teraction of Other Sensory Systems with the Sonar System, Sonar in the Blind, Social Communication Content in the Pulse Outside the Echolocation, Neural Processing Involved in Sonar, Theories of Sonar Systems and Their Application to Biological Organisms, and Experiments To Conduct To Obtain Comparative Results. There is a final section of discussion and conclusions.

Like most symposium volumes this one includes much from earlier literature, but it also contains a wealth of new material and much more "cross-fertilization" than has been apparent in the past. Engineers and psychologists are beginning to talk to each other. Even the old material is brought into perspective; and having it readily available with the new in a single book is a great convenience to the reader. This is a book that anyone interested in the field will be happy to have, and the organizers of the symposium and the editor are to be congratulated on a successful accomplishment.

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Ancient Civilizations

Handbook of Middle American Indians. Vol. 4, Archeological Frontiers and External Connections. GORDON F. EKHOLM and GORDON R. WILLEY, Eds. University of Texas Press, Austin, 1967. 375 pp., illus. $15.

One of those publishing efforts to which the term "monumental" may justly be applied is the 11-volume *Handbook of Middle American Indians.* As a previous reviewer commented in *Science*, there can be no doubt that "the completed handbook will be a major scholarly contribution and an indispensable reference work." Since each of the volumes is focused on a particular theme, each may be individually reviewed, although it can be fully appreciated only in its context as part of the series. The present volume consists of 15 essays, all by leading scholars and all concerned with the external and marginal connections of the native civilizations of Middle America, here meaning the Aztecs, the Mayas, and their predecessors. The vigor and creativity of these civilizations are evident in the archeological record of peoples who lived a very great distance from Middle America, and it is these long-distance contacts and influences that are the concern of this volume. The essays may be divided into four groups, their distribution reflecting our knowledge of the various regions: six articles are concerned with influences on the "northern periphery" ranging from Baja California across to the eastern United States; five articles deal with Central America and the Caribbean; two deal with the Andean area; and two consider trans-Pacific influences.

Except for the more controversial discussion of possible trans-Pacific influences, the contributions are designed to be up-to-date summaries of archeological knowledge for specific regions. Some of them incorporate a great deal of information based on recent excavation programs (notably the article of C. C. DiPeso on the northern Sierra); most are summaries of already-published material, but are highly useful because of the diffuseness of the body of literature on which they are based. The summaries were for the most part prepared some time ago, and like all summaries tend to be somewhat out of date by the time they appear in print. How out of date can be appraised from the excellent 29-page bibliography included in the volume: there are 59 references dated 1960, with a sharp fall-off to only three dated 1965. Most of the articles were completed about 1962 and have been given little updating.

Illustrations for the articles range from none at all to carefully prepared summary illustrations of artifact types. Most of the illustrations were not prepared for this volume but have been reproduced from other works. The principal shortcoming of the volume lies in the inadequacy of the illustrations; there is no illustration of innumerable artifact types referred to in the text, and the reader is forced to go to the original sources if he wants to know what many of the archeological finds look like.

Much of what is said has been published elsewhere, and with some exceptions the articles are more summary than synthesis. This does not, however, diminish the tremendous utility of the volume, which spans a far-flung and difficult literature and compactly presents the experts' point of view. On a number of significant topics, future researchers will find it an excellent beginning point.

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Histamine

Handbook of Experimental Pharmacology. Vol. 18, Histamine and Anti-Histaminics. Part 1, Histamine, Its Chemistry, Metabolism and Physiological and Pharmacological Actions. MAURICIO ROCHA E SILVA, Ed. Springer-Verlag, New York, 1966. 1027 pp., illus. $46.

The editor of the present compendium invited each of the 36 contributing authors, among whom are many of the world's leading histamine researchers, to present his own research and point of view as well as review his topic exhaustively and with its history in mind. These efforts have produced a readable and important encyclopedia.

The historical approach is particularly useful in explaining the diverse roles of histamine in living tissues, for this chemical has played an important part in the development of modern pharmacology. In an introduction Sir Henry Dale points out that "in the early 20th century, a newly progressive pharmacology . . . needed to be alert for evidence of the occurrence in normal animal tissues of substances (such as histamine) having activities which would make them likely contributors to the genesis of such symptoms as would call for medicinal treatment." Dale reviews the early work showing the similarity of the pharmacological effects of histamine to allergic phenomena, the subsequent demonstration of histamine release in anaphylaxis, and the development of antihistaminics.

The editor's instructions to the authors have resulted in an exhaustive compilation of information from a variety of disciplines and individuals spread over many years and countries. The integration of this information will provide a heuristic challenge for the reader, and presentation of individual viewpoints illuminates the multitude of theories and controversies over the physiological roles of histamine.

The opening chapter of the book covers the chemistry of histamine, its isolation from tissues, biological and chemical measurement, and occurrence in a variety of tissues. The chapter ends with a section wherein Riley and West detail their important work in establishing that most of the histamine in mammals is localized in mast cells. In these studies Riley and West integrated the data of many years of research on distribution of histamine in

tissues with their own investigations of the parallelism between histamine and mast cells in a great number of tissues.

Histamine has probably been proposed as a candidate for more functions than any other biologically active molecule. This is well illustrated in the sections on its pharmacology, which treat, among other matters, absorption from the gastrointestinal tract, binding to serum protein in various diseases, toxic effects, and actions on the autonomic nervous system, smooth muscle, circulatory system, salivary glands, and gastric secretion. Despite a very large body of literature, evidence that histamine plays a role in any of these systems except gastric acid secretion and allergic responses is still rather circumstantial.

The effects of histamine on smooth muscle have also been extensively investigated, and much of this information is compiled by J. L. Parrot and J. Thouvenot. In an elegantly complementary section, Rocha e Silva integrates many of these data into a theoretical model of the smooth muscle "histamine receptor."

Histamine release is dealt with more thoroughly than any other topic. The use of isolated cell systems for histamine release provoked by antigenic stimuli has provided an important experimental model for clarifying immunological phenomena. Unfortunately, much recent research working out the biochemical mechanism of histamine release from mast cells is not included. Although each of the sections here presumably treats histamine release by different agents or physiological conditions, there is considerable overlap.

Histamine metabolism is the least comprehensively treated subject in this volume, with the notable exception of a thorough and imaginative discussion of histidine decarboxylase by Richard Schayer. The scope of Schayer's contribution to the present understanding of histamine metabolism is documented in a second chapter contributed by him on histamine catabolism in vivo. Schayer inaugurated the use of radioactive tracer techniques for the study of biogenic amine metabolism in his investigations of histamine catabolism. In the early and middle 1950's he developed isotope dilution methods for measurement of radioactive histamine and its metabolites which are still the most sensitive and precise in the field. He participated in the discovery of the major catabolic pathways of histamine, ring-*N*-methylation and formation of the riboside of the oxidation product of histamine, imidazole acetic acid, and delineated important species differences in histamine metabolism. More recently he has described a ubiquitous inducible form of histidine decarboxylase, the enzyme that synthesizes histamine, which is activated by a great variety of local or systemic stresses.

It is surprising that no section deals with histaminase, or with diamine oxidase, the first histamine-catabolizing enzyme discovered and an important tool in the evolution of histamine research.

Seventy of the 120 pages on the Physiological Significance of Histamine are devoted to a section by Andrew Ivy and W. H. Bachrach on the significance of histamine in gastric secretion. Their extensive review provides a useful background for evaluating current findings in what, in the past two years, has become a very active area of histamine research.

There are several shortcomings in this text, the most significant of which is the obsolescence of many of the contributions. The most recent references are dated 1963, and many sections do not cite any literature after 1960. Moreover, it would have been helpful if summaries in English had been appended to the seven sections in French and the two in German. However, its shortcomings are few, and the treatise is authoritative, comprehensive, impeccably edited, and quite readable. It is now and probably will be for some time the standard reference work on histamine.

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Marine Science

The Encyclopedia of Oceanography. RHODES W. FAIRBRIDGE, Ed. Reinhold, New York, 1966. 1037 pp., illus. $25. Encyclopedia of Earth Sciences, vol. 1.

The publishers obviously like the hard sell: "Unprecedented in concept, brilliant in execution, absolute in authenticity," says their blurb. A soft sell is preferred by the editor, who writes in his preface that he "has tried to remain unbiased, even when opinions diametrically opposite to his own are stated (sometimes with great emphasis!)." He was fortunate to find so many distinguished contributors, whose "labors were donated freely for the good of our science." "The major portion of the editing costs were underwritten to the tune of several thousand dollars by the editor and his wife. So it has been a labor of love."

The product of this vast enthusiasm is a large book containing 245 articles by 126 authors. The editor himself has contributed to 59 and his colleague Takashi Ichiye to 22 of them. Individual contributions are often of a very high quality, with the essentials of complicated subjects set down in a way at once fair, brief, and readable. Perhaps the most useful are those that describe the marine geology and physical geography of many of the interesting ocean areas. These contributions alone will earn the book shelf space in many reference libraries.

There are some articles that seem less firmly based, but the difficulty in producing an encyclopedia is, one imagines, less with the individual contributions than with the choice of topics and the overall balance. Symphonies are harder than sonatas. In the present volume marine geology dominates, followed by marine physics, with marine biology well behind. The words *bacteria, fish,* and *mammal* do not occur in the index, though there is a two-page article on nekton. One even gets the impression that the amount of space allotted to a given topic is roughly in inverse proportion to its difficulty. This might also apply to topics within disciplines: seiches get 14 pages, tides 11, ocean waves 5. There is, to my mind, little justification for an entry on vector analysis, or for one on fluid mechanics which does not refer to the geophysically important effects of rotational forces: large-scale motions are almost always quasi-geostrophic. (If you look up the entry on "geostrophic motion" you will find a reference to a later volume, but there are implicit definitions under several other titles.)

Altogether this is a book which improves on acquaintance. There is more in it than the list of entry-headings or the index would indicate, to say nothing of the many references it includes. And the editor promises volumes on atmospheric sciences and astrogeology and on geomorphology, and a further 13 volumes on various aspects of geology. He has taken on an immense task.

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