trating the relation between equivalent weights and certain specific properties. The remainder of the book (147 pages) is 'On the relation between the properties of the elements in general and their combining weights; description of the first twenty-five elements and some of their compounds.' These elements are those comprised in the first three horizontal series of Mendeléeff's chart of the periodic system. The properties of the commoner elements of this selection and their compounds are described in considerable detail. Here the book proper ends. A second part (106 pages) gives the experimental illustrations and instruction in details of laboratory work. The book is illustrated by full-page portraits of many of the chemists and physicists mentioned.

This is indeed a different treatment from that commonly followed. A course in chemistry in which copper, mercury, silver and lead are ignored, while beryllium and cobalt find consideration is not common. Yet this does not prove that it is wrong. The author lays chief stress on general laws. The student's comprehension of a law is based on a roughly quantitative experiment illustrating it which he performs before studying the law. The experiments merit attention; they are well devised and easy to perform. The author illustrates these laws further by the behavior of a number of elements, including important metals, and most of the important acid-forming elements.

It is not the object of a college course in science to form specialists, and the question may be fairly asked whether the mental discipline and the capacity to pursue the study of chemistry afforded by this method are not of equal value, or (as the author believes) of greater value than can be obtained by the prevailing method. To those who agree with the author this book should be welcome.

The book has one grave defect, in omitting all mention of electrolytic dissociation. The author anticipates criticism in a passage on page eight of a pamphlet called 'Suggestions to Teachers' which accompanies the book; he says: 'Some perhaps would wish to include osmotic pressure and the electrical phenomena of conductivity, etc., together with the theory of ionization, but I have judged it impracticable to illustrate these phenomena experimentally without displacing other matter or going beyond the reasonable scope of one year's work.' To this the obvious answer is, that with our present knowledge it would be better to displace other matter, if need be, than to omit anything so fundamental and so easy of illustration as electrolytic dissociation, from a book called 'Elementary Principles of Chemistry.' With the hope that this gap may be filled in the next edition, the reviewer commends Professor Young's book to the attention of college and advanced high school teachers, who will find it suggestive.

E. RENOUF.

Studies in Evolution. By CHARLES EMERSON BEECHER. New York, Charles Scribner's Sons. 1901.

This is a notable volume. It is one of the series of the Bicentennial Publications of Yale University, and consists mainly of reprints of occasional papers selected from previous publications of the Laboratory of Invertebrate Paleontology, Peabody Museum. The most important are those on the structure and development of trilobites, and the 'Studies in the Development of the Brachiopoda.'

The aim of the first essay, 'On the Origin and Significance of Spines,' is an attempt, in the terms of ontogeny, phylogeny and chronology, to apply the general law of evolution to the spines of plants and animals. The discussion is a very interesting one, and we think Dr. Beecher satisfactorily shows from a great number of cases discovered by numerous observers that spines are a characteristic of the old age, both of the individual and of the type. In old age the organism, during the senescence of the type, 'blossoms out with a galaxy of spines, and with further decadence produces extravagant vagaries of spines, but in extreme senility comes the second childhood, with its simple growth and the last feeble infantile exhibit of vital power.'

We are inclined to think that the author is a little too hospitable to Wallace's notion that spines on desert plants may originate from

the attacks of snails and browsing cattle. Our observations in the North African area, from Morocco to Egypt, on the edge of the Sahara in southern Algeria, and in Palestine, lead us to fully endorse the view of the Rev. Dr. Henslow, that in desert areas where plants are especially spiny or thorny, there are few snails, and a general absence of cattle. Over a century ago Pallas, and afterwards L. Regnier, in a paper published in 1792 (II., p. 101) in the very rare *Journal d'Histoire Naturelle,* edited by Lamarck and others, attributed the spiny growth of desert plants to the dryness of the soil. His observations appear to have been entirely overlooked by modern writers. A second article (p. 354), written by De Ramatuelle, is thoroughgoing in its evolutional tone, barring perhaps the speculations as to the origin of the spines from 'germes particuliers.'

Professor Beecher's splendid discovery of the nature of the appendages of trilobites and of other important points in their anatomy has entitled him to the lasting gratitude both of paleontologists and zoologists. This reprint of his original papers and illustrations is very opportune. It is possible, however, that the last word has not been said as to the nature of the larval trilobites or as to the position of the trilobites in nature. How the protaspis stage of trilobites can be likened to the nauplius of crustacea, and why trilobites should be placed among crustacea, we do not understand. That the presence of antennæ necessarily obliges us to regard trilobites as crustacea, when all the succeeding appendages of the body are of the same general type, not being differentiated into specialized mandibles, maxillæ, maxillipedes, thoracic and abdominal legs, as they are in Crustacea, including the Phyllopoda (though in them the appendages of the trunk are alike), does not seem logical. We would prefer to regard the trilobites, merostomes and Arachnida as members of a phylum quite distinct from that of the Crustacea. Is it not probable that the rather artificial phylum of Arthropoda will eventually have to be divided into three phyla? The resemblances in trilobites to Crustacea seem to us to be a case of convergence. The papers on Brachiopoda are likewise of great interest and value, and are crowded with valuable suggestions. The line of thought is largely based on the work of the late Dr. A. Hyatt, whose philosophical and scholarly methods have had such a happy and fruitful influence on the new generation of paleontologists.

A. S. Packard.

Societies and Academies.

The American Philosophical Society.

The scientific program of the general meeting to be held next week is as follows:

Thursday, April 3, 10:00 o'clock.

'The President's Address': Gen. Isaac J. Wistar.

'Origin of the Oligocene and Miocene Deposits of the Great Plains': Professor John B. Hatcher, of Pittsburg.

'The Upper Cretaceous and Lower Tertiary Section of Central Montana': Mr. Earl Douglass, of Princeton.

'Evolution and Distribution of the Proboscidea in America': Professor Henry F. Osborn, of New York.

'On South American Mammals': Professor William B. Scott, of Princeton.

'The Mammals of Pennsylvania and New Jersey': Mr. Samuel N. Rhoads, of Audubon, N. J.

'The Identity of the Whalebone Whales of the Western North Atlantic': Dr. Frederick W. True, of Washington.

Afternoon Session, 2:00 o'clock.

'On the Molluscan Fauna of the Patagonian Formation': Dr. H. von Ihering, of São Paulo, Brazil.

'A Comparison Between the Ancient and Recent Molluscan Fauna of New England': Professor Edward S. Morse, of Salem, Mass.

'Distribution of Fresh Water Decapods and its bearing upon Ancient Geography': Arnold E. Ortmann, Ph.D., of Princeton.

'Systematic Geography': Professor William Morris Davis, of Cambridge, Mass.

'On Drift Casks in the Arctic Ocean': Mr. Henry G. Bryant, of Philadelphia.

'The Isthmian Canals': Professor Lewis M. Haupt, of Philadelphia.