mous, next the Ostriches, since the above groups have been clung to with a pertinacity worthy a better cause, while the breastbone of the Tinamous has too often barred them from associating with their next of kin. It is also gratifying to read that the likeness of Hesperornis to the Ratites seems mainly to rest upon the degenerate structure of the wings and that it cannot be put down definitely as the ancestral form whence both grebes and divers have branched off. The author might perhaps have gone a little farther and said that the extreme specialization of Hesperornis seems to indicate that it represents one offshoot from the main stem which terminated then and there. The gulls are placed among the *Limicolæ*, but the auks are omitted, although this may strike some as showing undue partiality, while the placing of the Flamingo with the Herodiones will be commended by some and condemned by others. The balance of evidence, however, including some recent observations on the feathers, seems to lean towards the association here given, and this, like many other instances, may well serve to illustrate the difficulties that beset the classification of birds. In writing of the skull of woodpeckers the author apparently accepts the validity of the 'saurognathous' type, but, later on, in discussing the Hesperornithes, his allusions to 'the presumed vomers of the woodpeckers' shows that he does not feel quite convinced, and for our own part we agree with Shufeldt in considering the so-called vomers as purely adventitious ossifications. It may be here remarked that Mr. Beddard is preeminently fair in his discussion of all matters, the pros and cons of doubtful questions being impartially considered, the book being entirely free from any didactic tone.

It would have been well in defining the groups to have followed some uniform plan and, instead of setting down characters indiscriminately, to have, so far as possible, given the same characters, osteological, myological or cæcal, in the same order. This would have facilitated comparison and enabled any one to form a better estimate of the value of the various groups. But while we may differ from Mr. Beddard in the manner of using facts, we are deeply indebted to him for the vast number he has placed at our disposal.

The mechanical execution of the book is excellent, the type clear and open, while the use of black-faced type for family names and of italics for anatomical characters is of great aid to the reader. The table of contents, however, is faulty, and it could be wished that the index was more than an index to species.

F. A. Lucas.

Rivers of North America. A Reading Lesson for Students of Geography and Geology. By Israel C. Russell. New York, G. P. Putnam's Sons; London, John Murray. 1898. Pp. xix + 327. 17 plates, 1 table and 23 figures in the text.

The third volume in The Science Series, edited by Professor J. McK. Cattell, is the very welcome monograph by Professor Israel C. Russell, the full title of which is quoted above. In this, the fourth volume that Professor Russell has given us concerning the greater topographic forms of North America, we have a treatise that has long been needed for every-day use, particularly by those of us who are teachers. The particular serviceableness of the book, however, does not lie in the fact that Professor Russell has given us a single-volume reference book concerning American rivers, but because he first, in this country, has here presented a general consideration of the work, function and phenomena of rivers in general. Indeed, this volume is the best popular and yet scientific treatment we know of the origin and development of land forms, and we immediately adopted it as the best available text-book for a college course in physiography.

The nine chapters treat the many aspects of rivers and drainage in a logical, concise, clear and appealing manner, and, though in part they must be read closely, are very attractive to beginners because of the very apparent spirit in which the book was written. No beginner in earth science could gather from such a treatment the common conception that geography deals with 'dead things' only. The book is full of life and vigor, and shows the sympathetic touch of a man deeply in love with nature. As we expected such a naturalist's treatment, we turned

first in our reading to one of the later chapters, entitled 'The Life History of a River,' in which Professor Russell has given us a delightful summary of a river history as seen by a supposed being sufficiently long-lived to have outlived the river. In spite of the imagination demanded for the writing or reading, or perhaps better, because of the necessary imagination, the chapter in question is of exceptional value in emphasizing the comparative lives of man and earth forms, and the difficulty of gaining proper ideas of time. It is, however, a chapter that should be read as a summary and not as an introduction by a beginner; for a body of facts is necessary in order to have such a broad view properly understood and appreciated.

The plan of the book is very logical and practical, the first seven chapters being devoted to a careful account of the details of river work under the following larger headings: The Disintegration and Decay of Rocks, Laws Governing the Streams, Influence of Inequalities in the Hardness of Rocks on Riverside Scenery, Material Carried by Streams in Suspension and in Solution, Stream Deposits, Stream Terraces and Stream Development. The last two chapters are devoted to considering the more important American rivers, and the Life History of a River, in which a summary use is made of the principles that have been previously developed.

The first chapter is devoted to a consideration of the processes of mechanical and chemical disintegration and the consequences of such work, and forms a natural and necessary introduction to the especial treatment of rivers, which really begins in Chapter II. Here we find a good treatment of the processes and results of river erosion and transportation, and the important controls of such river work. Especial and perhaps a little too emphatic emphasis is given to the effect of the rotation of the earth upon river cutting, particularly as seen on Long Island. From such a forceful exposition of this control the beginner might unconsciously gather an erroneous impression of its importance in general.

The chapter devoted to the loads of rivers is very detailed and one of the most important of the book. In spite of numerous analyses and tables, the text does not lose its interest, and the treatment is not above the ability of the average reader. The chapter is sufficiently inclusive for general needs, and yet free from the mathematical difficulties that scare the student so frequently in text-book considerations of this difficult subject.

In the consideration of river deposits the author gives a whole chapter to one group, namely, terraces, which, although of great interest, are not of such world-wide significance as the other greater groups considered together in Chapter V. In spite of this seeming divorce of related subjects, the arrangement is good, because the more normal conditions of river deposition can thus be considered in extenso, without too serious modification of the idea of a river's life cycle. We are glad to see the river deposits treated causally and inclusively. The consideration of deltas is particularly helpful and to the point. The classification is good, clear and workable, and one to be commended. The influences of climate, elevation and depression are treated at length, and the chapter closes with a summary devoted to the cross and longitudinal profiles of rivers illustrated with a few clear diagrams.

The most helpful chapter in the book is that devoted to stream development. Here we have for the first time available for public use the theory and the details of the newer classification of land forms. The questions of stream development and adjustment, the stages in river history and the topographic forms to be found in the various instances are considered concisely and clearly. The newer terminology is used with discretion and success. Only those terms that have to a certain extent been established by usage are included, and these are not given dogmatically in technical language. The author has not written his chapter to explain the terms to be found in the literature of his subject, as is so often the case, but has given each suggested term at the close of a clear exposition of a composite fact as a shorthand method of indicating the composite. The student reader of this chapter would not, we think, be led to use any term with quotation marks, either oral or written, but would avoid

a concise method of expression until his ideas were so clear that a short handle appealed to him, not as a possible, but as a necessary convenience. The chapter as a whole is a very serviceable text-book on modern physiography and is of exceptional value to all who have previously been embarassed by the inaccessibility of the literature on this subject.

The footnote references are many and well selected, and, although not complete, give a good introduction to the general literature. The illustrations are, on the whole, excellent, and the form of reproduction has been unusually successful. The book could well have been enriched with more illustrations of normal river topography, and would then have been much more valuable, both to student and teacher. The typography is clear and pleasing, and the book very attractive in its general form. A good index completes the volume.

We read the book through almost at one sitting, and laid it down with but two regrets: first, that there was not more; and second, that this, the best of the series of four monographs by Professor Russell, was not uniform in general appearance with its predecessors. It is certainly a misfortune that three publishers should have issued these four books. Had they been uniform in appearance, they would have been of greater interest to the general reader, especially to those who get pleasure from the shelf as well as the hand appearance of a row of related books.

We know of but few books that are so nearly what one would desire as this book. Adverse criticism can only be directed to details, and lamentation over details is out of place when a book is so generally pleasing as this.

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Anatomy and Histology of the Mouth and Teeth. By J. Norman Broomell, D. D. S. Philadelphia, P. Blakiston's Sons & Co. 1898. With 234 Illustrations. 8vo. Pp. viii + 428.

The book contains the best account of the teeth of man, which has yet appeared in the English language. It includes the treatment of oral anatomy and of dental histology and development. It is illustrated chiefly by original photographs engraved in half-tone. The most important and most meritorious part of the book is comprised in Chapters VIII.–XI. (pages 131–280), which offer detailed and valuable descriptions of the teeth, marred only by a fantastic subdivision of the incisors, canines and first bicuspids of the upper jaw into four types, bilious, nervous, sanguineous and lymphatic, an astonishing revival this of mediæval pseudo-science in the midst of a work otherwise serious and intelligent. The author's descriptions are clear and admirable, and by their thoroughness meet a real need. In fact, it has long seemed singular that there should be no adequate detailed account of human teeth, but the need seems to be now well supplied.

The chapters on the teeth, above referred to, are preceded by the seven which deal with the anatomy of the oral region, and are followed by six chapters on the development of the teeth, the histology of oral structures and the histology of the teeth. Dr. Broomell's attempt to apply photography for histological illustrations is not encouraging, all of the figures of microscopic structure being very far inferior to cuts from drawings. The account of the development of the teeth is fairly good, but not equal to the standard of the anatomical part. Some minor errors appear in the embryological portions, for example, 'tooth band' is used instead of 'dental shelf;' the tooth germ in Fig. 180 is so distorted that it gives no idea of the true relations; in Fig. 181 the hole between the tooth and the shrunken enamel organ is labeled enamel. But it is not worth while to dwell upon these defects in a work of solid merit.

The publisher's share has been well executed, the general appearance of the volume being dignified and attractive, the printing excellent.

Charles S. Minot.

BOOKS RECEIVED.

The Foundations of Zoology. William Keith Brooks. Columbia University Biological Series. Vol. V. New York, The Macmillan Company. 1899. $2.50.

The Native Tribes of Central Australia. Baldwin Spencer and F. J. Gilen. London and New York, The Macmillan Company. 1899. Pp. x + 671. $6.50.