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.

R. W. PARRY
Department of Chemistry, University of Michigan, Ann Arbor

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.

A. C. NIXON
Shell Development Company, Emeryville, California

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