

method should be equally applicable to all other specific ion electrodes.

- (1) M. S. Frant and J. W. Ross, Jr., *Science*, **154**, 1553(1966).
- (2) L. Singer and W. D. Armstrong, *Anal. Chem.*, **40**, 613(1968).
- (3) M. W. Sun, *J. Amer. Ind. Hyg. Ass.*, **30**, 133(1969).
- (4) M. S. Frant, *Plating*, **54**, 702(1967).
- (5) B. A. Raby and W. E. Sunderland, *Anal. Chem.*, **39**, 1304(1967).
- (6) N. Shane and D. Miele, *J. Pharm. Sci.*, **57**, 1260(1968).

- (7) J. J. Lingane, *Anal. Chem.*, **39**, 881(1967).
- (8) K. Strinivasan and G. A. Rechnitz, *ibid.*, **40**, 509(1968).

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Received May 8, 1970.

Accepted for publication June 25, 1970.

## BOOKS

### REVIEWS

*Editor's Note:* While it is not usual Journal practice to run more than one review on a particular book, "The Theory and Practice of Industrial Pharmacy" appeared to warrant a broader approach as it is an initial attempt to produce a textbook in the area of industrial pharmacy. For this reason, we are providing the opinions of two reviewers in the book reviews which follow.

**The Theory and Practice of Industrial Pharmacy.** Vol. 1. Edited by LEON LACHMAN, HERBERT A. LIEBERMAN, and JOSEPH L. KANIG. Lea & Febiger, Philadelphia, PA 19106, 1970. xii + 811 pp. 15.5 × 23 cm. Price \$24.50.

In their preface, the editors state that a good textbook on industrial pharmacy has been sorely needed. This is indeed the case and this book represents the first modern comprehensive treatment of industrial pharmacy to be published in the English language.

The book has three coeditors and thirty-eight contributors. As a result some chapters are truly outstanding and others are distinctly disappointing.

The book is written in four sections. These sections deal with the principles of pharmaceutical processing, dosage forms, quality control, and industrial pharmaceutical law and structures of pharmaceutical companies.

The first third of the book deals with principles of pharmaceutical processing and is written from a unit operations standpoint. Unit operations which are of particular importance in pharmaceutical processing are covered in separate chapters and include drying, mixing, milling, dispersion, clarification and filtration, compaction and compression, heat transfer, and fluid flow. Other specialized pharmaceutical processes treated are sterilization and tablet coating. One of the most outstanding chapters in the entire book appears to be very much out of place in the pharmaceutical processing or unit operations section and that is the chapter on biopharmaceutics. This chapter which was contributed by Professor Gibaldi is perhaps the most outstanding single chapter on the subject of biopharmaceutics to have been written to this date.

Section two treats on an individual chapter basis all of the various major classes of pharmaceutical dosage forms, including tablets, capsules, liquids, emulsions, semisolids, suspensions, suppositories, sterile products, aerosols, and sustained-release products. This section is entitled in the table of contents, "Dosage Forms: Design and Evaluation." Unfortunately dosage form design principles and drug product evaluation are either inadequately treated or are virtually missing from many of the chapters in this section. For example, in the chapter on capsules, no mention is made of the importance of availability studies or methods of characterizing *in vitro* availability. In most of the chapters in this section mechanical methods of manufacture are stressed. In the approximate 40% of the book dealing with dosage forms the chapter on sustained-action dosage forms by Eriksen, the chapter on sterile products by Avis, and the chapter on aerosols by Sciarra are outstanding in organization and content. The chapter on pilot plant scale-up techniques by Michelson is also

well done, but seems strangely out of place, not to have been located in part one of the book dealing with pharmaceutical processing.

The nearly 100 pages of the book dealing with quality control contain two chapters coauthored by Dr. Lachman, one dealing with kinetic principles of stability testing and the other with quality assurance. These are very well written and represent a significant textbook compilation on these subjects to the literature.

In the design, organization, and writing of their book the editors have overlooked one important aspect of industrial pharmacy today. That aspect is the role of preformulation research and the application of physical-chemical principles in a systematic manner for the rational design of pharmaceutical drug products and dosage forms. It is obvious from the examination of the table of contents that the authors were at some loss as to the location of the section on biopharmaceutics. This excellent chapter together with a section on preformulation, its implications in drug product design, and the components of a total preformulation system would have provided a very good foundation for the dosage form section of the book. Unfortunately the preformulation concept is not treated by the book, making the foundation for the following dosage form section inadequate, and accentuating the lack of total information on basic principles of dosage form design and evaluation.

Even though this book contains some obvious omissions, quite often is incomplete on the subjects of dosage form design principles and evaluation, and is questionably organized in two instances, the book does represent a creditable and laudable effort to cover a broad and very difficult area. This book is recommended as a textbook for any advanced pharmaceutics or manufacturing graduate course. The book warrants consideration for elective undergraduate manufacturing pharmacy courses. It is doubtful that the book will find wide-scale acceptance as an undergraduate text based on the specialized subjects treated and the nature of the material being covered. The book should, however, have a prominent place on the shelf of every pharmacy school and pharmaceutical laboratory library. It will also undoubtedly be a valuable contribution to the working bookshelf of many industrial and development pharmacists.

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The preparation of this first attempt at a text on industrial pharmacy was undoubtedly difficult. The very scope of the subject must have given rise to many hard decisions finally arrived at with much hesitation, breadth *versus* depth alone being one of the most weighty of these.