ence to the interpretations of interglacial stages both in Europe and America is laid aside when discussing the late glacial changes of level. In regard to these the author states that the Americans have carried out a series of researches on the shore lines around their lakes which rival in interest the magnificent results obtained by the Scandinavians. The author refers the uplift to the disappearance of the ice weight. He seems not to have reached the state of uncertainty on the question of the effect of the relief from ice weighting which certain Americans most closely connected with this investigation are experiencing.

The chapter on the Quaternary mammals is mainly descriptive, though they are listed as representing four classes, those characteristic of arctic tundras, of the steppes, of present-day southern distribution and extinct mammals.

The chapter on Quaternary man brings out the several stages of culture in accordance with the results of European investigations, and seems favorable to the correlation of certain stages of culture with late stages of the glacial epoch.

FRANK LEVERETT

ANN ARBOR, MICHIGAN

Biologie der Fische. VON DR. PHIL. OSKAR HAEMPEL, Privatdozent an der k. k. Hochschule fur Bodenkulture in Wien. Mit 55 Abbildungen im Text. Stuttgart, Verlag von Ferdinand Enke, 1912.

Attractively bound in true German style, this little volume appears as a separate from Dr. M. Hilzheimer's work on the "Biologie der Wirbeltiere." The author disclaims completeness, his object having been to put forth merely a guide or introduction to the biology of fishes. There is more information, however, than he would have one believe; much more, in fact, than can be found in any single American work on the subject.

The contents are grouped under three headings, namely: (1) A general review of the anatomy and physiology, (2) the dependence of fishes upon the chemico-physical conditions of habitat, (3) life manifestations of fishes with respect to other organisms.

The lateral line whose function is not well understood even at the present time has been studied and reported upon by at least one prominent American zoologist, but it has been considerably neglected by authors of general works. The adequate manner in which it is treated by the present writer is to be commended.

Literature concerning the food, feeding and digestion in fishes is widely scattered and in many cases unavailable to the student of animal ecology or of fish culture. Barring Dr. Forbes's admirable papers on the food of fishes, it can be said, also, that much of the published data are erroneous or at least that they give but a hazy notion of this important subject. Dr. Haempel here presents a full and most interesting account which evidently is the result of careful selection of those facts of practical importance.

The study of the breeding habits of fishes constitutes a large field of great diversity, one which has been surveyed but casually so far as American forms are concerned. And so, perhaps wisely, the author of the present work has confined his attention to the habits of European fresh-water forms and to the better known among marine fishes. His examples illustrating the various types of breeding are well chosen.

When one learns that the author was a former student of the well-known authority on fish diseases, Dr. Bruno Hofer, and in fact to whom this book is dedicated, it is a little surprising that this phase of fish biology is not treated more fully. The criticism may be favorable, however, in view of the fact that the work is designed merely as a guide.

It is unfortunate to find lancelets treated in a work on the biology of fishes, for they are not fishes and their inclusion necessitates many exceptions to the general statements.

The author is a teacher of fish culture as well as an ichthyologist and he has kept prominently before the reader the practical application of ichthyologic data. This is emphasized particularly in the sections dealing with

growth, development, physiology of respiration and digestion, his excellent summary of the principal investigations on the determination of age by means of the ootoliths, scales, opercular bones and vertebræ, and lastly, in a few pages relating directly to fish culture.

A summary of the important literature is given under each heading, emphasis being laid quite naturally upon European publications. This feature together with a full bibliography will be especially helpful to American students. The consideration of all recent experimentation and the judicious application of the principles set forth is a most commendable characteristic of the whole work.

G. C. EMBODY

The Care of Home Aquaria. By RAYMOND C. OSBURN.

This contribution of Professor Osburn's, published by the New York Zoological Society as a volume of the New York Aquarium Nature Series, on account of its small size and necessarily popular character, is too likely to be overlooked. The investigator of any form of aquatic life will find aquaria of the utmost service, and will do well to refer to this simple presentation of the fundamental principles which govern their care. Under the captions The Meaning of Balance, Temperature, Placing and Cleaning the Aquarium, Animals that Will Live Well Together, Feeding, Marine Aquaria, The Care of Young Fishes, etc., a great deal of broad, practical information will be found arranged. Ample illustrations are attractive rather than instructive. A short appended bibliography will be found useful.

The following paragraphs are quoted more or less at random:

"The fact that animals require oxygen in respiration and that green plants give off oxygen in excess were discovered and published as early as 1778, but lovers of aquatic life were slow to apply this knowledge. In fact, it was not until 1850 that the first properly balanced aquarium was described by Mr. Robert Warrington of Manchester, England."

"To supplement the surface absorption of oxygen, it is necessary to grow plants in the aquarium."

"It is a common but very mistaken notion that an animal should have food at hand at all times to keep it in good condition. It is well known that various forms of domestic animals, as well as the wild species confined in zoological gardens, make the best growth and keep in the most satisfactory condition when supplied only with what food they will clean up at one feeding. This applies with equal force to the inhabitants of the aquarium, but besides *there is a real and grave danger of contaminating the water by supplying more food than will be readily consumed.*"

Emphasis is placed on the great educational value of aquaria. The ordinary balanced aquarium is a little world apart, in which plants, fishes and microorganisms are mutually interdependent, and the art of aquarium-culture is to understand and control this balance.

JOHN TREADWELL NICHOLS

Animal Flight, A Record of Observation. By E. H. HANKIN. London, Iliffe and Sons, Ltd. 8vo. Pp. 413, 97 figures.

Considering the many explanations we have had of soaring flight, it is somewhat surprising that we know so little about it and that still further explanations seem necessary. The author of the book under consideration takes care to state in the preface that "the present book will be found to contain the facts in the case, with no explanation at all," a statement that seems at once to claim too much and too little.

Until he has watched and recorded the frigate bird and the albatross a large portion of the facts must be considered as lacking, while running through the record of the author's observations is an evident, though unexpressed, belief that some occult influence is at the bottom of it all.

The observations, for the most part, were made at Agra, India, and the majority of them on the kite, or cheel, *Milvus govinda,* though they include the adjutant and three species of vulture, all experts in soaring.