

tion of the activity of molecules, real or abstract, is remarkably difficult. This difficulty stems from the sensitivity of the equations to the form of the molecular wave function: because optical activity depends on both an electric and a magnetic dipole transition it is necessary to calculate two transition moments, and their relative phase is important. The discussion of these complexities is the substance of this volume, and although a number of reviews have appeared in diverse publications this is the first extensive, coherent account of the theories of optical activity since Lowry wrote his excellent book while quantum mechanics was too young to penetrate its mysteries.

And what a fierce theoretical problem it is! The first part of the book discusses in detail the classical theory of optical activity which is based on the coupled oscillator approach where an electron oscillates linearly and is coupled to another oscillating linearly or in a circle, or an electron oscillates in a helix. Although inadequate, such an approach is important because the pictures it provides enable one to introduce appropriate approximations into the quantum mechanical exegesis that follows. The bulk of the book derives and then develops the quantum mechanical theory by discussing the general equations for many-electron systems, and then applies it to specific chromophores (the carbonyl group, benzene derivatives, and transition metal complexes). Then a chapter, which is regrettably too short, is devoted to the Faraday effect, and another to a mixed bag of special effects, which include vibronic transitions and excitons. The book concludes with a very brief survey of the methods of interpreting some experimental data.

The book is welcome because it was so badly needed. It is difficult, but lucid, and it will doubtless stimulate a great deal of thought. My only regret is that it is so brief. P. W. ATKINS

Electrochemistry

Physical Methods of Chemistry. Part 2A: Electrochemical Methods. Edited by Arnold Weissberger and Bryant W. Rossiter. Pp. xiv+723. (Wiley: New York and London, November 1971.) £15.

BOTH the cost and the nature of this book make it essentially a work of reference to be sought in the library. The aim is to provide the reader with an appreciation of the techniques, the basic theory and apparatus involved. There would seem to be a number of important fields of investigation for which this information could be

required, such as the general properties of electrolyte solutions covering reference electrodes, the nature of ions in solution, ion association; analytical procedures, electrochemical synthesis; the study of mechanisms in both electrochemical and chemical reactions. It is against these requirements that some assessment of the present volume is advanced.

The earlier chapters deal broadly with electrolyte solutions — matters with which most chemists are more or less familiar. In the first chapter, on oxidation-reduction potentials, confusingly and surprisingly use is made of single electrode potentials; chapter 2 is concerned with pH measurements and ion selective electrodes, titration curves, dissociation constants and similar problems; chapter 3 deals with conductance and chapter 5 with transport number measurement.

There is no account of high temperature and pressure procedures which surely should have a place at this point in a book of this kind. Material presented in these chapters is extensive and accessible but in general they add little to the ease of obtaining similar information from other sources.

Chapter 5, on polarography, would no doubt be mainly consulted for the basis of analytical applications, and the introduction deals admirably with information problems with discussion also of applications to kinetic studies. The author is naturally very conscious of the large and excellent coverage of both these areas in existing books and monographs. Chapter 9, on controlled potential analysis, also deals with studies of reaction mechanisms. The general reader is much less likely to be familiar with the treatment of kinetics by electrochemical methods and this could have been the most valuable part of the book.

An initial, if minor, point must be made; electrochemistry is bedevilled with jargon words for techniques; for example, cyclic voltammetry, chronoamperometry, chrono-coulometry, chronopotentiometry, even perhaps potentiometry, and as such they make a poor choice for chapter headings.

If chapters 6, 7 and 8 are considered together there is a great deal of common interest in kinetics in each. A real complaint about the book is that there is an arbitrary editorial subdivision of the presented material which blurs the unity of interest. It also gives unjustified weighting of one technique against the other; for example, 10 pages on the use of rotating electrodes compared with 112 on linear potential sweep amperometry and the appearance of the latter in two chapters; an inadequate treatment of small scale perturbation methods, particularly sine wave perturbations; the unnecessary

repetition of theoretical treatments of the same general problems of chemical, electrochemical and diffusion control in these kinetically based chapters.

The sum total of these chapters is thus unhelpful in the sense that the necessary analysis for effective presentation has not been worked out at editorial level. This is not a reflexion on the competence of the separate chapters but it does mean that the use of the presented material would require, for interpretation, an investigator with skills comparable to those of the authors themselves. Thus the editorial treatment of chapters 5 to 9 has not helped in any way the expressed intention of the series.

Altogether this is not a happy book and most certainly it could have benefited very greatly by using the same authors with more appropriate terms of reference. As an electrochemist I would still consider it a useful volume to be found on the library shelves, and the earlier chapters 1 to 5 could be readily consulted by an experienced physical chemist. It would be difficult, however, to imagine effective reference to the later chapters being made by anyone, unskilled in electrochemistry, wishing for a balanced insight into modern electrochemical techniques. That these deal often with fast reactions, and that some of the methods were those laying the foundation of modern studies of fast reactions by perturbation methods, would never emerge.

There are a number of other fields of electrochemical experimentation omitted but coverage of these may be contemplated in future volumes.

H. THIRSK

Undergraduate Topology

Topological Geometry. By I. R. Porteous. Pp. vii+457. (Van Nostrand Reinhold: New York, London, Toronto and Melbourne, 1971.) £3.00 paper; £6.00 cloth.

THIS book, which is intended for undergraduates in their final year, consists of a basic course in affine approximation. It aims at applying linear algebra to analysis from a geometric point of view, in a way parallel to that of J. Dieudonné in *Foundations of Modern Analysis*. The book may be conveniently divided into three parts, each of which could be used as the basis for a term's lecture course.

The first eight chapters give a treatment of many of the fundamental notions from a standard course in algebra: sets and maps; the natural numbers; groups, rings and fields; the fields of rational, real and complex numbers; linear spaces and affine spaces. The geometric viewpoint shows itself in