which they call forth in his class. The figures of the book are large and clear: in one or two of the plates so much has been attempted that they appear, at first sight, confused; but this is a slight blemish in a book worthy, in other respects, of all commendation. The book is well fitted, in the language of the author in his preface, to "prepare the student for the work of subsequent daily life by training the observing and reasoning faculties."

PACKARD'S BRIEFER ZOÖLOGY.

Zoölogy. By A. S. PACKARD, jun. New York, *Holt*, 1883. 5+334 p., illustr. 16°.

THE Zoölogy of the same series as the preceding is also an abridgment of and introductory to the larger text-book by the same author. Of the 315 pages of the text, only 130 are devoted to invertebrates: of the 180 pages devoted to vertebrates, many are occupied by large and very ornamental but hardly useful pictures. Of about 300 cuts, 90 are devoted to birds and mammals, and 40 to fish: of these a few are anatomical, the rest illustrations. The removal of many of these cuts would leave room for more print, without affecting the attractiveness of the book. The book is intended for young pupils, and yields to the common prejudice that birds and mammals are most interesting to this class. Yet precisely these animals come least within their reach, and their study of birds especially involves far more memorizing than observation on the part of most young pupils. These same pupils, in one afternoon excursion, could collect scores of insects, in which Professor Packard, as his other books show, could easily interest them. But to insects proper only 16 pages are devoted. Here a few pages of tables for determining the families, at least with one or two of the most common and familiar species as examples under each, would encourage the young student to new search and observation.

Of most of the lower types and classes the young student sees generally only one or two specimens, if any. Here clear, sharp, and exact definitions are needed to enable him to distinguish between essential and non-essential characters. These we miss; and here, as under certain types in the larger text-book, the student becomes bewildered in the attempt to burden his memory with a mass of, to him, equally important data. This is especially noticeable in the treatment of the difficult type of the Coelenterata, but more or less marked elsewhere. The points of affinity and difference between the succeeding types and the structural characteristics which form the basis of classification in the subdivision of those types are not clearly or sharply stated. There are no grand outlines to direct the student's attention. In a text-book intended exclusively for use in the laboratory, it is perhaps admissible that typical and specific characteristics should appear side by side, and with equal emphasis; in a text-book designed largely for use in the classroom as well, it is a great defect. These outlines are little, if any, clearer in the abridgment than in the larger book. The anatomical cuts are generally good, but they are most of them small, much smaller than those of the elk or moose; and in some of them so much has been attempted that the organs are sometimes difficult to trace. Larger and more schematic drawings would have been more useful. Barring certain of these defects, Professor Packard's larger work is the best text-book which we have for use in our higher schools and colleges, but it certainly has not been improved by abridgment.

MARIE'S HISTORY OF THE SCIENCES.

Histoire des sciences mathématiques et physiques. Par M. MAXIMILIEN MARIE. Tome I. De Thalès à Diophante. Paris, *Gauthier-Villars*, 1883. 286 p. 8°.

THIS volume is devoted to the mathematics of the Greeks, and covers nearly a thousand years (640 B.C. to 325 A.D.).

The author divides this time into three periods, roughly distinguished by the nature of the work done in geometry; the first period (640 B.C. to 310 B.C.) being that in which no attempt was made to apply arithmetic to geometry, but exclusive attention was given to dealing with and comparing concrete magnitudes without reference to their numerical measures. During the second period (310 B.C. to 150 B.C.), numerical measures of complex magnitudes began to be investigated, — for example, Archimedes obtained a first approximation for the ratio of the circumference of the circle to its diameter; but the numerical work was merely incidental, and was usually suggested by some problem connected with astronomy: while, in the third period (150 B.C. to 325 A.D.), reasoning on concrete magnitudes began to be largely replaced by reasoning on their measures, and geometry developed mainly in the direction of trigonometry.

At the beginning of the history of each of these periods is an introductory chapter con-

taining a brief *résumé* of the principal characteristics of the period, together with a short account of the progress made during the period in each of the branches of the mathematical science of the time, — geometry, arithmetic, physics, and astronomy. This is followed by the biographies of the mathematicians and physicists of the period and an analysis of their work.

The three introductory chapters, taken together, form a short and interesting history of Greek mathematics; while the biographies are sufficiently full, and the analyses are remarkably clear and concise.

SECONDARY BATTERIES.

The chemistry of the secondary batteries of Planté and Faure. By J. H. GLADSTONE and ALFRED TRIBE. London, *Macmillan & Co.*, 1883. (Nature series.) 11+59 p. 16°.

THE valuable papers of Gladstone and Tribe, originally printed in *Nature*, have been published in a collected form in the present volume, which contains much information as to the chemical actions going on in the Planté and Faure batteries. In successive chapters the authors consider the subjects of local action, the chemical changes occurring in the charge and discharge of the cell, the function of the sulphate of lead formed, and some minor topics. The chapter devoted to the function of the sulphate of lead, which the authors have shown to be formed in the normal action of the battery, is especially interesting. In the formation of a Faure cell, sulphate of lead, originally produced by local action, is oxidated to a peroxide on one plate, and reduced to spongy metallic lead on the other; and, when the cell is discharged, lead sulphate is finally produced on both plates. On recharging the battery, the authors consider that the lead sulphate is again oxidated on one plate, and reduced on the other, as when the cell was originally formed, — a point which is a very practical one, as the lead sulphate, if not oxidated, will soon prove fatal to the usefulness of the cell. This view, announced in the original papers, is substantiated by a number of recent experiments, notwithstanding the doubts that have been thrown upon it; so that, in charging and recharging, the plate of the cell is not corroded. It is also shown that the fact noticed by Planté, that elevation of temperature facilitates the formation of the cell, is explained by the more rapid formation of lead sulphate under these conditions.

RECENT PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Vassar brothers' institute, Poughkeepsie.

Dec. 5. — Professor W. B. Dwight gave the results of a recent re-examination by himself of Van Duzer's iron-mine, Cornwall station, Orange county, N.Y. Here a low ridge presents a red rock of sandstone and conglomerate, running into red shales to the south, in contact conformably with a highly fossiliferous limestone in nearly vertical layers. No other combination of the kind is apparent in this region, and there was much speculation among early geologists as to the horizon. W. B. Rogers called the red rock the triassico-jurassic sandstone; Dr. W. Horton considered it the Medina group, and assigned the limestone some place lower; Prof. Mather, with some doubt, concurred with Horton, and further assigned the limestone to the Catskill shaly limestone. Prof. Dwight, after a careful study of the locality, is satisfied that the red rocks are of the Medina epoch, and the limestones lower Helderberg; but by the fossils he identifies, in addition to the Catskill shaly limestone, the tentaculite limestone and the lower pentamerous groups. He finds no foundation for the statements of Horton, indorsed by Mather, that the iron ore occurs in layers between the layers of limestone. On the other hand, it is a bed of limonite formed at the base of the ridge superficially, as in other iron-mines of the region, by the decomposition of the red ferruginous shales at the junction with the limestone.

Five hundred and sixty-two specimens, representing various departments of natural history and archeology, were reported to the museum by the secretary.

Franklin institute, Philadelphia.

December 19. — A special committee, appointed to consider the propriety of recommending the councils of the city of Philadelphia to pass an ordinance requiring steam-engineers to pass an examination and to be provided with a license, as evidence of their competency, made majority and minority reports; the first taking the view that such action on the part of the society would be inexpedient, and the latter recommending such action. The reports were freely discussed, *pro* and *con;* and the subject was postponed for final action until the stated meeting in January.

Mr. G. Morgan Eldridge then read a paper on 'The British patent designs and trade-marks act of 1883 as affecting American inventors,' explaining the provisions of the new law to go into operation on the 1st