

English frogs have the tongue 'bifid at the tip,' and breathe in an uncommonly awkward manner. "When the frog breathes it fills the mouth with air; the mouth is then closed and the external nares, while the muscles forming the floor of the mouth force the contained air into the lungs" (p. 80). In the tadpole, respiration is carried on by a 'free flow of oxygen containing water over the gills.' The adult frogs are said to have 'two first vertebræ,' from which the student infers that they are double-headed. On p. 103 the author says: "The skeleton of the fore limb consists of the pectoral girdle and of the limb which articulates with it." The student is left to wonder which of the two limbs enjoys this distinction and why the other is not equally favored.

Nothing is said about geographical distribution; sponges are nowhere mentioned; in the chapter on histology there is no figure or description of bone, no figure of nerve cells or fibers, of striated muscle fibers, of glandular structures, nor of adipose tissue. There is no index. Most of the figures are good, but there are not enough to make certain of the subjects clear to beginners.

There would be no excuse for giving Mr. Beddard's zoology an extended notice were it not that the scientific prominence of its author and name of its publishers are likely to carry much weight and to lead to its introduction into American schools in the place of other and better books, and this should not happen until it has been given a thorough and radical revision.

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Laboratory Exercises in Anatomy and Physiology. By JAMES EDWARD PEABODY, A.M., Instructor in Biology in the High School for Boys and Girls, New York City. New York, Henry Holt & Co. 1898. Pp. x + 79.

In view of the large amount of instruction in physiology that is given in secondary schools and the large number of text-books that exist, it is surprising how few attempts have been made to treat the subject practically by the preparation of laboratory directions. And the few attempts, although in several cases excel-

lent, are, without exception, inadequate. The immediate cause of this state of things is probably the lack of a demand by teachers for aids of this kind; and this lack of demand is probably to be traced to a lack of realization on the part of the majority of the teachers, themselves imperfectly trained in this respect, of the advantages of the practical method. Not a few teachers, however, have longed for help in endeavoring to raise the standard of instruction in this branch from its present alcoholic and narcotic condition, and such progressive ones will heartily welcome Mr. Peabody's book.

The book is apparently intended for high-school classes. Among the subjects treated are the human and mammalian skeleton, the muscles, the chemical testing of foods, digestion, absorption, the heart, the blood and its circulation, oxidation, respiration, the skin, the kidney, excretion, touch, taste, smell, yeast and bacteria. Directions for the use of the microscope and a list of apparatus and chemicals required for the exercises are added. The book is interleaved with blank pages for notes and is intended to be placed in the hands of the pupil. The latter is given simple directions for experimenting and, instead of being told what to observe, is asked concerning the results that follow. In this respect the book is in accord with the best of the practical guides in other departments of science. "The questions * * * have been framed with the object of leading the student to seek the facts *from the material itself*. The student should be trained especially to distinguish in the experiments *observed results* from the *inferences* that may be drawn from those results." This admirable intention is well carried out. To illustrate the care with which it is done one instance may be cited. After giving directions for making and using the common bell-jar apparatus to demonstrate the action of the diaphragm and lungs, the author asks the pertinent questions: "In what respects does this model illustrate the process of inhaling and exhaling air in our own bodies? In what respects does the model fail to illustrate the process of respiration?"

The book is preeminently a guide to the study of human physiology, and a large number of the experiments and observations are to be

made on the pupil's own body. It is interesting to see how much pure physiology, as distinct from anatomy, can be learned in this way, without the aid of complex apparatus, dissection or vivisection. Vivisection is neither employed nor referred to in any way in the book, and dissection only as it pertains to bones, muscles, the heart and the kidney. Anatomy is treated not as a finality, but as a basis for the study of function. The directions for the study of bacteria are excellent, and the practical applications of bacteriology include, among other things, the canning of fruits, the use of the tooth-brush, the cleaning of the streets, and the cleansing of wounds.

In the opinion of the reviewer physiology is usually taught in high-school courses too much as a human, and too little as a broadly biological, science. Hence some regret is unavoidable that in the present book more attention is not given to the comparative aspect. Notwithstanding this lack, the book is thorough, is calculated to arouse the interest and even the enthusiasm of the pupil, and is to be heartily recommended for use in schools.

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BOOKS RECEIVED.

A Text-book of General Physics. CHARLES S. HASTINGS and FREDERICK E. BEACH. Boston, Ginn & Co. 1899. Pp. viii + 768. \$2.95.

The Development of English Thought. SIMON N. PATTON. New York and London, The Macmillan Company. 1899. Pp. xxvii + 415.

The Shifting and Incidence of Taxation. EDWIN R. A. SELIGMAN. New York and London, The Macmillan Company. 1899. Pp. xii + 337. \$3.00.

The Cambridge Natural History. Volume IX., Birds. A. H. EVANS. London and New York, The Macmillan Company. 1899. Pp. xvi + 635. \$3.50.

The Elements of Physical Chemistry. J. LIVINGSTON R. MORGAN. New York, John Wiley & Sons; London, Chapman & Hall, Ltd. 1899. Pp. xiii + 299.

Examination of Water. WILLIAM P. MASON. New York, John Wiley & Sons; London, Chapman & Hall. 1899. Pp. 135.

De la méthode dans la psychologie des sentiments. F. RAUH. Paris, Alcan. 1899. Pp. 305.

SOCIETIES AND ACADEMIES.

THE BIOLOGICAL SOCIETY OF WASHINGTON.

THE 19th anniversary meeting was held January 17th, under the auspices of the Washington Academy of Sciences, in the hall of the Columbian University, the occasion being the address of the retiring President, Dr. L. O. Howard, entitled 'Are Insects as a Class Injurious or Beneficial in their Relations with Man?' The paper was published in full in SCIENCE for February 17th.

The 301st regular meeting was held January 28th and was devoted to a consideration of the 'Great Dismal Swamp.' Dr. David White traced the geologic history of the swamp and surrounding regions, showing how successive periods of elevation and depression had resulted in the formation of a considerable area so slightly elevated above sea-level that the natural drainage is insufficient to remove the rainfall. It was stated that the present period is considered to be one of subsidence, and it was noted by later speakers that Lake Drummond is evidently increasing in size.

Mr. F. D. Gardner described the soils from a practical standpoint, with special regard to the agricultural possibilities of the land extensively reclaimed by drainage. Large deposits of peat exist, which it has not been found possible to utilize on a commercial scale. The water of the streams and drainage ditches is very strongly impregnated with the soluble products of the enormous quantities of decomposing vegetable matter, and, like the soil, has a distinctly acid reaction. This acidity of the soil may be so excessive as to interfere with its fertility, although inexhaustible quantities of plant foods are present.

Mr. Thomas H. Kearney exhibited a large series of photographs illustrating the characteristics of the flora of the swamp. The various plant-associations were enumerated and described at length, and their relative importance in the formation of humus was noted. Reference was also made to the possible effects of the acidity and generally low temperature of the water as agents likely to retard growth and to require adaptations against excessive transpiration. The woody type of vegetation predominates, there being very few herbaceous species