Kansas, Nebraska, northwestern Iowa into South Dakota, following the Dakota Cretaceous, the great water-bearing beds of the plains. Over one hundred boxes of material were collected, with the result that new forms were found, some valuable rock-bearing beds located, and the second or third largest known collection of Cretaceous leaves made, numbering 4000 to 5000 specimens. Mr. Gould is devoting his undivided energy to these collections, working them out, recording and numbering them, classifying and describing them. This work is to be finished by July 1, 1900.

A third party consisted of Mr. G. E. Condra, a graduate student of the University of Nebraska, who spent the spring and summer collecting the fossil Bryozoa in the Carboniferous exposures, with the result that some 30 localities were visited and a large collection made, in which are already represented over 40 species, several forms being undoubtedly new. Mr. Condra will spend the remainder of the year upon his collections, preparing the material, numbering, recording, identifying and describing the same. Numerous microscopic sections are already cut, and as many more are to be prepared, and this work which was begun two years ago will be continued for at least another year before a paper is to be presented.

A fourth party, consisting of Miss Carrie A. Barbour, assistant curator of the State Museum, and an assistant, visited quarries in the Carboniferous, and Permian for the sole purpose of collecting fossils. Over 20,000 of the commoner species were procured, some of them apparently new to the State, with three or four species supposed to be undescribed. A fifth party consisted of the acting State Geologist, who visited all quarters of the State, and attempted to correlate work as far as he was able. There is such an accumulation of data and material that it will tax the department to dispose of it in time to begin the work of 1900. Besides, several lines of investigation are under way, the most noteworthy of which is that of Mr. W. W. H. Moore, who is making freezing and pressure tests of the mortar, cement and building rocks collected during the summer. This investigation bids fair to yield some useful if not important results. It is the intention that every line of work and investigation shall be so well finished and so nearly in hand that there will be little or no overlapping of the work of one year upon the next. It may be reported that the initial work of the survey seems to be as well systematized as is to be expected the first year. Barring unexpected difficulties and adversities, it seems assured that fair progress may be reported to this academy at the close of the present biennium.

Another sum of $500 will be available for a continuance of the work in 1900, and not less than five or six papers will be ready to submit to the Legislature, as the result of the work of the first biennium. The plan being to ask for a special appropriation for publishing. These papers, according to present intention, will be confined studiously and strictly to economic phases of our geology, with the hope and full expectation that a legislative as well as a university appropriation may be a reality for the second biennium.

Erwin Hinckley Barbour.
The University of Nebraska.

SCIENTIFIC BOOKS.

Text-Book of Vertebrate Zoology. By J. S. Kingsley, Professor of Zoology in Tufts College. New York, Henry Holt & Co. 1899. 8vo., pp. viii + 439. 378 figures in text.

Professor Kingsley has prepared a text-book for college students "intended," so says the preface, "to supplement both lectures and laboratory work and to place in concise form the more important facts and generalizations concerning

the vertebrates." The first half of the four hundred odd pages of text is taken up with an account of the morphology of the vertebrates, while the second half is devoted to a systematic review of the group.

In the first half an introductory four pages defines and illustrates the group of chordates and the position of the vertebrates in the group. There follow four pages of introductory embryology, dealing in the briefest and most generalized way with the pre-embryonic stages of development, and then eight pages of general histology.

The organs of vertebrates are then considered under the four heads of entodermal, ectodermal, mesothelial and mesenchymatous organs. The discussion of each is from the embryological standpoint, but includes a consideration of its adult structure. The space given to an organ is necessarily very little, to the teeth two pages, to the tongue half a page, to the cranial nerves eight and one-half pages. This part of the book closes with an account of the segmentation of the head, followed by a brief account of the early development of the egg of vertebrates (oögenesis, spermatogenesis, cleavage, gastrulation) and by a section on the origin of the vertebrates. If one should weave into a single account greatly condensed resumés of Wiedersheim's 'Comparative Anatomy' and Hertwig's 'Text-Book of Embryology,' the result would be very much that which we have here, though Professor Kingsley's combination is skillfully made, clear, generally accurate and brought up to date.

The author is to be congratulated on having the courage to give due recognition in the second part of his book to the importance of a knowledge of vertebrate classification. It is further a matter of congratulation that fossil forms have been included. The treatment is the usual one and this part of the book in its arrangement and general typographical make-up reminds one strongly of Sedgwick's translation of Claus's elementary text-book. It is not to be expected that Professor Kingsley has pleased every one in the matter of classification, that he has prepared a concise and useful summary few will question. Families are briefly characterized; important genera are mentioned; in some cases habitat and common names of genera are added, in other cases only the scientific names appear. But few specific names are mentioned. It is unfortunate that the plan of the book renders this part of it so brief. For purposes of identification it cannot be of great use, but as a convenient means of referring generic names to their families it is of distinct value, and hence the mention, merely, of many generic names is to be commended.

That a book meant for college use should omit references to the literature is a serious blemish.

The index, unfortunately, includes the anatomical and embryological references for the first part of the book only, and the taxonomic terms for the second part only. Thus Cladoselache is referred to page 237, but not to page 173. Even taxonomic terms used in the introductory sections of the systematic part of the book are not fully indexed. Thus Notodelphys is referred to page 287, but not to page 281, where it also occurs; while Rhinoderma, which occurs on the same page, is not indexed. This should be corrected in a later edition.

Among many old friends we find some excellent new illustrations, and many that are rough sketches. Particularly noteworthy are the very useful perspective diagrams, such as Fig. 127. Why, on the other hand, Fig. 16, should be thought worth printing, when so many excellent figures are available, is a mystery. The reproduction of the original figures is frequently bad, the reference lines and letters being often blurred, the latter sometimes illegible. (Figs. 34, 39, 85, 159, 283.) The copied figures are excellently rendered and in other respects the work of the publishers is well done.

Detailed criticism is perhaps superfluous where so much is good, but one wonders how Professor Kingsley overlooked this (p. 25) with reference to the air bladder of the fishes: "The bladder itself usually lies dorsal to the aorta and urinogenital system next the vertebral column." Does not every fisher-boy know better? That archenteron and stomach are synonymous terms, as implied on page 6, and that the duodenum is pre-hepatic, as one might infer from reading the statement at the bottom of page 35, are statements needing revision.

The style of the book is on the whole simple and clear (what does the subject-matter admit of else?), but one is occasionally startled by such English as this (p. 38): "In birds, at about the middle, the mid-gut bears a blind tube," or as this (p. 223): "The lampreys feed upon the mucus and blood which they *rasp* from fishes."

The method of treatment is then strictly morphological—the first part dealing with the morphology of the organs—the second part adding to this so much of external morphology as is of use in classification. Judged as a morphology the book deserves to be commended. But does this warrant the author in calling it a zoology?

A categorical description of the structures of vertebrates so arranged as to suggest their evolution is but a part of zoology. In the opinion of the reviewer it is the least interesting part, and by many modern workers it is regarded as the least important. It would be hard to imagine a college student calling Professor Kingsley's book either interesting or stimulating, though if used as directed in connection with lectures and laboratory work he will surely find it of value. It is easier to point out faults than to show how they may be remedied, but why, may we ask, should three pages be given to the mouth, lips, teeth and tongue, and no word said of the chain of causal relations connecting lip development in mammals with the power of mastication, heterodont dentition and articulate speech, so admirably worked up by Gegenbaur? Why an account of the peculiarities of structure of the Raiæ and no word as to the relation of these peculiarities to the mode of life? And so the rest of it: if we are to have pure morphology, why not more of the spirit of Gegenbaur and less of that of Haeckel? When the ideal text-book of zoology is written it will surely deal with causes, not merely with results.

Jacob Reighard.

University of Michigan.

Water-Supply Engineering: The Designing, Construction and Maintenance of Water-Supply Systems, both City and Irrigation. By A. Prescott Folwell, Associate Professor of Municipal Engineering in Lafayette College. First Edition. New York, John Wiley and Sons. 1900. Octavo, 562 pages and 19 plates. Price, $4.00.

The Filtration of Public Water-Supplies. By Allen Hazen. Third Edition, Revised and Enlarged. New York, John Wiley and Sons. 1900. Octavo, 321 pages and 22 plates. Price, $3.00.

It is a happy feature of American engineering education that many of the text-books used by the student are also manuals constantly consulted by the engineer in making his designs. In such a system of education there is no conflict between theory and practice, but each supplements and improves the other. Theory is indeed merely the systematic formulation of general laws derived from experience, and practice is the application of theory to the economic production of useful results. Both of the above books are well adapted to class use, both exhibit the details of the latest theories and constructions, and both are of high value to the practicing engineer. The first book covers the wide field of all the features of water works, while the second treats of that special part concerned with the improvement of the quality of the water.

Professor Folwell has succeeded well in presenting the principles and practice of this wide field in a single volume. The theoretical discussions may sometimes be criticised as rather incomplete, but it is evidently intended that the reader should have a good knowledge of applied mechanics and hydraulics. The question of the force of impact caused by a moving body or stream of water, which is always puzzling to practical men, especially needs correction and revision on pages 229 and 247. On the whole, however, the theory seems as well presented as can be done in such limited space. The practical details relate largely to the water supplies of cities and towns, irrigation systems being properly given a subordinate place. The subject of designing which includes quantity and quality of water and the details of the systems of collection, purification, and distribution, covers 452 pages, while construction and operation are treated in 94 pages. Methods of cleaning water mains, of thawing out frozen