suit of intellectual fame; nor did Newton do less for the greatness of his country, from whatever standpoint you choose to view it, by uncovering the secret of the universe than he would have done by sticking closer to earth in the strivings of his unrivalled intellect.—New York *Evening Post.*

SCIENTIFIC BOOKS

An Introduction to Historical Geology with Special Reference to North America. By William J. Miller. New York: D. Van Nostrand Company. With 238 illustrations. Pp. xvi + 399. $2.00 net.

The meaning of the word geology was greatly modified and vastly expanded in the early part of last century through the works of Wm. Smith, Cuvier, Brongniart and their followers. In the place of philosophical mineralogy the meat and marrow of the subject became earth history. To this phase of the subject Conybeare and Phillips devoted the greater portion of space in their well-known treatise of 1822. Lyell's tastes being largely along the line of the modern physical geographers, judiciously termed his great work not Geology, but the "Principles of Geology, or the modern Changes of the Earth and Its Inhabitants Considered as Illustrative of Geology." Yet he included in the earlier five editions of this work a large amount of stratigraphical matter gleaned during his various trips into the Tertiary fields of south Europe. In 1838, however, he excerpted the stratigraphical or historical matter from his "Principles," recast and enlarged upon the same and brought out a separate volume called "Elements of Geology." This ran through some half-dozen editions down into the "seventies" and was referred to by him as Elements of Geology, Students' Elements of Geology, Geology Proper or simply Geology. Some time before, however, De la Beche had foreseen the divisibility of the subject along similar lines, for he remarks in the preface to his treatise of 1833:

> It is not difficult to foresee that this science, essentially one of observation, instead of being, as formerly, loaded with ingenious speculations, will be divided into different branches each investigated by those whose particular acquirements may render them most competent to do so; the various combinations of inorganic matter being examined by the Natural Philosopher, while the Natural Historian will find ample occupation in the remains of the various animals and vegetables which have lived at the different periods on the surface of the earth.

A recent text-book of geology, by Pirsson and Schuchert follows practically the lines of subdivision suggested by De la Beche: Part I. is designated Physical Geology; Part II., Historical Geology. These parts may be purchased in separate binding. Another recent text-book by Cleland, is styled "Geology, Physical and Historical."

In Miller's work before us we have an independent volume styled "An Introduction to Historical Geology." This the author hopes "may find a place as a class-book dealing with the historical portion of a one-year course in general geology," adding, however, "An elementary knowledge of what is generally comprised under dynamical and structural geology is presupposed."

Except in this independent character of the work, Professor Miller's production does not differ radically from what has usually been found in the historical portion of the better text-books on geology. That is, the various periods are taken up in chronologic order. The origin of the name of the period, its subdivisions, distribution of rocks, physical history, foreign equivalents, climate, economic products, and life are the usual subdivisional topics. Under life, Plants, Protozoa, Porifera, Cœlenterata, Echinoderms, Molluscoids, Mollusca, Arthropods and Vertebrates, with subdivisions are systematically discussed. The author quotes freely from modern text-books, manuals and general geological literature, seemingly content to let well-enough alone. Likewise "appropriate illustrations more or less familiar because of their appearance in other text-books or manuals of geology, have not been abandoned merely for the sake of something new or different."

As regards the matter of allotment of space and attention to the several eras, we believe good judgment has been shown. 145 pages are

devoted to the Paleozoic; 80 to the Mesozoic; 100 to the Cenozoic. This is in pleasing contrast to what is seen in several recent works where an overweening preponderance is given to the Paleozoic, apparently because it was long! or, because the author's interests were largely in that era. To be sure some phases of the Mesozoic are ill represented in this country, and, in preparing a work for American students a less complete account of this era is permissible; but not so with the Cenozoic so grandly recorded throughout the length and breadth of this land. And again, in this era were evolved the teeming hordes of modern life on land, in sea and air, life of most fundamental interest to man, and man himself. Imagine a work on general history descanting on ancient civilizations, because they extended through vast periods of time! commenting more briefly on medieval epochs, and brushing aside with a few paragraphs the fundamentally important, profoundly intricate and comparatively accessible developments of modern history. The writer on historic geology has, however, greater difficulties before him than the assignment of space to eras. Above all comes the Herculean task of vividly portraying to the beginner the events of earth history by means of legitimate deductions drawn from fossil forms, all of which are unknown to the student. Whoever has listened to a lecture on a new subject in a strange tongue will appreciate the difficulty here referred to. The average American youth may listen profitably to a discourse on mountains, rivers, oceans, even perhaps on volcanoes and earthquakes. With animal and plant life in the form of horses, cattle, trees and grasses he is more or less familiar; but, in definite knowledge regarding the life of the sea—the very type the teacher wants to deal with most frequently—he is found wanting. We recall the startled look when he hears the common word Brachiopoda for the first time; we still respect the brilliancy of the student who mnemonically cinched *Tropidoleptus carinatus* not by its biological affinities but by the similarity of its specific name to "Carrie Nation." Professor Miller, like Dana and others, has recognized this general lack of biological preparation on the part of his readers and has devoted an introductory chapter to an outline classification of the animal and plant kingdoms. Thereafter, in orderly review, he gives under each period what is happening among the Echinoderms, Worms, Molluscoids, Molluscs, etc., etc. Now this orderly, card-index style of arrangement of facts is excellent in a book for reference only; but, the bringing up of each little branch of life again and again when not characteristically developed leads necessarily to the introduction of considerable unimportant matter; for example: "The Pelecypods and Gasteropods were still common, but they were in no important way different from those of the preceding period." Or: "Sponges were common but they require no special description."

It seems to the reviewer that such data might be confined to the excellent "Tabular Summary" at the close of each era. The question arises here, as in reference to the majority of texts on historic geology, would it not be better for the student's mental digestion, so to speak, if in place of this menu of a vast number of short-order courses a few well-balanced rations of carefully selected matter were served. Schuchert in the textbook already referred to has apparently acted upon this principle, interlarding his chapters on physical history of the periods with substantial essays on a few dominant types of life characteristic of each great geological period. Time will determine whether the student profits more by being continually reminded of the progress of the various minor subdivisions of life, or, by receiving once and for all a thoroughgoing discussion of a few great, dominant life-forms.

Professor Miller's book seems remarkably free from the small, yet sometimes ludicrous, mistakes that often appear in first editions. Quite probably, however, he will change the wording in the following sentences somewhat in the next edition of the work: (Page 106) "Conformably above the Clinton beds lies the Niagara limestone, which has a still wider distribution than the Clinton."

(Page 136) "All known Devonian vertebrates were aquatic."

(Page 321) "During the Pliocene and Quaternary, *Equus,* or the modern Horse, has one toe only on front and hind feet with the two side toes of *Protohippus* reduced to splints (the fetlock of the present day Horse)."

(Page 305) "In this vastly expanded interior sea true marine deposition took place, the most characteristic formation being a Nummulitic limestone, so called because it is chiefly made up of shells of a certain species (*Nummulites*) of unusually large Foraminifers. Perhaps no other single formation in the crust of the earth built up essentially of the remains of but one species of organism is so widespread and thick, its thickness at times reaching several thousand feet."

(Page 334) "At no time did the Labradorian ice sheet spread enough eastward or the Kewatin sheet far enough westward, to cover this driftless area."

Typographical errors in this book are rare. We now recall having noted but two, one in the caption of page 193, the other in the spelling of the specific name *choctavensis,* page 315.

The illustrations upon the whole are good. The printing of whole-page half-tone engravings on the class of paper used in the text (though very good) is scarcely to be recommended, as the plate on 129 clearly shows. The routing on the line engraving, Fig. 69, page 126, was carelessly done. Slight stains, perhaps from the paste used in securing the illustrations appear about their borders, in Fig. 52, page 95.

The printing is of uniformly good grade, the body type approaching very closely the 10-point modern Lining Roman No. 510 opened up by two point leading, giving always a clear, pleasing appearance. The paper, very slightly reddish tinted, is about 70 lb. book, scarcely shiny, but sufficiently calendered to take small half-tone engravings to advantage.

To sum up: Professor Miller has carefully compiled from recognized authorities facts and figures illustrative of historical geology as now generally understood. He is no iconoclast. He has apparently felt the need of a systematic tabulation of topics, serving as a ground-work for a series of lectures in historic geology. This with minor expansions and articulations forms the text-book before us. What were his needs are likewise the needs of other teachers of the same subject; and, since he has done his work well and his publishers have cooperated with good judgment and artistic ability, there would seem to be no reason why the book should not meet with deserved success.

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SPECIAL ARTICLES

BOILING BUFFALO CLOVER SEED

The discovery that the process of boiling the seed of spotted bur clover (*Medicago arabica*) one minute insures good germination has resulted in the adoption of the practise by the farmers of the south. The kindred discovery recently made by the writer that the seed of buffalo clover (*Trifolium reflexum*) can be readily germinated in the same manner, opens the way for experiment station men to investigate the economic merits of this little-known clover. Experiments heretofore attempted have been nipped in the bud, as far as is known, by failure to obtain a stand. With the practise of soaking and boiling, however, stands can be obtained and the merits and demerits of this legume can be found out.

In 1914, after successfully germinating spotted bur clover seed by the boiling process, the same method was tried by the writer on red clover, white clover, sweet clover and alfalfa, but with negative results. A single experiment with buffalo clover at that time increased the germination from four to thirty per cent. by boiling one minute, but this was considered too small a per cent. and the matter was dropped. Recently, however, the experiment was tried again in a slightly modified form and with excellent results.

The details of the experiment were as follows: