

of intelligent legislation—and the same remedy will no doubt be efficiently applied in due time to the evils attendant upon the latter, to which the attention of the whole country is now directed.

To consolidation as such, I think there can be no rational objection, and I will hazard the opinion that competent young men who are obliged to stand absolutely on their own merits have a better chance to succeed to-day than ever before in the history of the country. The time at my command—already, I fear, exhausted, as well as your patience—does not admit here of any extended discussion of this interesting question.

The 'good old times' were not as good as these, and I believe that these are not as good as those that are to come. Macaulay, who so richly embellishes every subject he touches, uses the following illustration:

In truth, we are under a deception similar to that which misleads the traveler in the Arabian desert. Beneath the caravan all is dry and bare; but far in advance and far in the rear is the semblance of refreshing waters. The pilgrims hasten forward, and find nothing but sand where, an hour before, they had seen a lake; they turn their eyes, and see a lake where, an hour before, they were toiling through sand. A similar illusion seems to haunt nations through every stage of the long progress from poverty and barbarism to the highest degrees of opulence and civilization. But, if we resolutely chase the mirage backward, we shall find it recede before us into the regions of fabulous antiquity.

At no time has the question of the rights of the people, as against those of the so-called vested interests, been as prominent, I may say as all-absorbing, as at this moment. Forty years ago the government was encouraging the building of railroads by enormous grants of land. The chief desire of the nation and the states was to get the means of transportation at any cost. The recent session of Congress has been largely devoted to devising means for regulating railroad rates—already at a lower

point than any one twenty years ago would have dared to predict. I have no quarrel with this wholesome legislation. I merely use the incident as an illustration. This is the day of the reasonable control of business and of the elimination of abuses which have inevitably sprung up alongside and been dwarfed by an industrial development more rapid and more stupendous than any that the world has ever seen. In this important work, educated men and, above all, technically educated men, should take the lead, if it is to be well done, and done it will be. The conscience of the country has been quickened as never before, largely, I believe, through the initiative of the president of the United States, who only needs to see a wrong to exert all the prerogatives of his great office to remedy it.

Happy that land where the people govern; where education is not for the cloistered few but within the reach of every child; where the limits to ambition are only those prescribed by the ability and disposition of the individual, and which advances from generation to generation to better and better things.

CHARLES G. WASHBURN.

SCIENTIFIC BOOKS.

The Biology of the Frog. By SAMUEL J. HOLMES, Ph.D., Assistant Professor of Zoology in the University of Wisconsin. New York, The Macmillan Co. 1906. \$1.60 net.

A most useful addition to our text-books on the frog. It presents not only the anatomy and embryology but also the physiology and natural history of the frog; so that for the first time a single book covering the whole ground of the biology of the frog is accessible to teacher and student.

The text of 358 pages is divided into nineteen chapters. The first places the particular kind of frog (the leopard frog, *Rana pipiens*), which is the chief subject of the volume, in proper relation to other kinds of frogs and to the salamanders by a brief consideration of

the classification of the amphibia with special reference to the common American forms and their habits. The second is one of the most interesting of all and considers in some three dozen pages the life and habits of this common frog; recounting its methods of locomotion and of feeding; describing its voice, enemies, parasites, as well as its breeding habits and its responses to changes in temperature, etc.

The succeeding two chapters briefly describe the exterior of the frog and the main features of its internal structure, reserving for later chapters detailed descriptions of anatomy and physiology. The fifth chapter devotes some 38 pages to the embryology of the frog from the time the egg is laid through the metamorphosis into the adult shape, and includes a brief historical introduction. Chapter six presents a brief outline of vertebrate histology as illustrated in the frog, while chapter seven takes up the digestive organs rather fully, with special emphasis upon glandular activity. The eighth chapter deals with organs of voice and of respiration from a physiological standpoint and leads to the ninth chapter, which is devoted entirely to the skin, an undue amount of space being devoted to its color changes.

The excretory organs and the reproductive organs each receive a chapter descriptive of their anatomy and functions.

The devotion of an entire chapter to the subject of internal secretions is timely and the restriction of the treatment of the skeleton to a single chapter of fifteen pages shows commendable restraint, considering the large amount of detail that might so readily have been retained here.

From the point of view of the student the ten pages devoted to the muscles might well have been made fewer.

The fifteenth chapter describes the microscopic structure of the blood, the anatomy and action of the heart, the distribution of the veins and arteries and the circulation as seen in the web of the foot, with also a brief consideration of the lymph system.

The sixteenth chapter gives a good description of the anatomy of the nervous system and considers reflex actions and the conflicting evidence as to the functions of the various

parts of the brain: so that 35 pages are needed.

The structure and uses of the sense organs are adequately treated of in some 20 pages.

The last two chapters deal with the instincts, tropisms and intelligence of the frog as known from the works of Yerkes, Parker and others. Probably the presentation given will give the student a just conception of the rather confused and tentative nature of the results thus far gained by the experimental study of the psychology of the frog.

The author has prepared the book as the outcome of six years of lectures given to students who had studied some general biology. As a compilation it gives the gist of the anatomy and histology of Gaupp's 'Ecker,' and enough of the embryology of Marshall and deserves great praise for bringing together in attractive form much of the scattered knowledge of the natural history and physiology of the frog. To be commended is the list of authors at the end of each chapter and the impression conveyed that the conclusions reached in the physiology and psychology of the frog are complex balancings of diverse facts and opinions while suspended judgment is often imperative.

The 94 illustrations are, with few exceptions, the familiar figures of Ecker, Howe and Marshall and while one need not expect many illustrations for a physiological presentation of the subject yet one could wish that the excellent photographs used as a frontispiece might have been followed by others illustrating the natural history of the frog.

While the book is easily read and the author's meaning clear, some hypothetical student punctilious as to English but ignorant of natural history, might be misled in reading of the feeding habits of the toad, page 14: 'angleworms are seized by the jaws and stuffed into the mouth by the fore legs.'

Every teacher of vertebrate zoology will need a copy of the book and many college students will find it a valuable text-book. But while the central idea of adding physiology and natural history to anatomy and embryology is a good one, it almost necessarily leads to putting too much knowledge before the student. In a second edition, for which we

hope there soon may be demand, the author might perhaps better satisfy a larger number of students by a thoroughly digested epitome of the present book, while the teacher should welcome another volume that would still further elaborate all but the anatomical part of the present book. For the teacher there might be added a consideration of the geographical distribution of frogs, with maps; a full discussion of the remarkable breeding and brooding habits of some exotic frogs; more ample reference to the field of regeneration in frogs; an account of the genesis of the egg and the sperm; and original illustrations. He would then have a fit complementary volume to Gaupp's 'Ecker.'

E. A. A.

Easy Mathematics, chiefly arithmetic; being a collection of hints to teachers, parents, self-taught students and adults, and containing most things in elementary mathematics useful to be known. By SIR OLIVER LODGE, F.R.S. Macmillan and Co. 1905. Pp. xv + 436.

When a man like Sir Oliver Lodge writes on arithmetic we naturally expect an unusually high motive. In the present case this motive is set forth in such forceful terms as follow:

The mathematical ignorance of the average educated person has always been complete and shameless, and recently I have become so impressed with the unedifying character of much of the arithmetical teaching to which ordinary children are liable to be exposed that I have ceased to wonder at the widespread ignorance, and have felt impelled to try and take some steps towards supplying a remedy. The object in writing the book has been solely the earnest hope that the teaching of this subject may improve and may become lively and interesting. Dulness and bad teaching are synonymous terms. A few children are born mentally deficient, but a number are gradually made so by the efforts made to train their growing faculties.

To read an arithmetic written in a breezy style yet thoroughly sane from cover to cover is a surprisingly interesting experience for most people who try it. While those who are familiar with elementary mathematics may not learn any new facts by reading this book, yet there will probably be few who will not have

a more cordial attitude towards the subject. It works a change of feeling and clearness of vision rather than a deeper insight into the more abstruse parts.

The charm of many illustrations lies in their extreme simplicity. For instance:

It is very often a mistake for teachers to suppose that some things are easy and other things are hard; it all depends on the way they are presented and on the stage at which they are introduced. To ascend to the first floor of a house is difficult if no staircase is provided, but with a proper staircase it only needs a little patience to ascend to the roof. The same sort of steps are met with all the way, only there are more of them. To people who live habitually on the third floor it is indeed sometimes easier to go on the roof than to descend into the basement. Educators should see that they do not forcibly drive children in shoals up an unfinished or ill-made stairway, which only the athletic ones can climb.¹

The first part of the volume is partly historical. In some of this the imagination is explicitly allowed to wander beyond the established facts. In addition to most of the questions which are met in arithmetic and elementary algebra, there are chapters on *Easy Mode of Treating Problems that require a Little Thought, dealing with Very Large or Very Small Numbers; Pumps and Leaks, Differentiation, etc.* The work is divided into forty-seven brief chapters and throughout impresses one with the fact that the greatness of a man is perhaps most strikingly exhibited by his treatment of common subjects. The author with a narrow outlook would not make such a wise choice of subject matter and would not be apt to refresh the reader with such broad views as 'Real living arithmetic is the same in any country; and most important of all is that which must necessarily be the same on any planet,' and 'An equation is the most serious and important thing in mathematics.'

While the book naturally appeals most strongly to the teacher, yet it seems to be eminently suitable for those who desire to get a clear view of the subject matter which has been employed in their early training. The sub-title has a quaint eighteenth century flavor, but the book itself is thoroughly modern

¹ Page 13.