ings, LVIII., No. 347, page viii, Forsyth says:

> I have heard Cayley describe how Sylvester and he walked round the courts of Lincoln's Inn discussing the theory of invariants and covariants.

Sylvester told me that the only time he ever saw the placid Cayley beside himself was when in the midst of a discussion on the theory of forms a fat bundle of legal papers was brought in to him. Cayley dashed the plethoric bundle on the floor in an access of chagrin.

Thus London was the birthplace of this unique friendship, not the Cambridge which, before ever the gentle Cayley came, had sent out Sylvester without even a degree.

George Bruce Halsted

Greeley, Colo.

SCIENTIFIC BOOKS

A Laboratory and Text-book of Embryology. By Charles W. Prentiss, A.M., Ph.D., Professor of Microscopic Anatomy in the Northwestern University Medical School, Chicago. Octavo of 400 pages with 368 illustrations, many of them in colors. Philadelphia and London, W. B. Saunders Company.

In this new manual of embryology an effort has been made, as stated in the preface, "to combine brief descriptions of the vertebrate embryos which are studied in the laboratory with an account of human embryology adapted especially to the medical student."

The subject-matter of the book, following an introduction, is divided into twelve chapters. The introduction presents the scope of human embryology, emphasizes its importance to the medical student and includes a résumé of the history of the science and a brief statement of the principles of growth and differentiation of the embryo. After a discussion of the methods of study, in which the dissection of embryos as a class-room practise is strongly recommended, this section of the book is concluded by a short list of carefully selected titles of journals and other works of reference dealing with embryology. Chapter I. is devoted mainly to a review of those fundamental facts which are usually learned by the student in connection with the biological studies of his premedical preparation. The description of the human ovum, which is too brief, and the good account of the morphology and developmental cycle of the human spermatozoon should have formed part of one of the later chapters dealing specially with the human embryo. The reviews of the subjects of cell division, maturation, fertilization and the questions concerning heredity, sex determination and twinning may be amplified, if the student so desires, by consulting a number of original sources and well-known books, to which he is referred by citations in the text. In Chapter II. the topics of segmentation and the origin of the germ layers are treated from a comparative embryological standpoint, amphioxus, lizard, chick, bat and rabbit serving as representative types. The study of chick embryos is the subject of the third chapter. Here the text and figures are adapted to work in the laboratory. Directions are given for the preparation of specimens for study; descriptions of whole embryos and sections in three stages of development are presented. Descriptive embryology is resumed in Chapter IV., which discusses the subjects "fetal membranes and early human embryos." Here again the comparative method of exposition is employed with good effect. The main feature of Chapter V., which deals with the structure of small embryos of pig, is the full and careful description of the anatomy of the 10–12 mm. embryo as revealed by study of the surface form, dissections and sections. As this part is adapted primarily for use in the laboratory, the explanation given in the next chapter of the technical methods involved in the preparation of specimens, might better have been included in the present one. The technique of the dissection of embryos evolved in the Harvard Medical School for class practise is described in detail. In the same chapter (VI.) this method is advocated in the study of the face, palate, tongue, salivary glands and teeth. The remaining five chapters (VII.–XII.), comprising more than half of the book, are an account of the development of the organs and organic systems which the student may consult in connection with the more strictly laboratory work represented by

preceding chapters. The subject-matter is divided as follows: Chapter VII., entodermal canal; Chapter VIII., urogenital system; Chapter IX., vascular system; Chapter X., histogenesis, skin and muscles; Chapter XI., central nervous system; Chapter XII., peripheral nervous system. Ductless glands are described in Chapters VII., IX., XI.

It will be seen from this statement of the contents of the book that the subject-matter of embryology is broadly represented. The treatment of topics is in general proportioned to their importance in the understanding of embryology, as means for scientific training and practical application. Descriptions are in the main concise and clear. If we should classify the book on the basis of material used in the text and figures it would be a "mammalian embryology"; yet in order to meet the requirements of the medical student of to-day, examples of developmental processes from lower forms are necessarily brought forward. The directions for class-room dissection is a most commendable addition to a laboratory book on embryology since it will encourage the adoption of this valuable method. While the subject of histogenesis is extensively discussed in text-books of histology it has not had a conspicuous place in the works on embryology which are in common use among medical students; Prentiss's book is an exception to this case and the step taken in devoting a section to the phenomena of differentiation of cells and tissues will be appreciated. Another feature of this work for which the instructor will be grateful is the large number of references to original papers aptly dropped into the text. Incidentally, a review of the names referred to brings out the fact that American embryologists have taken no small part in contributing to the science of development. The book is amply illustrated by figures for the most part well chosen. Many original drawings are included, but the larger number comprises very properly figures taken from original papers. The color work, as a whole, is unusually good.

Mechanical errors are not as common as might be expected in a first edition: a few may be indicated. On page 87, "convexity" is printed evidently for "concavity"; at the bottom of page 234, "scroti" should be italicized to conform with the type of "septum"; the adjective for "tear" is spelled in some places "lachrymal," in others, "lacrymal." The presswork is excellent throughout and the choice of different type for the most part effective and in good taste. One exception might be pointed out: in the selection of type, the use of fine print in Chapter VI. in the description of sections gives the impression of secondary importance to this subject which is unfortunate. Whereas the attention to subjects is in general carefully proportioned, as already stated, there are some instances of inadequate treatment. The discussion of the spleen is too brief and the same is true regarding the origin of leucocytes. Almost nothing is to be found in the book concerning the development of the skeleton. Works on anatomy usually include accounts of the ossification but not of the early developmental processes. Surely a text-book of embryology should present the essential facts of the blastemal and chondrogenous stages of the skeleton. A chapter, or part of a chapter, might have been given over to a consideration of growth and postnatal development in order to emphasize the importance of these subjects which are represented by statements throughout the book in connection with the description of organs. Likewise the subject of histogenesis is not, from a pedagogical standpoint, presented with best effect coupled as it is in the same chapter with subjects quite foreign to it.

If we examine the author's method of treatment of the whole subject of embryology in presenting it to medical students, it is evident that his book fits the peculiar needs of the present time and to some degree points the ways in which the science is growing. Throughout, it inculcates the idea of the incompleteness of our knowledge of embryology and the need of working to gain fuller understanding of developmental phenomena. The text is descriptive of structure primarily, but also largely of the processes of development. More space could profitably have been given to phys-

iological aspects of organs. For example, the questions on the functions of the corpus luteum in the light of many researches, should have generous treatment in our text-books. The same can be said for the results of research in, and for theories on the mechanics of development, experimental embryology and of the field of heredity which is of highest interest to the physician. While these methods and new territories will receive more attention in the future, Prentiss's book probably deals sufficiently with them at this time.

R. J. T.

CONCERNING THE SPECIES AMŒBA PROTEUS

While carrying on some experimental work during the past several years with the larger fresh-water amebas, I became convinced of the existence of considerable confusion concerning the description of *Amœba proteus,* generally regarded as the commonest species of the larger amebas occurring in our fresh waters.

In order to be sure of the exact nature of the organisms I was working on, which is of course essential in experimental work, I decided to look carefully into the matter of species description with the hope of removing, if possible, the confusion I was sure existed here. This work was completed some months ago, but on account of disturbances incident to the great war, the manuscript and drawings reporting the results of this work have apparently missed their intended destination—at any rate their present whereabouts are unknown. Since it is uncertain when the manuscript and drawings will be found again, I have thought that the publication at this time of a brief summary of my findings would be welcomed by other investigators of the larger amebas, who also must have felt the need of a reexamination of the specific characters of *A. proteus.*

Leidy in 1879 described in detail several species of amebas and to one of these species he applied the name *Amœba proteus,* resurrecting Pallas's (1766) old specific name which had been dropped through the influence of Ehrenberg. Leidy described the nucleus of *proteus* as "a thick *discoid* body, with the broad surfaces somewhat convex, flat, or slightly depressed, and the border rounded."[1] Most of his figures show the nucleus a concave discoid.

Penard described *Amœba proteus* as possessing "always an *ovoidal* nucleus."[2]

Now a discoid differs fundamentally from an ovoid. A discoid is a solid generated by revolving a semi-ellipse around its short diameter as an axis, while an ovoid is a solid generated by revolving a semi-ellipse around its long diameter.

Penard's *proteus* is not at all the same species as Leidy's *proteus.*

The question therefore is, Is Leidy's description adequate? It is adequate. All his figures show discoid nuclei, as may be seen by inspection or by reading the descriptions, with one possible exception, perhaps two: Figs. 3 and 4, Plate II. In these two figures the round or polar view of the nuclei is shown. Although these two figures resemble Penard's *proteus* more closely than they resemble Leidy's typical *proteus,* there is not sufficient evidence to enable one to be quite sure of their correct species reference. There can be no question then but that Leidy considered the *proteus* to have typically a discoid nucleus.

Penard described an *A. nitida* with a much folded or crushed-in nucleus and says[3] that Leidy's drawing of the *proteus* nucleus (Fig. 9, Plate II.) "represents so characteristically" the folded nucleus of his *nitida.* But Penard misinterpreted Leidy's figure entirely. Leidy's figure does not show a folded nucleus, but one with a smooth surface, a discoid with slightly concave sides. Moreover, the folded nucleus of Penard's *nitida* I have found represents an old-age stage of the smooth discoid nucleus of Leidy's *proteus.* The ectoplasmic ridges and grooves described by Penard as canals in the endoplasm of *nitida* were also observed by Leidy in *proteus.* Penard's *nitida* represents therefore old (or abnormally large) individ-

[1] "Rhizopods of North America," 1879, p. 41.
[2] "Faune Rhizopodique," 1902, p. 58.
[3] *Loc. cit.,* p. 61.