the author admits the possibility of true organ specificity caused by gene action on a field of differentiation or on the integrative processes which precede organ formation. The third is pleiotropy, of which a penetrating analysis is presented. Primary pleiotropy, that is, the existence of multifunctional genes, is considered as a possibility. Other types of intracellular or intercellular reaction chains that may lead to pleiotropism are illustrated diagrammatically. For one of these, namely, the selective activation of genes by the cytoplasm, Beale's work on *Paramecium* antigens might have been quoted as evidence. The terminology of pleiotropic mechanisms matches the subtlety of this analysis, and it leaves me wondering whether a simpler, though less precise, terminology might not be preferable. Some new terms, such as 'autophene' and 'allophene' for phenotypic traits that are determined respectively by the genes in the affected cells themselves or by genes in other cells, are useful and merit a place in the vocabulary of developmental genetics. For readers who are intimidated by the abundance of technical terms, a full glossary is provided.

The first third of the book treats more purely genetical questions, such as the detection of lethals, mutation-rates, and the frequency of chromosome rearrangements with lethal effect. These lucidly written chapters, although less stimulating and original than those dealing with gene action, should be very useful for the beginner in mutation work.

The clear writing and logical presentation make the work easy to follow and pleasant to read. It has been beautifully produced, and the paper does justice to the many excellent diagrams, most of them drawn by the author's son, which form a specially attractive feature. There is an extensive list of references. Altogether, this is an admirable book, interesting and stimulating for the experienced geneticist and yet simple and clear enough for a newcomer to the field of genetical research. One minor mistake may be corrected in the next edition: the hormone therapy against teleangiectasia, mentioned on p. 286, is used on heterozygotes, not on homozygotes which, as explained on p. 138, are probably inviable.

C. AUERBACH

THEORETICAL ORGANIC CHEMISTRY

Theoretical Principles of Organic Chemistry

By Prof. Walter Hückel. Vol. 1. (Translated from the corrected seventh German edition by Prof. F. H. Rathmann.) Pp. xi+904. (Amsterdam: Elsevier Publishing Company; London: Cleaver-Hume Press, Ltd., 1955.) 77*s.* 6*d.*

THIS English version of Prof. Walter Hückel's text-book, which has been given a clear, if apparently at times rather literal, translation by Prof. F. H. Rathmann, will be of interest to all organic chemists. The topics considered in this first volume, after a preliminary chapter on valency, include stereochemistry, oxonium compounds and molecular complexes, compounds with abnormal valencies, tautomerism, intramolecular rearrangements, steric rearrangements, unsaturated compounds, aromatic compounds, and the course of chemical reactions. The material is dealt with largely in chronological order from the point of view of the problems which arise directly from classical studies of organic reactions. Those aspects which require considerable knowledge of physical chemistry—particularly the relationships between constitution, physical properties and reaction velocities—have been deferred to the second volume.

Modern theories of organic chemistry derive some of their attraction from their power to enable, first, the correlation, within a consistent theoretical framework, of many of the at first sight diverse phenomena of organic chemistry, and secondly, the recognition of recurring patterns of behaviour, even though these may not always be quantitatively predictable. Not only do these theories rely on physical principles in discussing molecular properties and reactivities, but also they allow an extensive correlation of the physical properties of atoms and molecules with their chemical structures and reactivities. The impact on chemical theory of the ideas derivable from atomic and molecular spectroscopy, for example, has been very great, and the overlapping, in this kind of way, of pure chemistry, on one hand, and pure physics, on the other, is a striking and particularly happy feature of modern chemical thought.

The method adopted by Hückel suffers from the disadvantage that a considerable separation is made of the organic from the physical approach to the subject. Although the author himself has obviously such a thorough understanding of both aspects that he finds it necessary frequently to make references forward to more complete discussions which presumably will appear in Vol. 2, the result is still not entirely satisfactory.

Even within the adopted framework, considerable criticism is possible, particularly of the treatment of recent work. Many of the more significant advances of the past twenty years have been neglected, or are mentioned only in footnotes. The treatment of the Walden inversion is but one example of a limited recognition of recent advances. The rule is given that "the replacement of negative groups by anions gives a Walden inversion"; but it is stated that otherwise "for the greater portion of the yet known reaction processes, the riddle of the Walden inversion is not yet solved". Many would have considered that this was a conservative point of view even in 1938, when E. D. Hughes (*Trans. Farad. Soc.*, **34**, 213) discussed, in the course of a general survey of the Walden inversion, the effects of substituents in determining the steric course of unimolecular nucleophilic substitutions. To retain this attitude to-day, without even a passing reference to the development, by S. Winstein and his school as well as by British and by other American workers, of the stereochemical effects of substituents *beta-* to centres at which nucleophilic displacements occur, renders the whole discussion of this important aspect of aliphatic chemistry completely out of date.

Few authors, perhaps, succeed in putting the theoretical developments of their subject into completely proper historical perspective. As a source of references to the relevant experimental and theoretical contributions from the German schools of chemistry, this work is probably unexcelled. As a discussion of the phenomena of organic chemistry, and of the deductions which can logically be derived therefrom, it should be of some value to those prepared critically to compare this treatment with that preferred in other works. As a modern discussion of theoretical organic chemistry, it is disappointing.

P. B. D. DE LA MARE