

"Neuromuscular physiology" (G. Hoyle) raises the question: can one hypothesis of how muscle contracts fill the requirements for all species of muscles that have been studied? The Huxleys' hypothesis that two kinds of filaments slide over one another in contraction meets great difficulties, some muscles shortening only 5%, others 90%. Electron microscopy furnishes at present the most critical evidence, but has not proved decisive. Membrane potentials measured by intracellular electrodes do not all agree with the hypothesis that sodium moves inward and potassium outward during excitation. Thus, certain insect muscles contract in a medium of high magnesium and zero sodium. Again, pharmacological actions upon impulse-transmission are of considerable variety, as shown by actions of picrotoxin, glutamate and aminobutyrate. Other studies of control of nerve-muscle relations reveal that two kinds of motor axones serve a single muscle fiber; and also that different fibers respond differently to impulses within the same axone. A wealth of detail is brought to bear to show the special advantages of comparative physiological studies.

"Animal luminescence" (J. A. C. Nicol) dwells upon the biochemical reactions concerned in production of light. The reactants differ in bacteria, crustacea and fireflies; and the catalysts concerned in energy transfer also differ. Regulation of the flashes and intensities of luminescence differs widely throughout the animal kingdom. Some species secrete substances that reset extracellularly, again at characteristic rates and spectra. What good does the production of light do in various species? No single answer can be given; some serve as signals, others are lures; some aid vision, others have display patterns.

"Respiratory mechanisms in fish" (G. M. Hughes and G. Shelton) constitutes a definitive monograph in itself. Special structures, co-ordinated, rhythmically pump water that aerates the gills. The pressures and volume flows are phasic, for valves are concerned in the flow of water over the gill filaments. Gas exchanges with the blood depend upon volume flows, solubilities and surfaces. Variations of the main arrangements are illustrated in different species, and particularly are related to the oxygen availability in the water in which each lives. The sensory and nervous activities employed in respiratory control are clearly related to oxygen and carbon dioxide pressures, and the role of blood flow is part of the same functional system. Major consideration is given to the arrangements for rhythmical alternation of each pumping movement.

All the six reviews are carefully organized under subheadings. Evidently the general editor suggested some features common to the plans. The "coverage" tends to be exhaustive, so that numerous items are included without much relation to those general principles that are being put forward. Each chapter has a set of observations arranged according to phyla, an arrangement that did not generate much enthusiasm in some authors.

Of the several chapters, the one that illustrates best the power of comparative physiology is the one on neuromuscular physiology. The dangers of reliance upon studies of a single type of excitable tissue are clearly shown. At the same time, a single type of excitation and a single scheme of contraction seem to have been utilized in at least a dozen types of cellular performances. Certainly "important new generalizations have emerged from the extension of studies."

DEPARTMENT OF PHYSIOLOGY
THE UNIVERSITY OF ROCHESTER

E. F. ADOLPH

Methoden der Organischen Chemie (Houben-Weyl). Vierte, Völlig Neu Gestaltete Auflage. Band V/3. Halogenverbindungen. Fluorverbindungen. Herstellung, Reaktivität und Umwandlung. Chlorverbindungen. Herstellung. Edited by EUGEN MÜLLER, Tübingen. With O. BAYER, Leverkusen, H. MEERWEIN, Marburg, and K. ZIEGLER, Mülheim. Georg Thieme Verlag, Herdweg 63, Stuttgart, Germany. 1962. lxiv + 1217 pp. 18.5 × 26 cm. Price, DM. 262.-; Subskriptionspreis, DM. 235.80.

Volume V/3 completes the treatment of halogen compounds in the new "Houben-Weyl." About one-half of the page space is devoted to the preparation and reactions of organic fluorine compounds. Newcomers to this field, which has undergone virtually exponential expansion,

will welcome the brief discussion of the peculiarities of the nomenclature of organic fluorides. The preparative methods are presented in two large groups, the first describing procedures to introduce fluorine into organic molecules by a variety of reagents, and the second detailing modifications of compounds that already contain fluorine. The reactivity and transformations of fluorine compounds occupy the concluding portion.

The remainder of the volume is occupied by procedures for the preparation of organic chlorides. As the editors point out prefatorily, classification according to type of chlorinating agent has again been adhered to in contrast to the system adopted for the two heavier halogens, because the surpassing importance of elementary chlorine made desirable a presentation of the action of this reagent upon all types of compounds. To evaluate the possibilities of obtaining a specific chloro compound, the reader may avail himself of the unique tabulation at the end of the volume; here all compound types referred to in the text are arranged systematically, and the reagent employed for their preparations as well as the type of reaction and the page reference are included. The reactivity of the organic chloro compounds, as noted earlier, has been treated in volume V/4.

The selection of examples has again been made with wisdom and circumspection; the increasing shelf footage required as more and more volumes of the new "Houben-Weyl" appear engenders a feeling of gratitude toward the editors and colleagues, who have made readily available to the practicing organic chemist a large segment of the less and less manageable literature.

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SUMMIT, NEW JERSEY

HANS HEYMANN

Catalysis by Metals. By G. C. BOND, Department of Chemistry, The University, Hull. Academic Press Inc., (London), Ltd., Wing 1, 7th Floor, Berkeley Square House, Berkeley Square, London, W. 1, England. 1962. ix + 519 pp. 16 × 23.5 cm. Price, \$15.50.

This book which covers a major division of a difficult inter-disciplinary science is noteworthy among treatises in being written by a single author. Professor Bond has a perspective in presentation and a uniformity of treatment impossible to the team of selected specialists. The integration of the text with the Periodic Classification and in general with the electronic structure of the elements is one important factor in the author's success. This should prove useful in rational catalyst design. The excellent organization of the book highlights gaps and inconsistencies in the literature and, as the author states, these are useful in providing projects for future research.

The chapter titles describe the emphases of the book well: Introduction to Catalysis by Metals; Physics and Chemistry of Metals; Preparation and Study of Metal Surfaces; Adsorption at Metal Surfaces; Chemistry and Energetics of Adsorption; Kinetics of Adsorption and Desorption; Kinetics of Surface Reactions; Reactions of Hydrogen at Metal Surfaces; Exchange Reactions of Saturated Hydrocarbons with Deuterium; Exchange Reactions of Other Molecules with Deuterium; Hydrogenation of Monoolefins and Alicyclic Molecules; Hydrogenation of Acetylenic Compounds and Diolefins; Hydrogenation of Aromatic and Heterocyclic Compounds; Hydrogenation of Other Unsaturated Groups; Hydrogenation of the Oxides of Carbon and the Fischer-Tropsch Synthesis; Catalytic Synthesis and Decomposition of Ammonia and Related Reactions; Catalytic Hydrogenolysis; Catalytic Dehydrogenation; Catalytic Reforming; Catalytic Oxidation; Catalysis and Chemistry.

At least nine of the twenty-one chapters deal with ancillary aspects of the mechanism of catalysis, such as chemisorption and surface kinetics. The other chapters deal with specific catalytic reactions, such as hydrogen exchange, hydrogenation, ammonia synthesis, hydrogenolysis, dehydrogenation, reforming, and oxidation. The text is discriminating in its use of data and topics. Details of experimental techniques and details of commercial processes are skipped over in order to emphasize the unifying concepts of catalysis. Each chapter is accompanied by an excellent list of selected references which can serve as an introduction to a deeper study.

The reviewer is disappointed at the author's decision to terminate his efforts with the present book. A companion volume of similar style and aims entitled "Catalysis by Metal Oxides" is desperately needed.

A well organized author index (17 pages) and subject index (7 pages) provide a reference system to the contents.

BUREAU OF MINES
DIVISION OF BITUMINOUS COAL L. J. E. HOFER
PITTSBURGH COAL RESEARCH CENTER
PITTSBURGH, PENNSYLVANIA

Progress in Polarography. Volume I. Edited by P. ZUMAN, Polarographic Institute, Czechoslovak Academy of Science, Prague, with the collaboration of I. M. KOLTHOFF, Department of Chemistry, University of Minnesota, Minneapolis. Interscience Division, John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. xiv + 355 pp. 16 × 23.5 cm. Price, \$12.00.

Progress in Polarography. Volume II. Edited by P. ZUMAN, Polarographic Institute, Czechoslovak Academy of Science, Prague, with the collaboration of I. M. KOLTHOFF, Department of Chemistry, University of Minnesota, Minneapolis. Interscience Division, John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. x + 451 pp. 15.5 × 23.5 cm. Price, \$15.00.

The award of the Nobel Prize to Professor Jaroslav Heyrovský in 1959, almost coincident with the seventieth anniversary of his birth, has provided an appropriate occasion to summarize recent progress in polarography. As the Editors of these two volumes have noted, with 900 papers appearing annually, it is almost impossible for a single person to treat the entire field in an authoritative way. A total of 43 authors from all over the world have contributed the 35 papers in these volumes, which resemble a collection of symposium papers rather than a coordinated effort to cover the field. However, for the most part, the quality is high.

After an opening chapter on polarographic literature, Volume I presents several chapters on theoretical developments in conventional polarography. These include modifications of the diffusion current equation, instantaneous current at a single drop, double layer structure, electrode reaction kinetics, kinetic currents, complex compounds, and outstanding chapters by Reilley and Stumm on adsorption effects, and by Vlček on mechanism of electrode processes with a correlation between polarographic behavior and structure of inorganic complexes utilizing ligand field theory.

Other chapters cover a variety of topics: reduction of anions, chronopotentiometry, inorganic applications, influence of structure, and other trends in organic polarography and the use of non-aqueous solutions.

Volume II contains excellent brief reviews of square-wave and pulse techniques by Barker, the single-sweep method by Vogel, oscillographic polarography by Kalvoda, and AC methods by Breyer. At a more practical level, Kolthoff and Okinaka review modifications of the dropping mercury electrode, Riha discusses the hanging mercury drop, Adams describes applications of solid electrodes and Kemula reviews chromato-polarography. Except for Elving's excellent discussion of organic analysis, the remainder of this volume consists of rather routine reviews of instrumentation and applications in a number of special fields. An extensive and carefully prepared index for both volumes completes the book.

There is more than the usual variation in depth and scope of coverage among the various authors, and the reviewer would prefer a single volume of carefully selected contributions. Also considering the high cost of books, the editors might have at least grouped all of the theoretical papers in one volume, and the practical papers in the other.

Those workers who want a compact and critical review of progress during 1950-1959 will find these volumes indispensable. As a tribute to Heyrovský, it is very fitting that the contributions have been dedicated to him.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CALIFORNIA ROBERT I. PECSOK
LOS ANGELES 24, CALIFORNIA

Thermodynamics of Solids. By RICHARD A. SWALIN, Professor of Metallurgy, Institute of Technology, University of Minnesota, Minneapolis, Minnesota. John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. ix + 343 pp. 15.5 × 23.5 cm. Price, \$12.50.

This book is designed for use as a text in the field of material science which has been the domain primarily of physicists and metallurgists. A proper evaluation undoubtedly will be made by them in appropriate journals; however, since chemists are becoming more interested in this field where both the theoretical and experimental approaches can be extended on the basis of physical chemical experience, at least the principal features should be noted here.

Of the fourteen chapters, seven cover the usual basic thermodynamic relationships. One chapter is given to each of the three laws and other separate chapters cover the statistical interpretation of entropy, the relation between thermodynamic and physical properties, the free energy of heterogeneous reactions and the thermodynamic relations in solutions of solids. The development of the equations is nicely detailed and, where possible, numerical illustrations involving the solid state are included. Although the treatment in these chapters is standard, the student in the field of material science would almost certainly benefit if some selected references to well-known texts on chemical thermodynamics were provided; without such references the unwary students might conclude that thermodynamics had been developed solely to deal with the solid state and the inclusion of references would broaden their scientific outlook.

The quasi-chemical approach to ideal and regular solutions and its application to order-disorder reactions and to short range order in solids is covered in a separate chapter. This may prove to be one of the most interesting to chemists; however, the reader is left to infer, from the sources of the figures, the references to which he might turn to extend his understanding of this topic. A list of specific references to papers on the subject and to some of the standard books on statistical mechanics would be helpful.

There then follow three chapters on the thermodynamics of phase equilibria. The first of these discusses equilibria between phases of variable composition; there is no general treatment of the phase rule but, rather, emphasis is placed on the interpretation of binary diagrams to illustrate how quantitative thermodynamic data can be extracted from diagrams. There is also a chapter on the free energy of binary systems in which the problem of equilibria of coexisting phases is treated more generally; some discussion of composition fluctuations is included. The third chapter in this group covers the general theory of the thermodynamics of interfaces, of specific types of external surfaces, of crystal boundaries and of interfaces between phases of different composition or structure. Adequate references are cited in this rather highly condensed chapter, some of which will be required reading for a comprehension of the figures of grain boundaries since the symbols have not been explained in some of the diagrams.

The remaining three chapters are on crystal defects; the first describes the various types of defects and disorders, the second covers defects in elemental crystals and the third, defects in compounds. These three chapters are believed to be unique in U. S. texts. As the author has stated, the basic approach is the use of the law of mass action in treating interactions between defects in metallic and in non-metallic crystals. Because of the dependence of the properties of crystals on the concentration of various defects, these chapters should be of considerable general interest to chemists. In the last two chapters particularly, there is an excellent use of material from recent publications; some two dozen sources within the past ten years are used to relate theory and experiment to make the reader aware of the current situation.

There are finally included about one hundred thirty problems, somewhat more than half of which are numerical.

Very few typographical errors were noted. The printing and the figures are uniformly excellent.

This book appears to be a skillful and unusually well-organized statistical-thermodynamic exposition, much of which is an extension of chemical theories to the macroscopic and microscopic properties of solids. Although the physicists' approach has been dominant in the past in this field