

The classification adopted is described as a provisional one; in it the animal kingdom is divided into eight branches—Protozoa, Porifera, Cœlenterata, Echinodermata, Vermes (flat and round worms, Polyzoa, Brachiopods, Annelids, Tunicates), Mollusca, Arthropoda, and Vertebrata. It is hinted that the Tunicates might even form a ninth branch, to stand next below the Vertebrates. The evident aim and object of the writer has been to write in the smallest possible compass a clear and intelligent account of the animal kingdom, one that would give a fair idea to the reader of what is already known about it, and that would at the same time suggest where new work might be done and how to do it. In this effort it is our opinion that the author has in a very great measure succeeded; but the subject is so large a one that with all the help he has received he still sometimes falls short of his aim. Some of the shortcomings are strange; thus Fig. 33 is a copy of Lovén's *Hyalonema boreale*, a species having nothing to do with the vitreous sponges and yet referred to as typical. On p. 85 we read, "In Tubipora the polyps are compound and secrete solid, calcareous, bright red tubes arranged side by side"; and yet in the next paragraph but one it is stated that *Helipora* differs from *Tubipora* "in that the hard tissue of its corallium shows no sign of being composed of fused spicules." To call attention to all such instances as have caught our eye as we looked carefully over this book would serve no useful purpose. We could easily on the other hand call attention to many new facts here recorded, not to be found perhaps in any other manual, and we feel sure that this handbook deserves a successful career. It is brought out in a style in every way worthy of its publishers.

*Principles of Agriculture. Questions, Answers, Notes, &c.* By S. Tomlinson, Stud. Inst. C.E. (Bradford: T. Brear, 1880.)

THE object of this book is, we presume, the instruction of students about to be examined in subject xxiv. of the Science and Art Department. It mainly consists of such answers as Mr. S. Tomlinson would have given to the questions asked in the examination papers set by Mr. H. Tanner in the years 1876-9. It is difficult to characterise this incoherent pamphlet as it deserves. It is not merely inadequate; it is something worse than feeble; in fact it abounds in the errors, direct and implied, which a mere beginner in the study of agricultural chemistry would be most likely to make. We quote such statements as the following in support of our adverse criticism. "Some guanos contain phosphates," p. 20. Where is the guano free from them? "The general composition of cows' milk is:—Water 85.8, casein 6.8, butter 3.8, sugar 3.0, salts 6.0," p. 22. It is needless to remark that the figure representing butter in this analysis is the only one which approaches the truth. "Fibrin in wheat; albumen in corn," p. 30. What is the distinction implied here between wheat and corn? "The use of soils depends upon their place amongst other rocks," p. 39. Even if soils were species of the genus rock, their agricultural value could not be fairly stated to depend upon their geological horizon. On page 46 phosphorus is given as an element essential to the constitution of albumen and fibrin. But we will say no more, having already probably said too much.

A. H. C.

*The Cotton-Worm.* By Chas. V. Riley, M.A., Ph.D. *Bulletin* No. 3 of the United States Entomological Commission. 8vo, pp. 1-144. (Washington: Government Printing Office, 1880.)

WE think this monograph exceeds in value all others of Prof. Riley's well-known writings on North American injurious insects. The cotton-worm is the larva of a moth of the family *Noctuidæ*, and belongs to that section of it in which the caterpillars form what is termed a

"half-loop" in walking, owing to one pair of pro-legs being absent. It is calculated that in a year of severe visitation it occasions damage to the amount of 30,000,000 dollars, or 15½ per cent. annual average loss since the war. No wonder it has become a subject of governmental solicitude. The first forty-seven pages are occupied by an exhaustive natural history of the pest, illustrated by numerous very excellent original woodcuts, and a few (not original) that are indifferent, and also by a fine plate, admirably executed in colours, by what is termed the lithocautic process. This portion consists not only of a complete history of the moth itself, but also of every imaginable kind of parasite and external enemy, so that it is of the greatest service to the scientific, as well as to the economic entomologist. The formidable nature of the subject may be readily imagined, when it is stated that in the hot districts the number of broods is almost continuous, and that in summer the whole life-cycle may be completed in less than three weeks. As to whether the perfect insect hibernates or not, there appears to be considerable difference of opinion, but Prof. Riley believes it does so in the southern districts, but not otherwise. This biological portion is succeeded by an extended examination of the remedies proved or tried, and an illustrated description of the various implements and appliances used to distribute these remedies, reminding one of the illustrated catalogues of some of our large agricultural implement makers, only in these one looks in vain for any parallel to the "brushers," "distributors," "atomisers," "sprinklers," &c., that here figure. Considerations of the advantages of light and saccharine matters for attracting the moths are not lost sight of, neither is the new idea of infecting the larvæ by means of the yeast fungus, although this is reported upon somewhat disparagingly. Our author, while admitting the efficacy, in greater or lesser degrees, of other insecticides, appears to fall back upon "Paris green" as the most effective, as he has done in former cases, when treating upon the Colorado beetle, &c.

Not the least interesting and amusing part of the book is the appendix of answers by correspondents to a circular of questions addressed to them. These answers display that same amount of great knowledge and gross ignorance combined as one finds amongst agriculturists at home on similar subjects. Biologists inclined to favour the theory of abiogenesis will find enthusiastic advocates amongst cotton-planters, even in connection with an animal so high in the scale as a moth; one planter expresses his decided opinion that "the atmosphere created the germ right there;" others strongly deny that any pairing of the sexes takes place; another bold theorist states as his belief that "it is a peculiar parasite of the cotton-plant, and as such, that the cryptic germ of the insect is to be found with the germ of the plant itself, and, like all parasites, only requires favourable circumstances to develop it." Some, again, assert that the moths are brought from the south by strong breezes; others, that the larvæ are not especially attached to the cotton-plant, but feed upon anything on which the eggs were deposited, only then they differ from those on the cotton. Even supposing all Prof. Riley's time and trouble in investigating the matter to be thrown away—and there is no reason to imagine it will be—so far as arresting the damage, or lessening it, is concerned, he will have done good service in explaining to the planters the true state of things regarding the natural history of the insect; but we must not suppose all will believe him.

The moth is *Aletia argillacea* of systematists, *Aletia* being a genus closely allied to *Anomis*, Hübner. It has also been described as *Anomis bipunctina* by Guenée (if we mistake not), originally from a figure in Abbot's beautiful work, though our author makes no mention of this.