

# Book Reviews

**Electrophilic Substitution in Benzenoid Compounds.** By R. O. C. NORMAN, M.A., Ph.D. (Oxford), F.R.I.C., Fellow of Merton College, Oxford, and University Lecturer in Chemistry, and R. TAYLOR, B.Sc., Ph.D. (London), Lecturer in Chemistry, University of Sussex. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York, N. Y. 1965. ix + 343 pp. 13.5 × 21 cm. \$12.75.

Modern analytical techniques, the use of heavy isotopes of hydrogen, and theoretical treatments have advanced the field of aromatic substitution on almost all fronts. Consequently, there has been a greatly increased activity in the field in the last decade, but although several monographs and chapters dealing with specific areas have appeared, no comprehensive book treating all phases of electrophilic aromatic substitution has been published. The book by Norman and Taylor is the first one, and the third volume in the series "Reaction Mechanisms in Organic Chemistry," initially edited by the late E. D. Hughes. It is a worthwhile addition to the series.

The authors set out to present the current state of electrophilic aromatic substitution from a mechanistic point of view. On the whole, they succeed very well. After two initial chapters which deal essentially with electronic effects and the general theory of aromatic substitution, they systematically discuss in Chapters 3-10 all classes of electrophilic substitution, such as nitration, halogenation, hydrogen exchange, etc. These conventional reactions are followed by a treatment of reactions where the proton is the displacing electrophile, and one where the group X, other than hydrogen, is replaced by an electrophile Y. By the nature of it, these last two chapters cover in principle the most material. Every conceivable reaction that has ever been carried out, even if only once, appears to be mentioned. For some of these, mechanistic information or quantitative data are rather meager, but one is impressed by how much valid modern work has been done lately, and how much information has been gained from such reactions as, for instance, protodesilylation. How many readers will have known that the effects of more substituents have been studied for protodetriethylgermylation than for any other substitution reaction?

Because these eight chapters cover a very large amount of experimental material, no single reaction can be treated very deeply, but the authors manage to touch all important aspects of each reaction and always mention the latest work. Emphasis is heavy on substituent effects, and this becomes somewhat tedious and repetitive, because the effect of substituents is taken up separately in every chapter under each reaction, in addition to being discussed in the two introductory chapters and again in the last one. However, the reader who wants to familiarize himself with the latest advances in a particular reaction will find, in every chapter, a neat little package with worthwhile and interesting material.

In Chapter 11, the authors discuss quantitative correlations and the *ortho:para* ratio. They give a very good and critical account of the theoretical shortcomings of free energy relationships when applied to electrophilic substitution, and discuss the necessity of a multiparameter equation of the Yukawa-Tsuno type, which takes account of the effect of the electrophile on the effect of the substituent, even if it means the inclusion of two more parameters. A last chapter on preparative methods in aromatic substitution seems unnecessary and perfunctory.

In a book of this wide scope not everything can be covered comprehensively, and a choice has to be made. In recent years, one has learned a great deal from isotope effects about the actual course of the substitution process in different reactions, but the results of such studies have not been given sufficient treatment here. Nevertheless, an astonishing amount of material is included, and no important recent references are missing. This is not just the only book available; it is a good book, which can be recommended to students and research workers in other fields who want an up-to-date view of electrophilic aromatic substitution.

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