Rhodes's vigorously expressed desire that these young men should have the benefits of the influences of Oxford University at 'the most critical period of their lives.' If their characters are already formed, they are far more likely to alter the tone of Oxford than Oxford is likely to develop them.

Now, as to the desirability of this I offer no comment, I am only concerned with Mr. Rhodes's intention. He desired that poverty, religion, race—nay, even the lack of 'scholarship' itself—should not bar a boy of strong physique and moral character from obtaining one of these splendid prizes. Yet here is a scheme apparently gaining ground where poverty and the lack of scholarship will practically disqualify a candidate, and the application of the character test as outlined by the testator is rendered nugatory.

But it may be said that Mr. Rhodes only defined his ideas in respect of the South African scholarships. That is quite true, but he gave his intimates to understand that his motive was the same in all cases, viz., 'uniting of the Anglo-Saxon race.' That unity will be postponed if educational experts, in their very natural desire to secure the benefit of these great endowments to produce scholars, arrange the regulations in such a way as to eliminate possible leaders of men such as Rhodes was himself. He wanted picked potentialities, but, if I understand his mind aright, they were to be men of action rather than scholars.

RECENT ZOOPALEONTOLOGY.

VERTEBRATE PALEONTOLOGY IN THE UNITED STATES GEOLOGICAL SURVEY.

THE following abstract is published with the permission of the Geological Survey and covers the progress which has been made during the year 1903 on the work which was substantially begun July 1, 1882, by the appointment of Professor Othniel Charles Marsh, of Yale University, as paleontologist on the survey. As is well known, Professor Marsh devoted years to the collection and preparation of materials for a series of elaborate monographs. The work on these was most unfortunately interrupted by his death, but at that time lithographic plates of three monographs, namely, the Brontotheriidæ (60 plates), the Sauropoda (90 plates) and the Stegosauria (54 plates), were completely prepared and printed, together with hundreds of text illustrations. The drawings for the fourth monograph, the Ceratopsia, are on stone but not as yet printed. Practically none of the manuscript for these volumes was ready.

In appointing Professor Henry F. Osborn as Professor Marsh's successor, it was understood that the latter should receive full credit for the years of labor which he devoted to these monographs. The appointment of Professor Osborn was originally as paleontologist, June 30, 1900; in January, 1901, the appointment was changed to geologist and paleontologist.

The unfinished work was begun at once, and has been carried on in two lines: First, the preparation and supervision of the four paleontological monographs; second, the planning of geological field work connected therewith, the latter being of great importance, in order that the vertebrate paleontology of the survey may render service in connection with the stratigraphic history of the continent.

Professor Osborn undertook the preparation of the Titanothere and Sauropoda monographs himself; Mr. J. B. Hatcher, now of the Carnegie Museum, was entrusted with the preparation of the monograph on the Ceratopsia; and Mr. F. A. Lucas, now of the United States National Museum, was entrusted with the preparation of the Stegosauria monograph.

More in detail, the actual work on hand and accomplished is as follows:

1. *Titanothere Monograph.*—This monograph, begun January 2, 1901, has required more time than was anticipated, partly due to Professor Osborn's interruptions by other duties, partly to the unexpected expansion of the subject by the discovery, both in the Oligocene and Eocene, that the titanotheres embraced at least four entirely distinct and independent phyla. To learn the origin, history, succession and extinction of these animals it has become necessary to trace the materials scattered through many museums, at home and abroad. Yale, Princeton, Harvard, Ot-

tawa, Chicago, Washington and Pittsburg museums have been repeatedly visited. Mr. W. K. Gregory was sent to the British Museum of Natural History, London, for a special study of the titanothere material there, and work has also been done through the aid of Dr. Max Schlosser, in Munich. The chief results obtained thus far are: (1) The systematic revision of the entire group of titanotheres; (2) the separation of the contemporaneous phyla above referred to, illustrating the law of local adaptive radiation, and the polyphyletic division of the perissodactyls; (3) the establishment of the law of correlation of skull with skeletal structure; (4) the independent development of the horns in three separate Eocene phyla, illustrating the law of predeterminate evolution. New methods of illustration in photography have been developed especially for this volume, under the direction of Mr. A. E. Anderson.

A special geological expedition to the Fort Bridger Beds, under the direction of Dr. W. D. Matthew, assisted by Mr. Walter Granger, during the summer of 1902, laid the foundation for more exact stratigraphic data concerning the distribution of species, both of the titanotheres and of other mammals. This preliminary survey in a measure tends to replace the lake theory of deposition in the Bridger beds by the flood plain theory already advocated by Professor W. M. Davis. If confirmed, it will give a further blow to the long-prevailing 'lake basin theory,' which, during the previous season, was unsettled in the Oligocene beds by the observations of Mr. J. B. Hatcher and Professor Eberhard Fraas, in connection also with this titanothere monograph. A party from the American Museum, under the direction of Mr. Walter Granger, is now continuing the observations begun last season on the Bridger stratigraphy, and when these results are in, Dr. Matthew will be able to present his report.

2. *Ceratopsia Monograph.*—The assignment of this monograph to Mr. J. B. Hatcher is particularly appropriate, because of the fact that he practically discovered these animals while working for Professor O. C. Marsh under the U. S. Geological Survey; and that the entire collections in the National Museum and the Yale University Museum are due to him. Mr. Hatcher has completed the bibliographical and reference section, as well as the preliminary revision of the principal forms of the Ceratopsia, and has reached very interesting and novel results. By the terms of his agreement with the Survey, materials in the Yale University Museum, through the cooperation of Professor C. E. Beecher, have been further prepared for description; also, materials in the U. S. National Museum and in the American Museum of Natural History.

The necessity of more exact stratigraphic work than that already contained in the previous studies by Cope, Hatcher and others of the vertebrate paleontology of the Cretaceous became apparent in 1902 partly through the studies by Professor Osborn and Mr. Lawrence M. Lambe, under the Canadian Geological Survey, on the fauna of the Belly River region in the Northwest Territory.*

From these it appeared that the union of the Judith River and the Laramie by Cope and Marsh was partly, at least, erroneous, that two distinct vertebrate faunæ were represented, that part of this fauna in Montana, as well as in the Northwest Territory, was older than the Fort Pierre beds. The subject caused widespread interest and discussion. Never was the necessity of the union of accurate paleontological and stratigraphic work more apparent. Accordingly in June, 1903, Messrs. T. W. Stanton and J. B. Hatcher were detailed by the survey for a complete reconnoissance, extending from the Belly River beds in the north across the boundary down into the Judith River country, to terminate with the Converse Co., Wyoming, beds west of the Black Hills. Mr. Hatcher has reported by letter and in Science the complete success of this trip. The general conclusion is reached that the Judith River and Belly River are fresh-water deposits overlain by a *portion* of the Fort Pierre and distinctly older than the Laramie.

* 'On Vertebrata of the Mid-Cretaceous of the Northwest Territory,' Geol. Surv. Canada, 'Contributions to Canadian Paleontology,' Vol. III. (quarto), Part II., Ottawa, 1902.

3. *Stegosauria Monograph.*—Mr. F. W. Lucas has completed a preliminary outline for his memoir on the Stegosauria, covering principally the materials preserved in the U. S. National Museum. Mr. Lucas has succeeded in bringing together materials for a corrected restoration of *Stegosaurus,* which differs in important particulars from the restoration by Professor Marsh. It is understood that a model of the animal is in preparation for the St. Louis Exposition.

4. *Sauropoda Monograph.*—The first steps in the preparation of this monograph by Professor Osborn have been taken in the collection of additional material, especially in the Como region of Wyoming, where a deposit, unexampled for richness, has been explored and surveyed under his direction during the past six years. Explorations and studies by Messrs. J. B. Hatcher and E. S. Riggs have also greatly enriched our knowledge of these gigantic reptiles. Two entirely new forms of sauropoda have been discovered, and our knowledge of the forms already known has been extended, so that there is reason to hope that the monograph will contain a complete presentation of the skeleton of several of the known genera of these animals.

The exact stratigraphic work on the Jurassic was begun in the year 1901–2 and was provided for by an appropriation, but unfortunately has been interrupted by the inability of Dr. F. B. Loomis, of Amherst College, to survey the chief section at Cañon City owing to other duties. His sections of the Como region and the Black Hills region have, however, been completed and published by the American Museum of Natural History. Professor Eberhard Fraas, of Stuttgart, is also engaged in the study of the notes and collections made with Professor Osborn in the Jurassic, during 1901–2. He reports that his detailed comparison with the European Jurassic is nearly completed.

5. *Geological Results in Previous Years.*—In the spring of 1901 Mr. Barnum Brown accompanied Professor Lester F. Ward on a short trip into the Lower Trias of Arizona, and secured a number of valuable vertebrate remains, especially of the Phytosauria and Labyrinthodontia, among the latter the genus *Metopias,* which was found for the first time in this country. This collection is in the National Museum.

In 1902 Mr. N. H. Darton of the Survey accompanied by Mr. J. B. Hatcher and Professor Eberhard Fraas visited the *Titanotherium* beds of South Dakota with reference to the establishment of the geological levels of the various species. Mr. Hatcher was able to confirm and greatly extend his previous observations in connection with the Survey, finally establishing the stratigraphic succession of the greater number of the species of Titanotheres.

6. *Progress of Vertebrate Paleontology in America.*—This branch of science covers such a broad field, and the collections made by explorations in the west are so extensive and are multiplying so rapidly, that it is gratifying to report that the number of specialists engaged in the field, in museums and in research work, has rapidly increased, there being now upwards of twenty-five workers. A division of subjects and the friendly cooperation of different institutions have been brought about. Some of these researches, especially those of Prof. S. W. Williston on the pleiosaurs, are on so large a scale that their publication should be undertaken by the government. H. F. O.

SCIENTIFIC NOTES AND NEWS.

DR. G. W. HILL, of Nyack, N. Y., has been elected a corresponding member in the section of astronomy of the Paris Academy of Sciences.

THE Nobel prizes, each of the value of about $40,000, were awarded in Christiania, on December 10. The prize in physics was divided between M. Becquerel and M. and Mme. Curie, of Paris. The prize in chemistry was awarded to Professor Arrhenius, of Stockholm; the prize in medicine to Dr. Finsen, of Copenhagen, and the prize in literature to Dr. Björnstjerne Björnsen, of Christiania. The formal distribution of the prizes took place in the presence of the King and several members of the royal family and a distinguished gathering. A program of music was performed and the usual speeches de-