we believe, exclusively prepared. It was brought to the writer's attention not long since through his friend Miss Hyatt, the well-known sculptor of Cambridge, who states that it has come into general use among artists during the past few years. It does not appear, however, to have become known, or at least extensively employed in natural history laboratories, as it certainly deserves to be.

The following properties are claimed for plastiline in a circular obtained by the principal dealers in this country, Messrs. L. P. Pastorini & Co., of 1140 Third Avenue, New York:

"It is lighter than clay, does not dry nor contract, and remains firmly attached where it is placed, whatever be the quantity employed. It will not mildew nor produce any other fungus growth; will preserve indefinitely the shape given it, its color, and its adhesive and plastic properties. Heat or cold, and dryness or moisture of the atmosphere, have no effect upon it, whether exposed or hermetically sealed. Another great advantage is its harmlessness to health.

"Plastiline is used in exactly the same way as clay. A layer or two of painters' glue applied upon the wooden framework of the model or base will prevent any absorption of plastiline and greatly facilitate the latter's adhesion. To take the impression of an object and to prevent the composition from adhering to the original, powder the plastiline with pulverized talcum (glove powder). Plastiline does not adhere to the plaster when a cast is made. To insure the easy removal of the latter, simply bathe with water the outside of the plaster cast, when it will detach readily.* To give a finer finish to certain parts of the model, the application of a brush with alcohol or spirits of turpentine is recommended."

Plastiline is supplied in three grades of consistency; No. 1 being the softest, or about the same as glazier's putty; No. 2 being medium soft, and No. 3 medium hard. For taking impressions of fossils we have found No. 2 very satisfactory, but to render it more plastic one has only to knead it with a little vaseline or sweet oil. The best modeling tools are those used by sculptors, which consist of fine iron or brass wire wound evenly about a stiff wire loop and fastened to a short handle. One should always make his own tools, however, taking care to get the coils fine and even. Boxwood spatulas, sand-papered down to a thin edge, or even steel ones, such as plasterers use, are convenient for shaping in the rough.

The chief advantages of this compound consist in its non-liability to crack or dry up—hence it retains the most delicate impressions indefinitely; in its durability, as the same material can be used over again; in the ease with which plaster casts can be taken from it; and finally in its general convenience, being always ready for use and not requiring any care. For these reasons we have thought it worth while to bring it more prominently before the notice of naturalists.

C. R. Eastman.

* For taking plaster casts directly from natural objects no better lubricant can be employed than a mixture of vaseline and refined kerosene oil.

SCIENTIFIC BOOKS.

The Structure and Classification of Birds. By Frank E. Beddard, M.A., F.R.S., Prosector and Vice-Secretary of the Zoological Society of London. London, New York and Bombay, Longmans, Green and Co. 1898. Pp. xx + 548, with 252 text figures. Price, $6.00.

Mr. Beddard is to be congratulated upon having brought to a successful issue a task contemplated, and even commenced, by his predecessors, Garrod and Forbes, and as these by their labors have done much to further the work, and as their note-books have been freely drawn upon, they too may be credited with a share in the finished product. While we may admit that a hand-book on avian anatomy is scarcely so much needed now as it was when conceived by Garrod, the present volume is none the less welcome. The monumental treatise of Fuerbringer and the detailed work of Gadow are not at everyone's disposal, and there are still ornithologists who, to their sorrow, have failed to acquire that knowledge of German which is now almost indispensable to the orni-

thologist. Hence this book, replete with anatomical facts, is one that no working ornithologist can afford to do without. Not only does it contain a vast amount of original work, but a host of references to that of others, and if, as stated in the preface, one bird is occasionally described under two names this is of small consequence. It is a poor bird that does not rejoice in at least two names, and there is no danger now-a-days that questions of nomenclature will suffer from neglect.

The first 158 pages are devoted to the structure of birds, their more common anatomical features being described under such heads as pterylosis, alimentary canal, respiratory system, etc. Then follow 376 pages on the classification of birds where the structural characters of each group are given in detail and the affinities of each division discussed at some length. As Beddard and his immediate predecessors in the prosectorial chair have been more deeply interested in the soft anatomy of birds than in their osteology, it is not surprising to find the book particularly strong in those portions relating to myology and to the detailed structure of the syrinx and alimentary canal. The amount of original research displayed in these directions can but excite the admiration of anyone who has tried his hand at the dissection of small birds and found how trying it is alike to temper and eyesight.

This being the case the occasional slighting of osteological characters—for instance, little or nothing is said concerning the hypotarsus—may be readily forgiven, as well as the rare errors, mostly due to generalizations based on insufficient data. For example, almost on the first page we find the time-worn misstatement that in the Swifts all four toes are directed forward when this applies mainly, or wholly, to the true Swifts, *Micropodinæ*, since *Hemiprocne*, and probably *Macropteryx*, cannot, and the common species of *Chætura* do not, turn the first toe forward. Dr. Stejneger and Dr. Coues have both stated the case correctly, and it is a pity to have this error perpetuated. That the patella of the Comorants is perforated by the tendon of the ambiens is but partially true ; it is thus perforated in *carbo*, *dilophus* and *vigua* ; it is not in *urite*, *penicillatus*, *punctatus* and *melanoleucus*, while the orifice is minute in *magellanicus* and *albiventer*.

A slip of another kind is made in describing the hyoid, where the text neither agrees with the facts nor with the figure on the opposite page ; this last, however, is hardly to be wondered at when scarcely any two writers are agreed as to the nomenclature of the parts of a bird's hyoid, and the majority seem in some particular to be incorrect. These little errors are pointed out merely to emphasize the danger of generalizations from observations on a few members of an apparently homogeneous group, and to note that the field of avian anatomy is so large that even the most diligent laborer therein may overlook some of the distant corners.

Passing to the portion on classification it may be said in the main that the groups are those adopted by Fuerbringer and Stejneger. Beddard's divisions (orders?), corresponding, in a general way, to the super-families of Stejneger as given in the Standard Natural History. There is naturally some shifting about of debatable forms, for it is not probable that any two writers would agree on all points of classification, this largely because birds, as a class, are so homogeneous, while their minor modifications are so infinite, that their arrangement is a difficult matter. To add to the difficulty, the tendency is for convenience to pitch the divisions on too high a key, so that they are not comparable to those of other vertebrates.

The two principal divisions are, like those of Fuerbringer, *Saururæ* and *Ornithuræ*, the latter being sub-divided into *Anomalogonatæ* and *Homalogonatæ*, although, by a strange oversight, the latter group is only incidentally defined (p. 95), and is not even mentioned in the contents, and only by the process of elimination can we ascertain what birds belong to it.

A similar lapse occurs in treating of the Galli, where, on page 302, we are told the Alectoropodes may readily be divided into three groups and only two groups are given, while, to complicate matters still further, four families are spoken of a little later on.

Perhaps this may be considered as atoned for by the casting overboard of the divisions *Ratilæ* and *Carinatæ* and the placing of Tina-

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