signed. The charts and diagrams are good, and it is only occasionally with the color photographs, which are liberally used, that visual rather than illustrative values appear to have influenced the choice of a picture.

The encyclopedia's machinery is serviceable. Indexing is adequate, cross-referencing is not irksome, topics usually are found where the reader expects them, and a 16-page bibliography points the way for those whose appetite has been whetted for more information.

An encyclopedia must ultimately be judged on the basis of its usefulness, and the experience of using the Harper encyclopedia for several months has led this nonspecialist to expect to find what he needs.

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Chemical Engineering

The Theory of Recycle Processes in Chemical Engineering. M. F. Nagiev. Translated from the Russian edition (Moscow, 1958) by R. Hardbottle. R. M. Nedderman, Ed. Pergamon, London; Macmillan, New York, 1964. xiv + 278 pp. Illus. $15.

Fundamental concepts of the recycle processes used in chemical engineering are discussed in this book. In the petroleum and chemical industries it is common practice to separate the reaction products from the unconverted fresh feed by distillation, extraction, and crystallization when equilibrium limits the degree of conversion or prolonged exposure of the products in the reactor causes undesirable side reactions. These basic principles are developed in considerable detail in the text.

Apparently the author is more mathematician than chemist because many of the minor but important interactions that occur in recycle processes are not mentioned, but when he deals with a single straightforward reaction, such as light hydrocarbon isomerization, where no by-products are formed, the mathematical derivations are especially useful. However, important parameters in olefin alkylation by isobutane, for example, inlet olefin concentration, emulsion stability, and product quality, which are altered by degree of isobutane recycle, are not considered. In other processes, portions of the reactor effluent—hydrogen in destructive hydrogenation processes, for example—are recycled to control the temperature, to alter viscosity of oil, to maintain catalyst activity, and to improve the contact between the feed and the catalyst. For similar reasons in other processes, the value and effect of recycling are far beyond the elementary weight balance considerations expounded by the author.

Unfortunately thermal recycle cracking of light and heavy petroleum fractions is used as an illustrative example in several chapters; this obsolete process is no longer used in modern petroleum refineries. Other factors also make it a poor choice—the interactions that occur and the change in quality of the recycle feed with operating variables, conversion per pass, and efficiency of separation of products. Consequently, the operating conditions and yields must be established by experiments and cannot be predicted from general principles.

As the author notes, mathematical studies of this type are necessary to facilitate automatic control of processes and optimization of operating conditions with competitors. Of course, when many parameters are involved, laboratory data are necessary for confirmation, or only a small portion of the process would be subjected to analysis or control.

The translation is excellent. The English is easily read, and industrial terms are used. One exception is the "round" cracking process, which is merely recycle thermal cracking.

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Pharmaceutical Chemistry

Modern Inorganic Pharmaceutical Chemistry. Clarence A. Discher. Wiley, New York, 1964. xii + 636 pp. Illus. $12.

With the major emphasis in the pharmaceutical field on synthetic organic chemicals, or natural products, it is easy to forget that a whole area of science is concerned with the pharmaceutical applications of inorganic compounds. Discher's book is intended to vitalize the teaching of inorganic pharmaceutical chemistry, and he presents a different approach to the subjcet, because, as he states in the preface ". . . too often [the course on] inorganic medicinals has become just another chemistry course with some pharmaceutical overtures. . . ." In the main, the author has succeeded in presenting a new approach; students should enjoy using this text.

The book is divided into three parts, consisting of five, six, and nine chapters, respectively. The first, and by far the best section, begins with some elementary statements and soon leads into an elegant review of modern concepts of inorganic chemistry. Structure of molecules, their properties, and the background for reactions are well described. The fourth chapter, which includes acids and bases, is especially well done. Only the fifth chapter, on inorganic nomenclature, needs improvement; this discussion should have been presented much sooner.

Part 2 is concerned with "inorganic chemistry in the practice of pharmacy." Water as a solvent and as a unique chemical is adequately covered. Owing to the review of acids and bases in part 1, the concept of buffers is easily followed. The material on solubilities of pharmaceuticals is well written. An unusually long, drawn-out section on silicates concludes part 2.

In the third section acids and bases are again considered in the material on *p*H control. Basically this section, however, is concerned with inorganic therapeutics, trace elements, and electrolytes.

The author has certainly met his objectives in presenting a readable and well-organized book. He has provided basic chapter outlines, review questions, and some bibliography. The criticisms of the book are minor in comparison to its good points. Some will disagree with the choice, on page 78, of chromium rather than ferrocene, which is a better example. Also, the cyclopentadienes are not positioned correctly. But perhaps the most annoying feature is the use of arrows, pointing up or down, to show gases or precipitates. Wrong impressions can easily be given with this archaic system of notation—for example, on page 339, the implication is that hydrochloric acid gas will be liberated when sodium chloride is treated with *dilute* sulfuric acid. It should not be necessary to represent easily dissociable electrolytes as charged molecules—for example, Na^+Cl^-.

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