a student could not adequately adjust a patient's phenytoin dose. Since the authors have been involved in pioneering work in this field, it may be that such material will be included in an upcoming text to which they allude. However, in this reviewer's opinion, a more detailed treatment of nonlinear kinetics would have been useful.

Another significant defect of this text is that it is difficult to identify the primary source for some textual material. The source of the data contained in the tables and figures is identified. However, it is generally not possible to identify the source of information within the body of the text.

This book is well written and should be considered as a standard text for introductory courses in Pharmacy Baccalaureate and Doctor of Pharmacy programs and for freshman graduate courses in pharmaceutics and pharmacology.

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**Second Supplement to USP XX and NF XV.** Drug Standards Division, United States Pharmacopeial Convention, 12601 Twinbrook Parkway, Rockville, MD 20852. 245 pp. 20 × 29 cm. Price $8.00.

The *Second Supplement* is cumulative with the first one and contains changes that constitute revisions in the USP XX and NF XV effective May 1, 1981. Additions and deletions in the USP XX official monographs comprise the largest section, totaling 133 pages, whereas those in the General Requirements for Tests and Assays section are contained in 12 pages. Under General Information are selected portions of the regulations promulgated under the Controlled Substances Act and portions of the Poison Packaging Act and Regulations, of interest to students and practitioners in pharmacy and medicine. Changes in the official NF XV monographs comprise almost 20 pages and are followed by an appendix containing excerpts from federal regulations on antibiotics and an index to this supplement.

*Staff Review*

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**Solid Pharmaceutics: Mechanical Properties and Rate Phenomena.** By JENS THURØ CARSTENSEN. Academic, 111 Fifth Ave., New York, NY 10003. 1980. 259 pp. 15 × 23 cm. Price $35.00.

This brief book, written in terse mathematical style, is an ambitious attempt to consolidate the more important research in the field of solid pharmaceutics. The first chapter contains an introduction to the characteristics of single-component systems, with emphasis on the properties of crystals. Chapter 2 deals with particulate solids and their dimensions and properties. Chapter 3 extends this treatment to two-component systems and includes such topics as blending and the effect of moisture on solids. The next two chapters are devoted to successive stages in the manufacture of tablets: precompression operations, including wet granulation, dry milling, tablet formulation, and lubrication, followed by compression and hardness testing. The book concludes with a section on the physical properties of solid dosage forms, particularly the dissolution of tablets and capsules and their chemical stability.

Solid pharmaceutics is perhaps the area in which the catholicity of the pharmaceutical sciences is most in evidence. In his scholarly treatment of the subject, Carstensen draws heavily on the literature of powder technology, crystallography, chemical engineering, polymer science, and metallurgy. Yet he does not hesitate to offer his own views on controversial subjects. In discussing the upward curvature observed in Hixson–Crowell plots of the cube root of mass *versus* time, he suggests that deviations from straight-line behavior can be attributed to the lack of isometry of most real particles. He then proceeds to show how one can introduce a shape factor to correct for this deviation. In discussing angle of repose, he points out that the equations usually employed predict that as the particle diameter becomes smaller, the angle of repose approaches an infinite value rather than the value most consistent with the physical model, 90°. To remedy this, the cohesional and frictional coefficients are expressed in terms of trial functions with proper boundary conditions and an equation is obtained based on the force diagram for a powder heap.

Particularly lucid is his treatment of Prout–Tompkins kinetics of solid-state decomposition. Carstensen also shows how the boundary conditions of the Prout–Tompkins model can be modified to treat data that follow first-order kinetics.

Where appropriate, the text is augmented with solved quantitative examples, copious tables of empirical data, and more than 100 beautifully drawn, uncluttered, line figures. Those familiar with Carstensen's earlier treatments of this subject, "Pharmaceutics of Solids and Solid Dosage Forms" and "Theory of Pharmaceutical Systems," will see some of the same figures and numerical examples in the present volume, but repetition has been kept to a minimum. The problems are relatively easy and are mainly computational exercises.

One may make some minor criticisms of the book, especially with regard to topics such as lyophilization and spray drying, which are given short shrift. Symbols often are introduced without definition, and unconventional symbols are substituted unnecessarily for more familiar ones. For example, in the Bragg equation, $R_0$ rather than $d$ is used for interplanar spacing. The Greek letter $\theta$ is used for time. More confusing, $F$ is used for the Helmholtz energy rather than $A$. Formerly, of course, $F$ was used in textbooks for the Gibbs free energy. There are a few errors. An exponent has been omitted in the Shotten–Hersey equation (V-3-24a). In the plot of water vapor pressure *versus* moles of water, one plateau for sodium phosphate is mislabeled (Fig. III-15). But these are minor points and in no way detract from my opinion that the author has treated a comprehensive set of difficult problems with excellent conceptual organization and clarity.

Pharmaceutical development scientists and graduate students who require a quantitative understanding of the operations related to the manufacture of solid dosage forms will find this slender volume very useful. It is not for casual reading, and the nonspecialist who wants a broad overview of the field will have to find it elsewhere.

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