$$\Delta F_c = -nRT \int_0^1 \ln Q_c \, dY \qquad \text{(Eq. 4)}$$

Therefore, as $\Delta F_a = \Delta F_b - \Delta F_c$:

$$\Delta F_a = 2.3nRT \int_0^1 (\log Q_c - \log Q_b) dY \qquad \text{(Eq. 5)}$$

In Fig. 1, curve b represents log Q_b, so the area under the curve multiplied by $-2.3nRT$ is equal to ΔF_b. However, Q_c cannot be obtained in a similar manner, because, in general, reaction c cannot be followed experimentally. A good approximation for log Q_c can be obtained, because all protein molecules are in the R state when Y approaches 1 so the limiting value of log Q_b and log Q_c must be the same. Therefore, an estimate of log Q_c can be obtained from Fig. 1, because line c should equal log Q_c when it is assumed that all sites are equal in the R state. This assumption immediately implies that, from Eq. 5, ΔF_a is equal to the shaded area of Fig. 1 multiplied by $2.3nRT$. In the figure, this area is equal to 5.0 kcal. From the figure, it can be seen that ΔF_a is always a positive quantity in a cooperative process, so the associated equilibrium constant is less than 1 or, in other words, the T conformation is highly favored in the absence of ligand.

This important result is obtained following the assumption that all sites in the R state are equal. A qualitative picture of the situation, when this assumption does not hold, can be obtained in the following way. All protein molecules are in the R state when Y approaches 1, so the limiting value of log Q_b when Y approaches 1 should form one point of the line representing log Q_c. However, when the binding sites are unequal, log Q_c is no longer equal to line c in Fig. 1. Log Q_c cannot lie below line c in Fig. 1, because this would indicate cooperativity in a molecule totally in the R state. Under these circumstances, log Q_c must lie somewhere above line c. This means that the true value of ΔF_a for nonidentical sites is higher than that obtained by applying the method for identical sites. Only when some specific model is assumed can the exact value of ΔF_a be calculated (8). It is obvious that dissimilarity of binding sites in the T state has no influence on the determination of ΔF_a.

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BOOKS

REVIEWS

Topics in Infectious Diseases. Vol. 1. Drug Receptor Interactions in Antimicrobial Chemotherapy. Edited by J. DREWS and F. E. HAHN. Springer-Verlag, 175 Fifth Ave., New York, NY 10010, 1975. 314 pp. 17 × 24.5 cm. Price $19.40.

This book contains the papers presented at the Sandoz Symposium held in Vienna on September 4–6, 1974. It is divided into five general areas, *i.e.*, receptor hypothesis, DNA as a drug receptor, ribosomes as drug receptors, mode of action of chloramphenicol, and microbial enzymes as drug receptors, and includes papers that were contributed by 20 participants. The text of the book has 300 pages, 130 figures and illustrations, and 60 tables.

Drug–receptor interaction is the key to the effect and fate of a drug in the biological system. The authors exemplified the underlying mechanism of antibiotic–receptor interactions by systematically quantifying the relationship between physicochemical parameters and biological responses elicited by interactions of the drug with bioreceptors. Recent advances in research on binding sites of drug molecules to DNA and ribosomal subunits are presented.

The book offers a further insight into the mechanism of development of resistance in microorganisms and the role of plasmids in transmitting resistant genetic elements into the new cell line. Evidence has been produced demonstrating that there can be a surge of R factors in nonpathogenic enterobacteria which may be transferred to the pathogens such as *Shigellae* and *Salmonellae* due to the worldwide indiscriminate use of antibiotics. This is part of the endless race between medical science and microorganisms. The authors discussed the elimination of the genetic determinant elements from plasmids by binding DNA with a number of antibiotic as well as nonantibiotic agents. Enzyme inhibitory actions demonstrated by antibiotics and nonantibiotics suggest potential development of a bacterial enzyme inhibitor as an antimicrobial agent.

The authors suggest that when theory and knowledge of drug–receptor interactions are put into practice, a more ideal drug molecule with precise effect and anticipated mode of action may be designed with less time and expense.

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Medication Law and Behavior. By J. TYRONE GIBSON. Wiley, 605 Third Ave., New York, NY 10016, 1976. 407 pp. 16 × 23.5 cm. Price $15.95.

"The book is designed to help the reader learn more about the influence of medication law on the behavior of health care personnel who assist in providing medication and medication services." The author establishes this objective in the preface and in a highly readable style achieves it in the text.

Nonlawyers and those not in the health professions, as well as health professionals, can learn from reading this book. The book

provides a thorough review of medication law, particularly the Federal Food, Drug, and Cosmetic Act. However, it also considers such areas as professional practice acts and negligence.

The book, however, is not a text on pharmacy law. Rather, it relates the law to the behavior of people, primarily patients and providers of health care. For example, two chapters on the requirements of drug labeling are followed by a chapter on "How Drug Information is Used." The book deals not only with the legal controls on drug distribution but also with the behavioral aspects of why people take drugs (medication).

The book is well referenced and draws on legal citations, behavioral studies, and the clinical literature. The liberal use of figures and tables enhances the value of the book as a learning device. The book is unique in combining the legal aspects of medication with the behavioral aspects. It would be a valuable addition to the library of anyone involved in the drug use process.

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Microencapsulation. Edited by J. R. NIXON. Dekker, 270 Madison Ave., New York, NY 10016, 1976. 215 pp. 16 × 23.5 cm. Price $19.50.

This book constitutes a collection of 17 papers delivered in London at the second international symposium on microencapsulation. The contributors to this hard-covered book are recognized international authorities in the field of microencapsulation.

In Chapter 1, the processes of coacervation, spray encapsulation, and nanoencapsulation are reviewed by P. Speiser. The intricacies of each method are well defined by the author, and applications are also given.

In Chapter 2, A. Watanabe and T. Hayashi describe gelatin–gum arabic coacervation, interfacial polymerization, and the preparation of multiwalled microcapsules. The authors describe the applications of microcapsules in the manufacture of carbonless copy paper, encapsulated perfume ink, and the image display panel, the latter employing the electrophoretic behavior of microcapsules. The chapter is well illustrated with several photographs and diagrams.

In Chapter 3, A. T. Florence and A. W. Jenkins deal with the assessment *in vitro* of microencapsulated drug systems utilized in sustained-release parenteral dosage forms. Drug dissolution, stability, and biodegradability are discussed. The paper is clearly written, well referenced, and illustrated with photographs.

T. M. S. Chang, in Chapter 4, reviews the vast amount of research and clinical applications of semipermeable microcapsules used as artificial cells. Professor Chang, being a leading world authority in this area, is amply qualified to handle this topic, and his paper is documented with 42 references. The applications of microcapsules to augment artificial kidney function are further discussed by R. E. Sparks *et al.* in Chapter 9.

A major problem in the microencapsulation of enzymes has been the loss of enzyme activity during the microencapsulation process. T. Kondo and N. Muramatsu suggest solutions to this problem in Chapter 5.

The use of microcapsules as food particles for marine particulate feeders is discussed by D. A. Jones and P. A. Gabbott in Chapter 6. A nylon coat for the microcapsules provided an indigestable wall to reduce bacterial contact with the enclosed diet. The authors also suggest another important use for microcapsules in the cultivation of marine organisms and that is to supply medicinal compounds, *e.g.*, antibiotics, to prevent or cure disease.

In Chapter 7, M. Calanchi describes several new dosage forms containing microcapsules prepared *via* coacervation. The author discusses the microencapsulation of antibiotics, aspirin, vitamin C, and steroids and suggests applications of the technique to improve drug stability, overcome incompatibilities, prolong the action of drugs, and conceal the bitter taste of medicinals. Further applications for microcapsules as drug delivery systems, particularly in topical dosage forms, are described in Chapter 10 by R. H. Sudekum.

In Chapter 8, G. C. Maggi and F. DiRoberto outline a method used to diagnose and monitor peripheral vascular disorders by employing encapsulated liquid crystal thermography. R. G. Arnold, in Chapter 11, reviews the many varied applications of microencapsulation and describes the sequence of events and procedures the FDA requires to approve a new microencapsulated animal drug product for marketing. This chapter should be of great interest to those interested in marketing such products. Further veterinary applications of microencapsulation are outlined in Chapter 12 by G. Rognoni.

V. de Sabata, in Chapter 13, reviews several published articles concerned with drug bioavailability from microencapsulated dosage forms. Chapter 14 should be of particular interest to the biologist. T. Kondo *et al.* describe the preparation and properties of artificial red blood cells containing hemoglobin solution.

Chapter 15, an excellent chapter by J. R. Nixon and B. R. Matthews, deals with the surface characteristics of gelatin coacervate microcapsules using scanning electron microscopy. Photographs of microcapsules prepared *via* alcohol coacervation and sodium sulfate coacervation procedures display definite surface properties, and these differences are discussed in the paper. Further physicochemical studies of microcapsules appear in Chapter 16. L. Nang and P. F. Carlier mathematically derive the wall diffusion coefficient and discuss its importance in evaluating microencapsulating methods and the optimization of a coacervation process.

In Chapter 17, the final chapter in the book, L. A. Luzzi reviews the applications, methods of preparation, and physicochemical properties of microcapsules. The chapter is well written and well referenced.

Discussions of some applications and methodologies, such as coacervation and interfacial polymerization, are redundant in the book; however, due to the multiple authorship, this repetition could be expected. The book contains an even balance of reviews and original research. It provides an insight to the science of microencapsulation and should stimulate new research ideas. The book is not only of interest to the pharmaceutical scientist but is also intended for pharmacologists, biologists, chemists, and veterinary scientists.

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Practical Pharmaceutical Chemistry. Third Edition—Part One. By A. H. BECKETT and J. B. STENLAKE. Humanities Press, Atlantic Highlands, NJ 07716, 1975. 370 pp. 16 × 24.5 cm. Price $25.00.

Two major additions and several minor revisions have been made in the third edition of this textbook. A new chapter on the registration and assessment of medicines in the United Kingdom has been added. The implications of the Medicines Act of 1968 and Good Manufacturing Practices published by HMSO in 1971 to the analysts and compilers of product applications is presented in a general manner. The treatment of general analytical procedures has been extended. This new chapter covers all important product types including tablets, capsules, suspensions, ointments, creams, pressurized aerosols, lozenges, suppositories, solutions, and mixtures as well as dissolution testing, sustained-release preparations, and particle-size control.

The subject matter is presented in 14 chapters. A limited theoretical treatment is presented, where pertinent, followed by practical examples which have been drawn from the British Pharmacopoeia and other sources. These examples are intended to serve as laboratory exercises.

The book is practical in every sense of the word. It covers primarily the classical methods of analysis, with discussion of the more sophisticated methods being reserved for Part 2. Although the style of presentation of determination of equivalent weights is somewhat different than this reviewer is accustomed to, it is very easy to follow. An insight into the chemistry of many of the limit tests as well as many of the monographs in the British Pharmacopoeia is provided. Of particular interest to this reviewer were the chapters on chemical purity and control, registration and assessment of medicines, and techniques of quantitative analysis. These chapters very basically cover the what, why, and how of quantitative analysis, something that is not infrequently overlooked in the education of analysts.

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