SCIENTIFIC BOOKS

The Embryology of the Pig. By BRADLEY M. PATTEN. 323 pp., with 372 figures and a colored plate. P. Blakiston's Sons & Co., Phila., Pa. Price, $3.50.

BRADLEY PATTEN has again scored a marked success in this little book. The "Embryology of the Pig" will be ranked among the best of our text-books. With his former "Embryology of the Chick," Dr. Patten's accounts of these chapters of embryology make the story of development live for the student, while leading him, in a most interesting manner, to examine the facts for himself in the laboratory.

The reviewer would compare these up-to-date little texts of vertebrate embryology, for their combination of stimulating interest and vision of the meaning of processes, together with their practical treatment, to Balfour's "Elements" in the 80's, which is high praise.

It has been possible for Patten to make a great advance in two respects. First, the influence of a great growth of the literature of the subject is felt all through the new work; and secondly, Dr. Patten has devoted considerable study to the rich collections of the Carnegie Embryological Laboratory in Baltimore, where is found a great variety of specimens, models and illustrations of stages of the pig, paralleling one of the most extensive set of human material in the world. This has assured breadth of view and makes the statements of the author authoritative. It warrants his personal opinions where controversy has confused topics.

Glancing at the special characteristics of the book, we find certain interesting comparisons and supplementary features to those of the "Embryology of the Chick." The later text is a valuable extension of the earlier, as well as a supplement. Thus, much more space is given here to the history of germ-cells, maturation, the sexual cycle and fertilization. This is in accord with the special availability of such material for the mammal, as well as because of the large amount of published work on these stages of mammals. The chapter on cleavage, formation of the germ-layers and the development of the blastocyst is another most useful supplement to what is given for the chick. Such a definite and complete account of these stages of the pig has been long needed for our text-books. The incorporation of results from the Carnegie collection has done much for this chapter; and for the next on relations of embryo in uterus and membranes; as well as in the review of stages of the development of the body-form and primary systems. Here we are given, for the first time, ages of the chief stages. Something of the kind may have been given before, here and there, but the full series of pictures and timed data for the pig now furnished is consecutive and definite and gives a most convenient basis for comparisons with other mammals and man.

Chapter VII presents a rather full examination of early pig embryos, which are comparable to the four-day stage of the chick, well studied in the former text-book, and already familiar to the student. It is easy to turn from these stages of the pig to the study of human embryos, since models and well-illustrated articles abound for the human from this period onward.

The first seven chapters, or 137 pages, have carried the development well beyond the topics taken up for the chick; relatively early stages. Here is a thoroughly analyzed fundamental stage of a mammal, reminding one of Minot's 9 mm to 12 mm pigs, and furnishing an excellent basis for the comparisons and correlations which the author makes with the chick.

The rest of the book, 160 pages, is devoted to chapters which cover most of the features of later development.

The author, however, decides to select and emphasize certain topics, even at the expense of others which will be slighted. He feels that some subjects can be taken up in preference to others because of ease of technique, or special interest, while others would prove too difficult to warrant the time required. So although he covers the most important aspects of most systems of organs, some which may be regarded of equal value are not considered at all. This is announced as a definite plan, and the introduction should be read not only for the explanation, but also for other opinions and suggestions.

Some teachers will object to the omission of the lymphatic system, the later history of the musculature, skull and jaw development, sense-organ stages, and other special topics. The absence of such sections does indeed remove the book from the category of the ordinary systematic, all-around symmetrical and complete text-books. It must be remembered, however, that this little book is not ordinary, but a departure. We have already quite a series of the more complete, comparative and systematic type to which the teacher may refer for what is omitted.

The chapter on the nervous system groups the stages of development interestingly around a functional discussion and takes up items basal to later study of neuro anatomy. It might be well to add a few more paragraphs on the developmental changes in relations through which the basal ganglia of the third ventricle and the lateral ventricles are brought together, with the resultant adult shape of the lateral ventricle, and the defining of the Insula. A couple of figures would help here, showing these relations and the choroid plexus of the brain opened and viewed from above in pig embryos of about 40 mm.

The digestive and respiratory systems and the

glands derived from the pharyngeal walls are passed over rather lightly in Chapter IX. There is also absence of discussion of the later history of the mesenteries. Chapter X, however, is on the contrary a rather full and complete treatment of changes in the development of the kidneys and reproductive system and includes an excellent series of figures.

The circulatory system is well discussed and looks very modern with many of Heuser's and Butler's splendid figures, as well as new ones by the author, especially on the heart. The reviewer regrets the omission of the lymphatic system, since the chief stages in vessels and glands can be readily demonstrated in pig embryos and because American workers have contributed valuable papers and illustrations in this field, and important problems still lie before us here. The same might be said for the vessels of brain, face and appendages.

Chapter XII is devoted to the development of bones and of the skeleton. It is presented as a type of detailed study of one system, through histogenetic and macroscopic steps, studied by a variety of methods which give a good idea of how such work is done, as well as the results. The teeth are similarly studied in considerable detail, and many excellent new pictures are introduced in both of these chapters. Another good series is a set of pictures of the development of the face and palate in the pig.

The volume is concluded with an excellent bibliography, where the most important papers, especially modern studies, which deal with the stages considered in each chapter, are listed. References are also given to subjects slighted in the text.

Finally, the reviewer would conclude that the author of this little book has achieved a noteworthy success. It is a stimulating and exceptional text, and the publishers have certainly done their part thoroughly well. They have permitted a generous number of new illustrations, reproduced in excellent manner. These pictures not only parallel the text, but add much information. The careful artistic work of the author and his assistant is of course at the bottom of the success of the illustrations.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A RAPID METHOD FOR MECHANICAL ANALYSIS OF SOILS

As our knowledge and understanding of soils becomes greater, clearer and more comprehensive, the more we are coming to the conclusion that practically all the physical as well as the physical-chemical reactivities or relationships of soils reside almost entirely in the colloidal portion of the soil. Such properties or phenomena, for instance, as absorption of chemical elements, base exchange, retainability of plant food constituents, hygroscopic water, adsorption-absorption of water, water-holding capacity, capillary movement of water, evaporation of water, unfree water, wilting coefficient of plants, cohesive and adhesive properties of soils, shrinkage of soils, easiness of tillage operations, etc., are controlled mainly, if not entirely, by the colloidal portion contained in the soil. A study of soils, therefore, is really becoming to be a study of the colloidal portion of the soil.

This rather radically changed view of soils has been mainly brought about in the last few years by the discovery that the colloidal content of soils is infinitely greater than we used to think. The old idea, which was handed down mainly from the work of Schloessing, maintained that the amount of colloids in soils rarely exceeded 1.5 per cent. The newer methods of measuring the amount of colloids in soils, however, such as the water vapor adsorption, heat of wetting, base exchange and hydrometer method, show that the colloidal content of average soils is very high; in the sandy loams it may be as high as 20 per cent., loams 30 per cent., clay loams 50 per cent. and clay 75 per cent.

The old notion also maintained that whatever colloidal matter there was in the soils, it existed as a coating around the soil grains. It has recently been shown by the writer, however, that such is not entirely the case. The colloids exist in the soils both as a coating and as an independent component; which one of these forms predominates depends upon the amount of colloids present and upon the type of soil. In many soils, however, the largest amount of colloids exist as an independent component.

A great stride has recently been made in the study of colloids by the discovery of a method for determining the colloidal content of soils very rapidly as well as accurately. By the water-vapor adsorption, base exchange and heat of wetting methods, especially the first two, it would take more than a week to make a determination of the colloidal content of a soil. By the new method, which is the hydrometer method, it takes only about fifteen minutes to make a determination. The hydrometer method is able to accomplish this, by a rather remarkable factor or relationship that has been discovered to exist between the percentage of colloids as indicated by the heat of wetting method and the percentage of material that stays in suspension in a liter of water at the end of fifteen minutes, based upon the amount of sample taken. 'This relationship may appear to be empirical and incredible, but it has a fundamental relationship behind it, and the results it gives on the