novic, H. E. Zimmerman, H. E. Gunning and O. P. Strauss, R. Dessauer and J. P. Paris, and O. L. Chapman, respectively, have effectively written the last six chapters.

A second volume is promised almost immediately with others to follow. For volume 1, the editors have succeeded in securing authors thoroughly familiar with their fields. Subsequent volumes will be awaited with great interest.

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Evolution

The Process of Evolution. Paul R. Ehrlich and Richard W. Holm. McGraw-Hill, New York, 1963. xvi + 347 pp. Illus. $8.95.

Evolution. Jay M. Savage. Holt, Rinehart, and Winston, New York, 1963. viii + 126 pp. Illus. Paper, $1.25.

It is surprising how similar two very different texts can be. In both of these books evolution is discussed as a process of gene frequency change. Both authors present a strong interest in herpetology, which has led to a relative abundance of examples from a usually neglected field. These authors are based in California, and maps of that state are common and references to its backwoods require a greater knowledge of local geography than one might expect of students in other parts of the country. Both books tend to refer the student to other texts rather than to original papers. There is a tendency to state opinions and theories as if they were facts, and this is coupled with inadequate references to source material. The inquisitive reader often has no place to turn for enlightenment.

Ehrlich and Holm have written a reasonably good text on the process of evolution. Their book will probably be used in advanced courses but it was intended for a more general audience. Therefore, it contains an extensive exposition of genetics and an introduction to cytology, which, together, occupy about one-third of the book with material that is not needed by the bulk of the readers. The other major subjects covered include theoretical population genetics; examples of natural and artificial selection; methods for requiring, permitting, or prohibiting the recombination of genes; and a discussion of variation within and between species. In addition to this traditional description of the genetic aspects of evolution, there is a final chapter in which the authors discuss the problem of variation within a species complex from the computer user's ultramodern point of view. This section should prove far more impressive than understandable, but the student will receive some idea of the large amount of simplification present in the usual definition of a species. Throughout the book, information is firmly packed into each paragraph so that it is difficult to read. Undoubtedly, Ehrlich and Holm will prove to be an interesting competitor with the standard texts in the genetic explanation of evolution.

Savage's *Evolution* can easily be dismissed. It is short and catastrophically bad. The discussion of evolution is acceptable, but almost everything related to genetics is disputable or wrong—mostly wrong. The worst fault is the confusion of an allele's name with its frequency, so that p is the frequency of p and it is an allele of q, which has a frequency q. Two such loci are discussed at the bottom of page 41, and the number of errors there may set a record for six lines of print in a modern science text. No instructor should lead a student into this morass.

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Electron Deficient Compounds

Boron Hydrides. William N. Lipscomb. Benjamin, New York, 1963. x + 275 pp. Illus. $14.

In 1933 Alfred Stock published the first book summarizing his brilliant pioneer work on the identification and chemical characterization of the enigmatic boron hydrides. In this early volume structural and theoretical information was either nonexistent or mostly incorrect. During the past 15 years work on these early problem areas has been cleverly advanced by Lipscomb and his co-workers. It is thus appropriate that such new material forms the heart of Lipscomb's book, which includes developments up to the summer of 1963.

The first chapter is an excellent summary of structural information on about 40 boron hydrides, halides, and their derivatives. Chapters 2 and 3 are devoted to theoretical models for the so-called "electron deficient molecules." In chapter 2 boron hydrides are described in terms of localized two- and three-center bonds and electron delocalization is then described in terms of resonance involving these bonds. In chapter 3 a very terse introduction to the molecular orbital method for B_5H_9 precedes the description of an application of molecular orbital theory to such topics as an estimation of energy levels, spectral lines, ionization potentials, heats of formation, and charge distribution in the boron hydrides. Lipscomb is enthusiastic in his presentation and has devoted a large amount of space to the semiquantitative applications of theory, but in my mind many of the problems considered are so difficult that, despite the amount of space used, the results are not reassuring. For example, in B_2H_6 the bridge protons are referred to as more negative than the terminal protons (pages 33, 106, and 172) by one method, as more positive than the terminal protons by another method (page 106), and as a subject for further study (pages 107 and 112). As Lipscomb notes, our problems are probably indicative of the "symmetry of our ignorance."

Chapter 4 gives a résumé of available information on nuclear magnetic resonance spectra of boron hydrides and their derivatives. It contains a proper recognition of both the problems and strong points of the method. Chapter 5 is a concise summary of the chemistry of the various hydrides. Much of this information is presented in tables, equations, and illustrative reactions. Although I would prefer to have a little more detail, the book does provide a neat summary and entrée into most of the pertinent literature on the subject.

The book is nicely presented and reasonably free from typographical errors. One of the features that will cause some annoyance to the average reader is the constant reference to numbered borons in the theoretical discussions of chapters 2 and 3 and the complete absence of numbers for borons on all of the accompanying figures.

It is inconceivable to me that anyone working with boron hydrides or related compounds would wish to do

without the tremendous assistance of this volume. For all chemists (experimental and theoretical) this volume summarizes neatly the tremendous progress that has been made in our understanding of "electron deficient" compounds. At the same time even the casual reader will note that significant problems remain. The book is a major contribution to a rapidly expanding field.

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History of an Industry

The Petroleum Industry. George Sell. Oxford University Press, New York, 1963. x + 276 pp. Illus. $5.60.

The author attempts in this short book to give the reader a panoramic picture of this vast industry, its history, its techniques, and its size. The story ranges from the building of the ark to the production of biologically soft detergents. In general, the story is well told. It is a book intended for the general reader, of course, not for the specialist; although specialists are becoming so specialized that perhaps they, too, will pick up new information. In any book of this type, the question that the author must answer is, "how much information should I include?" If he includes too much, the book is costly and overspecialized; if he includes too little it is superficial. Sell has managed to steer skillfully between this literary Scylla and Charybdis.

The book is logically arranged; Sell begins with the origin and nature of petroleum and considers exploration, drilling, and production. He then moves to manufacturing—various refinery processes (distillation, cracking, platforming, treating, and the like) as well as the physical and chemical properties of petroleum products are discussed. The use and distribution of petroleum products are considered and the vast research activities of the petroleum industry are noted. A following chapter recounts how these research activities have led to the production of chemicals.

That the author emphasizes exploration and production more than manufacturing and research is probably a reflection of his background. There are a few specific points that might be raised: the double bond in an olefin is not a weak linkage, it is a reactive linkage; diolefins are not really less stable, just more reactive. Sell's statement (p. 145) that during refining the total sulfur content is reduced to negligible proportions is at odds with the immediately following statement in which he (correctly) says that this sulfur has an adverse effect on the antiknock properties of tetraethyl lead. In the discussion of jet fuels the five-line paragraph (p. 151) on thermal stability seems somewhat inadequate in view of the importance of this property with respect to present and future aircraft and the immense amount of work devoted to its study. Further, in the discussion of detergents produced from alkylated benzene, a few words explaining that branched dodecenes are replaced with straight-chain dodecenes because this provides a more palatable food for microorganisms and thus promotes the purification of water supplies, might have been worthwhile in view of the great current interest in water conservation.

However, these are relatively minor points. My only major criticism is that almost no references are cited. Apart from the IP and ASTM test numbers and some indication of sources for the statistical data on production and reserves, there is no indication that the author consulted anyone in writing this book. References to some of the more extensive and intensive works that are available would have made this book more valuable, for the general reader could then have satisfied his urge for more detailed information.

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Mathematical Psychology

Handbook of Mathematical Psychology. vol. 1. R. Duncan Luce, Robert R. Bush, and Eugene Galanter, Eds. Wiley, New York, 1963. xiii + 491 pp. Illus. $10.50.

Although mathematical psychology has been with us for many years and its central role in the area of psychometrics has long been well established, the approach has only recently begun to assume an important place within the framework of general experimental psychology. The past 15 years have seen a remarkable growth in the development and use of mathematical models in various areas of experimental psychology. The editors of the *Handbook* have undertaken the task of bringing together the new material into a single source, as a kind of advanced introduction to the present state of mathematical psychology in each of the areas in which the techniques are now being extensively used. To accomplish their purpose, they have persuaded major contributors in each area to prepare chapters in their special fields. This first installment of what will be a three-volume work fully lives up to expectations. It will certainly become a necessary item in the libraries of all who profess interest or competence in quantitative experimental psychology.

In the first chapter, Suppes and Zinnes present by far the most elaborate and sophisticated formal analysis of the nature of measurement that has appeared in the psychological literature. Because it is written largely in "axiomatics," a language not unlike English but with a somewhat different vocabulary and a greatly expanded character set, this chapter is likely to be avoided by all but the most highly motivated readers. This will be unfortunate: the chapter states with great (and agonizing) precision a good many things that badly need saying.

Roughly half of the book is devoted to the "new psychophysics." Included here is an organizing chapter by Bush, Luce, and Galanter, a chapter on detection and recognition by Luce, and chapters on discrimination and psychophysical scaling by Luce and Galanter. The new psychophysics is a rather surprising discipline. The experimental methods and the simple sensory continua to which the methods are applied are essentially those of traditional psychophysics: only the problems have been changed. Concern here is not so much with what is detectable or identifiable or discriminable as it is with the response processes themselves. Three main classes of models have been developed which attempt to account in detail for the behavior of subjects in these simple judgmental tasks. Chapters 3 and 4 are largely devoted to presenting adaptations and modifications of these models to fit various psychophysical situations. The same scheme is followed as far as possible in the chapter on psychophysical scaling. Here, however, the carefree empiricism underlying the quantitative judgment methods presents a truly formidable task for the axiomatic approach of the theoretician. The exposition throughout the section