participated in many different aspects of the study of vitamin A over a professional lifetime of nearly thirty years. He has obviously been as systematic in his reading and recording of bibliographic data as he has been in conduct of his own research.

The comprehensive character of the work is shown by the sectional organization of historical, assay, chemical, biochemical, physiological, pathological, clinical, dietetic, and animal-husbandry material. In many cases data of importance may be found in two or more of these sections, but with cross reference. This makes the volume useful for quick reference without the necessity for consecutive reading of the entire book. The author shows a gratifying perspective about the various facets of the highly complicated problems he treats.

As features of the excellent organization of this book, mention should be made of the adequate summaries which introduce chapters and sections of the volume. Liberal use of marginal topical headings facilitates rapid perusal of long chapters. The documentation is organized by chapters and is very extensive but is limited to items used in development of the themes.

The line drawings are well done. Some of the plates are reproductions of the classics in the field, suffering as usual from the technical faults inherent in such copying. Nevertheless, they are useful in this compendium of the progress in our knowledge of vitamin A, to date.

The appendix, with nine sections, provides much technical information, which has been well organized. The indexes are separate for authors and subjects. Both are very complete. It is notable that all the authors of each paper quoted are to be found separately listed.

This book will be found useful in the libraries of a wide variety of those interested in vitamin A. Among other matters it provides numerous suggestions of the gaps in the total picture, where investigators might well undertake further research.

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German-English Glossary of Neurophysiology. Roger Merritt Morrell, Ed. Consultants Bureau, New York. 181 pp. $7.50.

This German-English dictionary of the specialized language of physiology, anatomy, biochemistry, and electronics was assembled by an American neurophysiologist to help him in his work. Some 9000 words and phrases are entered, these being translated, mostly, into single English words or phrases. The book contains many misspelled German words and incorrect translations, there being at least 20 such, for example, between pages 58 and 61. The book is very cheaply—and in places very badly—reproduced from a typescript, and it is difficult to understand why it should be so expensive. On the positive side, elimination of low-priority information about the German words (for example, their gender, and umlauts) makes the list easy to use. This book may, despite its many faults, prove to be of some value to English-speaking specialists with a limited knowledge of German scientific terminology.

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Zoogeography: The Geographical Distribution of Animals. Philip J. Darlington, Jr. Wiley, New York, 1957. xi + 675 pp. Illus. $15.

The orderly geographic patterns of systematic groupings of animals have long challenged the interpretive mind. With modern progress in geology, systematic zoology, ecology, phylogeny, and evolutionary theory, the time is ripe for correlating the data from different fields of biology into a geographic synthesis. Darlington has written an admirable book with a critical evaluation of facts and principles of the distribution of land and fresh-water families of vertebrates. Geographic order and its interpretation are of value not only to biogeographers but also to taxonomists, ecologists, and evolutionists. Principles deduced from the distribution of the lower taxonomic categories are less adequately treated than are those for the families and higher categories, but *Systematics and the Origin of Species,* by E. Mayr (Columbia University Press, 1942), fills this gap. It is understandable why the invertebrates were left out. The systematics, ranges, fossil histories, and phylogenies of the vertebrates are much better known. However, a few excellent studies of the distribution of invertebrates have been published. *Evolution and Classification of the Mountain Caddisflies,* by H. H. Ross (University of Illinois Press, 1956), *The Faunal Connections between Europe and North America,* by C. H. Lindroth (Wiley, 1957), and Darlington's own studies of the Carabid beetles might have been used for corroborative evidence for some of the main concepts.

Many of the gaps in Darlington's book are not the fault of the author. The fault is rather in the complexity of the subject, the dependence upon an unattained taxonomic and phylogenetic precision, and the prevalence of errors in the literature that can only be corrected by specialists (of which there are far too few) using modern systematic techniques. Darlington has gathered much evidence for the contemporary and ancient causes of major geographic patterns, and even with the omissions, the book should be an important reference work for many years to come.

The style is rather individualistic and, in my opinion, makes for easy reading. Dogmatism is avoided, sometimes to the point of obscuring the evidence that has statistical significance. The illustrations are highly diagrammatic and simplified. More detailed figures of vegetation and climatic patterns would have clarified the correlated animal distributions. For example, Fig. 50 could have shown some of the main ecological features of the Nearctic region, but, as it stands, it is a waste of space. Phylogenetic trees, with inserted data on fossils, geologic time, and contemporary distribution in zoogeographical regions, would have clarified many of the discussions in the text.

I commend the author on his useful tables and lists, upon his use of fossils, and upon his discussions of controversial concepts such as Wegnerian continental drift, oceanic land bridges, and the origin of island faunas. The book is a first-class text for a course in zoogeography, particularly if *Ecological Animal Geography* by Hesse, Allee, and Schmidt (Wiley, 1951) is used as a companion volume.

Much useful zoogeographical information still remains to be discovered, but Darlington has provided a base for further exploration. There is no question but that the science of animal distribution is still in its infancy, but great promise for future maturity is already evident.

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The Friendly Fungi. A new approach to the eelworm problem. C. L. Duddington. Faber and Faber, London, 1957 (order from Macmillan, New York). 188 pp. Illus. $4.50.

The Friendly Fungi is concerned with the exciting possibility of using predacious fungi for the biological control of eelworms (nematodes) which beset cultivated plants and domesticated animals. These fungi are "friendly" only from our point of view, because the way in which they capture eelworms by means of garrotes, snares, adhesive pegs, and sticky nets and the efficiency with which they dispatch their prey make them distinctly unfriendly to nematodes.

The book begins with a description of nematodes, their habits, and their economic importance. It then goes on to a consideration of the methods by which the control of these pests has been attempted and the difficulties which have

been encountered. The next chapters concern the fabulous predacious fungi themselves and review some of the investigations which have been conducted to determine the distribution and mode of operation of these extraordinary organisms. The possible usefulness of these fungi for the biological control of nematodes becomes apparent during these chapters, and the last part of the book is devoted to an account of the limited attempts that have been made to apply these capabilities and to suggestions for future work.

After reading the description of them in this book, many readers will be tempted to have a look at predacious fungi for themselves, and yielding to this temptation is facilitated by two appendixes. One appendix gives methods for obtaining and examining predacious fungi for those who have at their disposal the usual equipment for dealing with microorganisms; the other gives improvised methods which can be used by anyone who has a microscope as his only piece of scientific equipment.

The book should appeal to anyone who is interested in living things. Not only are the predacious fungi of great inherent interest, but the ecological problems touched upon and, indeed, the whole matter of biological control are of very general concern. Moreover, the book is not written for the specialist; in fact, its style is an excellent example of semipopular scientific writing, because it is straightforward and avoids unnecessary terminology without sacrificing accuracy or being condescending. It is to be hoped that the book will find its way not only to the shelves of mycologists but also into the hands of high-school students and college undergraduates who are casting about for reading to supplement a course or for a subject for a research project, because such students will find *The Friendly Fungi* instructive and stimulating, just as the specialist will find it delightful.

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The Life of Mammals. J. Z. Young. Oxford University Press, New York, 1957. xv + 820 pp. Illus. $10.

J. Z. Young has already devoted 200 pages to the origin, evolution, classification, and ways of life of mammals in his *The Life of Vertebrates* (1950). This companion volume was constructed from the essentials of mammalian gross anatomy, histology, physiology, and embryology, smoothly fashioned into an account of what it takes to keep mammals alive as individuals and to perpetuate them as species. It is intended as a text for premedical students, but it could be read with enjoyment by any biologist and deserves wide notice as an example of a relatively new pattern of thinking about living matter.

Biology, says Young, must free itself from the limitations of an outmoded language. The uniquely biological properties of living matter cannot be described properly in terms now available, but as a step in the right direction he suggests the developing language of information theory. He sprinkles his text with terms like *feedback, servomechanisms, control systems, signals, sets of instructions, coding and representation.*

A mammal (or an ameba) is distinct from its environment yet continually makes interchanges with it and can survive only by containing within itself stores of information which represent what its environment has been in the past, and through which it can calculate what the environment will probably be in the future. Then it must be patterned so that it will select one of the alternatives of behavior which will be permitted by the environment. Part of the store of information (for which the word *memory* is freely used) is printed into the genes, the rest being garnered and stored here and there during the life of the individual. All cells, all tissues, exist in a state of "double dependence," becoming patterned or controlled by these two stores of information, whether in the maintenance of a homeostatic economy or in the production of a new one. It is urged throughout the book that such a choice of metaphor is unifying and fruitful in the coordinating of knowledge of such different disciplines as gross anatomy and biochemistry. Young suggests that suitable terms for describing forebrain functions will presumably evolve as men make machines that imitate these complicated actions more closely.

However, this is far from being a tract for philosophers. The gross anatomy of mammals is covered in detail quite sufficient for the premedical student, the rabbit being chosen as type. Skeleton, muscles, and nerves are considered as functional units for support and locomotion. There are solid traditional approaches to the subjects of digestion, respiration, endocrinology, and so on. The concept of homeostasis is examined from many angles. Chapters are devoted to the body fluids, to the sensory systems, to the functions of the central nervous system, and to recent advances in muscle and nerve physiology. Fourteen of the 47 chapters deal with embryology, and six of these constitute the principal departure from mammalian biology, presenting experimental embryology pertaining to amphibians and birds.

To the credit of the author and his style, and by virtue of his selection from what, even to him, must have seemed an endless range of available knowledge, there comes out clearly in this book a sense of the staggering intricacy, and the almost unbearably beautiful fitness, of the parts of living things.

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The Physiology of Fishes. vol. II, *Behavior.* Margaret E. Brown, Ed. Academic Press, New York, 1957. xi + 526 pp. Illus. $14.

Volume I (*Metabolism*) of *The Physiology of Fishes* was reviewed in the 8 Nov. 1957 issue of *Science* [**126**, 981 (1957)]. Happily, only a short interval elapsed before the appearance of volume II (*Behavior*). Perhaps it is a sufficient commentary on the state of our knowledge of fish physiology that the second volume is the larger of the two and, in that sense, represents a triumph for the students of behavior. So important has their use of fishes as experimental animals become, and so much does it promise, that whole fields of classical physiology may be thought of as tools for the study of behavior.

Treatment of these tools makes up about 60 percent of the volume, the largest single section being that on the nervous system, by E. G. Healey. The group of chapters on conditioning (H. O. Bull), ethology (G. P. Baerends), and reproductive behavior (L. R. Aronson) constitutes less than another 20 percent, as do the chapters on the eye (J. R. Brett), the acousticolateralis system (O. Lowenstein), and the olfactory and gustatory senses (A. D. Hasler).

To this core is added a group of chapters on the structures that are unique, or almost so, to the fish: the swimbladder, by F. R. Harden Jones; the electric organs, by R. D. Keynes; and the luminous organs by E. Newton Harvey. Each of these authors is able to present a considerable body of work published since 1950. The next two very brief chapters, on the pigments (D. L. Fox) and color changes (J. M. Odiorne), present relatively little new work but draw together the material relative to fish. The chapter on the quality of water required by fish, by P. Doudoroff, might almost be entitled "pitfalls in conducting experiments with fish." The book concludes with a useful review of the physiological genetics of fish, by M. Gordon.

The choice of contributors to volume I was rated as outstanding; the high standard has certainly been maintained in volume II. With minor exceptions, each chapter was contributed by an active worker, usually one whose own contributions to the field in question have