are combined in sets of three and four large volumes, respectively, and the books are therefore scarcely suitable for extensive field use. One wonders, however, whether the portability of a manual is of sufficient importance to warrant separation of the keys and descriptions from the illustrations. There are arguments on both sides, and it may be that in the long view the postponement of publication of the drawings may speed the appearance of a manual by a factor large enough to offset most of the disadvantages of such a procedure.

For this first of an expected four volumes of illustrations for their excellent *Flora* the authors are to be congratulated. It will be of real use to herbaria everywhere which are concerned with problems of general identification.

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Applied Optics and Optical Design. A. E. Conrady. Dover, New York, 1957 (unabridged and corrected edition of ed. 1). ix + 518 pp. $2.95.

This celebrated treatment of lens design exerted a great influence on computational methods when it first appeared in England in 1929. Written by a highly individualistic, not to say uncompromising, teacher of his subject, the book makes no concessions by way of popularization. Thus, although the treatment is not especially mathematical, the reading is not easy. Perhaps it is a sign of our scientific times to find this rigorous account of one of the disciplines of physics appearing as a paperback; serious students will welcome its increased availability. They will do well to read it, in order to relive the thinking which led to the design of the famous Holoscopic series of microscope objectives. The publishers assure us about the durability of the binding, which will be essential if its meaty contents are to be thoroughly digested.

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Annual Review of Entomology. vol. 3. Edward A. Steinhaus, Ed. Ray F. Smith, Assoc. Ed. Annual Reviews, Palo Alto, Calif., 1958. vii + 520 pp. $7.

This is the third and latest volume of an annual series, started in 1956, comprising numerous papers in which specialists in the various branches of entomology have prepared, for their colleagues and others, authoritative and scholarly progress reviews of their specialties. The very definite need for a reference work of this particular type was long realized by all who had to struggle with the widely scattered literature of entomology. Until the establishment of this series, nothing comparable to it existed anywhere.

It was in 1953 that a committee of the Entomological Society of America was appointed to examine the problem of providing adequate reviews of the literature. After exhaustive search and study, the committee recommended that such needs would best be met by a review publication of the general type published by the nonprofit organization, Annual Reviews, Inc. After appropriate investigations and appraisals, the work was started cooperatively between Annual Reviews and the Entomological Society of America. The objective has been the publication of authoritative, concise treatments of subjects of current interest. It is expected that the more active fields of research will require critical reviews annually, while less active fields will be summarized and evaluated as developments require. It is certain that this latest volume will be given the same warm welcome accorded those previously issued, because it possesses the same outstanding usefulness. It is a privilege to commend the 23 papers which make up this volume to the attention of fellow workers everywhere.

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Host-Parasite Relationships in Living Cells. A symposium. Sponsored by the James W. McLaughlin Fellowship Program, University of Texas, Medical Branch, 27 Apr. 1956. Harriet M. Felton, Ed. Thomas, Springfield, Ill., 1957. xix + 245 pp. Illus. $6.50.

This symposium, held in April 1956, was a fruitful commingling of scholars from various disciplines, all concerned largely with biological events within the cell and aware of the urgent need to span the gaps between various disciplines that are focused primarily on the same objective. Contributors to the symposium were E. W. Dempsey, R. J. Dubos, R. Dulbecco, C. E. Georgi, R. A. Good, J. H. Hanks, S. Mudd, C. M. Pomerat, M. G. Sevag, and J. T. Syverton. The meeting contributed to the construction of bridges between cytology and microbiology, including both morphologic and physiologic aspects.

The studies presented and discussed included morphologic observations by electron and light microscopy, immune mechanisms active at the cellular level, and metabolic and other factors influencing the resistance of either host cell or parasite to the effects of the other. A generous portion of this book is devoted to a faithful transcription of the stimulating informal discussion that took place.

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Psychotropic Drugs. S. Garattini and V. Ghetti, Eds. Elsevier, Amsterdam, 1957 (order from Van Nostrand, Princeton, N.J.). 606 pp. Illus. $19.50.

This book consists of papers presented at the International Symposium on Psychotropic Drugs, held in Milan, Italy, in May 1957. Most of them are written in English; others are in German, French, or Italian, with English summaries. These papers reflect the surging interest in biological aspects of normal and abnormal brain function which has resulted from a number of recent events: the discovery that lysergic acid diethylamide, in extremely minute doses, elicits a model psychosis; the discovery that reserpine and chlorpromazine induce effects almost opposite to those of lysergic acid diethylamide; and finally, and most important, the discovery that the biologically active amines, serotonin and norepinephrine, are present in certain parts of the brain. This book, spiced with the diverse viewpoints, hopes, prejudices, disagreements, and naiveties inevitable to a new and emotionally charged area of research, leaves the reader with an appreciation of the urge that provokes investigators to work in "psychopharmacology." This word has been coined to represent the branch of pharmacology which uses drugs affecting behavior to study brain function in the expectation of arriving at an understanding of normal brain function and, ultimately, at the cure or prevention of mental disease.

A number of biochemical papers discuss the possibility that brain norepinephrine and serotonin act as central synaptic transmitters and that certain psychotropic drugs elicit central effects by interaction with these amines. Various views are presented to the effect that mental disease is due to interference with synaptic transmission either by formation of an aberrant metabolite or by the faulty formation, release, or metabolism of a neurohormone. In addition, the effects of psychotropic drugs on a number of enzyme systems involved in brain intermediary metabolism are described.

In the papers on the behavioral effects of psychotropic drugs are described a number of the ingenious methods for studying normal animal behavior and

the effects of drugs thereon. The electrophysiologic presentations are particularly rewarding. These describe the effects of neurohormones and of various types of psychotropic drugs on electrical activities in various parts of the brain and attempt to relate these activities to normal and abnormal behavior.

The pharmacological papers accent the complexity of the pattern of effects elicited by psychotropic drugs. What makes these papers of particular value are attempts to relate pharmacological effects of the drugs to their effects on brain electrical activity and on behavior.

The clinical and psychiatric papers indicate the difficulty of determining the merit of drugs in the treatment of mental illness. Yet they leave the impression that certain of the "tranquilizing" agents are of definite aid in treating the symptoms, though not the basic defects, of mental illness.

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The Bacteriology of Tuberculosis. Egons Darzins. University of Minnesota Press, Minneapolis, 1958. xi + 488 pp. Illus. $10.

The effective treatment of tuberculosis with antimicrobial agents has led to the popular belief that this disease has been conquered. While great strides have been made in decreasing mortality (but probably not morbidity), many unsolved bacteriological problems still remain, and new ones have arisen. The purpose of this book is threefold: (i) to list in historical perspective the advances made toward the understanding of the tubercle bacillus; (ii) to present areas where further knowledge is needed; and (iii) to describe the newer experimental methods for the study of tubercle bacilli.

Basic theories and methods of general microbiology and specific problems pertaining to mycobacteria are described. Tubercle bacilli are discussed under the general headings of "Morphology and cytology," "Sources of energy and growth," "Isolation and identification," "Types and pathogenicity," and "Experimenting." In not all instances, however, are concepts and factual data accurately analyzed and presented. For example, the discussion of L forms of bacteria, on page 71, is misleading, and the tabulation of albumin as a nitrogen source for the metabolism of tubercle bacilli, on page 241, is incorrect. Nevertheless, an extensive subject index and a very comprehensive bibliography provide excellent access to the available literature.

A large section devoted to experimentation with the tubercle bacillus will be of value to the bacteriologist unfamiliar with the special techniques and precautions required in the laboratory.

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The Principles of Semantics. Stephen Ullmann. Philosophical Library, New York, ed. 2, 1957. 346 pp. $10.

This book is essentially a reprinting of the first edition with a supplement on recent developments in semantics and an expanded bibliography. For Ullmann, semantics is the scientific study of meaning, and meaning is the relation between name and sense, or, as some might prefer to put it, between sign and *designatum.*

Ullmann has described a variety of approaches to questions of change in meaning, semantic laws, homonymy and so on, and in the added chapter he correctly indicates that the most important new problem is that of whether a structural semantics is possible. A meaningful answer must be based on some explicit definitions of the terms *semantics* and *structure.*

A related and, in a sense, logically prior question is whether any semantic notions are essential, or indeed relevant to the syntactics—that is, the purely formal aspects of grammar, consisting of signs and of rules for their combination. If the two are not separable (and this seems to be Ullmann's view), then there is little point in discussing a structural semantics as distinct from a structural syntactics. If they are separable, then whether or not a structural semantics is possible obviously depends on what is meant by structure.

Structural is equated by some with *scientific.* If, as Ullmann suggests, semantics is the scientific study of meaning, then a structural semantics is possible by definition. However, there are some who are not convinced that meaning can be approached scientifically at all. Ullmann asserts that such a discipline exists but nowhere demonstrates that the meaning of a form is anything but an intuitive notion.

One not uncommon use of *structural* is as a synonym for *syntactical.* That is, the rules for the combination of signs are the structure of a language. In accordance with such a usage, structural semantics would seem to be a contradiction in terms.

Some students of language make a dichotomy between the structural elements (by which they mean inflectional endings like the plural *s* and the past tense *ed*) and the *lexical* elements, like *book, run,* and so on. From this point of view a structural semantics would presumably be the study of the meanings of these elements; such a study is not only possible but traditional in many schools of linguistics.

Ullmann quotes some linguists who use *structure* to mean symmetry or patterning and therefore make statements about certain systems or parts of systems being more highly structured than others. This would reduce the problem to the rather trivial question of how much symmetry one can discover (or impose) on the meanings of forms.

Other linguists have mistakenly used *structural* as equivalent to descriptive (as opposed to historical) studies. This is unfortunate, since surely one of the contributions of modern linguistics is to indicate how changes in language may be more clearly understood through a comprehension of the relationships of units to one another at any given time.

Now, if structure is used to express the notion that abstract units are defined in terms of hierarchical relationships to one another, as well as the fact that these relationships recur, then the conscious investigation and systematic description of these features in the area of semantics will be a discipline of increasing interest and importance.

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Toeplitz Forms and Their Applications. Ulf Grenander and Gabor Szego. University of California Press, Berkeley, 1958. vii + 245 pp. $6.

The study of spectral properties of matrices

$$[(C_{i,j})] = [(C_{i-j})],\ C_p = \overline{C}_{-p},\ 1 \leq i, j \leq n,$$

in the limit $n \to \infty$ has received considerable attention in the mathematical literature since the early days of this century.

More recently, analogous studies of integral equations of the form

$$\int_0^T K(x-y)\psi(y)\,dy = \lambda\psi(x),$$

$K(x) = \overline{K}(-x)$, in the limit $T \to \infty$, were also undertaken.

The present volume is an excellent and virtually complete summary of the work done on these and related problems up to 1955.

Toeplitz matrices and translation kernels occur in a wide variety of branches of pure and applied mathematics, ranging from the theory of analytic functions to crystal statistics and the theory of random noise. To present such wealth of material in the limited space of 240 small pages is a feat in itself. To do it