listings of 25 physics journals programmed into the computer memory of the M.I.T. Technical Information Project. References from papers in these 25 journals raised to 850 the total number of journals available for citation.

Approximately 450 diagrams convey the essential information to the reader, with a minimum of distracting text. References to the original literature accompany each figure, making it easy to look up details concerning experimental methods if the reader so desires.

The present volume is a complete revision of Brown's 1959 volume of similar purpose, bringing the data up-to-date as of 1965. Most of the descriptive text in the earlier edition has been eliminated, leaving only the barest minimum of theory necessary to define the symbols used in the diagrams. Unfortunately, in the course of the revision a large number of typographical errors have crept in, making it necessary for the reader to verify each equation and numerical factor. Some of the sentences have been chopped so that one must guess at their meaning. There has been an apparent neglect of editing and proofreading at some stage in the manufacture of this book.

Reading a book like this makes me wonder if education by computer will leave the next generation of children indifferent to the beauties of English style and sentence construction. Or will we, as suggested in the recent science-fiction story "Babel-17," learn to think in computer language?

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## Cellular Structures

**Regulation of Metabolic Processes in Mitochondria.** Proceedings of a symposium held in Bari, Italy, April–May 1965. J. M. TAGER, S. PAPA, E. QUAGLIARIELLO, and E. C. SLATER, Eds. Elsevier, New York, 1966. 594 pp., illus. $27.50.

This collection of papers by European biochemists includes accounts of experimental work and discussions of most of the major known functions of mitochondria. The gathering together of a large number of papers in this field in a single volume not only serves to highlight areas in which there is essential agreement among different investigators, but also reveals that in other areas there is a lack of unanimity and basic understanding of the mechanisms controlling metabolic reactions in mitochondria. The concluding panel discussions on selected topics are particularly valuable and should provide a stimulus to investigators in their search for new approaches and tools to resolve such problems as the mechanism of energy conservation, the nature of energy-rich intermediates of oxidative phosphorylation, and the metabolic significance of ion uptake and swelling in mitochondria.

Among the more interesting papers are P. Mitchell's defense of his recently developed chemi-osmotic theory of energy conservation against the more conventional chemical theory, and E. C. Slater's summary of evidence in favor of the existence of high-energy chemical compounds as intermediaries in respiratory-chain phosphorylation. Proposals for new mechanisms of fatty acid activation are presented by several authors, and concepts on the control of glutamate oxidation and competition between substrates for oxidation are also reported.

G. D. Greville presents a fine review of the control of utilization of substrates by mitochondria, which focuses attention on the multiplicity of possible control sites and their interaction. It reveals clearly that a deeper understanding of the intramitochondrial location of enzymes and permeability barriers to substrates and cofactors is necessary before observed metabolic events can be interpreted unambiguously. An experimental approach to this difficult problem is described by M. Klingenberg and E. Pfaff, who present data, based on analytical measurements principally of isotopic nucleotide exchange, that formalize functional compartments. V. P. Whittaker discusses the morphological compartments seen in the electron microscope. Once functional compartments are defined in relation to the mitochondrial ultrastructure, it may be expected that basic problems involving mitochondrial control mechanisms will be solved. This book provides examples of profitable, as well as unprofitable, approaches.

Although *Regulation of Metabolic Processes in Mitochondria* contains a large body of experimental facts, it would have been more authoritative had the editors been more selective. The impression exists that some of the reported findings may be inconsequential, essentially unrelated to the broader issues of metabolic control. This may confuse the nonspecialist seeking a background in mitochondriology and makes the specialist pay an unnecessarily high price for the dozen or more excellent articles. A major defect in many of the papers themselves is an insufficiency of detail in the description of the experimental procedures. This makes it difficult to judge the data on such controversial subjects as the mechanism of action of atractyloside, carnitine, and thyroid hormone, where discrepancies between observations reported by various laboratories may, in large part, reside in the different experimental procedures used.

However, the extensive bibliographies, excellent indexing, and the presence of previously unpublished data in most of the contributions, make this volume a useful reference work well worth the initial investment.

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## Physicochemical Phenomenon

**Ion Exchange.** A Series of Advances. Vol. 1. JACOB A. MARINSKY, Ed. Dekker, New York, 1966. 436 pp., illus. $16.75.

This is the first volume of a series of Advances initiated, according to the editor, to satisfy the need "for examination and evaluation of ion-exchange theory and experiment as they evolve."

The first chapter, on transport processes in membranes (Caplan and Mikulecky), stresses the application of nonequilibrium thermodynamics. I found the material quite difficult to follow, apparently as a result of the desire of these authors to present a complete and rather detailed treatment in a limited space. A review restricted to fewer phenomena and less detail would have made this section more useful. The treatment of ion-exchange kinetics (Helfferich) gives a good summary of recent experiments and results, followed by an excellent review of recent theoretical treatments, largely those of the author. The study of complex formation in ion exchangers (Y. Marcus) is detailed and complete, but of interest probably limited to those concerned with this rather narrow application. The chapter on theory and experi-

mental results of liquid ion exchangers (Högfeldt) is excellent; it stresses fundamental phenomena rather than specialized applications, and makes an intelligent and critical evaluation of theory and experiment in this field.

The next two chapters concern themselves with the microscopic examination of particles to determine their diameters (Freeman) and the employment of staining and other precipitation techniques (Goldring). The swelled volume of exchangers is a useful parameter, but since several simple and reliable methods exist, the allocation of an entire chapter to the details of a single methodology (the most cumbersome one) is not worthwhile. The same criticism applies to the discussion of staining and precipitation techniques, which have yet to yield useful information. The following chapter, on selectivity (Reichenberg), attempts to be critical, but the author tends to lose perspective. Ion-exchange equilibria are determined by several effects, and one must make a judicious selection of a suitable system where but a few effects predominate to allow this subject to be discussed at a sophisticated level. The discussion of resin selectivity in dilute to concentrated solutions (Diamond and Whitney) attempts to systematize a mass of data for both simple and complex organic and inorganic ions. The discussions of the authors' own work and of the effects of water structure are good, and the compilations most useful. After cataloguing all of the different influences which can come into play in determining selectivity, the authors proceed to oversimplify to the point where they negate their own rationale. Further, they make a few serious errors, for example, in ascribing the inversion of the selectivity of polystyrenesulfonate exchangers for a homologous series of quaternary ammonium salts as the degree of cross-linking increases to size screening, in spite of the fact that the capacity of the exchangers could be saturated by each ion, individually. The final chapter (Marinsky) interprets ion-exchange phenomena from the theory of coulombic interactions in polyelectrolyte solutions, employing the charged-rod model. All of the significant data are tabulated, and the applicability of the additivity rule is well documented. This chapter makes a serious and meaningful attempt to make use of polyelectrolyte theory, and the discussions are complete and thoughtful.

Volumes of collected chapters by different authors are usually uneven; this one is no exception. All in all, I find serious fault with but 100 out of about 400 pages. The extensive bibliography will be of benefit to research work in this field.

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## Troublesome Plants

**Weeds of the World.** Biology and Control. LAWRENCE J. KING. Leonard Hill, London; Interscience (Wiley), New York, 1966. 564 pp., illus. $18.

The author of the present volume defines weed science as "the study and control of the more aggressive, . . . troublesome, harmful, or otherwise annoying plants to man and to his agriculture." The present volume fills the great need for a general survey of the subject. For the first time all the information from the voluminous literature of the subject has been brought together in one place. The book is abundantly illustrated with line drawings, black-and-white plates, tables, charts, and maps. Although it is not a taxonomic treatment the scientific names of the weeds (without authority citations) are employed.

The coverage of the ecological literature is "reasonably complete" to 1957, but after that date only books and the most important research contributions are listed. The literature on the chemical control of weeds, however, is complete to 1966. An extensive bibliography—including an addendum listing works published while the volume was in press—follows each chapter. Any disadvantage in locating a particular citation is overcome by a complete author index, as well as a separate subject index, at the end of the book. An impressive total of nearly 5000 references are listed.

The first 11 chapters, constituting roughly half the book, contain an encyclopedic and fascinating review of the information about weeds—their history, definitions, and classification; their uses, harmful aspects, and injurious effects on crops; parasitical weeds, the establishment, growth and development, reproduction, and dispersal of weed plants; and their origin, evolution, phytosociology, and geographic distribution. The second part of the book is devoted to weed control, both chemical and nonchemical. The emphasis is on the relationship between biology and control rather than on methods and techniques for specific crops, although a number of tables do list methods for many crops.

The classification and type of action of herbicides and their entry, retention, and movement in plants are well covered. Contact or caustic herbicides, inhibitors of cell growth, "auxin-type" growth-regulating chemicals, inhibitors of chlorophyll formation, and other translocated herbicides such as sodium chlorate and the amides CDAA and CDEA are discussed. General uses of herbicides for control of weeds in field, vegetable, ornamental, fruit, and forage crops, pastures, rangelands, lawns, and sports areas are presented. The use of arboricides in silviculture is touched upon.

All nonchemical methods of weed control are reviewed in the final chapter. Since so many topics are discussed, the author's use of numerals to indicate into which general category (mechanical and fire, biological control, ecological control, or weed seeds) each of the nearly 500 references in the bibliography for this chapter falls should be very useful.

This volume will be a fine library addition for anyone interested in weeds and will be indispensable for the research agriculturist, whether he is working with weeds directly, or indirectly because of their relationship to crop plants.

[*Weeds of the World* is complete in one volume. Announcements that it would be a three-volume work were incorrect.]

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## The Fungal Organism

**The Fungi: An Advanced Treatise.** Vol. 2, The Fungal Organism. G. C. AINSWORTH and ALFRED S. SUSSMAN, Eds. Academic Press, New York, 1966. 823 pp., illus. $27.

In their preface the editors of this book, the second in a series of three, say that the object of the series "is to summarize what is known about fungi as fungi." Indeed one of the contributors accurately describes his own