accorded and made use of by me for the benefit of the object in view.

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SCIENTIFIC LITERATURE.

General Principles of Zoology. By RICHARD HERTWIG. Translated by GEORGE W. FIELD. Henry Holt & Company, New York. 1896.

The most pressing need for teaching elementary zoology in American schools is a suitable text-book; one that treats the general principles in a way that clothes with flesh the skeleton of systematic zoology; one written with genius that holds the attention and inspires. It must be clear and compact. Prof. Hertwig's 'Lehrbuch der Zoologie' is such a book, and an English edition will doubtless give an impulse towards better teaching and better discipline in acquiring the foundations of animal biology. The separation of the 'General Principles' from the 'Systematic Part' as an independent volume may be regarded as an advantage, since its clear, comprehensive, though brief, generalizations and discussions make it a useful handbook for teachers, students and general readers who want to find and understand the latest position of the science.

In the introduction the author defines the purpose of zoological study, morphology, comparative anatomy, ontogeny, etc. The body of the book proceeds under two general heads — 'The History of Zoology' and 'General Morphology and Physiology.' The former covers sixty-seven pages in which are presented with surprising satisfaction and impartiality the positions of the creators of the science from the systematists and anatomists of classic antiquity to the investigators and teachers of to-day. Two-thirds of this space is justly given to the theory of descent, its history and proofs. Lamarckianism and Darwinism are succinctly interpreted and the additions and modifications suggested by advocates and opponents stated. In the general morphological part after certain definitions are given comes the history of the cell and the general principles of cytology; the latter and the chapter on general embryology are perhaps the most helpful in the book and leave little to be desired in a summary of these subjects. If one wants to know the position of zoologists on mimicry, distribution, promorphology, or the nature of species, this modest manual will afford him a reliable exposition.

The translator certainly deserves much credit for his part, scarcely an involved or muddy sentence occurs. The illustrations are familiar but well selected.

One so disposed might make a case in apparent criticism, for example, the young sponge figured on page 159, named '*Spongilla fluviatilis* (after Huxley),' some would prefer to see as *Meyenia fluviatilis* (after Lieberkühn); again on page 199: "Many *Protozoa* fuse with one another and form large bodies in which the individual animals can still be recognized." This seems to imply more than some feel like granting. *Ophrydium versatile* and *Proterospongia haeckeli*, for example, occur in large masses with hundreds of individuals imbedded in the support of cast-off or accumulated matter for protection; it seems to mean no more than the compound pedicels of other forms, or a chain of the loricæ of *Cothurnia variabilis*. But such differences may not be criticisms and certainly do not detract from the usefulness of the book.

Surely all who read this treatise will earnestly hope that the systematic part of the 'Lehrbuch' may speedily follow in the same admirable style.

D. S. KELLICOTT.

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Lehrbuch der vergleichenden mikroskopischen Anatomie der Wirbelthiere. DR. MED. ALBERT OPPEL. Erster Theil; Der Magen. Jena, Gustav Fischer. 1896.

Since Leydig's 'Histologie' appeared forty years ago there has been no systematic attempt at a summary of our histological knowledge. The works on histology have confined themselves chiefly to the histology of man and the higher animals, except in cases where a lower form happened to be especially favorable for purposes of illustration. The study of histology has been so closely connected with that of medicine that this is not to be wondered at; but now, when the value of comparative study is so obvious, and when the lower animals are being studied from a purely scientific point of view, an attempt to collate and arrange the

scattered facts of histology must be welcomed as affording a comprehensive review of past work and a firmer basis for investigation. The author of this Comparative Microscopical Anatomy has made this attempt for the Vertebrata and has succeeded admirably, if one may judge from the character of Part I., which is all that has appeared.

The work is conceived with the characteristically German disregard of difficulties and long years of labor, although the author recognizes the magnitude of the task before him. Indeed, in his preface he states that his notes are so arranged that his successor will be perfectly able to continue the work, if it should drop from his hands.

Part I. treats of the histology of the stomach. Just why Dr. Oppel should have begun with this organ is not clear. It would seem that the study of the organs in some natural series would preserve a more logical order. Why not begin with the upper end of the alimentary canal, for instance, and follow with the different sections in their order?

A work of this nature must, of necessity, be largely a compilation of facts or opinions gathered from the literature on the subject. Furthermore, it is important that the authorities be given, in order to avoid confusion and to enable the student to refer to the original papers. This end the author has had in view throughout the work. As he himself states, the book is intended not to replace the literature, but to serve as a key to it. In his references not only the name of the author is given, but also the year of publication, and an empirical number referring to the alphabetical index of authors, where the title and place of publication are given in full. The summary of each author's view, whether it be a few words only or several paragraphs, is enclosed between two straight bars placed obliquely (//). This arrangement aids distinctly in separating sharply the work of different authorities. The typographical work is good, the number of errors being exceedingly small. The figures are, as the author states, mostly copies, some of which he has found it necessary to schematise. Except five lithographic plates, they are all wood-cuts (375 in number) and nearly all extremely good.

The subject-matter is divided into chapters corresponding to the classes of Vertebrates. Following the introduction—a short statement of the purpose and scope of the work—is a chapter on the general plan of structure of the vertebrate stomach. The following chapters deal successively with Fishes, Amphibia, Reptiles, etc. Each chapter opens with a general summary of the structure of the stomach in each class, given under the various heads of Epithelium, Muscular Layers, Lymphatic Tissue, etc. Following this the various forms of the class are discussed in their proper systematic order, so far as they have been investigated. Considerable space is also given to a discussion of the physiology of the glands and the constitution of the gastric juice, especially in the higher animals. The chapter on the mammalian stomach occupies somewhat more than half the book and is, of course, much more complete than the other chapters.

As the various points of theoretical interest arise, they are thoroughly discussed, the author in most cases giving his own views after a summary of the literature. An important question, the phylogeny of the gastric glands, is discussed in the first chapter. Oppel concludes that it is by no means proved that the oldest Vertebrates did not possess gastric glands, and that those cases among fishes where they are absent are to be explained through degeneration. The absence of the glands in these forms is thus wholly a secondary modification, as is well shown by the fact that the near relatives of those species in which the glands are absent often possess them in well-developed form. The glands have arisen, not by a deepening and narrowing of the folds of the mucous membrane, but as independent invaginations starting from a very limited area. The absence of gastric glands among the Monotremes, where the whole stomach is lined with a stratified epithelium like that of the œsophagus, is due to secondary changes, the œsophageal epithelium having gradually grown down and displaced the original gastric epithelium.

An exhaustive discussion of the physiology of the mammalian gastric gland-cells is given, and the variety of views held by different authorities shows very clearly the difficulty

of such investigation. The author's conclusion is that the 'central cells' (Hauptzellen) of the fundus-glands are certainly very closely connected with the secretion of the gastric juice. It is very probable that they secrete pepsin, but they may also secrete the hydrochloric acid, though there is no good evidence that they do. The cells of the pyloric glands also probably secrete pepsin. The function of the 'parietal cells' (Belegzellen) of the fundus-glands is not so well understood, but it is probable that they also secrete pepsin. The 'parietal cells' of mammals are by no means identical with the fundus-cells of lower Vertebrates. In closing the discussion he says: "I have emphasized the point that a certain function in one kind of cell does not exclude the possibility of the same or a similar function in another kind." In fact the whole discussion only tends to show how much in the dark we are as regards the actual functions of these cells.

It is impossible to take up the different chapters in detail, as they are so largely summaries of the work of various investigators.

Following the text appears a table of the animals mentioned, arranged according to their systematic position. The classification is in part that followed by Claus in the fifth edition of his 'Lehrbuch der Zoologie.' This table is followed by a list of the same names arranged alphabetically, their systematic position being indicated by the name of the family, order, etc. The next thirty pages are occupied by the literature, and a good index finishes the book. Thus this part is complete in itself as a histology of the vertebrate stomach.

The volume comprises some 530 octavo pages. In reading it one cannot fail to be impressed with the patience of the author, nor to admire the temper of a man who enters single-handed on a subject of such magnitude. It is to be hoped that the work may be carried to completion, for it will constitute a most valuable aid to future research. It is not a book for the general reader, nor is it a text-book, but the student and investigator will find in it a careful resumé of our present knowledge of the histology of the vertebrate stomach. It is, in fact, as the author has said, a key to the literature, and thanks are due to the man who is willing to undertake the so often thankless task of compilation necessary to such a work.

C. M. CHILD.

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SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON; 264TH MEETING. SATURDAY, OCTOBER 24.

DR. ERWIN F. SMITH exhibited specimens of *Leuconostoc mesenteroides* from a sugar house in Louisiana. These were in the shape of fist-large gelatinous aggregates. If the vats are not sterilized at frequent intervals this organism multiplies very rapidly in the sugar cane juice and causes much inconvenience and loss.

Mr. Frederick V. Coville exhibited specimens of the *Hæmatococcus* which is the cause of the so-called 'red snow,' and also the seeds of the Western water lily, *Nymphæa polysepala*. These seeds, in spite of their small size, are an important article of food of the Indians of western Oregon and are extensively collected in Klamath Lake. The seeds are dried and parched in baskets by the use of heated stones.

Mr. C. L. Pollard noted the addition of *Iresine paniculata* to the fauna of the district, specimens having been found on Plummer's Island.

Mr. B. E. Fernow exhibited a series of shrubby and arborescent plants from Arizona, in which many growing points and shoots are changed into spines; the series beginning with *Ceanothus* and ending with *Kœberlinia* and the rare *Holacantha emoryi* showed, with the decrease in the amount and size of foliage, an increase of the number and size of spines, the latter two species consisting entirely of spines, the leaves being reduced to early caducous bracts.

Mr. Albert F. Woods spoke of a plant disease of the foliage of maples, caused by 'red spiders' and excessive atmospheric moisture.

Dr. C. Hart Merriam described a 'New Fir from Arizona,' which he named *Abies arizonica*. It differs from its nearest relative, *A. lasiocarpa*, in the character of the bark, which is a fine-grained cork and in the shape of the cone scales.

Mr. Frederick V. Coville briefly noticed