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.