sult either from a natural property of soil nitrogen or may be caused by denitrification of soil nitrates usually caused by improper cultural methods.

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SCIENTIFIC BOOKS

Water Reptiles of the Past and Present. By SAMUEL WENDELL WILLISTON, professor of paleontology in the University of Chicago. University of Chicago Press, 1914. Pp. vii + 251, with 131 text-figures.

This interesting volume summarizes in a most authoritative manner our knowledge of the reptiles which have become adapted to aquatic life, and it also includes a chapter on the classification of reptiles, a subject upon which Professor Williston, with his forty years of special study, is abundantly fitted to speak.

In his introduction the author speaks earnestly in the defense of reptiles, which are so often of ill repute as cold, gliding, treacherous and venomous creatures shunning sunlight and always ready to poison. As a matter of fact, but few reptiles possess these evil propensities, for, aside from the venomous serpents, there are but two poisonous reptiles known, and the vast majority are not only innocent of all offense toward man, but are often useful to him. More than four thousand reptiles are living, representing, however, but four of the fifteen orders which were formerly alive. The terse definition of a reptile as a cold-blooded, backboned animal which breathes air throughout life is not surely correct, since it has been believed that certain extinct ones may have been warm-blooded.

While there are very marked distinctions of structure between the amphibians and the reptiles, there can be no doubt that the early amphibian ancestors of the modern toads, frogs and salamanders were also the ancestors of all living and extinct reptiles. This is proved by the fact that discoveries of recent years have bridged over nearly all the essential differences between the two classes so completely that many forms can not be classified unless one has their nearly complete skeletons. In the case of some of the oldest amphibia, the Stegocephalians, we know that they were water-breathers during part of their lives, because distinct impressions of their gills have been preserved, but we are not so sure that some of the more highly developed kinds were not air-breathers from the time they left the egg; if this be true, our definition of a reptile as distinct from an amphibian is rendered still less secure. We are quite certain that from some of the early extinct reptiles—probably the immediate forebears of the great dinosaurs—the class of birds arose, while another group of primitive reptiles, called the Theriodontia, and known chiefly from Africa, gave rise to the mammals.

The classification of reptiles is still a matter of much doubt and uncertainty, no two authors agreeing on the number of orders or the rank of many forms. Many strange and unclassifiable types which have come to light in North America, South Africa and Europe have thrown doubt on all previous classification schemes and have weakened our faith in all attempts to trace out the genealogies of the reptilian orders; and classification is merely genealogy. It is only the paleontologist who is competent to express opinions concerning the larger principles of classification of organisms and especially the classification of reptiles. The neozoologist, ignorant of extinct forms, can only hazard guesses and conjectures as to the relationships of the larger groups, for he has only the specialized or decadent remnants of past faunas upon which to base his opinions.

Williston's scheme of classification differs only in minor details from the more conservative of the generally accepted views, and those differences are, for the most part, the writer's own opinions, to be taken for what they are worth. It may be said decisively that no classification of the reptiles into major groups, into superfamilies or subclasses that has so far been proposed is worthy of acceptance; there is no such subclass as the Diapsida or Synapsida, for instance.

Williston recognizes and briefly diagnoses fifteen orders, of which three groups, the Proganosauria, Protorosauria and Thalattosauria, are provisionally given this rank.

The third chapter is an illuminating discussion of the skeleton of reptiles, in which the principal elements are not only fully described, but illustrated by the author's drawings.

The chapter on the Age of Reptiles contains a chart showing the range in time of the various reptilian suborders, beginning with the Carboniferous. Each important horizon is taken up in turn and the character of the sedimentation and location of the chief exposures discussed. This section is illustrated by Williston's restorations of various Permo-Carboniferous reptiles.

All this is by way of preparation for the main theme of the book—that of the adaptation of reptiles to aquatic life—and the fifth chapter discusses the problem in general, with the principal structural changes which water-living brings about, comparing the reptiles in their modification with other important aquatic types. Then in regular sequence the water-inhabiting orders are discussed: the Sauropterygia, *Lystriosaurus* among the Anomodontia, the Ichthyosauria in which the summit of aquatic adaptation is reached, *Mesosaurus* of the Proganosauria, *Pleurosaurus* of the Prolorosauria, many of the Squamata, especially the marine iguana *Amblyrhynchus* of the Galapagos Islands, and the Agailosaurs and Mosasaurs, our knowledge of the last named being largely due to the author's own researches.

Another chapter treats of the Thalattosauria recently described by Dr. J. C. Merriam, while the Rhynchocephalia are represented by *Champsosaurus*. Crocodile-like forms are included under two orders, Parasuchia and Crocodilia, *Geosaurus*, an Upper Jurassic crocodile, going to the extreme and developing an ichthyosaur-like tail for swimming. The final chapter treats of the Chelonia, the most sharply distinguished order of reptiles and the one which had the most uniformly continuous and uneventful history from the Triassic to the present time.

This book is a thoughtful exposition of the entire subject from a master hand, and while necessarily technical in part, is written in such a style as to be eminently readable. It departs from the great majority of popular books of "ancient monsters" because it is written by one who has a world-wide reputation as an authority on the subject of which he treats.

In view of the success of the present volume and of the preceding "*American Permian Vertebrates*," Williston's announced volume on the evolution of the reptiles is anxiously awaited.

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Yale University,
February 1, 1915

Festschrift Max Bauer zum siebzigsten Geburtstag gewidmet. Edited by R. Brauns. Stuttgart, E. Schweizerbartsche Verlagsbuchhandlung, 1914. Pp. viii + 568, portrait, 32 plates and 47 text-figures; Neues Jahrbuch für Mineralogie, Geologie und Paläontologie, Beilage Band XXXIX.

As a richly deserved and most fitting tribute of regard and esteem to a scientist of distinguished merit, the recent issue of a supplementary volume of the "Neues Jahrbuch für Mineralogie, Geologie und Paläontologie," in honor of the seventieth anniversary of the birth of Herrn Geheimrath Professor Dr. Max Bauer, founder of the Mineralogical Institute of the University of Marburg, enlists the sympathies of all interested in scientific progress, more especially in the domain of mineralogy. This handsome octavo volume extends to nearly 600 pages, and is embellished with an excellent likeness of Professor Bauer, as well as with 32 well-executed plates and 47 text-figures illustrating the subject-matter of the various articles. The dedication from his friends, coworkers and students gives warm expression to their appreciation of his services in the cause of science.

Of the many valuable papers in this testimonial "Festschrift" we can do little more than cite the titles or indicate the subject-matter. Professor Alfred Bergeot, of Königsberg, treats of the structure of the manganese deposits at Meggen-an-der-Lenne, and emphasizes their value in a determination of the geological formation of this region (pp. 1–63);