yielding or synthetic reactions, but that these reactions supply the over-all potential for the very rapid ion-transport events that are probably responsible for its characteristic electric activity.

For this reason, perhaps, the interested reader is bound to feel some disappointment on reading any book of this type. It seems that, as yet, research at this level falls short of a biochemical "explanation" for psychological, or even neurophysiological, phenomena.

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Androgens. Biochemistry, physiology, and clinical significance. Ralph I. Dorfman and Reginald A. Shipley. Wiley, New York; Chapman and Hall, London, 1956. 590 pp. Illus. $13.50.

Experimental endocrinologists, biochemists, and clinicians will enjoy this reference volume as a source book of information on the androgens. There are 1852 references in this medium-sized book, which consists of four parts: (i) "Introduction," (ii) "Biochemistry," (iii) "Physiology," and (iv) "Clinical aspects."

The arrangement of the textual material is clear, concise and presented in an interesting manner. The four sections are further subdivided into 20 chapters: (i) "General aspects" and "Historical background"; (ii) "Sources of androgens," "Isolation and chemistry of androgens and related compounds," "Preparation of urinary extracts," "Assay of androgens and 17-ketosteroids," "Metabolism of the androgens," "Relative activities of androgens," and "Biological actions and interactions of androgens"; (iii) "Androgens and the embryo, intersexuality," "Actions of androgens on sex structures of animals," "Androgens and behavior," "Influence on endocrine glands, other than gonads, and various non-endocrine glands," and "Influence of androgens on metabolism and enzymes"; (iv) "Normal puberal development in boys," "Conditions of androgen excess," "Androgen deficiency—hypogonadism," "Androgen therapy," "Androgen preparations and methods of administration," and "The excretion of androgens and 17-ketosteroids in various clinical conditions."

Immediately following a very comprehensive review of the clinical aspects of the androgens is an appendix containing "Names and structural formulae of compounds," "Preparation of urinary extracts for 17-ketosteroid and androgen assay," "Androgen bioassay methods," and "Chemical assay methods."

It is apparent that the authors have an excellent appreciation of the literature on this subject, and their survey of the basic and clinical literature, collated in an interesting fashion, should prove useful to the busy investigator. The combination of a basic scientist and a clinician adds considerable merit to their unbiased treatment of the subject matter.

This reference book is so heavily laden with information that the two unqualified statements I observed should be cited only for academic reasons devoid of any tones of criticism. On page 4 it is stated, ". . . the adrenocorticotropic hormone (ACTH) is essential for the full function of the adrenal cortex . . ." Robert Gaunt [*J. Clin. Endocrinol. and Metabolism* **15**, 621 (1955)] states that "Although the mechanisms which regulate the secretion of aldosterone are not yet known, one important fact is all but certain: aldosterone is not under the complete and direct control of ACTH, as are the other major corticoids." Therefore, according to Gaunt, it seems inadvisable to say that "ACTH is essential for the full function of the adrenal cortex." Further evidence bearing on this point may be found in Gaunt's paper. On page 16 the authors refer to a "female prostate." The term is incorrect, and it is believed that they are referring to the urethral glands including paraurethral ducts, a structure in the female that is homologous to the male prostate [H. Morris, *Human Anatomy,* J. P. Schaeffer, Ed. (Blakiston, New York, ed. 11, 1953), pp. 1565, 1567–1568].

In the final analysis, it is my opinion that the authors should be congratulated in bringing 1852 references together on the androgens. They have used these references well in writing their volume. This book could be greatly improved by the inclusion of more photographic material and by the citation of reviews, both of which could serve to highlight information that is at present documented elsewhere.

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Immunology and Serology. Philip L. Carpenter. Saunders, Philadelphia–London, 1956. vi + 351 pp. Illus. $6.50.

This is the latest addition to a field in which, as the author points out, there is a shortage of textbooks. It will be the more welcome because knowledge of the subject is growing rapidly, and numerous significant advances have been made not only since the publication of the second edition of Boyd's book in 1947, but also since the publication of Raffel's book in 1953.

The book has many other virtues. For one thing, it is smaller than either of the other two books, and thus perhaps better adapted to the needs of students in the invariably abbreviated courses in immunology that are available in our medical schools. It shows throughout the signs of having been written to accompany a course that emphasizes laboratory serology. Among the attractive features are a clear discussion of the physical properties of the serum proteins that is liberally illustrated with electrophoretic and ultracentrifugal diagrams, a discussion of plasma fractionation, good accounts of the current theories of antibody formation, a rather full account of the phylogenetic applications of the precipitation reaction, and a good account of complement fixation.

The subjects that must be discussed in such a book are pretty generally agreed on, and it comes as no surprise that the chapter headings are, respectively; "Infection and immunity," "The immune reactions," "Antigens," "Serum proteins," "The production of antibody," "The antigen-antibody reaction," "Precipitation," "Agglutination," "Isohemagglutination," "Toxins and antitoxins," "Phagocytosis," "Cytolysis and complement fixation," "Antiviral immunity," "Allergy," and "Experiments in serology." This last chapter constitutes a brief laboratory manual.

Some omissions, doubtless deliberate, render the book less attractive for certain purposes. There is little account of the actual operation of immune mechanisms in disease; there is only fragmentary discussion of the use of serological methods in the diagnosis, treatment, and prevention of specific diseases; and the chapter on blood groups is rather incomplete. However, without these and other omissions the book could not have been kept down to its attractive size.

There are some debatable statements. On page 22, the discussion seems to ignore the abundant modern evidence that the "unitarian" theory is a great oversimplification; on page 46, old work on the role of lecithin and cephalin in precipitation, which has not been confirmed, is presented without comment; on page 84, the probably nonexistent nonspecific anamnestic reaction is presented as well established; and on page 179, it is stated that "most (Rh) typing serums in use today contain blocking antibodies, so saline must not be used as a diluent." The first part of this statement is true, but the second exactly reverses the consequences of this fact, which are that saline *must* be used as a diluent. Throughout the book, the author writes *haptene* instead of Landsteiner's actual (English) neologism *hapten,* which he meant to sound analogous to *antigen.* In this particular matter,

however, Carpenter sins in company with a number of our British colleagues. These and similar minor errors are not any more numerous than they are in the average textbook, and they do not seriously detract from the value of a well written and informative treatise, which the student should find very useful.

The book is well printed on good paper, with numerous clear illustrations. There is a good index.

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Methods in Enzymology. vols. I and II. *Preparation and Assay of Enzymes.* Sidney P. Colowick and Nathan O. Kaplan. Academic Press, New York, 1955. xxv + 835 pp and xx + 987 pp. Illus. vol I: $18; vol. II: $23.50.

With the tremendous growth of enzyme chemistry in recent years, interest in enzymes as indicators of cellular events or as analytic and clinical tools has spread to diverse scientific fields. However, these new applications have scarcely begun. Many investigators who might have utilized enzymes in some phase of their work have either not been aware of the potentialities or have been discouraged by the vast, widely-scattered literature of enzyme methodology. The compilation of this literature in *Methods in Enzymology* provides a working handbook for the preparation of enzymes.

The two volumes reviewed here are the first in a series of four that will cover the entire field of enzyme methodology, including many ancillary subjects such as chromatographic, physicochemical and other analytic techniques. The preparation and assay of enzymes is covered in volumes I and II, while the preparation and assay of substrates and special techniques for the enzymologist will provide the subject matter for the later volumes.

It is apparent that the ambitious aims of the editors give rise to numerous problems. The problem of presenting authoritative directions has been solved by a careful choice of authors. Thus, more than 200 contributors are represented in these two volumes. Each of these has worked in at least one phase of the field he reviews and often is the original author of much of the material presented. The problem of integrating the reports of these many authors so that duplication is avoided has been approached in two ways. The first is illustrated by the organization of the series. For example, substrates that are used for more than one enzyme system are considered separately in volume III. These are then omitted from the individual descriptions, and the appropriate reference to volume III (as yet unpublished) appears. A number of general preparative procedures are also given, and these are also omitted from reports on individual enzymes. Second, the various descriptions of individual enzymes are integrated by cross references in each article to appropriate parts of other articles. These two devices, plus an excellent author and subject index, constitute one of the most attractive features of these books. Without such organization, the subject matter could hardly have been covered in the space allotted. It should be noted that this integration means that all four volumes (or at least the first three) must be available to take advantage of these features.

Volume I contains four sections, as follows: "General preparative procedures," "Enzymes of carbohydrate metabolism," "Enzymes of lipid metabolism," and "Enzymes of citric acid cycle." The first section contains a wealth of material of general utility to the protein chemist. The review by R. K. Morton on methods of extraction of enzymes from animal tissues presents an excellent series of approaches to the first question one considers in investigations involving enzymes: How is the enzyme obtained in a soluble form? The various new techniques using butanol, which were devised by the author, are a significant, original contribution to this field. Other articles, on the preparation of various cell fractions, protein fractionation by solubility, and the use of adsorbents and resins in protein fractionation, outline the general procedures available for enzyme purification. Although some of this material has appeared previously in review articles, its inclusion here is needed in order to present a complete summary of the enzyme techniques that are available. The first section ends with a useful compilation of buffer mixtures by G. Gomori.

The order in which the various individual enzymes are described in the other sections follows, in general, metabolic sequences. For example, enzymes involved in polysaccharide metabolism are followed by descriptions of the monosaccharide kinases, then by mutases, aldolase-type enzymes, and so on. Each report follows a fairly standardized form, which includes, in order, assay method, purification procedure, and properties of the enzyme. Volume II continues the description of enzymes with five sections devoted to enzymes of protein metabolism, nucleic acid metabolism, phosphate metabolism, coenzyme and vitamin metabolism, and respiratory enzymes, respectively. This is a quite reasonable order of presentation of the material.

The list of enzyme preparations covered in each field is very complete and includes enzyme activities that can be assayed but that have not yet been separated to any degree. I have prepared two enzymes using these volumes as a text. In both cases, the directions were sufficiently complete so that the purification procedure given could be used successfully. Reference to the original literature was needed on occasion. The directions given here for the preparation of enzymes, in general, are more complete than those given in other handbooks of preparative methods. The detailed description of the assay procedures is particularly helpful. In a few cases, where a large number of enzymes from different sources are described (such as amino acid decarboxylases), the directions are somewhat less detailed and the original literature must be consulted. A spot check for errors in references revealed none. A few typographical errors were found.

One hopes that succeeding volumes of the series will match the high standard set by these two books. Volume III appears to be well integrated (based on the outline given) with the first two. The outline for volume IV does not appear as promising. Some of the subject matter falls outside the scope of the first three volumes and might well be omitted.

It is regrettable that the cost of this series will keep it off the bookshelves of most students, for the series contains so much that can be applied to daily research work. One could consider it a "dictionary" of methods that is dipped into almost daily, if only to find a reference.

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Advances in Virus Research. vol. III. Kenneth M. Smith and Max A. Lauffer, Eds. Academic Press, New York, 1955. ix + 338 pp. Illus. $8.

The policy of publishing intensive reviews of rather restricted topics has been continued in volume III of *Advances in Virus Research.* However, the paper by Seymour Cohen on "Comparative biochemistry and virology" is an exception, for it ranges broadly over the virus field, including plant, insect, and animal viruses as well as bacteriophages. The emphasis is on diversity rather than uniformity, and the author closes with the well-justified warning that reasoning by analogy is a poor substitute for observation. The paper by R. E. F. Mathews and J. D. Smith on the "Chemotherapy of viruses" is not only a good review of this subject but also a good review of the biochemistry of nucleic acids. A review of "Tumor viruses" by Beard, Sharp, and Eckert is more restricted than the title would indicate, being primarily a review of rabbit papillomatosis and chicken