It is quite easy to recognise certain evident proofs of this fact, such as the drawing along of a model of the boat of the sun in a procession to typify the sun's course in heaven, or the drawing of the boat of the god Seker round the sanctuary at dawn in imitation of the sun's motion, but many other equally evident proofs are not so easily explained. We know tolerably well what ceremonies were performed, but we know not the why and the wherefore. In making inquiries into such difficult matters it is important to remember that the knowledge of astronomy possessed by the Egyptians has been greatly overrated, just as their knowledge of mathematics has been, from time immemorial, over-estimated; they probably knew more of both subjects than the rest of the world in the early period of their history, but the limits of their exact knowledge were reached tolerably soon.

No better proof of this statement can be found than in the excellent essay of Sir Norman Lockyer, entitled the "Dawn of Astronomy," a work which has not received the attention which it deserves from certain Egyptologists. It is, however, unnecessary to repeat here the deductions which he has carefully drawn from carefully ascertained facts. Two of the most important results of his work are the certainty with which we may now accept the conclusions that astronomical religion in Egypt dates from a period which may be measured by thousands of years, and the discovery of the principles which guided the Egyptians in planning the sites of their temples from Memphis to the Sudân.

Passing from general considerations such as these we come to Mr. St. Clair's book on "Creation Records discovered in Egypt," wherein we have the first fruits of fifteen years' systematic study of mythology, and an attempt to construct methodically the mythology of the Egyptians. Mr. St. Clair claims, and claims rightly, that it was impossible to understand Egypt's religion and mythology until the various documents which the Egyptians themselves wrote on these subjects had been studied and translated; but the question which naturally arises is, Have enough of these documents been studied, and have they been correctly interpreted? Mr. St. Clair does not pretend that his work is final, and therein is much to be commended; but beyond doubt it shows great industry, and a catholic use of authorities and writers which is not commonly to be found in the book of a man who is attempting to promulgate a theory, however sound or however learned. He has read, apparently, everything which he thought would bear upon his subject, and has fitted a number of facts together with considerable ingenuity; more than this, he states his conclusions and deductions with modesty. Of course many of his conclusions will be combated with vigour, and many will be rejected off-hand; still the whole book is suggestive, and much of it will be accepted by students of astro-theology. The great storehouse from which Mr. St. Clair has drawn is the "Book of the Dead," and it will astonish many to see what an extraordinary collection of facts he has deduced from it; it is, however, a pity that he did not make more use of the early version of the work such as we find on the coffins of Amamu and the Mentu-heteps.

After a table of the Egyptian dynasties, and chapters on the Calendar and its relation to Egyptian Myths, we have a series of essays on the gods, the Nile, the reign of Rā, celestial cities, &c.; these are followed by another series of short chapters on the Creation, Deluge, Confusion of Tongues, and the doctrine of a future life, which many readers will think the most interesting part of the book.

Certain omissions are in places noticeable. Thus in the section on the Creation (p. 420 f.) we notice no account of the story of the Creation as told in the papyrus of Nesi-Amsu; the belief in the necessity of eating the scarabæus in order to obtain children, which exists to this day in the Sudân, ought to have been discussed. It is interesting to point out also that as Thoth was held to be a healer of diseases, so also was the ape, which represented him and was sacred to him, and that this idea of the ape's powers is extant in Egypt to the present day. Barren women have been seen to pass their bodies over Egyptian statues of apes, and to pray at the same time that the disease of barrenness from which they were suffering might be done away by these means; Mr. St. Clair might have instanced several survivals of this nature. On p. 96, for *tet* read *khat*; and to the five constituent parts of the body and soul there enumerated add *ren*, "name"; *khu*, "intelligence"; *sekhem*, "form"; and *ḥb*, "heart."

PSYCHOLOGICAL SCIENCE.

Psychologie als Erfahrungswissenschaft. By H. Cornelius. Pp. v + 445. (Leipzig: B. G. Teubner, 1897.)

Primer of Psychology. By E. B. Titchener. Pp. ix + 314. (London: Macmillan and Co., Ltd. New York: The Macmillan Company, 1898.)

Outlines of Descriptive Psychology. By G. T. Ladd. Pp. xi + 428. (London: Longmans, Green, and Co., 1898.)

Versuch einer Darstellung der Empfindungen. By W. Przibram. Pp. 28, with five plates. (Vienna: Alfred Hölder, 1898.)

THE marked difference in contents and tone of the four works before us is a striking proof of the extent and variety of the topics embraced in the modern science of psychology. By far the most original and important of the four is the work of H. Cornelius, which treats the problems of psychology, in the main, from the epistemological point of view, with unusual carefulness of statement, and still more unusual lucidity of style. The author is clearly familiar with the recent literature of the subject, English and French as well as German; but the writers whose influence is most clearly traceable in his treatment of his material are both Germans, Avenarius and Mach. The author's attitude towards the main problems of psychological science may be briefly summarised as follows: — Psychology, as the science of "psychical facts," is the only possible basis of a sound general philosophy. Its special task is, by describing those psychical facts in the simplest possible terms, to explain the growth and meaning of the more or less artificial and complicated hypotheses which we frame to ourselves in every-day life, and in scientific reflection, about the nature of the world. In

pursuance of this task Mr. Cornelius first devotes a chapter to the question, "What are the ultimate elements into which mental processes can be resolved by analysis?" and then proceeds to trace in detail the formation of derivative psychical products of ever-increasing complexity. In this way he passes in review, one after another, all the most important concepts of physics, æsthetics and ethics. The most noticeable feature of the chapter on the elementary processes is the admission of "ideas" by the side of sensations as a distinct class of primitive mental facts. It is significant that the two best "Psychologies" of recent years, those of Stout and Ebbinghaus, agree in this rejection of the old theory that an "idea" is merely a weaker "impression." Among the many admirable things in Mr. Cornelius' work, which space will not allow me to mention in detail, specially admirable are the careful and elaborate account in Chapter ii. of the growth and meaning of the concept of objective existence and the discussion of the concept of "truth" in Chapter vi. Mr. Cornelius' philosophical position is, as becomes a follower of Avenarius, one of "naïve realism"; that is, he contents himself with explaining how the plain man's ordinary notions of objective existence, of things and of causes, naturally arise from the workings of the psychological mechanism; and he abstains from any metaphysical theories as to the agreement or disagreement of these notions with "reality." Perhaps it may be necessary to remark, for the benefit of any one to whom the term is new, that "naïve realism" is, in fact, almost the same doctrine as the "idealism" of Berkeley's "Three Dialogues."

Physiological psychology falls outside the scope of Mr. Cornelius' treatise, and is explicitly relegated in his introduction to its proper place as a useful appendage to the direct investigation of mental phenomena; he has, however, some ingenious remarks on the "ambiguous" character of the relation between stimulus and sensation which challenge the validity of current methods of formulating the results gained by the "method of just perceptible alterations." His contention, which certainly seems reasonable, is that as the position of the "Unterschiedschwelle" in any series of experiments depends largely upon the direction in which the changes of stimulus have been taking place, it is not permissible to assign to it a value derived by taking the arithmetical mean of the values obtained by varying the stimulus in both directions.

Prof. Titchener's "Primer" is a brief and brightly-written account of the main facts of psychology as seen by a disciple of Wundt, and is better adapted than any work which has as yet come into the present reviewer's hands to serve as a first book for the beginners for whom it is designed. Two most excellent features of the little book, from this point of view, are the price list of psychological apparatus, and the often singularly ingenious problems and exercises appended to the various chapters for home or class work. As was to be expected from Prof. Titchener, the standpoint adopted throughout is that of the new "experimental" school. Here and there one may notice little points of detail, which it is to be hoped the author will improve in a second edition. For instance, the statement on p. 40, that "colours" are "really mixtures of pure colour and brightness" seems to involve a confusion between colour as directly perceived (psychological colour) and the physical and physiological conditions of colour perception. Again, the treatment of "Weber's law," on p. 50, is so brief and meagre as to be rather harmful than helpful to a beginner. There should surely have been some attempt to explain to the beginner what is meant by saying that a certain sensation of pressure, $2P$, is double another sensation P. In asserting, with rather more confidence than the ascertained facts seem to warrant, the existence of special "pain-spots" in the skin, as well as in extending the conception of association to cover virtually the whole ground of mental synthesis, Prof. Titchener is presumably following the lead of his master's "Physiologische Psychologie." There is also, perhaps, an excess of loyalty in the adoption of the Wundtian theory about the functions of the frontal lobes (p. 90–91). These however are, after all, very minor blemishes in a work which is on the whole admirably adapted for interesting the young student in a difficult and to some extent repellent subject. It should perhaps be mentioned that the present work is quite independent of the author's "Outlines of Psychology."

Prof. Ladd's "Outlines of Descriptive Psychology" covers much the same ground as Prof. Titchener's little book, and is addressed to the same class of readers. As compared with Prof. Titchener, Prof. Ladd can hardly be recommended to the beginner as a good master. His style is difficult and slightly verbose, while the comparative paucity of experimental detail and the constant reiteration of vague qualifying phrases, like "as it were," "so to say," suggest that he does not always feel quite sure of his ground. The fact is there is far too much for the beginner in Prof. Ladd's "Outlines." There is a good deal of implied metaphysics which can only puzzle a young student, and even apart from the metaphysics, which are probably unconscious, some of the more complicated psychological problems are dealt with in a way that is at once too difficult for the beginner, and too short and easy for the advanced psychologist. It would for instance, have perhaps been better in a work designed as a first book for beginners, to say nothing about the controversy between "nativist" and "empiricist" views of space-perception; but, if the matter was to be introduced at all, a view that has the support of such authorities as Stumpf and James, should not have been dismissed with the curt reflection, "this view is . . . obviously false." Prof. Ladd is perhaps at his best in one or two of the later and more specially philosophical chapters, notably in the last of all, which contains, besides a good summary of the ascertained facts about brain localisation—in which, however, Flechsig is rather disrespectfully treated—a really excellent defence of the popular view of the relation of mind to body.

The posthumously published little pamphlet of W. Przibram is devoted to an attempt to construct a mathematical theory of sensation by means of the symbol $i(=\sqrt{-1})$ and its successive powers. Of the value of Mr. Przibram's tract as a contribution to mathematics, I am hardly competent to judge; the singular arbitrariness of its psychological assumptions seems to me to deprive it of any serious significance for the psychologist.

The values of the successive powers of ι of course recur in sets of four; consequently the author boldly affirms that there are only four classes of sensation, and that sensations of temperature are identical in kind with sensations of pressure, and smells with tastes. Pain and pleasure (*Wollust*) appear as opposite special qualities of touch, and are equated with the taste pair bitter-sweet, and the sound pair $e - b$). So again the antithesis red-green is said to correspond to cold-hot and $c - g$.

It is hard to believe that a mathematical theory which involves these and numerous other equally unmeaning assertions can be turned to any serious account by psychologists. A. E. TAYLOR.

OUR BOOK SHELF.

Elementary Practical Zoology. By Frank E. Beddard, M.A. (Oxon.), F.R.S. Pp. vi + 210; with 93 illustrations. (London: Longmans, Green and Co., 1898.)

THIS little book is written as a guide to the elementary zoology required by the Science and Art Department. There already exists at least one work designed for this special purpose, and several others more or less adapted for these examinations. Most of these have been written by men who though teaching zoology can hardly claim to be specialists in this subject; consequently, on coming across a book written by such a well-known zoologist as Mr. Beddard, one naturally expects that the work will be something out of the common. We are afraid that any one taking up this book with such expectations will be disappointed; for although this book may be better than those already in existence, we do not consider that Mr. Beddard has done either himself or the subject justice in it, the book having the appearance of being turned out in a hurry and without due care.

In spite of Mr. Beddard's remark we still believe in Huxley's method of working from the known to the unknown, and should rather have seen the book commence with the frog than with the amœba.

One of the most disappointing portions of this book is the chapter dealing with the earthworm. Mr. Beddard, as is well known, is perhaps our greatest authority on the Oligochæta, and one consequently expects that this chapter would be very superior; but even here we find evidence of want of care, the very illustrations being bad. The first one (Fig. 9), stated to be a side view of the worm, is really a latero-ventral view, and what the row of setæ on the left margin of the figure are is difficult to imagine; they do not tally with the description, nor do they exist in any of our common earthworms. Figs. 12 and 13, too, are curious combinations of the anatomical characters seen in *Lumbricus* and *Allolobophora*, two worms that have been so long confused in the practical text-books; but the author does not state that they are combined figures, and the student will look in vain for the origin of the lateral œsophageal vessel on the twelfth segment, or for six "hearts" in a worm with three pairs of calciferous glands.

So throughout the book we find this lack of care in the preparations of the illustrations, which latter should be of the greatest importance in a practical text-book, and especially in one in which the author frequently states that a description of a given set of organs is unnecessary as the illustration will explain the facts.

Some of the figures are combinations from several published by well-known teachers, and during the process of combination they have suffered considerably; so much so, that the originators will hardly care to see their names attached to them. In the diagram of the vascular system of the frog, after Howes, the *anterior abdominal* is represented as entering the liver quite independent of the *hepatic portal system*, and the latter is indicated in part as joining *directly* with the inferior *vena cava*.

We have yet to learn that the teeth on the radula of the snail are calcified, and that the rabbit has only one deciduous premolar on either side of the lower jaw.

We have only drawn attention to a few of the errors which occur in this work, and we cannot congratulate Mr. Beddard on its production. In our opinion the more elementary a book is the more correct should be its facts, and the greater should be the care expended on it.

M. F. W.

Elementary Conics. By W. H. Besant, Sc.D., F.R.S. Pp. 176. (London: George Bell and Sons, 1898.)

Examples in Analytical Conics for Beginners. By W. M. Baker, M.A. Pp. 87. (London: George Bell and Sons, 1898.)

OF these two volumes of the "Cambridge Mathematical Series," Dr. Besant's book is practically a reprint of the first eight chapters of his "Conic Sections treated Geometrically," which has for so many years held its ground as a favourite text-book among teachers. "Geometrical Conics" seems to be rather less "the fashion" now than it was formerly, and we hope that the present issue, containing all the more important propositions in a small compass, will encourage students in looking up geometrical proofs instead of trusting too exclusively to the often cumbrous and ill-understood methods of coordinate geometry.

Mr. Baker's collection of examples, though intended primarily for the use of Sandhurst and Woolwich candidates, will be welcomed by University students as well. Most beginners in coordinate geometry find the want of a thorough drilling in simple examples which are straightforward applications of book-work, before they can fully grasp the significance of the principles involved. Such exercises this book is intended to supply; but perhaps the most useful feature is the set of questions on "book-work," as these cannot usually be found in any text-book. G. H. B.

Dobbie's Horticultural Handbooks. Edited by William Cuthbertson. *Pansies, Violas, and Violets.* By Charles Jordan, John Ballantyne, Jessie M. Burnie, William Cuthbertson. Pp. 102. (London: Macmillan and Co., Ltd., 1898.)

TO all who grow for pleasure or profit the delightful flowers treated of in the book under review, the present work is to be recommended. In the space of about a hundred pages as much information regarding the evolution of the various varieties of the flowers, their botany, the methods of growing for the garden or for exhibition is given as is likely to be necessary for most readers. And the sentimental side is not overlooked, for some thirteen pages are devoted to the poetry of the subject, short extracts from the writings of various poets being gathered together in praise of the flowers under consideration. The work is illustrated by several very clear wood-engravings.

The Mechanical Engineer's Handy Office Companion. By Robert Edwards. Pp. viii + 70. (London: Crosby Lockwood and Son, 1898.)

THIS small book is what it professes to be, viz. a "handy office companion," giving, as it does, in a succinct form a variety of information likely to be required by mechanical engineers in their every-day office work. At the end of the volume appears a somewhat invidious list of books on mechanical engineering, and allied subjects, which the author recommends to his readers. We miss from the list the titles of very many books which we should have thought merited inclusion as much as several to which attention is called.