of virus, increasing in strength on every transmission, is at the same time inoculated into a dog. This latter will then be found capable of resisting the most fatal virus, having become completely refractory to rabies, no matter whether the virus, derived from a case of common rabies (*rage des rues*), is introduced by intravenous inoculation or by trephining."

THE MAMMALIA OF INDIA AND CEYLON

Natural History of the Mammalia of India and Ceylon. By Robert A. Sterndale, F.R.G.S., F.Z.S. (Calcutta: Thacker, Spink, and Co.; London: Thacker and Co., 1884.)

THIS book may fairly be described as an attempt by an unscientific writer to compile a scientific work. The author is favourably known as a describer of Indian wild sports, and his observations on the habits of animals are generally good and often original. His best known publication, "Seonee or Camp Life in the Satpura Range," although not quite equal to Forsyth's delightful "Highlands of Central India," rises above the level of ordinary Indian sporting works. In the volume now published he has attempted the somewhat ambitious task of compiling a popular manual of Indian mammalia, comprising not only those described in Jerdon's "Mammals of India" (which is restricted to the kinds found in the Indian Peninsula and the Himalayas), but also the species living in Assam, Burmah, Ceylon, and "the countries bordering the British Indian Empire on the north." By including some (not all) of the mammals described by A. Milne-Edwards from Eastern Tibet, several of those recorded by various authors from Kashgaria, Afghanistan, and Persia, and some Malay types, the total number of species enumerated is brought up to 482. This number, however, is partly made up by nominal species, the writer having compiled his lists from various authorities of unequal value.

Had Mr. Sterndale confined his descriptions to the larger and better known mammals of India and the surrounding countries, he might possibly have achieved greater success. He has bestowed much labour upon the book, and has in some cases, but unfortunately not in all, had recourse to good and recent information. Thus he adopts Flower's and Mivart's classification of the *Carnivora*, and Alston's arrangement of the rodents, whilst he places the dugong in the *Cetacea*, and *Galeopithecus* amongst the lemurs.

The actual descriptions of species are for the most part taken from other writers, and the same may be said of localities, which, however, are not always correct, even in the case of the larger and better known animals. Thus the markhor (*Capra falconeri* v. *megaceros*) is said to be found in Ladakh, where it does not occur, although common in Astor and Gilgit, and the hog-deer, *Axis porcinus*, is stated to exist "throughout India, though scarce in the central parts," whereas it is not known with certainty to inhabit any part of the peninsula of India except the plains of the Ganges and Indus. Many other instances might be quoted. Mr. Sterndale is not even aware that *Tragulus kanchil* exists in Tenasserim, although its occurrence there was well known to Blyth, at least twenty-five years ago. He is unaware also that *Canis lupus* has been obtained in Gilgit, and *Nectogale elegans* in Sikkim. But although *Tragulus kanchil* does not receive a number and separate notice as one of the Indian mammalia, *Mustela nudipes*, a purely Malay insular type, not recorded from continental Asia, is included in the list as No. 190, with the remark that "this species may be discovered in Tenasserim." There is a want of system in the admission and exclusion of species throughout. Thus *Macacus thibetanus* (No. 23) and *Nemorhædus edwardsii* (No. 453) are described, whilst *Semnopithecus roxellana*, *Elaphodus cephalophus*, and *Cervulus lachrymans* are ignored, although all are from the same country in Eastern Tibet, and described in the same work by one author. Similarly whilst some Andaman and Nicobar bats, *e.g. Rhinolophus andamanensis* (No. 48) and *Phyllorhina nicobarensis* (No. 63) are included, no mention is made of four *Megacheiroptera* from the same islands, viz. *Pteropus nicobaricus*, *Cynopterus brachyotus*, *C. scherzeri*, and *C. brachysoma*.

As might be anticipated, the micro-mammalia are not treated in a manner that will afford much aid to a student. The writer is unacquainted with Mr. Oldfield Thomas's important paper on the rats and mice, and with Mr. Dobson's work on the *Insectivora*. The account of the latter order and of the *Rodentia* is full of errors. The mistakes in the case of the bats are even less excusable, for Dobson's catalogue is quoted, and, to some extent, followed. Had Mr. Sterndale simply taken all his names, descriptions, and localities from Dobson he would have been safe. But he appears to have found a difficulty in making the names and the arrangement in Jerdon's "Mammals" fit into Dobson's scheme, and he has adopted a compromise, with the result that, besides repeating several mistakes of Jerdon's, he has added not a few of his own. Thus, to take a few examples, he gives as two distinct species No. 54, *Hipposideros armiger*, and No. 64, *Phyllorhina armigera*, although he notices that *Hipposideros* and *Phyllorhina* are the same genus. He quotes as distinct species No. 92, *Scotophilus fuliginosus*, and No. 119, *Miniopterus schreibersii*, shown by Dobson to be identical. Similarly No. 58, *Hipposideros larvatus*, is the same as No. 59, *H. vulgaris*. But perhaps the most characteristic instance of error is in the last species in the order No. 121, *Nyctophilus geoffroyi*. This is taken from Jerdon, and no trace of it is said to be found "in Dobson's monograph, which is so exhaustive as far as Asiatic species are concerned." As the bat in question (*N. timoriensis*) is peculiar to the Australian region, it is naturally omitted in Dobson's "Monograph of Asiatic *Chiroptera*," but it is included in his General (British Museum) "Catalogue of Chiroptera." Jerdon's mistake in classing the species as Indian was founded on what looks very like a printer's error in Blyth's "Catalogue of Mammalia in the Museum of the Asiatic Society."

These details will show the character of the work: mistakes such as those enumerated are to be found throughout. At least a dozen omissions have been noted besides those already mentioned. The book is well printed and illustrated, and many details of osteology, &c., described and figured, so that it is important to show why, despite its merits, it falls far short of what is required in an exhaustive account of Indian mammalia.

There are two portions of the work of which it is possible to speak in terms of high praise. First, wherever

the habits of animals are recorded on personal observation they have evidently been accurately and carefully noted. The author is a genuine naturalist with a thorough love and admiration for animals, and in consequence he possesses considerable power of understanding and appreciating them. Secondly, the woodcuts are numerous and for the most part excellent. A few, such as the big-headed Gaur (*Bos gaurus*) on p. 530 and the musk-deer on p. 493 are less successful, and it may be questioned whether a nylgao can stretch itself into the gallop depicted at p. 477, but the spirit of the cut last-named would atone for a worse fault, and there is far more ground for admiration than for criticism. As an amusing work, with good illustrations, to which residents in India may have recourse for the identification of the principal mammals, this volume will probably find a ready place in the Anglo-Indian library. For the determination of the smaller kinds, and for a knowledge of the less known and more difficult species, the student will do well to search elsewhere.

W. T. B.

NORTH AMERICAN MOLLUSCA

A Review of the Non-Marine Fossil Mollusca of North America. By Charles A. White. (Washington: Government Printing Office, 1883.)

THE Hon. J. W. Powell, the Director of the Geological Survey in the United States, continues his valuable contributions to scientific knowledge by the publication of his annual reports; and the volume which is now before us forms part of the Report for 1881-82.

This volume contains 144 pages, besides a full index, and thirty-two lithographic plates. It is carefully and modestly written, and the author candidly admits that our knowledge of the subject treated by him is "very imperfect." The title of the work may be open to a slight criticism; and the word "inland" ("*binnen*" in German) might be preferable to the negative expression "non-marine," which is used by the author.

The geological formations which are embraced in the "Review" are the Devonian, Carboniferous, Jurassic, Triassic, Cretaceous, Laramie, and Tertiary. With respect to the Laramie formation, the author regards the group as occupying a transitional position between the Cretaceous and Tertiary; it is remarkably fossiliferous, inasmuch as a greater number of the species mentioned in the "Review" come from that group than from any other. The total number of North American non-marine or inland fossil species and well-marked varieties appears to be 227, of which 141 are found in the Laramie formation or group. Twelve species are Palæozoic, and of these no fewer than seven species belong to the Pulmonibranchiata, and to the families *Limacidæ* and *Helicidæ*, which are not only terrestrial mollusca, but undoubtedly air-breathers. *Strophites grandæva* of Dawson, from the Devonian formation, is by far the most ancient land shell hitherto known to us. In the face of these facts and in the absence of any facts to warrant the conclusion of the author, how can we reasonably agree with him "that molluscan life began in the sea, and that all fresh-water and land mollusca have been primarily derived from those of marine origin"? Although no land mollusk has yet been discovered in the oldest fossiliferous formation, it is evident that land and consequently terrestrial conditions must then and long previously have existed, so as to account for the sedimentary strata of which that formation consisted and for the prevalence of *Lingula* and other shallow-water Brachiopoda in the Silurian epoch.

It is curious to notice that so many species of what are usually considered marine Conchifera (*Ostrea*, *Anomia*, and *Mytilus*) occur in the Laramie group, and one of *Anomia* in the Cretaceous formation. This confirms the experiments of Beudant and other naturalists, that many marine gill-bearing mollusks can live either in their own native and proper element or can gradually become accustomed to a brackish and ultimately a fresh-water habitat. The author also notes the "persistence through long periods of geological time of even the simpler types of non-marine mollusks, after they were once established." And he remarks with respect to the Gastropoda that, "although in geological rank the Gasteropoda are so much in advance of the Conchifera, the various families of the former seem to have been developed as early in geological time as those of the latter, and so far as we are now acquainted with the history of the fossil non-marine mollusca of North America, it appears that highly-organised land pulmonate Gasteropods were introduced quite as early as any of the Conchifers. Indeed from present indications we are led to believe that the relations of the different classes of non-marine mollusca to each other were much the same in all geological epochs as they are to-day." The following is also interesting:—"Notwithstanding the annual migration of myriads of aquatic birds between the northern and southern provinces of North America at the present time, and doubtless also ever since it has been a continent, the fresh-water molluscan fauna of those regions respectively are still distinct."

A few minor points of classification which are met with in the present work will not be accepted by conchologists without some hesitation, *e.g.* the extension of the so-called family *Rissoidæ* (or more properly *Littorinidæ*) so as to include the genera *Hydrobia* and *Bythinella*, which latter is a subgenus of *Bythinia* and belongs to the *Paludinidæ*. The families *Pisidiidæ*, *Physidæ*, *Ancylidæ*, *Vitrinidæ*, *Arionidæ*, *Pupidæ*, *Succinidæ*, and *Viviparidæ* seem to be also superfluous. In every well-organised army there ought to be a due proportion of men to officers of different ranks.

J. GWYN JEFFREYS

OUR BOOK SHELF

Plant-Life. By Edward Step. Third Edition. (London: T. Fisher Unwin, 1884.)

THIS is another attempt to give a popular description of some of the more sensational parts of the science of botany; though the plan is disconnected, the general idea of the book would not be bad, provided it were well carried out. It is to be regretted that the author has failed to realise that it is necessary to be accurate in popular description. For instance, it is gravely stated in italics that roots are never green (p. 29); we also read that *Ruscus aculeatus* "presents the remarkable appearance of a flower growing in the centre of a leaf" (p. 94), that the Cryptogams have no embryo (p. 211), and that the *Ricciaceæ* and *Characeæ* have stomata (p. 212)! On p. 171 he mistakes intercellular spaces for cells in *Isoëtes*, which he classes under the *Marsiliaceæ* (spelt *Marcileaceæ*, p. 212); and on p. 165 we are informed that the elaters