a knowledge of the true morphology of the lymphatic system. For example, the question of whether the lymphatics have an especial relation to the serous cavities is wholly cleared up on the basis of the lymphatic vessels being modified veins rather than modified tissue spaces. This section has two excellent pictures of lymphatic capillaries—on pages 74 and 76. They are both thoroughly characteristic and hard to reconcile with Sappey's figure of the lymphatic vessels in the skin given in the same section. In regard to the question of open and closed lymphatics our author is again dogmatic, stating that the lymphatic capillaries are invariably absolutely closed. The recent embryological studies agree that the lymphatic capillaries develop as closed ducts; this, however, does not prove that they are always closed, nor closed in all parts of the body. We may admit that openings have not been demonstrated and that lymphatic capillaries can be injected without extravasation, but how do we explain how the granules of coal pigment get from the air sacs of the lung into the lymph nodes. Experimental evidence obtained from injecting granules into the abdominal cavity is certainly against the idea that all of the granules are carried into the lymphatics by leucocytes. In other words, our histology of the lymphatic capillaries is not yet adequate to explain our physiology, and until it is it is safer not to be dogmatic on the subject of open and closed lymphatics.

In connection with the lymph nodes no one has yet given us such clear pictures as His and we can not but think that this chapter would be improved were it based on his work. A good picture of the connective tissue framework of the node would add much to the clearness of the descriptions. The comparison of lymph nodes in different animals is helpful and the chapter contains many suggestive points.

In general, the first part of the book is an excellent compilation of the facts. It gives a complete literature, but in treating of the development of our knowledge of the subject does not bring out which works have marked the important steps in advance. Though it will be a helpful book to students, it will not do for the lymphatic system what Waldeyer's critical review did for the nervous system, that is, give an even clearer picture of the subject than could be obtained from reading original literature.

The last of the book on 'Regional Anatomy' is a higher type. Though based on the work of Sappey it is not a compilation, but presents a number of new and valuable figures. The subject is treated under the following heads: (1) The lymphatics of the lower limb, (2) of the pelvis and abdomen, (3) of the thorax, (4) of the upper limb, (5) of the head and neck, and finally (6) the collecting trunks. The body is thus gone over systematically and numerous points noted where our knowledge is quite inadequate. The subject of absorption from the central nervous system is untouched. This part of the book is not only helpful to the student in giving what is already known, but will form a good starting point for further investigations.

In general the book will give any one who does not have access to the original literature on the subject, to the works of Sappey, Ranvier, His, Fleming and von Recklinhauser an excellent presentation of the subject.

Florence R. Sabin.

The Teaching of Biology in the Secondary School. By Francis E. Lloyd, A.M., and Maurice A. Bigelow, Ph.D., Professors in Teachers College, Columbia University. American Teachers Series. New York, Longmans, Green and Co. 1904. Pp. viii + 491.

Of this book it may certainly be said that it is by the two men who, of all in this country, are best fitted by their official positions and the nature of their work to write it, for the Teachers College is the one educational institution which lays equal stress upon content and upon method. There will be, I believe, no dissent from the opinion that it justifies our expectations. Its title is not precisely descriptive, since it is not one book, but two separate works by different authors devoted to the teaching of botany and zoology respectively. Yet their union here is amply

justified by practical and educational considerations, and is in this case the more fitting since there runs through them both a certain agreement in thought and treatment. Both consist of monographic chapters upon the important phases of their subjects, discussing both their educational theory and their practical applications, enriched by full bibliographies and frequent citations of opinions and authorities. The attempt to analyze the philosophical or psychological basis of the matters under discussion, quite in place in a work intended for teachers, is prominent in both, but especially in the botanical part, where, indeed, it is sometimes carried to a length not easy to follow. But in neither is fact subordinated to theory, and both are notable for their clear, positive, full discussion of the practical phases of their subjects. In reading the book one is impressed again and again by the remarkable advances that have been made of late in the spirit and method of biological teaching, and also by the great amount that has been done, through such books as this and others, for the guidance of the teacher of biology. Obviously the method of the leaders is far ahead of the general practise, and it is the task of the immediate future to bring the latter more closely into touch with the former.

Professor Lloyd's chapters deal with the value of biology in education, with nature study (which requires particular attention in these days of shallow and lying 'nature books'), with the value of botany in secondary education and with the proper content of a botanical course. The author refers to the development of the popular idea which has been so disastrous to the educational interests of this science, that, in the words of a writer of 1829, 'botany is peculiarly fitted for girls' schools, and is admirably adapted to the tastes, feelings and capacities of females'; and all of us will agree with Professor Lloyd that the subject must be made to stand, 'in some part at least, for plain, old-fashioned discipline.' There can be no doubt that it is along this line the educational salvation of the subject must be worked out. When botany and zoology aim to teach the love of nature, or the wisdom of the Creator, or a habit of observation, or anything whatsoever except a knowledge of the facts and a training in the methods of study in those sciences, they are lost. In the chapter on the various types of botanical courses the author gives his strong support to the synthetic course, that which disregards the conventional divisions of the subject and selects the most important parts of the science for educational use, a matter which will be rendered the easier in the future through the rapidly growing disregard of the same conventional boundaries by investigators. It is a question, however, whether our author is not too severe in his judgment upon the 'systematic' course, which, after all, was what the teacher made it, and which gave some, even if not the greatest, opportunity to a teacher of good spirit. Chapters on the method of thought, and upon general principles to be emphasized in this teaching (the *raison d'être* of the limitations of the chapters being not always plain), lead to the most important chapter of the book, the 'detailed discussion of the course in botany for the high school.' This discussion is more detailed, practical and generally excellent than anything heretofore attempted, a notable and new feature being the frequent references to where scientific studies of the commonly used materials may be found. Sections upon the laboratory and its equipment and materials, and upon botanical books complete this valuable work.

Professor Bigelow's part is somewhat more direct and simple in style than his colleague's, chiefly because of a lesser attempt at method analysis. His chapters deal with the educational value, the subject-matter, the laboratory method in the teaching of zoology, and the relation of the animal nature study and human physiology of the elementary school to high school zoology. The author does not minimize, but faces squarely, the practical difficulties of teaching zoology in the high school, which are undoubtedly considerable, and it is interesting to observe that he, like his colleague, argues for more intensity of work in the subject as essential to the realization of its full value. Other chapters deal with the elementary course, the selection of types for study, an outline for an elementary course, zoological

materials, methods, equipment and zoological books, these latter chapters having a direct positive practical character just such as the inquiring teacher must need. In the discussion of the relation of school courses in zoology to college entrance credits in that subject the author argues for an entrance option in zoology, which indeed is wise, since under educational conditions in this country it is well-nigh impossible to secure proper time and attention to a subject in the high school unless it can be counted for college entrance. The author makes the welcome announcement that such an option is being formulated by an authoritative committee, and is to be published, probably early in 1905. The final chapter deals with the teaching of human physiology in the high school, which the author thinks should be combined with the instruction in zoology. It is interesting to observe the temperate but firm stand the author takes upon a subject which scientific men can hardly be expected to speak of with patience —the 'scientific temperance' instruction in schools.

The limits of space forbid more than this inadequate account of the parts of this very sane, modern, scientific and quite admirable book. It is indispensable to the teacher of biology, and it will exert great influence upon future biological teaching. W. F. Ganong.

Outlines of Physiological Chemistry. By S. P. Beebe, Ph.D., and B. H. Buxton, M.D. New York, The Macmillan Company. 1904. $1.50.

The title of this work does not correctly describe its contents or define its scope. It contains little physiological chemistry in the ordinary sense of the term. Yet it may prove a very useful handbook as an outline of chemical theories for the use of physiological chemists.

There are many laboratory guides in physiological chemistry now available. These works, however, have in most cases given little space to the theoretical side of the subject. In order, therefore, to repair this deficiency the student must consult the hand-books of physical chemistry and of organic chemistry. In doing so he is apt to overlook those matters which especially concern him, because of the great mass of unfamiliar ideas with which he meets, and because the writers of such works had not his special needs in view. The work before us aims to meet these special needs. It presents in convenient form so much of chemical theory as is essential to the comprehension of the subject matter and present problems of physiological chemistry.

The first chapter (twenty pages) is devoted to that part of physical chemistry which is of especial importance in physiological chemistry—the theory of solution. It explains briefly and clearly the significance of dissociation, chemical equilibrium, osmotic pressure, why reactions take place, and calculation of chemical formulæ. The succeeding four chapters are devoted to organic chemistry. Structural formulæ of the paraffins, and of the nitrogen and cyclical compounds, are given quite fully, and their significance clearly set forth. In chapter VI. sixty pages are devoted to the proteids, their chemical character, in the light of the preceding chapters, being dwelt upon rather than their reactions as in a laboratory guide. Chapter VII., on enzymes, gives an account of this most important subject, which is not so well generalized as is the treatment of the subject matter of earlier chapters. It even encroaches on the domain of the laboratory guide in giving an enzymatic test for the detection of tyrosin. The eighth and final chapter presents diagrams of Ehrlich's side chain theory, and explains their significance for the phenomena of disease and immunity.

The usefulness of this book would have been enhanced by giving at the end of each chapter a list of the works to which the reader might refer for more detailed information.

The typographical work, which in the presentation of diagrams and structural formulæ is of prime importance, is excellent throughout.

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Scientific Journals and Articles.

The November Number of the *Journal of Nervous and Mental Disease* opens with an