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.

In general, the excellence attained in the first two volumes is maintained in this one. Particularly outstanding is the treatment of *p*-aminobenzoic acid and pteroylglutamic acid. More than 200 pages are devoted to these related vitamins, an indication of the thoroughness attempted. Despite this thoroughness, a few literature oversights were noted together with several minor errors in structural formulas. A shortcoming apparent in this volume, in contrast to the earlier ones, is a more limited use of gross and histological photographs in association with the pathology of the specific vitamin deficiencies. Tables on the occurrence of certain vitamins, particularly of pteroylglutamic acid, pyridoxine, and *p*-aminobenzoic acid, should be of value to nutritionists. However, a more detailed presentation of the occurrence of several of the other vitamins would have seemed desirable.

With the publication of this final volume, a very excellent series of reference books on the vitamins is now available and should be most welcomed by biochemists, nutritionists, and other investigators.

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Dictionary of Mathematical Sciences, English-German. vol II. Leo Herland. Ungar, New York, 1954. 336 pp. $4.50.

The first volume, German-English, of this dictionary was published some time ago.

The designation, "mathematical sciences" is here taken quite broadly to include statistics (entries by Gregor Sebba) and commerce (entries by Robert Grossbard). One might well expect the statistics, but possibly not the commerce. In addition, there are entries identified as arising from acoustics, architecture, astronomy, aviation, ballistics, cartography, chemistry, crystallography, electricity, electronics, engineering, finance, geography, geology, insurance, logic, magnetism, meteorology, optics, and physics, not to mention the several branches of mathematics proper.

The lexicographer's lot is not an easy one, and at least this particular nonlexicographic reviewer would stand in some awe before the mere task of deciding which entries to include and which to omit. For example, there is an entry *paralogism,* but none for the antonym *sophism.* Certainly, if either term is to be left out, it should be *sophism.* One can think of arguments both pro and con, or the omission could have been an oversight. This is a trivial example. On the other hand, there are entries for the suffixes *-digit, -sheeted, -sided,* but none for such ubiquitous prefixes as *poly-, mono-, bi-, deci-, centi-,* and *mega-.* In fact, if there are any prefixes, they are very few. There are some proper names and adjectives derived therefrom: *Boyle, Galois,* and *Galton,* but neither *Boole* nor *Boolean.* The use of *proper,* as in *proper value* and *proper vector,* is not recognized. Throughout there are innumerable decisions to be made. The criteria are not always clear, but none of the omissions would seem to impair the utility of the result to any extent. These points, therefore, are made, merely for descriptive purposes and with no implied criticism.

On the positive side, the most noticeable feature of the *Dictionary* is the great abundance of cross references. For example, under the single entry *field* there are 50 cross references. This is, of course, extreme, but indicative. Another feature is the abundance of phrases, each listed under the most important word of the phrase, be it substantive or modifier. One wonders at times about the selection of key words; thus, *health insurance* is a separate entry, but *group insurance* comes under *insurance.*

No pronunciations are given except for an occasional accented syllable in German words. English words are separated etymologically (not by syllables), but the etymologies themselves are not given. English parts of speech and genders of German nouns are included. Indication is made where a usage is peculiar to American or British English, as in the inelegant American use of *billion* and *trillion.* The arrangement throughout, including the preface in both English and German, is such as to make this book equally usable to readers of German or English.

Three typographic errors have been noted, none of which could cause confusion. Altogether, the volume should prove extremely useful both to the German speaker reading English and to the English speaker attempting to write in German.

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Mathematics in Type. William Byrd Press, Richmond, Va., 1954. xii + 58 pp. Illus. Paper, $3.

It is unfortunate that few authors of papers or books on mathematical subjects know so little about the possibilities or limitations in mathematical composition. The staff of the William Byrd Press made a thorough study of the problem, during which it sought the advice of many organizations, and now presents a plea for foresight on the part of an author in his use of mathematical symbols.

A machine is limited in what it can economically do; a mathematician seems to possess unlimited inventiveness so far as symbolism is concerned. Unless an author does use good judgment in his writing, the cost of composition for his paper or book will be great.

By means of well-chosen examples and clear exposition, this small book presents excellent advice. The type face itself is that used in many mathematics publications. This adds to a reader's visual concept of what a printer can do with his manuscript. In the discussion of preparation of a manuscript, any mathematician will find suggestions that will save himself, his editor, and his printer much work.

On page 15, "totalling" sent me rummaging for a dictionary. The tradition of the impossibility of pub-