nent place to his map, the authors have not been able to avoid various parenthetical and semi-apologetic references to the "holarctic." The divisions of Sclater, made in 1857, are introduced as the beginnings of zoogeography and no mention is made of the much earlier work of Wagner in 1844[1] nor of the map published by Agassiz in 1854.[2] The groups illustrated by the maps are taken up in systematic order in the zoological text, the number of species in each is stated, peculiarities of distribution are mentioned, and brief statements are given of the character and habits of the animals. In addition, the number of fossil forms in each is stated. The distribution of fossil forms is not illustrated and only the present range is shown of animals that have become restricted during historic times. The bibliography is conveniently classified according to regions and groups and is rather extensive, although necessarily consisting of selected titles, since the number of publications having some pertinence is almost unlimited. Certain important papers are omitted, however, and many rather inconsequential ones have a place. Under Neotropical Region, one notes with some surprise the absence of any reference to such important works as Azara's "Paraguay," Tschudi's "Fauna Peruana," Maximilian's "Naturgeschichte," Castelnau's "Expedition," and Darwin and Waterhouse's "Zoology of the Voyage of the Beagle."

As a book, the atlas is very pleasing. The binding, paper, typography and arrangement are excellent. All the maps are mounted on linen-hinged tabs and the colors employed in limiting the distribution areas are soft and harmonious. That it will have a large sphere of usefulness is unquestionable and in spite of what must be said as to looseness of detail, a large measure of gratitude is due the authors for having performed the prodigious labor involved and produced a work on such excellent general lines.

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[1] "Die Geographische Verbreitung der Saugethiere."

[2] In Nott and Gliddon's "Types of Mankind."

Der Aufbau der Skeletteile in den freien Gliedmassen der Wirbeltiere. Untersuchungen an urodelen Amphibien. By H. von Eggeling, a. o. Professor und Prosektor anatom. Anstalt Universität Jena. Gustav Fischer. 1911. Pp. 324, with 4 lithographic plates; 147 figures in the text.

The author states in the preface that he was led to undertake a broad study of the comparative anatomy and histogenesis of the skeleton and ligaments because of the unsatisfactory literature on this subject which he was able to find when beginning a course of lectures at Jena. The present volume represents the first stage of this study and contains an extensive account of the skeletal structure of the limbs of urodeles. The three questions of general bearing which the author set for himself on taking up the study were as follows:

1. "In what relation to one another stand the so-called coarse-fibrous and fine-fibrous bony substances, the 'Wurzelstock' of Gegenbaur, the cement of the teeth and Sharpey's fibers? What part do these structures take in the structure of bone, aside from a merely topographical one?"

2. "What is the phylogenetic development of the compact bony substance of long bones? How have the Haversian canals arisen, to what extent does their ontogenetic development reproduce their phylogenesis? Are biological conditions to be made out on which the development of vascular canals appears dependable?"

3. "What appears to be the phylogenetic development of enchondral ossification? In what form and under what conditions arise the marrow cavity and the bone-marrow? Where, in what form, and under what conditions do the centers of ossification of the epiphyses develop? Is there an explanation for the late, purely enchondral, ossification of the carpus and tarsus of mammals?"

The author gives a good review of the literature dealing with the questions which he postulates, then gives an account of the structure of the limb skeleton in the amphibians which he himself has studied, some twenty-

five different species belonging to the phanerobranchiata, the cryptobranchiata, the lechriodonta and the mecodonta. He comes to the following conclusions in answer to the three questions postulated:

1. Osseous tissue is divisible into two distinct classes, coarse-fibrous and fine-fibrous. Coarse-fibrous bone is the more primitive of the two. It is formed beneath the periosteum from which at first it is not sharply separated, and in ontogenetically and phylogenetically primitive conditions the coarse fiber-bundles are usually interwoven in an irregular manner. In highly developed bone the fiber-bundles are more regularly arranged. Some fine-fibrous bone is usually interspersed among the coarse fiber-bundles. Sharpey's fibers are those bundles of coarse-fibrous bony substance which extend inwards perpendicular to the periosteum. The cement substance of the teeth and the substance of the basal plates in placoid organs of selachians are to be classed with coarse-fibrous bone. Fine-fibrous bone is laid down about the loose connective tissue which accompanies the blood vessels which are enclosed in the sub-periosteal bone or which penetrate the endochondrium. It is laid down in concentric layers about the spaces in which the blood vessels lie. No coarse fiber-bundles are ever interspersed among these concentric layers. The dentine of placoid organs and of the teeth is of a nature similar to fine-fibrous bone.

2. Compact bone is composed mainly of fine-fibrous bone and is a far higher type of bone than the primitive coarse-fibrous bone. The vascular canals in bone appeared at first as the chance accompaniment of the periosteal development of bone. They proved useful for the nutrition of the bone. Their importance became increased when fine-fibrous bone was laid down in concentric layers about their walls and when blood-corpuscle-forming bone-marrow was developed from the loose connective tissue accompanying the blood vessels.

3. Enchondral ossification represents the spread of the vascular canals from periosteal bone into axial cartilage. Marrow cavities arose through the anastomosis of branched vascular canals and were present even in the extinct ancestors of the present amphibians. The marrow cavity first appeared in the shaft, then extended into the epiphyses. The development in the epiphyses of special marrow cavities by the ingrowth of blood vessels from the surrounding periosteum represents a relatively advanced stage of development. The elements of the carpus and tarsus phylogenetically long remain cartilaginous. In some of the lower forms there is a slight periosteal ossification of these bones, but this is never extensive and is not found at all in the highest vertebrates in which the ossification of these bones is purely enchondral.

From this study of the development of the skeleton of the limbs in urodeles the author is inclined to take the view that the phanerobranchiates, the cryptobranchiates and siredon are derived from the caducibranchiates. The caducibranchiates, he thinks, are divisible into two groups, of which one, including the desmognathinæ and the plethodontinæ are distinguished from the second group, the salamandrinæ and amblystoma opacum, by a lesser development of marrow cavities, the simple structure of the carpal and tarsal bones, and the almost complete absence of fat cells in the bone marrow.

The monograph, as a whole, represents a careful and satisfactory study of the subject.

C. R. BARDEEN

SCIENTIFIC JOURNALS AND ARTICLES

THE twenty-second volume of the *Journal of Morphology* is a memorial volume in honor of Charles Otis Whitman. The third part, issued on September 20, contains the following articles:

"Some Problems of Cœlenterate Ontogeny," Charles W. Hargitt.

"Physiological Animal Geography," Victor E. Shelford.

"On the Olfactory Organs and the Sense of Smell in Birds," R. M. Strong.

"On the Regular Seasonal Changes in the Relative Weight of the Central Nervous System of the Leopard Frog," Henry H. Donaldson.

"The Physiology of Cell-division. IV., The Action of Salt Solutions followed by Hypertonic Sea-water on Unfertilized Sea-urchin Eggs and the Rôle of Membranes in Mitosis," Ralph S. Lillie.