

and the various draws and breaks on Little Sandy creek, Chatman creek, Bear creek, Bluff creek and Hackberry creek, where the Cretaceous formation, is extensively exposed. The following is a brief summary of the general results:

The Cheyenne formation rests everywhere unconformably upon the Red Beds, occasionally with a gravel bed at its base. It is a good geological unit, clearly marked off from the overlying Kiowa, the lowest member of which forms a thin ledge of marine shells, the Champion of Cragin. The lower part of the Cheyenne is almost always a massive sandstone, often cross-bedded, pure white, or more frequently stained yellowish. It contains no admixture of clay, but occasional thin clay shales, and very rarely more or less lignite. Near its base silicified wood occurs, at some points in considerable abundance. This bed, No. 1 of Hill, the 'Coral Sandstone' of Cragin, varies greatly in thickness, but where well preserved reaches 50 feet. In typical exposures this is overlain by some 15 feet of carbonaceous shales, consisting largely of dark, sandy, stratified clays, much lignite, and abundant vegetable remains, usually matted and confused so as to yield few determinable impressions. This is the No. 2 of Hill's section, the 'Lamphier Shales' of Cragin. Above this is the 'Stokes Sandstone' of Cragin, Hill's No. 3, having a thickness of some ten feet and consisting of stratified sandstone of a somewhat darkish or grayish color, considerably argillaceous and carbonaceous and often holding plant impressions. The character and relations of these upper beds, however, were found to vary so extensively that this subdivision has very little value. A large collection of fossil plants, amounting to 44 boxes, with an aggregate weight of about 3,000 pounds, was made in these upper beds and has been received at the U. S. Geological Survey.

The Cheyenne is confined exclusively to what may be called the Belvidere region, chiefly along Medicine Lodge river, as above noted, but passing southward along the head of Elk creek, across Mule creek and Indian creek, some six miles southeast of Nescatunga, forming a sort of crescent. It does not occur in the

Avilla Hill nor anywhere in Clark county, so far as Mr. Ward was able to observe; the rocks of the former region, supposed by Prosser to represent the Cheyenne, being wholly different and belonging to the lower Kiowa beds, underlain by black papyraceous shales; and the Big Basin Sandstone, which Prosser also referred to the Cheyenne, being clearly, as Cragin states, nothing but the upper indurated portion of the Red Beds, the top of which is almost always whitened.

Perhaps the most important result of this expedition was the discovery of the true base of the Dakota group in a series of remarkable beds, nearly 200 feet in thickness and not hitherto described, forming an uninterrupted transition from the Kiowa Shales, holding *Gryphaea* and *Exogyra*, to the typical Dakota Sandstone, yielding characteristic dicotyledonous leaves, a small collection of which was made. Mr. C. N. Gould, who was a member of Mr. Ward's party, and who had previously seen most of these deposits, will soon publish a paper setting forth their relations in detail.

Under the title 'The Geological Sequence in Jamaica,' Mr. Robert T. Hill presented an account of the stratigraphic succession in Jamaica, describing the various rocks of igneous, sedimentary, oceanic and organic origin and their relations. Mr. Hill's paper was an extract from his report to Professor A. Agassiz, under whose auspices the studies were made. In discussing the elevated coral reefs he stated that there can be no possible doubt but that they were formed around emerging land, as held by Agassiz.

W. F. MORSELL.

U. S. GEOLOGICAL SURVEY.

NEW YORK ACADEMY OF SCIENCES—SECTION OF  
GEOLOGY—NOVEMBER 15, 1897.

THE first paper of the evening was by Dr. F. J. H. Merrill, of the State Museum at Albany, entitled 'Geology of the Vicinity of Greater New York.' Dr. Merrill considered the distribution, relations and structure of the Crystalline, Metamorphic and Intrusive rocks east of the Hudson. He noted particularly in the vicinity of New York City the Pre-Cambrian Fordham Gneiss, overlain at certain places, as

at Lowerre, Hastings, Sparta and Peekskill, by a very thin bed of Quartzite, probably representing the Georgian Quartzite of Dutchess county. Above this is a thick series of Crystalline Limestones, forming the river valleys of the Harlem, Bronx and other rivers, and underlying most of the navigable water ways in the vicinity of New York. The upper rocks are Mica-schists, which are probably of Hudson River age, and make most of the highlands of New York City and vicinity. These rocks are extensively folded in a general direction of N. 40° E., with occasional cross foldings, producing the cross valleys. The whole series is crossed by the Manhattanville Fault, running from Manhattanville, North River, southeastwards to the East River, between Ward's and Blackwell's Islands, into Astoria Bay. The fault, along which there has been a throw of a number of hundred feet, was long ago described by Professor Dana.

The second paper of the evening was by Captain J. J. Riley, entitled 'The Guano Deposits of the Islands of the Southern Pacific, and their Prehistoric Remains.' Capt. Riley considered in detail the depth, value and manner of working of the guano deposits in the Chincha Islands, off the southern coast of Peru, from which guano was first taken by Humboldt in 1804, and which have since been very famous for their guano deposits. Between 1850 and 1880 it is estimated that guano to the value of \$550,000,000 in gold was taken from three islands alone. The islands lie in the rainless region, and the preservation of the guano is due to the absence of water. Once in about seven years there is a season of quite a little rainfall, which has undoubtedly a great effect upon the guano, and was considered by Captain Riley to be the cause of the blacker bands in the layered deposits. Two burial tombs containing bodies of great antiquity have been discovered in the guano. The bodies were evidently those of royal personages, and apparently, from the evidence of slabs containing certain symbols, related to the Incas. These tombs were found at a depth of 35 and 68 feet, but it is not possible to state whether they were buried in the guano or later covered by it. The islands, three in number, are granitic in character, and

were covered by a varying thickness of guano, reaching in the more important island a depth of 203 feet in places. The exportation of guano has, however, ceased since 1880.

In the discussion Dr. Julien compared these islands with other guano-bearing islands of the West Indies, paying particular attention to the absence of any evidences of human remains showing life coincident with the formation of the guano.

The third paper, read by title, was by Mr. Stuart Weller, and entitled 'A New Crinoid from the Coal Measures of Kansas.'

RICHARD E. DODGE.  
*Secretary.*

#### BOSTON SOCIETY OF NATURAL HISTORY.

THE first general meeting of the season was held November 3d, seventy-five persons present.

Mr. J. B. Woodworth spoke of Mr. Saville-Kent's work concerning the Great Barrier Coral Reef of Australia. He sketched briefly the chief results of the studies of Darwin and others upon the theory of coral reefs and showed a series of lantern slides giving a general view of the life upon the Great Barrier Reef. This reef stretches along the coast for a distance of more than 1,200 miles; the distance from the outer edge of the reef to the mainland varies from 10 to over 100 miles. The reef and adjacent waters abound in Nullipores, Madreporas, Alcyonarians, Holothurians, etc. The pearl and pearl-shell, Trepan and oyster fisheries are of very great importance.

SAMUEL HENSHAW,  
*Secretary.*

#### NEW BOOKS.

*Bau und Leben unserer Waldbäume.* M. BÜSGEN. Jena, Gustav Fischer. 1892. Pp. viii+230.

*Handbuch der Klimatologie.* JULIUS HAUN. Stuttgart, J. Engelhorn. 1897. 2d edition, revised and enlarged. Vol. I., pp. xii+404; Vol. II., pp. viii+384; Vol. III., pp. viii+576.

*Essai sur les conditions et les limites de la certitude logique.* G. MULHAUD. Paris, Alcan. 1898. 2d edition. Pp. viii+202. 2 fr. 50.