

bility that *Evotomys* would cease to exist within the limits of Barnstable county.

#### UNIVERSITY AND EDUCATIONAL NEWS.

THE corner stones of the Havemeyer Hall of Chemistry and of the Engineering Building of Columbia University have been informally laid. The buildings are already further advanced than might be supposed from the fact that the corner stones have just been laid, and it is hoped that these, as well as the Library, Schermerhorn Hall for the Natural Sciences and the Physical Building, will be ready for occupancy in the summer of 1897. The excavations, which are the most extensive hitherto undertaken in New York, for the University Hall are nearly completed. This building will contain the Academic Theatre, the Gymnasium and the Dining Hall.

THE Yale Alumni Association of California, following the example of the Harvard Alumni of the same State, has established a graduate scholarship at Yale University, yielding an income of \$300, to be awarded to a graduate of one of the California colleges on nomination by the Association.

THE present registration at the University of Pennsylvania now amounts to 2,752, which is a gain of 130 over last year, although the requirements for admission have been raised.

THE number of students in German universities last summer is reported to have been 29,802; in 1895 it was 28,709, so that the numerical increase for the present year is 993, or 3.5 per cent. The distribution of the students among the various universities was as follows: 4,649 in Berlin, 3,777 in Munich, 2,876 in Leipzig, 1,863 in Bonn, 1,425 in Breslau, 1,415 in Halle, 1,379 in Freiburg, 1,339 in Würzburg, 1,172 in Tübingen, 1,164 in Heidelberg, 1,138 in Erlangen, 1,007 in Göttingen, 965 in Marburg, 948 in Greifswald, 938 in Strassburg, 761 in Jena, 708 in Kiel, 700 in Königsberg, 630 in Giessen, 500 in Rostock, and 420 in Münster. The number of students at Vienna was 2,228, but only 1,370 of these were regular students.

THE Right Hon. Joseph Chamberlain has been elected Lord Rector of the University of

Glasgow, having a majority of 234 votes over his opponent, Mr. Augustine Birrell.

#### DISCUSSION AND CORRESPONDENCE.

##### AGE OF THE ISLAND SERIES.

IN my paper on '*The Potomac Formation*' in the Fifteenth Annual Report of the United States Geological Survey, describing the section along the Raritan River, I remarked (pp. 335-336) that "from Morgan, the most easterly point, the formation may be traced northward across Staten Island and the northern shore of Long Island, and it reappears on Martha's Vineyard in the celebrated cliffs of Gay Head. \* \* \* Along this most eastern line a new phase is seen, viz., the occurrence of concretions in the variegated clays, in the form of hard ironstones, which, when broken open, are found to contain vegetable remains in an admirable state of preservation. I am, therefore, disposed to regard these ferruginous, concretionary beds, extending from Staten Island to Martha's Vineyard, as the very latest phase of the Potomac formation, which I shall call the Island Series, although, from the similarity in the flora, I am disposed to include them, along with the Raritan and Amboy Clays, in the Alburup Series."

Later in the same paper (pp. 373-382) the nature of the flora of this series was set forth, and it was shown that, so far as known at the time that paper was written, it consisted of 133 species, 52 of which were also found in the Amboy Clays, and the great preponderance of which were well developed dicotyledonous forms. The nearest affinities to these plants are afforded by the Atane beds of Greenland, which have always been correlated with the Cenomanian of Europe. Dr. Newberry regarded the Amboy Clays as representing that age and therefore as belonging to the Upper Cretaceous. In his monograph of the '*Flora of the Amboy Clays*,' soon to appear posthumously, he gives his argument in full. He thought them of about the age of the Dakota Group. My opinion that they were somewhat lower, and should be placed at the summit of the Lower Cretaceous, having been called in question, I defended it in the paper referred to (pp. 373-374), as I think successfully. I had

never supposed that any one would attempt to place these beds lower than I had done, because it seemed impossible that such highly organized plants could have flourished earlier than the extreme upper portion of the Lower Cretaceous.

It is, therefore, a matter of the greatest surprise to me that Prof. Marsh should have discovered evidence which points to the Jurassic as the true date of the strata in question. His two papers on 'The Geology of Block Island,' published in the *American Journal of Science* for October (pp. 295-298) and November (pp. 375-377), are well calculated to stagger one who has been studying these deposits for eight years and who has visited all the exposures from the Raritan River to Nantucket, usually in company with Mr. David White or Dr. Arthur Hollick, and helped to make the extensive collections that they have yielded. It is true that until the present year I had not personally visited Block Island, but Mr. White was there in 1890, and his notes agree with my own later observations. Being a noted watering place I had naturally avoided it, and most geologists who have studied it have been chiefly interested in the glacial deposits that occupy its surface. But lying, as it does, directly in the line of the Cretaceous outcrop, and rising somewhat higher above the sea than most of the other islands, it was to be expected that the underlying clays would be exposed. I had long desired to see them, and in August last I requested Dr. Arthur Hollick, of the School of Mines, Columbia University, whose studies in this line, especially on Staten Island and Long Island, are so well known, to accompany me, and after making an excursion to certain critical localities on Long Island, including Montauk Point, we crossed to Block Island and spent three days in making a careful examination of all the exposures. We found the Cretaceous axis immediately. It originally occupied the northern half of the island. It is clearly visible at the north end of Grace Cove, on the west side of the island, but is best exposed below Ball's Point, on the east side. It has, as on Martha's Vineyard, a local dip to the northwest, due to the action of ice tilting it in the direction opposite to its normal dip. This,

however, was not sufficient to prevent the Clay Marls, which immediately overlies these clays wherever conditions are normal, from coming into view on the south end of the island, and numerous exposures of these were discovered containing their characteristic molluscan fossils, of which a fair collection was made and submitted to Dr. Whitfield for identification. Fossil leaves were also found at many points, but they were usually too poor for safe determination. They were sufficient, however, to show that we were dealing with precisely the same beds as those of Gay Head, Long Island (Glen Cove), and Staten Island, which have yielded such a large flora, and, therefore, they belong to the Island Series. The characteristic red micaceous clay shales were identical with those found erratic all along the coasts of these islands, often where the clays themselves are below tide level. In Split Rock Cove, immediately east of Black Rock Point, the alternating red, black, and white clays, with a steep incline, simulate very closely those of Gay Head and leave no doubt that they represent the same conditions.

Prof. Marsh does not question the parallelism of all these beds, but refers them all to the Jurassic. He says: "An examination of both the Raritan and Staten Island clay deposits has supplied two links in a chain of evidence that I had not before known from personal observation. This chain now extends from the Potomac river to Martha's Vineyard, along the natural line of the Jurassic horizon, and indicates the Jurassic age of this series of strata beyond reasonable doubt."\* In another place † he says: "The Raritan clays of New Jersey I regard as belonging to the same series as the Potomac beds." From these statements it seems clear that he regards the Potomac formation as representing one and the same horizon throughout, and believes that it is all Jurassic in age.

In his important paper just published in the Sixteenth Annual Report of the United States Geological Survey he figures a few Dinosaurs from the Potomac formation, but seems to include none that were not published by him in his paper in the *American Journal of Science* for

\* *Am. Jour. Sci.*, November, 1896, p. 376.

† *Am. Jour. Sci.*, October, 1896, p. 296.

January, 1888. These were collected by Mr. Hatcher in an iron mine near Muirkirk, Md., associated with Sequoian cones and silicified wood. This horizon is now known to be the equivalent of the Basal Potomac of Virginia, and a rich flora of ferns, cycads and conifers has been discovered in it by Mr. Arthur Bibbins, which refers it without doubt to my Rappahannock series. From the date of this deposit to that of the Amboy clays, as I have shown, and *a fortiori* to that of the Island Series, there was an immense interval of time, and during that interval the flora completely changed. Only 15 species of plants out of 329 survived this period.\*

The Potomac formation, therefore, while it is a geological unit, represents a great epoch in the history of the coastal plain, perhaps extending from the Jurassic below to the Cenomanian above, and occupying practically the entire Lower Cretaceous. It is thus to be compared with the Comanche series of Texas, and a mere reference to it without specifying which one of its six great subdivisions affords no idea of the position of any fossil that may have been found in it. The two lowest subdivisions, the James River and Rappahannock series, I have called the 'Basal Potomac.' It was of this portion of the formation that I treated in a paper read before the National Academy of Sciences in April 1888, and of which I said: "If the stratigraphical relations and the animal remains shall finally require its reference to the Jurassic, the plants do not present any serious obstacle to such reference."† I still stand by that statement, but when it is proposed to refer the 'Newer Potomac' also, with its great dicotyledonous flora allied to that of the Upper Cretaceous, to the Jurassic, the evidence for such a reference must be overwhelming. Indeed it may be questioned whether any amount of evidence from vertebrate remains would be sufficient to convince geologists generally. All geologists know that no dicotyledonous plant has thus far ever been reported with certainty from any formation lower than the Cretaceous. In my

\*Fifteenth Annual Report U. S. Geological Survey, p. 378.

†Am. Journ. Sci., 3d. ser., Vol. XXXVI., August, 1888, p. 131.

'Sketch of Paleobotany'\* this fact was clearly brought out, and in the eleven years of great paleobotanical activity that have elapsed since that paper appeared no discoveries have been made to modify it. It is true that I argued in that paper that the dictyledonous floras then known from the Middle Cretaceous, including our Dakota Group, were too highly developed to warrant the assumption that this class of plants had no earlier origin, and in my diagram (pl. lviii.) of the probable first appearance of the several great types of vegetation I projected the dicotyledonous column downward into the Jura-Trias. The Older Potomac flora was then unknown, and its discovery has gone a long way toward justifying this claim. But in this, as I pointed out in the paper already mentioned,† the dicotyledons are rare, of strange aspect, embryonic, and prophetic of the great type of plant life that was to dominate the earth. Even in the Middle Potomac (my Aquia Creek series), which overlies the Rappahannock beds with some indication of unconformity, the dicotyledons are peculiar in character and are far outnumbered by the lower forms. Not so the great Amboy Clay flora. Here, and still more markedly the flora of Gay Head and Long Island, the dicotyledons are fully developed, many of them probably belonging to genera now found in our forests. They also make up the great bulk of the vegetation, and ferns, cycads and conifers are comparatively rare.

In a paper just issued and forming part of the Sixteenth Annual Report of the United States Geological Survey I have discussed the 'Earliest Dicotyledons'‡ and also certain 'Archetypal Angiosperms,' § and have reproduced figures of forms from the Jurassic that the late Marquis Saporta thought might represent, not dicotyledons, but ancestral angiosperms, prophetic of both monocotyledons and dicotyledons, which he called 'Proangiosperms.' I sympathize more or less with the point of view of the great French paleobotanist, and fully expect that forms will yet be found in the Jurassic which,

\*Fifth Ann. Rep. U. S. Geol. Survey, p. 441, pl. LVI., LVII.

†Am. Journ. Sci., 3d. Ser., Vol. XXXVI., August, 1888, pp. 129-130.

‡Pp. 510-515. §Pp. 535-536.

if they are not true dicotyledons, will prove to be their immediate ancestors. But I certainly do not believe that any number of well developed dicotyledonous plants will ever be found in the Jurassic, nor that such plants flourished at a period so remote.

Aside from the Carboniferous and the Miocene scarcely any geological age is better known from the botanical side than the Jurassic. From the Rhetic to the Wealden, rich Jurassic floras have been made known in many countries of Europe, in the arctic regions, in Siberia, in China and Japan, in India, Australia, South Africa and South America, and only last year the discovery was made for, the first time, of a true Jurassic flora in the United States, viz., near Oroville, in California.\* Yet of all the hundreds of Jurassic forms thus brought to light not one is dicotyledonous.

In view of all this it is clear that there is no room for controversy over the age of the clays of Block Island or any of their equivalents. When the vertebrate remains that Prof. Marsh has found in these beds shall have been described, it will simply be a question of the relative weight that each one may choose to give to the two classes of paleontological evidence before the world. Many of the plants have already been published with full drawings and descriptions, and a list of them, which has since been considerably increased, is given in my paper on the Potomac Formation. Dr. Newberry's work on the 'Flora of the Amboy Clays' will soon appear as a Monograph of the United States Geological Survey, and Dr. Hollick is now engaged on a similar monograph of the flora of the Island Series. Those who are capable of supposing that such a flora as this could have flourished in Jurassic time are certainly at liberty to do so, and the geological world will doubtless duly appreciate their courage.

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#### THE DATE OF PUBLICATION.

IN SCIENCE for November 6th Dr. J. A. Allen objects to the resolution adopted by the Zoological Section of the American Association

\*See Prof. Fontaine's paper in the Am. Journ. Sci., for October, 1896, pp. 273-275.

for the Advancement of Science at the Springfield meeting (1895), which recommended that the date of printing be regarded as the date of publication. He regards the position taken in the resolution as expressing both 'absurdity and mischievousness,' and insists that sale, or distribution only, constitute publication. He thinks that his opinion to this effect is a corollary of the definition given by the Century Dictionary, namely, that publication consists of 'the act of offering a book, map, piece of music, or the like, to the public by sale or by gratuitous distribution.'

The resolution was presented to the Section by a committee after consultation with many of the members who are engaged in scientific publications, and who are perfectly familiar with the subject in all its aspects. It was felt that, while it would be very desirable if a rule of distribution could be formulated, such a course is simply impracticable. The difficulty of so doing is set forth in the whereases that precede the resolution. Dr. Allen has not met these difficulties, but he adduces some objections to the adoption of the date of printing as that of publication. On the general position taken by Dr. Allen I make the following comments:

*First.* The date of printing, or alleged printing, of the last printed part of a book, the title page, has always been regarded as the date of publication. Who has ever inquired into or determined the date of sale or distribution of any scientific book published during the past, up to within a very few years? We are accustomed to refer to the title page, or last page, to ascertain this date, for further than that we cannot go. In most instances it will be impossible to ascertain the date of sale or distribution of books published in past years, apart from the date of printing:

*Second.* The probabilities are so great that a book is 'offered to the public' at the date affixed to it, that it is not safe to assume that it is not, except in two contingencies. The first is the case of fraudulent antedating of a book. This is likely to be of extreme rarity among scientific men, and if attempted would be easily detected by reference to the records of the printing office. The second case is the one brought forward by Dr. Allen, that of government pub-