Book Reviews

Cellulose and Cellulose Derivatives. pt. II. Emil Ott, Harold M. Spurlin, and Mildred W. Grafflin, Eds. vol. V of *High Polymers.* Interscience, New York–London, rev. ed. 2, 1954. viii + 511–1055 pp. Illus. $12.

This is a continuation of what was so ably done in part I of this treatise. The principal chapters deal with the manufacture of cellulose from its natural sources, its conversion into paper products, and the chemistry of the cellulose esters, ethers, and the xanthate.

Although full consideration is given to the underlying chemical principles on which the respective industries are based, the nature of the subjects justifies considerably more attention to the technologic aspects than was found necessary in the preceding part. Like part I, this volume contains no index, and part III is required to make it especially useful for reference purposes.

Pulping, bleaching, and alkaline refining are adequately and splendidly treated for this type of book. It is to be regretted, however, that it was found necessary to abbreviate the discussions of the currently important prehydrolysis pulping procedure to a single paragraph. Were more space allotted, the section on the refining of wood cellulose would undoubtedly have included further reference to other important factors, such as the influence of chosen conditions during chlorination and the relative advantages of cold and hot alkaline procedures for the manufacture of the high alpha cellulose wood pulps.

The section that describes the actual conversion of wood pulp to paper is well prepared and serves the intended purpose. The various theories of beating are excellently presented. The influence of hemicellulose in the wood pulps is discussed and some reference is made to the role played by pentosans. With further expansion of the subject, the authors would undoubtedly have noted that type and history, as well as total amount of pentosans, are also determining factors.

The subject of cellulose reactivity is fully and admirably discussed and is up to date. Surely much more will be known of this interesting behavior by the time the next edition of this work is compiled. Calculation for theoretical arrangements of substituent groups is given in considerable detail, and the usefulness of statistical consideration as a guide to research programs is stressed. This study of increased accessibility by swelling and of partial loss of reactivity on drying has been, and will continue to be, a fruitful field.

The section on organic esters has been completely revised. It places new and major emphasis on such items as the role of sulfuric acid catalyst during esterification, the preferential esterification of primary hydroxyls, the importance of the ratio of primary and secondary hydroxyls present in the hydrolyzed ester, and the very important subject of ester stability.

Although much of the chapter that deals with xanthate and regenerated cellulose is necessarily a repetition of the material in the 1943 edition, the technologic progress made in the last decade, as well as the modern concepts that aim to explain more satisfactorily the practical knowledge of this industry, are presented in a clear and concise manner.

This second part fulfills the promise of the first and continues to mark *Cellulose and Cellulose Derivatives* as an excellent work that possesses both educational value and utility for the student and the professional practitioner.

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Treatise on Invertebrate Paleontology. Raymond C. Moore, Ed. pt. D, ***Protista 3: Protozoa*** (chiefly Radiolaria and Tintinnina), Arthur Shackleton Campbell and Raymond C. Moore. Geological Society of America; Univ. of Kansas Press, Lawrence, xii + 195 pp. 1954. Illus. $3.

This very meaty part of the *Treatise* considers the Actinopoda and Heliozoa by Moore; then the Radiolaria by Campbell; the Sporozoa and Ciliphora by Moore; and lastly the Tintinnina by Campbell.

The several groups considered by Moore are those most lacking in fossils or even unknown as fossils but are justified in being included. Some have rare fossils and others such as the *Sporozoa* must have a paleontologic history and played an important, although unknown, part in evolution. The very completeness of their inclusion is wise.

The two groups handled by Campbell are most important. It is the first time since Haeckel's Challenger Report in 1887 that the Radiolaria, both recent and fossil, have been studied as a group and the classification been brought up to date and emended in the light of recent knowledge and the Rules of Zoological Nomenclature, a very necessary and valuable study.

The subclass Radiolaria is divided into the order Porulosida with two suborders, 12 superfamilies, 57 families, 95 subfamilies, 474 genera, and 504 subgenera; and the order Osculosida with two suborders, 11 superfamilies, 46 families, 87 subfamilies, 427 genera, and 258 subgenera. In all, 901 genera and 762 subgenera are in the subclass. These are treated systematically with numerous genetic illustrations through some 133 pages of text. Some of the figures are very complete (for example, Fig. 8 has 65 drawings).

The suborder Tintinnina, one of the subdivisions of the ciliate protozoans that do leave fossils, is also by Campbell. Here he has brought together all the

genera living and fossils known up to Jan. 1953. He lists 13 families, 11 subfamilies, 73 genera, and 23 subgenera and illustrates 60 genera, including all known fossil ones.

The morphology (with a glossary), the biology, the ecology, the geologic distribution, the method of study, and the classification are skillfully handled for the two major groups. For the student of micropaleontology this book is a must, and all protozoologists should study it as well.

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Advanced Organic Chemistry. E. Earl Royals. Prentice-Hall, New York, 1954. xii + 948 pp. Illus. $12.

Until the appearance of *Advanced Organic Chemistry,* no textbook had attempted an advanced-level survey of a broad range of factual material unified by the intensive use of modern electronic theory. Royals has succeeded admirably in presenting electronic theory "as a practically useful aid to the understanding and memory, not as a predictive tool." The book is particularly suited for the first-year graduate course in organic chemistry.

Part 1 begins with a survey of principles governing structure and reactivity of organic compounds. There follow chapters devoted to alkanes, cycloalkanes, alkenes, aromatic hydrocarbons, and alkynes. Part 2 deals with carbonyl compounds of all types. A short chapter on the nature of the carbonyl group is followed by chapters on methods of preparation of carbonyl compounds, addition reactions of carbonyl compounds, and reactions of carbonyl compounds dependent on active hydrogen. Throughout the 846 pages of actual text, emphasis is placed on chemical transformations and their mechanistic interpretations. The large number of structural formulas facilitates understanding. Structure as such and particularly physical methods for determining structure are not emphasized. The book generally is well documented, literature references for the most part ending at 1950. The excellent 90-page subject index greatly increases the usefulness of the book. Specialized subject material purposely is omitted, and "fundamental knowledge" is emphasized. Results of kinetic and stereochemical studies are used with pleasing frequency and force. However, it is to be regretted that a systematic introduction to stereochemistry was purposely omitted.

The author's treatment of theory is most critical and unusually well done. Some of his theoretical analogies are indeed brilliant, and virtually all of them will be extremely helpful to students. However, the frequent misprints will be disturbing to some. Where more stilted authors would use more "elegant" terms, Royals rightly uses the term *rationalization* to describe theoretical interpretations of experimental results. I believe that this repeated contact with the word *rationalization* will stimulate a healthy attitude in the minds of those student readers who otherwise might tend to exaggerate the accuracy and the level of development of present-day theoretical ideas.

No book the size of *Advanced Organic Chemistry* could be expected to be free from error or to satisfy the desires of all teachers or students. Nevertheless, I feel that the space (100 pp.) devoted specifically to aromatic hydrocarbons is considerably smaller than is warranted by their importance. It seems likely that the justification ("the average undergraduate course in organic chemistry gives a much more complete descriptive treatment of aromatic than of aliphatic chemistry") will not be widely accepted. In the relatively brief treatment of aromaticity of polycyclic hydrocarbons, too much emphasis is placed on the "average" resonance energy per benzene ring. The conclusion (p. 424) that "phenanthrene is slightly more stable than anthracene and slightly more aromatic" needs elaboration in terms of the double-bond character of individual bonds. This latter concept also would strengthen the author's well-taken comparison between alkenes and aromatic hydrocarbons. The very brief treatment of the Mills-Nixon effect is written with great penetration and clarity. The mechanism (p. 801) postulated for the Elbs reaction is in interesting harmony with the limited amount of experimental evidence—which apparently appeared too late for inclusion. The statement (p. 408) that naphthalene derivatives do not act as dienes in the Diels-Alder reaction overlooks the recent (1950) work of Kloetzel. Ethylene should not be included among the alkenes that are "best polymerized by a polar mechanism . . . under the influence of acid catalysts" (p. 320).

These criticisms are not intended to detract from the over-all usefulness and value of this comprehensive book, which is certain to gain the widespread recognition merited by its general excellence.

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The Vitamins: Chemistry, Physiology, Pathology. vol. III. W. H. Sebrell, Jr., and Robert S. Harris, Eds. Academic Press, New York, 1954. xi + 665 pp. Illus. $15.

This final volume of a three-volume work on the vitamins is devoted to *p*-aminobenzoic acid, pteroylglutamic acid, pyridoxine, riboflavin, thiamine, tocopherols, and the new and unidentified growth factors. As in the earlier volumes, each of the various aspects of the vitamins, such as chemistry, estimation, occurrence, biogenesis, effects of deficiency, pharmacology, and requirements, is presented by one or more authorities noted for the specific phase.

The editors and authors have performed a masterful job of organizing and presenting the mass of material to be covered in a manner that is very clear and easy, and enjoyable to follow and read. The author and subject indexes were also very carefully and thoroughly done to enhance the value and usefulness of this series.