after the first. In this case, it happened in only 3 years, and in some ways it was overdue. At rate this field is progressing, however, who knows how soon the next edition will be warranted. Until that time, this text will be a standard for undergraduates who need to gain a general understanding of genomics.

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Industrial Pharmaceutical Biotechnology. Heinrich Klefenz, Wiley-VCH Verlag GmbH, D-69469 Weinheim, Germany, http://www.wiley-vch.de, 2002, ix, 307 pp., illustrations, $125.00.

Industrial Pharmaceutical Biotechnology is a very appropriate book for anyone working in the biotechnological, pharmaceutical, or chemical industry. The book addresses all aspects of these industries, including drug discovery, marketing, research, and production. The book thoroughly covers areas such as functional biotechnology and biotechnology in medicine by discussing currently developing ideas in science like genomics, proteomics, cellular cloning, gene therapy, and nanotechnology. The book also discusses molecular pharmabiotechnology by examining areas such as bioinformatics, genotyping, and sequencing. Accompanied by information on safety, the environment, and even ethics, the book constructs a complete and informative text. Special strengths of the book are the comprehensive coverage of both scientific details of industrial technology and the procedures for successful development of commercially viable products. Being informative and up-to-date, it is an excellent reading material for anyone in the pharmaceutical biotechnology industry.

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Rational Design of Stable Protein Formulations. Theory and Practice. Pharmaceutical Biotechnology, Volume 13, John F. Carpenter and Mark C. Manning, Eds., Kluwer Academic/Plenum Publishers, 233 Spring Street, New York, NY 10013, http://www.wkap.nl/, xvii, 2002, 203 pp, illustrations, $105.

This book is a small text edited by two individuals known for their fundamental work in the formulation of proteins for parenteral administration. The book consists of eight chapters comprising a shade over 200 pages, covering topics from the chemistry of protein degradation to interactions with typical excipients, to the application of processing methods. Chapter 1 is not so much a practical approach to protein formulation as it is an overview of what must be done to obtain a usable formulation for clinical studies. Much of the material in the chapter is not necessarily specific to proteins or peptides but does offer a good starting point to those scientists not familiar with drug delivery. Especially helpful will be the explanation of the regulatory issues that seem so frustrating to scientists from other fields who finding themselves trying to bring a new product to the market. Chapter 2 addresses issues of expression, isolation, and purification of proteins. It is a useful overview of the production process that occurs before the delivery of the protein to the hands of the formulator. Although there was some discussion of solubility problems (inclusion bodies) and refolding issues, the chapter could have benefited from a more clear linkage of the issues in drug substance production to similar concerns of the formulator.

Chapter 3 introduces the concepts of physical stability and ways of taking advantage of such forces to promote stability in the formulation. Thermodynamic formalism was kept to a minimum, but the discussion of excipients and excluded volume effects was cleverly done to maximize physical understanding. Chapter 4 discusses the effects of conformation on chemical stability, notably deamidation and oxidation. Numerous experimental studies and previous reviews are cited, as are ways of linking excipient effects to a stabilization of protein structure via the excluded volume theory.

Chapter 5 covers lyophilization, the criteria for success and the rational for inclusion of excipients. It is a short chapter but does attempt to explain some of the theory underpinning the process as well as identifying those issues in need of further research. Chapter 6 covers spray drying as an alternative to lyophilization. The field of spray drying of protein solutions is not mature, so the chapter is more a listing of past studies rather than a "cook-book" on how to spray dry. It will be interesting to witness the development of the field.

Chapter 7 addresses the interactions of proteins with surfactants. Although one of the longer chapters, little in the way of guidance toward the practical selection of surfactants is provided. The chapter would have benefited from some discussion of the regulatory considerations in the use of surfactants, especially in the question of chronic verses acute administration. The concept of high throughput formulation is the topic of Chapter 8. Most of the material of the chapter really was covered in other parts of the book, but it is reasonable to call attention to the onslaught of protein agents expected in the near future as a result of high throughput screening and how formulation science may deal effectively with the avalanche of potential compounds. Computer searching of databases may make predictive algorithms possible.

With the possible exception of Chapter 6 (spray drying) and Chapter 8 (high throughput formulation), the book covers familiar ground. On the plus side, for those just entering the field of protein formulation, the book provides a good starting point for more detailed studies. A majority of the authors are in the industry or are associated with the Center for Pharmaceutical Biotechnology at the University of Colorado (an institution well known for its work in the field of protein pharmaceuticals). The authors are solid scientists and educators and the reader can be confident in the conclusions drawn from the cited work.

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Cell-Penetrating Peptides. Processes and Applications. Ülo Langel, Ed., CRC Press LLC, 2000 N.W. Corporate Blvd., Boca Raton, FL 33431, http://www.crcpress.com, 2002, 406 pp, illustrations, $159.95.

Peptide Nucleic Acids. Methods and Protocols. Peter E. Nielsen, Ed., Humana Press, 999 Riverview Drive, Suite 208, Totowa, NJ 07512, www.humanapress.com, 2002, x, 274 pp, illustrations, $89.50.

One of the major challenges in drug delivery is to design proper vectors that will permit the cellular internalization of hydrophilic biomacromolecules. Rapid developments in functional genomics have allowed identification of various peptide domains involved in protein-ligand recognition in increasing numbers, thus paving the way to design bioactive peptidic molecules. Development of peptides as potential drugs, however, is limited by the inability of most peptides to cross biological membranes efficiently. The cell penetrating peptides (CPPs) hold promise of a becoming a new tool that can be complementary to using endogenous transporters, viral transfection, lipofection, and electroporation.

Recently, synthetic oligodeoxynucleotides (ODNs) and peptide nucleic acids (PNAs) have been used to control gene expression through specific interactions with DNA, RNA, and even proteins. Poor cellular uptake and inefficient escape from the endocytic compartments remain as two of the most important bottlenecks in the development of clinically useful ODN and PNA drugs. Conjugation or complex of ODNs and PNAs to cell-penetrating peptide seems to be a rational extension of the existing technologies for enhanced cellular internalization and delivery to nucleus.

The book *Cell Penetrating Peptides, Processes and Application* provides a family of CPPs identified to date. They are derived from naturally occurring proteins, most of the current CPPs consist of 30 amino acids, and their cellular internalization is receptor or protein independent. Different CPPs are described through the first seven chapters. Because

the uptake mechanism of each CPP may differ and is still not clearly understood, the transport processes of different CPPs through cellular membranes can only be speculated, as done through Chapters 8 through 14. The factors important for cellular uptake of PCCs seem to be positive charges in side chain of lysine or arginine, amphiphilicity of the peptides, the presence of tryptophan or phenylalanine residue in certain positions, and the length of peptide. Polypeptides and oligonucleotides themselves are considered to be of limited therapeutic values because of their low biomembrane permeability and rapid degradations. The discovery of CPPs, however, may allow intracellular transport of conjugated peptides, proteins, oligonucleotides, ramda phages, and nanoparticles as discussed in the final four chapters of the book.

CPPs may be of great value for enhanced permeation of PNAs through the cell membranes. PNAs were initially designed as sequence-specific DNA binding reagents, mimicking triplex-forming oligonucleotides that target the DNA major grooves. The backbone structure of PNAs is pseudopeptide, instead of the sugar-phosphate backbone of oligonucleotides. PNAs still form stable duplex structures with DNA and RNA, and such binding properties, typically based on 12–18 mers, can be useful for antisense or antigen applications. The usual problems with PNAs regarding poor transport through the cell membranes may be overcome by complexing with CPPs. The book *Peptide Nucleic Acid. Methods and Protocols* provides an excellent introduction to PNAs. The book deals with synthesis of PNA oligomers, PNA-peptide conjugates, immobilization of supercoiled DNA, PNA openers, and PNA-DNA hybridization, to name several topics. The book also describes diagnosis and antisense applications of PNAs, such as PNA-mediated polymerase chain reaction clamping, and detection of point mutation, and antisense inhibition of gene expression and transcription. The book also describes preparation and potential applications of CPP-PNA conjugates, such as Penetratin-PNA conjugates.

The new peptide technologies described in the above two books are expected to provide some solutions and strategies for enhanced transcellular uptakes and targeting to nucleus. Both books will provide useful information for the readers in the development of delivery systems for bioactive macromolecules.

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Introduction to Drug Metabolism. Third Ed., G. Gordon Gibson and Paul Skett, International Specialized Book Services, Inc., 5824 N.E. street, Portland, OR 97213-3644, http://www.isbs.com, 2001, viii, 256 pp., illustrations, $41.25.

This third edition of Gibson and Skett's primer to drug metabolism represents a useful text to introduce students to the fundamental concepts of drug metabolism. The revised material in this new edition is significant and, recognizing the advances in the field since the last edition, certainly justifies the production of a new edition. The text begins with an overview of pathways of drug metabolism, followed by introductory level material on the enzymology and molecular mechanisms of enzymes of importance in the metabolism of xenobiotics. These chapters contain many useful illustrations that are excellent aides to understanding the material. Following this essential background material, the authors review important elements of drug inhibition and induction. Further factors influencing drug metabolism are discussed in two chapters, one focused on internal factors and the other on external factors. The authors then review the pharmacologic and toxicologic impact of drug metabolism. The book closes with a chapter on the clinical relevance of drug metabolism. This chapter includes a *brief* overview of pharmacokinetics, which was more confusing and misleading than it was helpful. The use of novel symbols for pharmacokinetic parameters is also an unfortunate choice. In this latest edition, the authors have deleted the chapter describing techniques and experiments in drug metabolism. As some of the techniques were rather outdated and unlikely to be useful for use of the book as a text in professional programs, elimination of this chapter (which appeared in previous editions) was a wise choice.

As with previous editions, I do not feel the order of the chapters represents the best way in which to introduce the topics. An introductory chapter containing a brief historical overview of the field of drug metabolism would be a useful addition to this text. I have also found that early introduction of the material provided in Chapter 6, "Pharmacologic and Toxicologic Aspects of Drug Metabolism," helps to build a sound rationale for the study of the molecular and biochemical aspects of drug metabolism. It is also surprising that the subject of pharmagenomics, as it relates to drug metabolism, is not covered in more depth. This is a significant weakness in this latest edition. Although the inclusion of web sites for references for drug-metabolizing enzymes is a good addition, the listings provided are rather incomplete—being limited to CYP450 and UGT. Absent from the two lists provided are references to web sites for other enzymes (e.g., NAT and FMO).

Despite the shortcomings noted, the 3rd edition of *Introduction to Drug Metabolism* fills a gap in available texts and is, in the overall assessment, a very useful book. It would serve as a useful supplement to standard pharmacology or pharmacokinetics texts, depending on where in the curriculum drug metabolism is taught. The material in the book is written at a level readily accessible to professional students in dentistry, medicine, pharmacy, and veterinary medicine. The book is also a very good text for use in introductory graduate courses.

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Medicinal Natural Products. A Biosynthetic Approach. Second Edn., Paul M. Dewick, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012, http://www.wiley.com, 2002, xii, 507pp., illustrations, $115.00.

The second edition of this book is arranged as in the previous edition. In addition to two introductory chapters, "How to Use This Book" and "Secondary Metabolism: The Building Blocks and Construction Mechanisms," the textbook covers six major classes of natural products on the basis of their biosynthetic pathways, including "The Acetate Pathways: Fatty Acids and Polyketides," "The Shikimate Pathway: Aromatic Amino Acids and Phenylpropanoids," "The Mevalonate and Deoxyxylulose Phosphate Pathways: Terpenoids and Steroids," "Alkaloids," "Peptides, Proteins and Other Amino Acid Derivatives," and "Carbohydrates." All chapters begin with a brief introduction of the related biosynthetic pathways, followed by detailed biosynthetic schemes and reaction mechanisms, and end with further readings, which contain recent reviews for further supplementary references. All figures and structures with stereochemistry are well produced, with only a few structural errors. However, none of the figures have captions. A brief caption for each figure would have been helpful. The comprehensive index is very useful.

This textbook is primarily written for the pharmacognosy curriculum of pharmacy undergraduate program. In contrast with many of other natural products books focusing on descriptive compilations of numerous structures and processes, this book builds on the integration of the diverse natural products and their biosynthetic pathways. Mechanistic understanding of the biosynthetic correlations is the main emphasis of this textbook. Clearly, this is the best learning approach for understanding natural products chemistry and biochemistry. This book covers many bioactive natural products that are used in medicine or other synthetic drugs derived from natural products. In addition, short monographs in boxes are provided for important classes of natural products. These monographs include useful information pertinent to sources, production methods, principal constituents, medicinal use, mode of action and synthetic derivatives.

Overall, this updated edition is an excellent book for advanced pharmacy undergraduate students and beginning chemistry graduate students interested in natural products.

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Topical Absorption of Dermatological Products, Robert L. Bronaugh and Howard I. Naibach, Eds., Marcel Dekker, Inc., 270 Madison Avenue, New York, NY 10016, http://www.dekker.com, 2002, xiv, 523 pp., illustrations, $175.00.

Cosmetic Lipids and the Skin Barrier, Thomas Förster, Ed., Marcel Dekker, Inc., 270 Madison Avenue, New York, NY 10016, http://www.dekker.com, 2002, x, 358 pp., illustrations, $165.00.

Topical Absorption of Dermatological Products is quite well organized and covers several topics in depth, although at times it can be heavy reading. It is very thorough in covering issues ranging from mechanisms underlying transdermal transport and factors affecting percutaneous absorption to analytical techniques for characterizing drug transport in various regions of cutaneous tissue and transport characteristics of a few general classes of bioactives in the context of specific transport enhancement. The book, however, is lacking in the areas of mathematical treatment and modeling of transdermal transport. It is highly recommended for individuals seeking to understand the issues and challenges in transdermal transport and delivery and as a reference text.

Cosmetic Lipids and the Skin Barrier is aimed at the experienced readers seeking to dive into the fascinating area of transdermal research. The book does an excellent job of describing the chemical make-up of skin and its various layers and their roles in imparting the barrier properties to skin. This very concise and well-written book introduces the readers to mathematical modeling of the skin barrier properties as a function of lipid composition. The section dealing with analytical techniques is more than adequate. The chapters are adequately referenced and well organized. An excellent text, that goes well beyond just introducing the field of transdermal delivery to the reader.

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Tumor Targeting in Cancer Therapy. Michael Pagé, Ed., Humana Press Inc., 999 Riverview Drive, Suite 208, Totowa, NJ 07512, http://www.humanapress.com, 2002, x, 463 pp., illustrations, $149.50.

Drug targeting to the therapeutic sites, organs, or tissues remains as one elusive dream ever since Paul Ehrlich developed the "magic bullet" concept in the beginning of the 20th century. Although there are several clinically useful formulations that have the property of drug targeting, the development of formulations with true drug targeting is yet to come. In this sense, the book is a very timely publication that focuses on potential drug targeting in cancer therapy and medicine. The drug targeting can be classified into two methodologies: active and passive targeting. The active targeting uses specific interactions between molecules on the target sites and drug carriers. Carriers classified in this methodology include antibodies and transferrin. The passive targeting is defined as a methodology to increase a target/non-target ratio of the amount of delivered drugs mainly by minimizing nonspecific interactions with nontarget sites. This book focuses on active targeting using specific antibodies for cancer therapies, as written in the preface: "The purpose of *Tumor Targeting in Cancer Therapy* is to describe both experimental and clinical applications of antibodies to targeting tumors." This book stands out among many books with similar titles in that it deals with topics in a sequence that best describes the fundamentals and applications of drug targeting. The book describes principles of targeting, variety of active targeting car-

riers, technologies used in targeting system preparations, clinical status, and future perspective. Each chapter of the book was well balanced to have both basic and clinical aspects. Readers of the book should be able to get enough information to understand the past and the present as well as the future of active targeting for cancer therapy.

The book consists of nine parts. Part 1 is an excellent overview that covers principles, current status, and concise introduction of various targeting (mainly using antibodies) with updated clinical information. In addition, it describes clearly problems of targeting in fundamental study and clinical applications for each targeting system. This review, which is approximately 100 pages long, is probably the best review written on the antibody-based targeting. Parts 2 through 8 describe various targeting systems, such as antibody alone for cancer therapy, antibody-drug conjugates, and immunotoxins. Each part describes most updated information, especially on clinical results. Several very innovative targeting systems are also described, such as RNA damaging agent delivery system, multi-drug resistance-overcoming system, and antibody-enzyme conjugate system. Description of those innovative systems allows the reader to draw future perspectives on drug targeting. Part 9 deals with unique topics (e.g., internalization of antibodies) and questions such as "Targeting by antibody or ligand? Which is better?" These points are very important to all targeting systems. One chapter in part 9 concisely describes chemistry frequently used in conjugation for targeting system preparations. This chapter is very useful in understanding all chemical reactions used in parts 2 through 8. In summary, this book is highly recommended for all graduate students, researchers, and clinicians who are involved in the antibody-based drug targeting.

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Dendrimers and Other Dendritic Polymers. Jean M. J. Fréchet and Donald A. Tomalia, Eds., John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012, http://www.wiley.com, 2001, xxxix, 647 pp., illustrations, $225.00.

New attention on macromolecular chemistry has been focused on dendrimers and dendritic macromolecules since Tomalia reported a synthetic method of a dendrimer in 1985. This book covers a variety of topics ranging from the history of dendrimer synthesis to recent applications of dendrimers to chemical and biological fields. The book provides an excellent introduction to dendrimers and dendritic conjugates and comparative studies on physical/physicochemical properties between the dendritic architecture and the other architectures (e.g., hyperbranched and linear macromolecules). Part I describes control of macromolecular architectures by various synthetic methods (such as atom transfer radical polymerization), the relationship between dendrimer generation and viscosity, and crosslinking of dendrimers and/or graft macromolecules via supramolecular assembly. Part II of the book deals with recent progresses in characterization of dendrimers using various analytical techniques.

Properties and applications of dendritic polymers are described in Part III of the book. Of special interest in this part are the biomedical applications of dendrimers, such as dendrimers as anti-adhesion agents, complexation with guest molecules via intermolecular interactions, and DNA delivery. Multivalent interactions between influenza virus and dendriglycoconjugates provide a new strategy for developing anti-adhesion agents. Host-guest interactions with dendrimer cores provide basic understanding of the phenomena. DNA delivery was based on commercially available Starburst® polyamidoamine dendrimers, and the readers can understand advantages and limitations of the approach. Biomedical and drug delivery applications of dendrimers have just begun, and it will be a while before detailed reviews on the topic is available.

This book can serve well as a good reference for those in bioengineering and pharmaceutics fields, but to appreciate the book, one may require knowledge on both polymerization techniques and biological analyses. This book will be highly useful for those who are involved in the synthesis of dendrimers and dendritic polymers, and their potential applications in biomedical and drug delivery areas.

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Liposome Methods and Protocols. Methods in Molecular Biology, Volume 199. Subhash C. Basu and Manju Basu, Eds., Humana Press Inc., 999 Riverview Drive, Suite 208, Totowa, New Jersey 07512, http://www.humanapress.com, 2002, xi, 249 pp., illustrations, $89.50.

Although liposomes have been used widely as a powerful tool for *in vitro* studies, their clinical applications are still limited, and only a handful of clinically useful formulations have been developed. Clearly, further understanding on various issues on liposomes, such as liposome interactions with cell membranes, and controlling drug loading and release, are necessary. The editors of this book focused on those topics to bring a wide range of detailed laboratory protocols covering different aspects of liposome biology.

This book consists of three parts. Part I (Physical Properties; two chapters) refers to the preparation and characterization methods of liposomes containing synthetic or natural lipids, such as sphingolipids. This part will be very useful for the beginners. Part II (Liposome Fusion/Modulation; three chapters) focuses on the peptide-induced fusion of liposomes, the protein-lipid interaction, and the role of lipids in the viral fusion process. The lipid/peptide/protein handling methods and the fusion assay methods were described in detail in these chapters, and they should be highly useful for daily experiments.

In Part III (Application of Liposomes; 10 chapters), ap-

plications of liposomes as a model membrane system and a drug delivery system are effectively handled. As a model membrane system, liposomes are utilized in sphingolipid metabolism studies, enzyme assays, cell adhesion studies, lectin-glycolipid interaction studies, monoclonal antibodies production, and blood coagulation protein-membrane interaction studies. Drug delivery systems reported in the book include antioxidants-containing liposomes for pulmonary diseases, virosomes for gene delivery, and glyco-replica peptide-modified liposomes for inhibition of tumor metastasis.

Since the discovery of liposomes by Alec D. Bangham nearly 40 years ago, innumerable articles have been published on liposomes, but only several liposomal formulations containing anticancer agents and antifungal agents are now clinically used. The readers who expect information on clinical applications of liposomes may be disappointed, but for those who deal with liposome in their work, this book with detailed laboratory protocols and many notes will be very useful.

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Encyclopedia of Smart Materials. Volumes. 1 and 2, Mel Schwartz, Ed., John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012, http://www.wiley.com, 2001, xi, pp. 1-590 for Vol. 1 and pp. 591-1176 for Vol. 2, illustrations, $595.00 for Vols. 1 and 2.

This encyclopedia, composed of two volumes, introduces extensive works on smart materials, structures, devices and systems, which can provide several functionality in information processing, sensing, actuation, modulation, damping, and system integration across a wide range of industrial applications. At first glance, the meaning of the term "smart" may not be understood by researchers working in pharmaceutical fields, because smart materials and systems are really diversified and have covered many fields, not only in biomedical but also in automotive and electronic industries. This encyclopedia is released for managers responsible for technology development, research projects, R&D programs, business development, and strategic planning in various industries considering these technologies. The contents of this encyclopedia will not fail to meet expectations of readers, who have much interest in the application of smart materials and systems for drug formulations. Biomedical applications, biomedical sensing, biomimetic electromagnetic devices, biosensors, chitosan-based gels, drug delivery systems, gels, molecularly imprinted polymers, polymers, and powder industry applications are well described. Their contents ranged from the principles to the state of the art that can be used as valuable source of information at hand. Conductive polymers, molecular tube, shape memory alloys and materials may be useful to the readers who are not familiar to material physics, and it is a good opportunity for them to learn basic knowledge in those areas.

It was very exciting to read many chapters on well-established smart materials and systems in seemingly very different research fields, such as electromechanically driven materials, piezoelectric devices, electrorheological fluids, and so on. Those may provide fresh ideas on the use of new materials in drug delivery. I strongly recommend this encyclopedia to researchers in the pharmaceutical field, who have insufficient time and chances to keep up with progresses made in the smart materials and systems in such interdisciplinary fields. Finally, I would like to quote the editor's message from the preface: "The field of smart materials offers enormous potential for rapid introduction and implementation in a wide range of end-user sectors industries. Not only are the organizations involved in research and preliminary development keen to grow their markets in order to capitalize on their R&D investment, but other technologically aware companies are alerted to new business opportunities for their own products and skill sets."

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Medical Textiles. Proceedings of the International Conference 24 & 25 August 1999, Bolton UK., Subhash Anand, Ed., CRC Press, 2000 N.W. Corporate Blvd., Boca Raton, FL 33431, http://www.crcpress.com, 2001, vii, 237 pp., illustrations, $147.95.

The preface of this book mentions that "hygiene and medical textiles will account for 1.65 million tons or almost 12 percent of the total worldwide technical textiles market of nearly 14 million tons in the year 2005." One of the main reasons for this stunning growth of medical textiles is hidden in the nature of textile *fibers*. Fibers are the building blocks for a vast array of structural designs that can be controlled. The control over the fiber design goes well beyond the feed material. It stretches throughout the spinning techniques, the fiber shape and size, surface modifications and coating, compounding the feed polymeric material for the purpose of physical and mechanical properties alterations and incorporation of therapeutic agents, and weaving techniques. Furthermore, these fabrics can be used as backbone for more complicated composite structures. Such a wide structural versatility can hardly be found in other forms of medical device areas.

Although there are numerous publications in the medical textiles, new updates are always welcome. The book *Medical Textiles* is a new addition to this important armamentarium in medical technology. The book is a collection of reviews on recent developments in this field from materials used in creating fibers to engineering in design of fabrics in direct contact with compromised tissues. It is divided into six chapters: modern materials and processes, compression and bandaging, healthcare and hygiene, wound care, implantable devices, and test methods.

In the first session (six chapters), an exhausted investigation into mechanically reinforcing alginate fibers is presented. "Moist wound healing" has been recognized as the best condition for wound healing (in an article published by

George Winter in 1962), and the finding is now widely used in developing appropriate modern wound dressings that control the amount of moisture in the wound bed without drying. Alginate, a natural polysaccharide, is particularly attractive, but alginate fibers may not possess mechanical strength sufficient for the applications. Chapter 1 describes several reinforcing techniques and machine designs, such as new development in manufacturing circular knitting machines and knitting seamless three-dimensional shell structures on modern electronic flat-bed knitting machines.

In convalescence and rehabilitation medicine, there are many cases (e.g., chronic venous insufficiency) that an adequate and exact pressure on healing tissues is of utmost importance. Session 2 (five chapters) examines how to calculate the pressure needed for treating hypertrophic scarring caused by burns, measure the pressure distribution of commercial padding materials, measure comfort properties of elastomeric commercial fibers used in the construction of pressure garments, and develop methods (finite element simulation) for calculating pressure created by a shell in contact with a curvilinear surface of a body, like legs.

In Session 3 (five chapters), a special attention is made to the quality of fabrics used in hospitals and healthcare centers. Hospital-acquired infections have become increasingly troublesome. Although the sources of bacteria infection in healthcare centers are multifaceted and difficult to suppress, the role of abundantly used fabrics in the bedding and patient clothing as carriers and infestation sites cannot be overemphasized. Rendering these fabrics antimicrobial seems to be an obvious approach, although development of antimicrobial agent with long-term efficacy is not easy. For a short-term solution, the first article in this chapter discusses treatment of textile materials with a synergistic system of antimicrobial chemical formulations. It concludes that the treated materials possess excellent bactericidal activity against various Gram-positive and Gram-negative bacteria, and the full effect was observed up to 50 launderings. There is also a good discussion on air permeability and porosity evaluation of fabrics to control the spread of allergens. Needless to say that all fabrics should come sterilized to begin with. Another study concludes that ethylene oxide is the best method for sterilization.

In wound healing, the exudate removal from the wound bed is important. It is really not important how this task is accomplished. This can be performed by *chemical* absorption using water-absorbent materials (i.e., hydrogels), by *physicochemical* methods, or by *mechanical* methods (also called wicking action). There is always a concern or question whether the hydrogels could actually take away solid contents of the wound exudates in addition to water and water soluble components. One of the articles in this section studies the wicking action of non-woven fabric dressings, i.e., the anisotropy of the in-plane directional permeability of fluid transmission. Session 4 (five chapters) on wound care provides a review on application of fibers in tissue engineering. Fibers are positioned to play a unique role in tissue engineering because of their capability to build designer structures with high porosity and surface area. In addition to biodegradable fibers, nonresorbable carbon fibers were used in engineered tissue growth for hernia reinforcement, pressure sore repair, and articular cartilage resurfacing. Challenges in wound healing become even more difficult when devices in direct contact with compromised tissues are permanently implanted. Session 5 (four chapters) of the book examines these challenges in detail. For four widely used suture materials, such as silk, polyester, polyamide, and polypropylene, creep and recovery behavior appear to depend on the suture structure (braided, monofilament, etc.) rather than the nature of suture's materials, such as polyester or polyamide, natural or synthetic.

This anthology of research papers is another good reminder to professionals in the medical technology indicating how diversified the filed is and how much further growth is necessary to mature the field.

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Safety Evaluation of Medical Devices. Second Edition. Revised and Expanded, Shayne C. Gad, Marcel Dekker, Inc., 270 Madison Avenue, New York, NY 10016, http://www.dekker.com, 2002, xii, 558 pp., illustrations, $185.00.

This book presents a concise and comprehensive review of regulatory testing for medical devices, highlighting many misconceptions and providing an excellent historical rationale on regulatory practices in the medical device field. The book is divided into four main elements, which include an introduction to regulatory agencies and practices; specific tests and a basic introduction to the materials science and biology for each of them; a unique and timely chapter on combination devices (i.e., drug/biologicals combined with engineered devices); and clinical issues followed by case studies of clinical products.

The authors include an excellent source of references and Internet sites that allow the readers to gain information on specific aspects of the device markets and regulatory policies in countries around the world. The book can be easily read and understood with a general materials engineering, chemistry or biology background. It is a valuable reference tool for engineers and scientists involved in product development and testing of medical devices. It is an excellent educational manual for academic scientists involved in medical device start-up companies. In addition, the book could be a primer for teaching in biomedical-engineering programs.

The strengths of the book include the clarity with which the author has distilled much of the body of information available on the topic to provide clear guidance on the strategies needed for planning, testing and carrying out the analysis of such tests, so that a productive result is achieved. The chapter on combination devices, although very peripheral on the topic of drugs, does shed light on the pathway to follow for this growth area. A revision of the chapter with more relevant case studies pertaining to it is already warranted, and hopefully will appear in the literature within the next year or two. A weakness of the book is that although it provides some direct information on testing laboratory consultants, it is limited to a few US companies. What would be more useful is a critical description of such services globally in terms of what to look for and how to evaluate and rank these services.

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Pharmaceutical and Medical Applications of Near-Infrared Spectroscopy. Emil W. Ciurczak and James K. Drennen III, Marcel Dekker, Inc., 270 Madison Avenue, New York, NY 10016, USA, http://www.dekker.com , 2002, ix, 192 pp., illustrations, $135.00.

Near-infrared (NIR) spectroscopy has a long history of utilization in other fields of science as noted in a complementary book (*Handbook of Near-Infrared Analysis*, D.A. Burns and E.W. Ciurczak, Eds., Marcel Dekker, Inc., NY, NY 1992) edited by one of the authors of the subject book. As the authors point out, these fields include agriculture, food, textile, polymer, petroleum, and the fine chemical industry, but not until recently has the application of NIR been focused on pharmaceuticals. This book is divided into seven chapters highlighting the theory, instrumentation, and applications of NIR to the pharmaceutical and medical industry. The authors are well regarded in the field of NIR having published numerous works on all aspects of the technique.

The first two chapters of the book focus on the theory of NIR and instrumentation used to collect spectral data. For the non-spectroscopist, Chapter one, "Basic Principles and Theory" sufficiently leads the reader through the basis of NIR absorption spectroscopy. The basic theory of NIR is explained and supplemented with proper illustrations and equations. The level of theory presented is limited to the novice reader and individuals seeking a more thorough explanation of the theory are referred to the sufficient number of references published within the chapter. Considering the size of the book and possible intentions to act as a standalone resource to the pharmaceutical readers, it probably would have been appropriate to expand the theory section to encompass the needs of the more experienced readers as well. The second chapter, "Instrumentation," follows-up nicely to the theory chapter and presents the general types of instrumentation available, namely filter-based, scanning grating monochromators, interferometer-based, acousto-optic tunable filter-based, and photo-diode array spectrophotometers. The principle of operation for each type of instrument is succinctly explained in addition to common usage. An additional feature of the chapter is a comparison of the strengths and weaknesses between each type of instrument, which is very helpful to the reader when selecting an instrument type for purchase.

The next three chapters focus on specific pharmaceutical application areas for the use of NIR. "Blend Uniformity Analysis" is the title of chapter three whereas "Granulation, Drying, and Coating" is the subject of chapter four, and "Pharmaceutical Assays" the subject of chapter five. There is some overlap between these chapters, but this is in fact a useful feature of the book connecting the technique to numerous different applications. Within each one of the aforementioned chapters, the authors present an extensive summary of the NIR approach to the subject area. In most cases, the summary of the body of work encompasses current, traditional methodology, how NIR has been used, and cross-correlation of the results of the different approaches. In most cases, NIR has shown equal if not better results as well as other advantages such as decreased analysis time, location of testing, or cost. An additional feature of each chapter is the discussion of a number of powerful data treatment techniques that are used to process the data (BEST, QQ, PCA). Chemometrics is an intimate consideration for NIR spectral data processing and an initial introduction to the multivariate approach is discussed in each chapter. One overlooked feature in these three chapters is the inconsistent formatting of references. A fair number of citations in these chapters include conference presentations that are referred to by different or incomplete formats.

As correctly pointed out by the authors, the most cleverly designed NIR method is of no use to the pharmaceutical world unless it has been validated and accepted by the agency in charge. This is the lead-in to chapter six, "Validation Issues." Initially, the chapter presents some philosophical approaches to validation, but more importantly presents important information for the qualification and verification of a NIR instrument. Table 1 in this chapter recommends acceptance criteria for performance qualification (PQ) on a NIR instrument. The remaining sections of the chapter focus on ICH guidances for method validation and applicability to NIR. Specific examples of NIR method validation are outlined with accompanying references for further reading. This chapter highlights one of the most important aspects of utilizing any analytical technique.

Finally, the last chapter presents medical applications of NIR. This chapter is very well organized into the various subject areas: blood glucose, blood oxygenation, tissue analysis, major organ analysis, in-vitro blood chemistry, in-vivo blood chemistry, newborn analysis, and cancer research. Additionally, the references are extensive, very well organized, and complete. Overall, the presentation of this chapter allows the reader to obtain a very good perspective of the current utilization of NIR in the medical community. Each of the subject areas are very well presented outlining previous forms of analysis, new NIR approaches, but also a critical review between the approaches. The end of the chapter presents a number of review articles, which again, allow the reader to become very familiar with the current status of NIR in the medical community.

The book was well produced and the artwork of uniform good quality. The subject index allows the reader to quickly find topics of interest and for the most part, the references are up-to-date and complete. One shortfall of the book becoming a standalone reference book for the NIR pharmaceutical scientist is the medium level of theory. In summary, the book is a welcome addition to the library of pharmaceutical scientists contemplating, or currently using, NIR analysis.

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Books Received

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