double synclinorium, whose lowest member is the Cambro-Silurian Stockbridge limestone. This is succeeded by the Berkshire schist, the Bellowspipe limestone and the Greylock schist, all Silurian. Now, the interesting geological thesis established by the monograph is that the metamorphosed clastics of the Hoosac Mountain are the shore deposits, which in the case of the Hoosac schist correspond to the deeper water, Stockbridge and Bellowspipe limestones and their accompanying schists. The determination throws a flood of light on the entire stratigraphy of the region, and simplifies the problem of the Green Mountains. The difficulties that were overcome in tracing out these metamorphic schists to their original sediments, in proving the uncomformability of the Vermont conglomerate gneiss upon the Stamford gneiss, when the foliation was the same in both, and the neat way in which it was done by the discovery of the eroded and depressed pre-Cambrian outcrop of a trap dike in the Stamford gneiss, which was buried under the Vermont formation, all called for patient study and close observation in the highest degree. And when the passage of the Hoosac schists into the Stockbridge limestone was finally established, a very hard problem was at last solved. The authors are to be warmly complimented and congratulated on their success.

Besides the stratigraphic results, many important contributions are made to our knowledge of the general metamorphism of sediments to crystalline schists.

The three authors were also aided in a degree calling for mention by Mr. B. T. Putnam, whose untimely death removed him in the midst of his career, and by Prof. W. H. Hobbs. The report is richly illustrated with that profusion of maps and plates which is only attainable in this country by attachés of the United States Survey. The investigations have been continued on the south by Professor Dale, whose later results are published in the Fourteenth Annual Report of the Director as reviewed in these columns, p. 632.

J. F. Kemp.

The Laccolitic Mountain groups of Colorado, Utah and Arizona. Whitman Cross. 14th Annual Report of the Director of the U. S. Geological Survey, Washington, 1894. Pp. 165–241. Pt. ii.

Mr. Cross makes in this paper the second considerable contribution to our knowledge of laccolites, the first having been made by Gilbert in 1877. The West Elk Mountains, in Colorado, including Ragged Mount, Mt. Marcellina, the Anthracite range, Mt. Axtell, Mt. Carbon, Mt. Wheatstone, Crested Butte, Gothic Mount and probably others in the same group, are laccolitic in origin. So also are the San Miguel Mountains, about 70 southwest of the West Elk group. Still farther south, at a distance of 25 miles, the La Plata Mountains form a remarkable group of laccolites. About 65 miles farther south-west, in the northeastern corner of Arizona, lie the Carriso Mountains, the laccolitic nature of which is not positively stated. El Late Mountains, in the southwestern corner of Colorado, are believed to be laccolites. Next, the Abajo Mountains of eastern Utah are compared with the laccolites of the type area, and the La Sal Mountains, about 35 miles north of the Abajo Mountains, are only doubtfully considered as due to intrusions. In discussing the conditions of intrusion in laccolites, Mr. Cross concludes in agreement with Dana that Gilbert's explanation of the incoming of the magma into the strata is complete without reference to the relations which may exist between the densities of the lava and the stratified rocks.

Comment: The time of formation of laccolites and volcanoes in the same field seems not yet to be fully determined, but in two of the areas described it is probable that laccolites were first formed and subsequently dikes and volcanic rocks were formed, the former appearing at the present denuded surface and the latter having poured out upon the surface. If this order should prove generally true, it would agree with that observed in the case of small intrusions in the Boston basin. Thus in the slate area bordering the Mystic River there are at least three series of intrusions in the form of dikes and sills. The sills, here the analogues of laccolites, are in every instance connected with the earliest movements of the magma. Moreover, the sills came in before the

strata were well jointed, and at a time when the stratification planes were the leading lines of weakness. The dikes connected with the sills have irregular contact planes. The later dikes which cut the sills follow master joints. There is reason, in this field at least, for supposing that intrusion in the form of sheets took place, because the rock yielded more readily in a horizontal direction along the bedding planes than it did along vertical lines. But there is little in the mode of occurrence, or in the scale of these intrusions or the elevation of the strata above them, to afford a full comparison with the typical laccolites of the West.

In the review of the literature of laccolitic intrusions, an early account of a quaquaversal hill covering a domeshaped mass of trap in Derbyshire, England, seems to have been overlooked. The account and a cross-section will be found in Bakewell's Introduction to Geology, 2d Am. ed., New Haven, 1833, pp. 95–97.

J. B. WOODWORTH.

HARVARD UNIVERSITY.

Bibliography of North American Paleontology 1888–1892. By CHARLES ROLLIN KEYES. Bull. U. S. G. S., No. 121. 251 pp. Washington. 1894.

This publication will be received with welcome by paleontologists. Each separate paper appears under several subject headings, biologic, stratigraphic or geographic, so that the cross references make the list as good a substitute for a card catalogue as a printed list can be.

Several criticisms can, however, be made, for a close examination shows the work to be full of imperfections. Firstly, the compilation was carelessly done. This is evidenced in the careless copying of titles as well as in the omission from the list of nearly 150 papers published during 1888–1892, which is one sixth of the total number of papers appearing in the list under the authors' names. In many cases the titles are not given in full (as it is claimed they are in the introduction, p. 7).

Examples of such wrong copying are:

P. 229, second entry should be—Vodges, A. W. A Bibliography of Paleozoic Crustacea from 1698 to 1889, including a list of North American species and a systematic arrangement of genera.

P. 70, seventh entry includes two separate papers by separate authors. They are—Dawson, J. William. Preliminary note on new species of sponges from the Quebec Group at Little Mètis (Can. Rec. Sci. III, 49–59, figs. April, 1888). Hinde, George Jennings. Notes on sponges from the Quebec Group at Mètis, and from the Utica Shale (Can. Rec. Sci. iii, 59–68. April, 1888).

P. 183, second entry should be—Ringueberg, Eugene N. S. The Crinoidea of the Lower Niagara Limestone at Lockport, N. Y., with new species.

P. 190, third entry should be—Shaler, N. S. The Geology of the Cambrian District of Bristol county, Mass.

P. 108—Hollick, Alfred, should be—Hollick, Arthur.

P. 73, fourth entry should be—Hamilton, Chenango and Otsego counties, New York.

P. 73, third entry. 'Geology of Skunnemunk Mountain, Osage county, N. Y.,' should be ; Geology of Skunnemunk Mountain, Orange county, N. Y. This title together and several others, though appearing under certain of the subject headings, are not entered under their author's names.

Pp. 21, 86, 198, 226. — 'Bison latiformis' should be Bison latifrons.

Pp. 30, 39, 42, 71.—The generic term Clymenia (a Cephalopod) appears as 'Calymene' (a Trilobite).

The proof reading is very bad, surprisingly so in a publication issued by the United States Geological Survey. The proof was read evidently by a person having no knowledge whatever of paleontological terms, for a large number of generic and specific names are incorrectly spelled. Some of the most unpardonable mistakes are 'Necomian,' 'Cheyene,' 'Ciasaurus,' 'Paneka,' 'Ceatopsidæ,' 'Foraminiferial,' etc.

P. 76, twelfth entry, 'Magia' probably means Niagara. The spelling in the species lists under titles of Matthew, G. F., is particularly bad.

The value of the publication would be greatly increased were the subject-matter printed on one side of each sheet only. This arrangement would enable the working paleontologist to