Review: Biology and Biophysics

Reviewed Work(s):

Plant Growth Substances by L. J. Audus

Catalogue of Fossil Cirripedia in the Department of Geology (British Museum), Vol. III: Tertiary by Thomas Henry Withers

Primates: Comparative Anatomy and Taxonomy, Vol. 1: Strepsirhini by W. C. Osman Hill

The Polyporaceae of the United States, Alaska and Canada by Lee Oras Overholts

Phylogeny and Morphogenesis: Contemporary Aspects of Botanical Science by C. W. Wardlaw

Physiological Acoustics by Ernest Glen Wever; Merle Lawrence

Nerve Impulse by David Nachmansohn

Textbook of Genetics by William Hovanitz

The Anatomy of the Migratory Locust by F. O. Albrecht

General Virology by S. E. Luria

The Medusae of the British Isles: Anthomedusae, Leptomedusae, Limnomedusae, Trachymedusae, and Narcomedusae by Frederick Stratten Russell

James Bonner; Dora Priaulx Henry; Bryan Patterson; L. R. Hesler; Ralph H. Wetmore; Robert Galambos; L. J. Mullins; Ernst Caspari; Ashley B. Gurney; R. Dulbecco; Joel W. Hedgpeth

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macromolecules was accepted. For a long time, polymers were regarded as aggregates held together by unidentified forces of various kinds, and the idea that a polymeric material was made up of large molecules held together by the same kinds of valence bonds that exist in ordinary low-molecular-weight compounds did not receive early recognition. As soon as it was realized that the only essential difference between polymeric and ordinary molecules is size, rapid progress was made toward understanding the preparation and behavior of polymeric systems.

After an interesting historical background followed by definitions, Flory proceeds to tell how polymers are made, either through condensation or vinyl addition. His discussion includes a thorough treatment of the kinetics of condensation, free radical and ionic polymerizations. The author then turns to the important question of structure, the determination of molecular weights, the characteristics of nonlinear polymers, and the theory of gelation. The latter part of the book is concerned with chain configurations, the thermodynamics of rubber-like elasticity and polymer solutions, and, finally, the fractional properties of macromolecules which are important for understanding solution viscosities and diffusion. The book naturally reflects those topics in which the author has been most interested. However, since Flory's own research contributions and interests have been so extensive, the coverage of the book is very broad. In this connection, it should be mentioned that there is little reference to proteins, a subject of particular importance to those leaning toward biochemistry.

The latter part of Flory's book will be especially useful to physical chemists who should welcome his excellent summaries of the theories and properties of polymer solutions; the earlier portions should be useful to organic and physical chemists alike. On the whole, this reviewer was highly pleased with the book and can recommend it without reservation to anyone interested in the principles of preparing and characterizing polymeric systems.

FREDERIC T. WALL

Department of Chemistry and Chemical Engineering
University of Illinois

The Screen Projection of Chemical Experiments. E. J. Hartung. Melbourne Univ. Press, Melbourne, Australia; Cambridge Univ. Press, New York, 1953. 291 pp. Illus. + plates. $4.75.

We have come to expect scholarly monographs from our English friends, and this volume is true to tradition. It is full of new ideas for making lecture demonstrations more visible: 5-ft test tubes, gas bubbles a foot in diameter, 3-ft cathodes. The first 100 pages discuss projection equipment; the last 200 pages describe 250 projection demonstrations. An experimental index and a general index conclude the book. Figures and plates are excellent.

I prefer a practical to the pedantic approach for the first 100 pages. For example, a half-page reference to the Polaroid Corporation kit for projection of experiments with polarized light would be better than the discussion (pp. 34–49) of this subject. Or a five-page evaluation of commercial projectors, à la Consumers Research, would help the teacher far more than the 31 pages on principles of optics in projection and the 41 pages on equipment. May the author who, in this book, has demonstrated such complete competence in his field, spend some months on a traveling fellowship in the United States, Great Britain, and Germany evaluating commercial equipment and add this material as a new chapter in the second edition.

The scope of the demonstrations in the last 200 pages is best judged by citing a few. Experiment 8, Shadow projection of gases of different densities streaming into air; 15, Water in a dilatometer contracting upon cooling to 4°C, but expanding below that; 24, C.T. and C.P. of ether; 32, Thermal expansion of wire; 41, Speed of crystallization of some organic compounds; 46, Dimorphism of red-yellow HgI_2; 51, Efflorescence of $CuSO_4 \cdot 5H_2O$; 56, Isomorphous growth of $NaNO_3$ on calcite; 69, Optical activity of crystals; 70–95, Solubility experiments; 100, Color changes with $Ag_2S_2O_3$; 107, Crystals of $K_2Cr_2O_7$ oxidizing $FeSO_4$; 114, Solid particles in a candle flame; 147–8, Formation of osmotic cells of copper ferrocyanide and of silicates; 152, Migration of ions; 156, Swelling of a Pd electrode upon absorbing hydrogen; 161, Na formed by electrolysis; 162, Formation of ammonium amalgam; 182–215, Surface phenomena; 219, Formation of colloidal gold; 235, Development of the latent image; and 246, Line spectra of metals.

This is not the death knell of the conventional lecture demonstration—small classes will still prefer most of their experiments firsthand, not projected. But this will go a long way to help the teacher in large classes, particularly Messrs. Zabrisky and Zimmerman in the back row.

HUBERT N. ALYEA

Frick Chemical Laboratory
Princeton University

Biology and Biophysics

Plant Growth Substances. L. J. Audus. Leonard Hill, London; Interscience, New York, 1953. 465 pp. Illus. + plates. $6.50.

This volume by Professor Audus, of Bedford College, University of London, is an important new summary of our knowledge of the chemistry and physiology of plant growth. He has undertaken to bring up to date the subject first reviewed by F. W. Went and K. V. Thimann in their classical *Phytohormones* and by P. Boysen-Jensen in *Growth Hormones in Plants* nearly 20 years ago. In the interim, our understanding of the chemical mechanisms used by plants to control and integrate their growth has increased considerably.

A development of equal importance in this 20-year period has been, however, the application of our knowledge to agriculture. The manufacture of synthetic plant growth substances has become an industry; the application of plant growth substances has become an agricultural practice; and the study of plant growth substances has spread from the academic cloister to the industrial laboratory. We know how to supervise the development of the plant by sup-

plying it with appropriate chemicals at timely intervals. In this way, we may retard or hasten the fall of leaves or fruits, we may cause the formation of new roots or buds, we may encourage or suppress the development of flowers and induce the set of fruits under conditions where fruits might otherwise be absent. We may even, if we desire, treat a mixture of plants, a plant community, in such a way as to remove species that we do not want and, therefore, call weeds without doing violence to the species that we do want, the crop.

The Audus book reflects this new direction of interest. The subject of plant growth substances is developed applicationwise. We discuss, for each application, the background of available physiological and chemical lore is given. The discussion then proceeds to matters such as methods of supplying the appropriate chemical, dosages, spreaders, duration of effects, influence of climate on the response, suitability for individual crops, and so forth. The author has, in fact, taken some pains to assure that biologist, horticulturalist, agricultural chemist, and even (he says) the gardener will each find something of interest and value in *Plant Growth Substances.*

We recognize a very considerable number of plant growth substances, each concerned with regulation of a specific aspect or aspects of plant growth (ch. 13). The bulk of our information and the bulk of this book concerns, however, just one group of hormones, the auxins. The auxin is produced, characteristically, in apical buds and other apices and is transported downward through the stem, where it is used in the control of the cell elongation process. Chapter 2 describes the basic experiments on which the auxin concept is based. The chemical identification of the native auxin of plants, a matter with which we have been concerned for more than 20 years, is discussed in Chapter 3. Audus concludes that much evidence suggests that indoleacetic acid is the native auxin of plants. The investigations of Haagen-Smit and Went in 1935 revealed that certian synthetic nonnative compounds related in structure to indoleacetic acid are able to replace the latter in its plant function. This is true, for example, of naphthalene acetic acid and of 2,4-dichlorphenoxy acetic acid, and it is upon these compounds rather than indoleacetic acid itself that agricultural applications have been based. Chapter 3 includes a full survey of the enormous amount of work that has been done in recent years on the relation of chemical structure to physiological activity of these synthetic auxins.

Although the auxins were first recognized and are still to be thought of primarily as agents that control cell enlargement, they also exert a great variety of other (and possibly secondary) effects on a variety of plant tissues. Chapters 4 through 12 are concerned with these varied responses of the plant to auxin. Effects on root and seedling growth, on rooting of cuttings, on cambial activity, on fruit development, on inhibition of lateral buds, on the herbicidal activity of auxins in high concentration, on inhibition of leaf and fruit drop, and on flowering are considered in turn. These chapters, as indicated in a foregoing paragraph, contain not only a summary of scientific background but also a wealth of detail on agricultural applicability and procedure. Brief chapters on the growth substances of roots (thiamine, pyridoxine, and niacin) and other organs, on naturally occurring plant-growth inhibitors (such as the inhibitors or seed germination contained in fruits), and on the biochemistry of growth substances in the soil complete the book.

It is a difficult matter for the author of a summary such as this book to regiment the wealth of available detail into any strict and orderly array of general principles. Audus has chosen, in general, to bring together the pertinent facts and to eschew any vigorous attempt at systematization, which is then left in a large measure to the reader himself. This is a book that will be useful to a wide range of readers just because of the wealth of matter assembled in it.

JAMES BONNER

Kerckhoff Biological Laboratories
California Institute of Technology

Catalogue of Fossil Cirripedia in the Department of Geology (British Museum), Vol. III: ***Tertiary.*** Thomas Henry Withers. British Museum (Natural History), London, 1953. 396 pp. Illus. + plates. £4 10s.

This catalog is the first comprehensive review of the fossil cirripedes since Darwin's monographs of 1851 and, in addition, is a major contribution to the study of paleozoology. This volume on the Tertiary cirripedes completes the catalog of the known fossil cirripedes with the exception of the Balanamorpha. (The Triassic and Jurassic cirripedes were dealt with in Vol. I, published in 1928, and the Cretaceous in Vol. II, published in 1935.)

The present work, which includes all the known Tertiary stalked cirripedes of the world, is an outstanding monograph. The author reexamined most of the type and figured specimens and studied many of the earlier collections as well—some 7100 specimens, of which 5650 are in the collection of the British Museum. Ninety-three species and varieties of Tertiary cirripedes, distributed among 15 genera and subgenera, are now known, as contrasted with the four Tertiary species known to Darwin. In the present volume, one new genus and 38 new species and varieties are described. In addition, the geologic and geographic ranges of both genera and species have been considerably extended and, equally important for the knowledge of this group, many species known heretofore by only one or more valves are now known by all the valves.

Terminology, ontogeny, and classification, dealt with fully in the first and second volumes, are treated only briefly in this volume. The phylogeny of the cirripedes, also covered in the previous volumes, has been amplified here. The reduction in number of valves and the change in position of the umbo owing to upward growth of the valves are fully discussed and illustrated, and some information on decalcification of the valves is added.

The chapter on the distribution of the Tertiary cirripedes includes a general discussion of the geologic formations, a list of species arranged geographically, a stratigraphic survey of marine Tertiary beds, and a review of the fauna. The liberal use of tables and summaries in this chapter makes the comprehen-

sive information more readily available to those interested in the subject.

The largest chapter in the book (pp. 99–352) is that covering the systematic descriptions of the suborders Lepadomorpha and Brachylepadomorpha. In addition to a concise diagnosis of each family, genus, subgenus, and species of Tertiary cirripedes, systematic discussions of each genus and many species are included. Here is correlated all the previously published information on these genera or species with new information elucidating their geologic and geographic relationships. The illustrations for each species add to the value of this chapter as well as to the concluding chapter on the noncirripede or doubtful species.

A complete bibliography and well arranged index complete the volume. The author is to be highly commended for this excellent contribution to our knowledge of barnacles.

DORA PRIAULX HENRY
Department of Oceanography
University of Washington

Primates: Comparative Anatomy and Taxonomy, Vol. 1: ***Strepsirhini.*** W. C. Osman Hill. University Press, Edinburgh; Interscience, New York, 1953. 798 pp. Illus. + plates. $12.50.

The primates have attracted more attention than any other group of animals, and in consequence the literature dealing with them—excellent, competent, and bad—has reached enormous proportions. The last good general summary of the order is 60 years old, and the only attempt at a partial synthesis published in the interim, that by Elliott in 1913, is almost as much a hindrance as a help. A situation such as this is quite enough to discourage almost anyone from undertaking a general compendium, and Dr. Hill must be congratulated on his courage in making the attempt. He has strived to give a broad survey. Although the subtitle reads *Comparative Anatomy and Taxonomy,* the treatment also extends to what is known about development and behavior. Distribution in time, as well as in space, is considered, a generous amount of text being devoted to extinct forms.

Following Pocock, Hill divides the primates into two "grades," the Strepsirhini and the Haplorhini. The former, the subject of this volume, comprises the lemuroids, including the extinct European and North American families usually grouped with them, and the lorisoids, both regarded as suborders. His treatment of this assemblage is prefaced by a short general discussion of the anatomy, reproduction and development, distribution, taxonomy and phylogeny of the order as a whole. This is followed by a more extended summary of these features in strepsirhines. The same general plan is adopted for the suborders, families, genera, and even species, which inevitably entails a certain amount of repetition. Subspecies are treated quite fully, but in small type, "so as to avoid embarrassment to the seeker after purely general or morphological information."

A number of keys are provided, and there are many attractively executed distribution maps. The majority of the plates illustrate mounted skeletons and captive specimens or mounted skins, and many of the figures are devoted to external characters, particularly the genitalia. The index is adequate, a very important feature in a work of this nature. The date of publication is 1953, but it is evident from the bibliography that the manuscript must have been completed early in 1948, a point that users of the volume should keep in mind.

It is open to question whether Pocock's classification of the primates is the best of several alternatives. It is true that in other orders the presence or absence of a rhinarium, the key character separating strepsirhines and haplorhines, is remarkably constant, but it still does not necessarily follow that the earliest tarsioids lacked one. The various other features that *Tarsius* has in common with higher primates, which occur in a matrix, so to speak, of lower primate characters, may well have been independently acquired. In fact, to the reviewer at least, it would seem that the old threefold division into Prosimii (including tarsioids), Platyrrhini, and Catarrhini accords rather better with what is known of the history of the order. Hill excludes the tupaioids from the primates, a step for which a good case can be made, and does not discuss them at all. This omission is a pity, because regardless of the taxonomic position assigned them, in part merely a matter of definition, there is little or no room for doubt that of all living mammals they are the closest to the primates. As such, some consideration of them is highly desirable in any comprehensive work devoted to the order. Their inclusion would not have greatly increased the magnitude of the formidable task the author set himself.

Discrepancies occur in various parts of the work. For example, on page 11 it is reported that no certainty exists on whether the metadiscoidal or the deciduate and hemichorial type of placentation is primitive for the order, whereas page 92 informs us that conditions in *Galagoides* settle this question in favor of the metadiscoidal. Numerous characters are given as diagnostic of lorisoids as opposed to lemuroids (p. 105), but later on (p. 318 *ff.*) we learn that a number of these are also present in the cheirogaleine lemuroids. It is unreasonable to expect the author to be equally well versed in all the fields he has attempted to cover, but some errors or misinterpretations of fact in paleontology, the field that may be least familiar to most of those who will use the volume, must be pointed out. Eocene primates are not unknown in Asia (p. 19); they are present in the Late Eocene of Burma. The table showing Tertiary chronology (p. 21) is long out of date with regard to North America. It is true that primates do not appear in Europe until the Late Paleocene and "even then they are represented solely by plesiadapids (p. 19)," but this does not mean that a varied fauna did not exist there during that time. The facts are that in Europe no Early and Middle Paleocene mammalian faunas are known, and knowledge of Late Paleocene mammals is based essentially on material from a single horizon. If our knowledge of the Paleocene in North America were similarly restricted, it is quite likely that only *Plesiadapis* would be known here too.

The more ground covered by a work, the more, of course, a reviewer can find to carp about. The important question is always: how useful will the work be? To this it may be confidently replied that the situation with Hill handy on the shelf is infinitely better than before, and this is surely praise enough.

BRYAN PATTERSON
Chicago Natural History Museum

The Polyporaceae of the United States, Alaska and Canada. Lee Oras Overholts; prepared for publication by Josiah L. Lowe. Univ. Michigan Press, Ann Arbor; Oxford Univ. Press, London, 1953. 466 pp. + 132 plates. $7.50.

Those who knew the author will not be surprised at the substantial excellence of his achievement. About 40 years ago, he familiarized himself with polypore anatomy and basic techniques. Twenty years ago, the author published diagnostic keys which, being critically used, were perfected for this book.

In his introduction, Overholts recognizes basic work of such Americans as Lloyd, Murrill, Schweinitz, Peck, and others, and Europeans including Patouillard and Romell. The author concludes this chapter with a discussion of the early history of the Polyporaceae, generic segregates, morphology, anatomy of the hymenium, economic importance of the family, wood decay, his concept of parasitism as it pertians to tree-invading polypores, and pure cultures in taxonomy. Finally, the author presents a taxonomic account of all known species of pileate Polyporaceae of North America north of Mexico and southern Florida. Most students will be pleased that Overholts has held to his conservative generic concepts.

Of the 466 pages of text, some 75 pages are devoted to keys, notes, and descriptions of 40 species of the genus Fomes; 266 pages are given to 162 species of Polyporus. In all, eight genera are appropriately treated.

Nomenclature employed follows the International Code. Technical descriptions, based on examination of numberless specimens, are well drawn and, so far as checked, bear a practical relationship to the diagnostic key. Habitat notes are also based on the examination of many specimens collected widely over the continent. Geographic distribution is presented through a listing of the names of states from which the author has examined collections. Carefully selected illustrations published by others are cited. The text is followed by a bibliography of 238 titles, valuable in that it lists important European, as well as American, publications.

Of the illustrative plates 124 are halftone plates bearing 675 figures. Gross structural details are clear, and it appears that good judgment was exercised in the selection of the photographs. Five plates carry line drawings prepared to show the chief characters of the hymenium for scores of species. The volume closes with an adequate glossary and index.

As many of Dr. Overholts' friends well know, he passed away in 1946, before the manuscript was completed. It was then that Dr. Frank D. Kern, a colleague of Overholts, prevailed on Josiah L. Lowe, of Syracuse University, to assume the burden of preparing the manuscript for publication. Little imagination is required to appreciate the complexity of such a task.

For reasons of health, Overholts had not incorporated some 30 species and varieties that have been described since 1938, most of them by W. A. Murrill. Dr. Lowe, in preparing the final manuscript, included such species in their appropriate places as Omitted Species. In completing this task, Dr. Lowe proved himself worthy of a difficult assignment and gained the everlasting gratitude of science. Finally, the University of Michigan Press in publishing the manual has maintained its usual high standard. The volume fills a need, and does it superbly and with authority.

L. R. HESLER

Department of Botany
The University of Tennessee

Phylogeny and Morphogenesis: Contemporary Aspects of Botanical Science. C. W. Wardlaw. Macmillan, London; St Martin's Press, New York, 1952. 536 pp. Illus. $7.50.

It is somewhat more than a year since Wardlaw's *Phylogeny and Morphogenesis* appeared. A few months earlier, Methuen had published his shorter discussion *Morphogenesis in Plants.* The early account described representative experiments carried out by the author on apical meristems of the shoot systems, especially of ferns, and discussed the implications of these experiments in the interpretation of the genesis of form and structure.

In *Phylogeny,* the author has described and interpreted many of his experiments more fully. He has also emphasized the importance, and indeed the indispensability, of developmental studies to the phylogenetic worker. The paleobotanist may well avoid errors by knowing the variables of ontology and the possible impact of environmental realities such as nutrition, light, and moisture, upon the extent of genetic variation during development. Since phylogenetic trends proceed as a result of the survival of organisms with genetic modifications expressed during development, then certainly the two seemingly separate disciplines of phylogeny and morphogenesis must be directly connected and can with justice be considered in a single volume. Wardlaw states it thus, "Phylogeny and morphogenesis are not separate disciplines: they are one . . . each being essential to the other." Certainly Wardlaw's own training in comparative morphology under F. O. Bower, at Glasgow, has borne fruit in the morphogenetic findings of his recent fascinating experimental studies.

Of the 20 vigorously written chapters, and bibliography of approximately 1000 titles, comprising *Phylogeny and Morphogenesis,* seven chapters (125 pp.) consider the phylogenetic point of view, historical and present. The remaining 351 pages (13 chs.) represent a significant assessment of the whole subject of morphogenesis in vascular plants. The book is not only an epitome of extensive studies from Wardlaw's laboratory at Manchester; it comprises one or more chapters each on genetical, biochemical, physical, and mathematical aspects of morphogenesis, with appraisal of pertinent investigations in these fields. For the student of morphogenesis of the higher plants, much fundamental spadework has been done in this assemblage of cogent material from diverse approaches.

For the paleobotanist and general student of comparative plant morphology, Wardlaw points out that although experimental investigations are necessarily based on living plants, "a clearer understanding of the factors that determine form and structure in living plants" should permit "a more adequate interpreta-

tion of the developments indicated by the fossil record." The earnest botanist looking for new leads may find himself excited by the possibilities of utilizing the microscalpel and the culture tube to supplement the microtome and the microscopic slide. He may even be drawn to explore the experimental advantages of some vascular cryptogam instead of, or as a preliminary step to, an angiosperm for experimentation.

RALPH H. WETMORE
The Biological Laboratories, Harvard University

Physiological Acoustics. Ernest Glen Wever and Merle Lawrence. Princeton Univ. Press, Princeton, N.J., 1954. 454 pp. Illus. + plates. $10.

Physiological acoustics is defined in this book as the events that transpire between the impingement of sounds upon the ear and the arousal of nerve impulses by them. The text, therefore, deals with detailed measurements of the mechanical excursions of the eardrum, middle-ear bones, and cochlear contents. It will be a surprise for many to discover how many such measurements exist and a real help, for those sophisticated enough to know of their existence, to find them systematically assembled in a single place.

The authors, however, do not deal merely with a body of facts; theories derived from or supported by them weave in and out of the text and serve to bind what might be a set of tables into what can be called a book. These theories stem from many sources, which means that there are many of them. The authors describe each theory in simple declarative sentences and evaluate most of the theories, using either the available published experimental evidence or experiments reported here for the first time. The end-result is not easy reading, nor will it appeal to a general audience; the experts, however, will find much here both to agree and disagree with.

Toward the end of the book, some 50 pages are devoted to otosclerosis, a type of deafness in which violation of the normal laws of physiological acoustics occurs owing to fixation of the footplate of the stapes. In this section, what is known about these laws is brought to bear upon the practical clinical problem, and the discussion of the fenestration operation that often relieves the deafness serves to focus the fact and theory in an interesting and informative way. This section will have the most general appeal, and in some ways it is the best of the book.

In the final section, there is a brief account of the neural mechanism of perception of pitch. As the authors see it, the two familiar concepts, the place and volley principles, operate in the way Professor Wever discussed in his recent book.

A glossary of terms, an adequate index, and five appendices—some very useful—round out this book. The list of 383 references, while not exhaustive except for the work of some authors, covers the field completely.

ROBERT GALAMBOS
Department of Neurophysiology
Army Medical Service Graduate School
Walter Reed Army Medical Center

Nerve Impulse. David Nachmansohn, Ed. Josiah Macy, Jr. Fdn., New York, 1954. 224 pp. Illus. $4.

This fourth conference on the nerve impulse had for its program the following topics: Mechanism of vision (Wald), Mechanism of Hearing (Davis), and Sensory Receptors (Zotterman).

In the presentation of the mechanism of vision, the facts are most ably set forth, but neither the paper itself nor the discussion develops anything that can be construed as a connection between the initial photochemical event and the subsequent nervous excitation. Hartline notes that at threshold the delay between light absorption and excitation may be one second, and that certainly the photochemical excitation cannot last this long. The discussion turns to a consideration of how the bleaching of one molecule of rhodopsin can be amplified into some sort of biochemical change; it is not at all clear where the free energy to operate this amplifier is to come from.

The mechanism of hearing now appears to involve many new factors not dealt with in conventional neurophysiology. Some of the more remarkable of these are the marked differences in Na^+ concentration between labyrinthic fluids and direct current with superimposed alternating-current potentials in the labyrinth. It is apparent from the presentation that the subject is in a rapid state of development, but the discussion of these results by the group is rather disappointing. Communication difficulties appear; the participants divide into the electro-analog and the biochemical groups; and no middle ground for discussion appears. The fault may lie in the very newness of the data, and the fact that there has been little time to develop coherent schemes for changing sound into nerve impulses within the framework of this new work.

The treatment of sensory receptors concerns mainly the activity of the thermal receptors in the cat's tongue. Again there are conflicts with conventional notions of the way stimuli produce changes in receptors. The cold receptor has an electric activity dependent upon temperature as well as an activity dependent upon changes in temperature; it is the first finding that is unusual—that a constant stimulus produces a continuous response. The presentation and discussion are a valuable summary of recent work on thermoreceptors. As might be anticipated, considerable difficulty arises when explanations are sought for the reason thermal sensitivity of a small fraction of a degree centigrade can exist in a receptor. An entirely personal feeling of the reviewer is that authors and participants ought to be allowed to delete from these printed discussions some of the more unfortunate remarks that are made.

L. J. MULLINS
Department of Biophysics, Purdue University

Textbook of Genetics. William Hovanitz. Elsevier, Houston–Amsterdam, 1953. 419 pp. Illus. $5.95.

This new textbook of genetics is distinguished from other books in the field by an extensive treatment of elementary or "formal," genetics and of the statistical techniques used in this field. Of the more advanced topics of genetics, population genetics is emphasized at the expense of physiological and developmental genetics.

Elementary genetics, including linkage and the mapping

of chromosomes, accounts for 10 of the 18 chapters. The chromosome theory of heredity is introduced as a statement on page 3, and the distribution of genes in crosses is derived from the behavior of the chromosomes at meiosis. This procedure may be deplored by teachers who prefer the historical approach, particularly since it involves omission of some of the elegant experiments which form the evidence for the chromosome theory of heredity. The present way of presentation is, however, didactically just as sound and may be easier to understand in an introductory course. In the examples given, *Drosophila* and corn genetics are more thoroughly treated than in most elementary textbooks. The statistical methods are introduced in appropriate places in the text and are thoroughly and competently explained.

Of more advanced topics, chromosome rearrangements and changes in chromosome number are well covered. The chapters on selection and populations and on evolution are very clear and concise. The chapter on mutations does not consider the more recent developments in this field. There is only one chapter on biochemical and developmental genetics that includes the discussion of sex determination and of cytoplasmic inheritance. Bacterial genetics and the genetics of *Paramecium* are barely mentioned. One chapter deals with human and agricultural genetics.

The style of the book is occasionally awkward, and although the author's meaning is always clear to a trained biologist, some statements may be bewildering to beginning students.

At the end of each chapter, there are a number of well-conceived problems and a bibliography. There is a large number of very good illustrations, many of them original. Two appendices contain a direction for laboratory experiments with *Drosophila* and corn and an abbreviated version of Warwick's well-known tables of Mendelian ratios in small numbers.

It may be expected that this will be a useful textbook for introductory courses in genetics.

ERNST CASPARI

Department of Biology
Wesleyan University

The Anatomy of the Migratory Locust. F. O. Albrecht. Athlone Press, University of London, 1953. (U.S. distr.: Curtis Brown, 347 Madison Ave., New York 17.) 118 pp. Illus. 30s or approx. $4.25.

This book is a concisely written, well-illustrated manual of much value in academic laboratories where grasshoppers are being used as subject animals in teaching, and it is also a basic guide for specialists in acridology. Undoubtedly this manual will give impetus to the increased use of grasshoppers as experimental animals, since they have been found to be excellent representatives of the arthropod phylum, while at the same time laboratory studies provide basic information of value in applied studies. The author conducted his work at the University of London, and he is now a staff member of the Anti-Locust Research Centre.

Here it may be helpful to explain to American biologists that the distinction between grasshopper and locust is not a sharp one. In essence, locusts are grasshoppers that tend to be outstandingly migratory and gregarious in behavior, and they have anatomical features which usually are correlated with greater flight capacity.

The title correctly gives the scope of this work as anatomy, since no attempt at comparative morphology with other Acrididae is made, and little attention is given to function. The style is brief and to the point, and the various parts of the body, first externally, then internally, are reviewed in order, illustrated with clear line drawings by the author. The appendix of instructions for dissection will be very helpful.

The author states that the Snodgrass series of papers on grasshopper anatomy has been of the utmost value, and to a large extent he has been guided by Snodgrass in interpretations and choice of terms. Descriptions are brief, and certain details of specialized parts of the body, such as the patches of sensory hairs near the vertex of the head, described in recent years by Weis-Fogh as aerodynamic sense organs, are not mentioned. A list of 34 references is included. Evidently, here again the aim is to give the student what is most important and not to clutter his mind and time with details that he will discover later if he continues the study of grasshoppers. Papers by Snodgrass, Slifer, E. M. Walker, and Vinal are among the basic American works cited.

Acridid specialists may not be accustomed to certain of Albrecht's terms. He apparently prefers *protergum* (which is correct morphologically) to the more familiar *pronotum,* and he uses *spines* instead of *spurs* for the movable structures at the apex of the tibiae. Wing veins are named according to a modified Comstock-Needham system, and the interpretations are said to be based on recent unpublished studies by D. R. Ragge, of London. Although many British students of acridids apply *elytron* to the front wing, Albrecht calls it the *tegmen* as is usually done in America.

It may be predicted that this book will rank as a fundamental contribution, especially because it covers all body systems. The author is logical and has done will in his attempt to provide a manual that will help other students.

ASHLEY B. GURNEY

Entomological Society of America
Washington 5, D.C.

General Virology. S. E. Luria. Wiley, New York; Chapman & Hall, London, 1953. 427 pp. Illus. $8.50.

This textbook offers for the first time a remarkable synthesis of the facts and concepts of a new science that is now emerging from numerous scattered contributions of many workers, often having different purpose and interest. This new science studies "the virus" from a chemical and physical point as an inert particle and as an operating constituent of functional cells. In this book, information from the field of bacterial, plant, and animal viruses is pooled together, although the important differences among them are duly emphasized.

Because of the author's background as a phage worker, one might have expected the book to be essentially devoted to bacterial viruses. This is not so, for equal consideration is given to each branch of virology, and none of its significant aspects has been neglected.

The main characteristics of this book are the excel-

lent definition of the problems, the accuracy and extent of the information, and the critical evaluation of the data. The experimental results presented are numerous (697 references) and amazingly up to date; many neat and easily understandable tables are included, as are also effective illustrations.

The first seven chapters of the book discuss the general properties and physical and chemical characteristics of the viruses. The statistical and physico-chemical principles involved in the determination of some characteristics are adequately discussed. The concept of purity of virus preparations is discussed in an acute and original way. The following five chapters discuss the interaction of viruses and of their hosts in bacteria, plants and animals. Other chapters discuss hemagglutination phenomena, interference, and variation of viruses. After discussing the transmission of viruses and the tumor problem, the book ends with a general discussion of the origin and nature of viruses. A discussion of the Rickettsiae is given as an appendix.

The book stresses the problems of greatest actuality: for example, one chapter is mainly devoted to the use of tissue cultures in animal virology; another, and an inspiring one, to the relationship between viruses and tumors. In discussing debated questions, which are numerous in a new science, the author restrains from taking too sharp a position, although his attitude is always critical and progressive. The practical implications of many biological properties of viruses are not neglected, as proved by the extensive discussion of the medical aspects of virus serology (ch. 6), of the problems of transmission of plant and animal viruses and of their epidemiological significance (ch. 16), and of many other points.

Owing to the considerable number of facts and to the high level of the discussion, the book, in a few places, may not be easy to read; mature students will profit most from it.

All together the book is truly outstanding. It will constitute exciting reading for everyone interested in some of the most intriguing aspects of biology.

R. DULBECCO

Division of Biology
California Institute of Technology

The Medusae of the British Isles: Anthomedusae, Leptomedusae, Limnomedusae, Trachymedusae, and Narcomedusae. E. T. Browne Monograph of the Marine Biological Association of the United Kingdom. Frederick Stratten Russell. Cambridge Univ. Press, New York, 1953. 530 pp. Illus. + 35 plates. $22.50.

Every devoted systematist must secretly cherish the hope that he might emulate the example of Alfred Goldsborough Mayer who wrote, in his *Medusae of the World,* "I have always felt that each working naturalist owes it as a duty to science to produce some general systematic work," but few have been able to do so in these days when so many things seem more important than a knowledge of the species of animals. Yet, without such knowledge, much practical work in oceanography, agriculture, physiology, and medicine would be impossible. It may well be true that Dr. Russell's original motivation for taking up the study of medusae is their utility in studying water movements, but it is plain that he is a zoologist and a devoted systematist as well, for it took perseverance and interest to carry this work on to its delayed but successful conclusion.

All the species known to occur in British waters (some 90 species, including the one fresh-water form) are discussed, and a number of possible species, not surely known for the area, are also considered. Exhaustive synonymies are given for most of the species, although the author has had to throw up his hands once: "Sufficient has already been said to indicate the confusion that exists in the synonymy of *Obelia.* There is nothing to be gained by further mention." Nevertheless, the highest traditions of scholarship have been met, and every effort has been made to make this work useful. Many of the drawings are of preserved material, rather than idealized perfections seldom seen in collections, and a neat pictorial key consisting of 80 vignettes is offered in place of the usual verbal dichotomy. The bibliography on *Craspedacusta* is listed separately from that on the marine species. Citations are not restricted to regional references.

From the standpoint of zoology, it is of interest to note that the author makes no attempt to harmonize the divergent classification of hydroid and medusae stages, since he is of the view that our knowledge of the hydroids is still too imperfect. Rather limited use has been made of nematocysts, and it may well be that this is the last major monograph that does not at least make the attempt to ascertain the validity of this character in a comprehensive manner, although much remains to be done before we can decide whether this character may be used for both hydroid and medusoid stages.

Publication of this work on such a handsome scale has been made possible in part through the bequest of E. T. Browne, himself a student of medusae and in a sense the inspirer of this work. It is a splendid piece of bookmaking, and the color plates look fresher and more lifelike than those in Mayer's monograph.

JOEL W. HEDGPETH

Scripps Institution of Oceanography
La Jolla, California

The Medical Sciences

Adventures in Physiology: A Selection of Scientific Papers. With excursions into autopharmacology. Henry Hallett Dale. Pergamon Press, London, 1953. (U.S. distrib.: Macmillan, New York.) 652 pp. Illus. $19.50.

This remarkable volume presents a dramatic portrait of one of the greatest and most beloved scientists of this century. It is principally a reproduction of his important papers with comments by the author which bring the facts and ideas of the past into relationship with the current state of knowledge. The papers chosen by Sir Henry are concerned with his two main areas of research and serve to emphasize his extraordinary versatility as a scientific investigator. In their pursuit he utilized the techniques and background of several scientific disciplines including pharmacology, physiology, and experimental pathology. In the author's own words: