

garded, by all who believe the Darwinian factor to be operative in organic evolution, as transmissible. In a later number of the *American Naturalist* (vol. li., pp. 250-56) Dr. W. H. Longley has criticised Dr. Pearl's argument, expressing the opinion that "neither genetic research nor studies upon elimination closely limit the possibility that selection has played a very important part in evolution. . . . Recent field studies demonstrate novel facts of common occurrence which must apparently be ascribed to the action of this factor." G. H. C.

TERRESTRIAL MAGNETISM.

ON the occasion of the centennial celebration of the United States Coast and Geodetic Survey, held in April, 1916, Dr. L. A. Bauer delivered an address on the work done by the Survey in terrestrial magnetism, which has now been separately published. Dr. Bauer was himself in charge of the magnetic work of the Survey from 1899 to 1906, and was largely responsible for its greatly increased activity during the present century. Up to the end of 1915 the Survey had made magnetic observations at 5500 land stations, and its ships had taken many observations at sea, while five magnetic observatories were in constant operation. Magnetic charts of much increased accuracy had been published for the United States, and a reduced copy of the chart for 1915 is included in the publication. Dr. Bauer advocates the erection of a new magnetic observatory in the Panama zone, and the uninterrupted maintenance of the existing observatories for a number of years. He expresses some interesting opinions as to the relative importance of theory and observation, which, coming from a man of his great experience, deserve careful consideration. "All experience," he says, "tends to show that, instead of looking upon the establishment of a theory as the goal of an investigation, it should ever be regarded merely as a means to the goal, the advancement of human knowledge." He speaks with feeling of the "uselessness of empirical formulæ for the purposes of prediction" (of secular change), and his final advice to the superintendent of the Coast and Geodetic Survey is "*continued, unceasing, and intelligent observation.*"

The annual report of the director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington for the year 1916 extends to fifty pages. It mentions that vol. iii. of the researches of the department is nearly ready, and that it will contain the final results of the ocean magnetic work from 1905 to 1914, and preliminary results of a recent cruise of the survey ship *Carnegie*, extending from March, 1915, to September, 1916. The present publication gives a good many details of this cruise. The *Carnegie* sailed in the first instance from Alaska to New Zealand, then circumnavigated the south polar regions, the track lying mainly between 50° S. and 60° S., and finally returned from New Zealand to San Francisco. Tables give full particulars of the errors observed in the British, German, and American charts on the several journeys. In most areas the errors are less than 1°, but in several they are considerably larger. The largest errors were observed near 59° S., 110° E. They were as large as 10°, or even 12°, in the British and American charts, and still larger in the German. The land work done in the year includes observations in South Africa, South America, China, and Australasia. The department has taken steps for the erection of a magnetic observatory about 100 miles north of Perth, Western Australia. At the end of the report is a series of abstracts of recent scientific publications by the staff of the department, including several dealing with atmospheric electricity.

NO. 2499, VOL. 100]

AMERICAN FOSSIL VERTEBRATE ANIMALS.

A PAUSE in the discovery of strange new forms of extinct vertebrate animals in North America has afforded an opportunity for obtaining more exact knowledge of some species hitherto known only by fragments. It has also given time for a more careful consideration of the habits and affinities of several problematical types which have previously been only hastily discussed. The American Museum of Natural History, New York, has been especially active in furthering such research, and has lately published in its Bulletin four papers of more than usual interest.

It has long been known that at the beginning of the Tertiary period there were very large and stout running birds both in Europe and in America. The greater part of a skeleton of a new species of *Diatryma*, which was found last year in the Lower Eocene of Wyoming, shows for the first time the true nature of one of these birds. The remains, as usual, are not sufficiently well preserved to exhibit all the features that are needed for an exact systematic determination; but, according to the studies of Messrs. Matthew and Granger, *Diatryma* is now proved to be more closely related to the South American crane-like bird, *Cariama*, than to any other known form. It can no longer be associated with the ratite birds, with which the first fragments were compared. The new species, *Diatryma steini*, must have been about 7 ft. high when standing, with a short and massive neck and an enormous head having a high compressed beak. It would, indeed, present much the appearance of the well-known *Phororhachos* from the later Tertiary formations of the Argentine Republic, which is also generally compared with *Cariama*. The discovery of such a bird in the oldest deposits of the Tertiary period shows how early must have been the differentiation of the birds into the groups which are familiar at the present day.

Of the Dinosaurian reptiles with hind limbs nearly like those of running birds, much has been learned by the discovery of nearly complete skeletons in the Upper Cretaceous of Alberta, Canada. Prof. H. F. Osborn therefore takes advantage of the opportunity of discussing these in connection with the skeletons of *Ornitholestes* from the Upper Jurassic of Wyoming, and of *Tyrannosaurus* from the Upper Cretaceous of Montana. He also publishes many beautiful drawings of osteological details. The forms previously known were obviously grasping flesh-eaters; but the new *Struthiomimus* has a small toothless skull shaped much like that of an ostrich. Prof. Osborn, indeed, thinks it most probable that this strange reptile had the same mode of life and habits as an ostrich.

Equally great diversity is being met with among the armoured and horned dinosaurs from the Upper Cretaceous of Alberta, but all the remains hitherto described are more or less fragmentary. A nearly complete skeleton of *Monoclonius*, now made known by Mr. Barnum Brown, is therefore of great interest and value. Compared with the hypothetical restorations of *Triceratops*, the body is shorter and deeper in the posterior dorsal region, while the feet are more digitigrade with toes turning outwards, the axis of the manus being through the second digit, that of the pes being between the second and third digits. There is no bony exoskeleton, but the epidermis is hardened into low, polygonal tubercles, which do not overlap.

The gigantic herbivorous dinosaurs such as *Diplodocus* present as many difficulties in nomenclature as whales, and Prof. Osborn, with the help of Mr. Charles C. Mook, is now attempting to decide which characters can best be used for the recognition of

the several species. Taking *Apatosaurus* as an illustration, Mr. Mook points out the necessity of making allowance for differences of age in the various individuals compared; which differences can generally be recognised by studying the degree of fusion of certain bones and the development of crests and rugosities on them.

As an aid to the study of Prof. Osborn's numerous papers on the fossil vertebrate animals, we welcome the handsome second edition of the Bibliography of his published writings which we have just received. It includes a classified index as well as the usual chronological list, and forms a most useful compendium for the student. It shows not merely where Prof. Osborn has described the various fossils, but also where he has discussed the points of philosophical interest which arise from these descriptions.

A. S. W.

FORTHCOMING BOOKS OF SCIENCE.

AGRICULTURE AND HORTICULTURE.

Cassell and Co., Ltd.—1000 Gardening Hints, H. H. Thomas, illustrated; The Garden: How to Make It Pay, H. H. Thomas, illustrated; Gardening Handbooks for Amateurs, edited by H. H. Thomas: The Allotment; Early Vegetables; The Garden Frame; Pruning Fruit Trees. *Macmillan and Co., Ltd.*—The Vegetable Garden, E. J. S. Lay. *John Murray.*—The Book of the Rothamsted Experiments, issued with the authority of the Lawes Agricultural Trust Committee, originally edited by A. D. Hall, a new and revised edition, edited by Dr. E. J. Russell, illustrated; Cotton and other Vegetable Fibres, Dr. E. Goulding (Imperial Institute Handbooks). *John Wiley and Sons, Inc. (New York).*—Botany for Agricultural Students, J. N. Martin.

ANTHROPOLOGY AND ARCHÆOLOGY.

Constable and Co., Ltd.—Tools and Weapons, illustrated by the Egyptian Collection in University College, London, and 2000 outlines from other sources, Prof. W. M. Flinders Petrie; Scarabs and Cylinders, with names, illustrated by the Egyptian Collection in University College, London, Prof. W. M. Flinders Petrie. *Macmillan and Co., Ltd.*—Folk-Lore in the Old Testament, Sir J. G. Frazer, two vols. *Methuen and Co., Ltd.*—Primitive Ritual and Belief, E. O. James.

BIOLOGY.

Constable and Co., Ltd.—Coniferous Trees, A. D. Webster, illustrated; Profitable Keeping and Feeding of Rabbits, Capt. C. G. Moor. *J. M. Dent and Sons, Ltd.*—The Imperial Studies Series: The Exploitation of Plants, a Series of Lectures Delivered at University College, edited by Prof. F. W. Oliver. *H. Holt and Co. (New York).*—General Zoology, Prof. A. S. Pearse. *Longmans and Co.*—A Handbook of Nature Study and Simple Agricultural Teaching for the Primary Schools of Burma, E. Thompstone. *Methuen and Co., Ltd.*—Secrets of Earth and Sea, Sir Ray Lankester, illustrated. *John Murray.*—The Life and Letters of Sir J. D. Hooker, L. Huxley, two vols., illustrated. *John Wiley and Sons, Inc. (New York).*—Fresh-water Biology, H. B. Ward and G. C. Whipple; Applied and Economic Botany, K. Kraemer.

CHEMISTRY.

George Allen and Unwin, Ltd.—The Treasures of Coal Tar, Prof. A. Findlay. *J. and A. Churchill.*—A Short Account of Explosives, A. Marshall; Allen's Commercial Organic Analysis, edited by W. A. Davis, vol. ix. *Constable and Co., Ltd.*—What Industry Owes to Chemical Science, R. B. Pilcher; Elements of

Industrial Chemistry, A. Rogers, illustrated; The Nature of Solution, H. C. Jones, illustrated; Principles of Quantitative Analysis, Dr. W. C. Blasdale, illustrated; The Life and Letters of Joseph Black, the late Sir William Ramsay, with an introduction by Prof. F. G. Donnan. *Gurney and Jackson.*—Supplementary Volume to the Manufacture of Sulphuric Acid and Alkali, vol. i., Prof. G. Lunge; The Chemistry of Linseed Oil, Dr. J. N. Friend (Chemical Monographs). *J. B. Lippincott Company.*—Chemical Analysis of Iron, Blair, new edition. *Longmans and Co.*—The Chemical Constitution of the Proteins, Dr. R. H. A. Plimmer, part i., Analysis, new edition (Monographs on Biochemistry). *Scott, Greenwood and Son.*—Vegetable Fats and Oils, L. E. Andés, new edition; Dyers' Materials, P. Heerman, new edition. *University Tutorial Press, Ltd.*—Senior Practical Chemistry, H. W. Bausor. *John Wiley and Sons, Inc. (New York).*—Laboratory Manual of Elementary Chemistry, H. C. Cooper; Bio-Chemical Catalysers in Life and Industry, G. Efront; An Introduction to Theoretical and Applied Colloid Chemistry, Dr. W. Ostwald; Examination of Water, W. P. Mason, new edition; Colloid Chemistry, R. Zsigmondy and E. B. Spear; Scientific and Applied Pharmacognosy, H. Kraemer; Theoretical and Practical Pharmacy, E. A. Ruddiman; Manual de la Fabricacion de Azucar de Cana, G. L. Spencer; Empirical Formulas, T. R. Running.

ENGINEERING.

Cassell and Co., Ltd.—All About Engines, E. Cressy, illustrated. *Constable and Co., Ltd.*—Industrial Engineering: Its Present Position and Post-War Outlook, F. W. Lanchester; Airfare of To-day and of the Future, E. Middleton, illustrated; With the French Flying Corps, C. D. Winslow, illustrated; Electrical Measuring Instruments, K. Edgcombe, new edition; The Flying Machine from an Engineering Point of View, F. W. Lanchester, new edition. *Electrician Printing and Publishing Co., Ltd.*—Electrical Measuring Instruments, C. V. Drysdale and A. C. Jolley; Balancers, Carter; and new editions of Wireless Telegraphy and Telephony, Dr. Eccles; Electricity Meters, C. H. W. Gerhardt; Electric Mains and Distributing Systems, Dick and Fernie; Electric Switch and Controlling Gear, Dr. Garrard; Electric Cranes and Hoists, H. H. Broughton, two vols. *Crosby Lockwood and Son.*—The Founder's Manual: A Presentation of Modern Foundry Operations for the Use of Foundrymen, Foremen, Students, and Others, D. W. Payne. *John Murray.*—The Life and Letters of Sir Colin C. Scott Moncrieff, 1836-1916, edited by his niece, Miss M. A. Hollings, illustrated. *Scott, Greenwood and Son.*—Strength of Ships, J. B. Thomas; Strength of Structural Elements, E. H. Sprague; Precision Grinding Machines, T. R. Shaw. *Seeley, Service and Co., Ltd.*—The Romance of War Inventions: An Account of the Destructive Engines and Weapons and Life-saving Appliances used in Modern Warfare, T. W. Corbin, illustrated. *Whittaker and Co.*—Continuous-Current Motors and Control Apparatus, W. P. Maycock, illustrated; Power Wiring Diagrams: A Handbook of Connection Diagrams of Control and Protective Systems of Industrial Plants, A. T. Dover, illustrated; Electric Motors and Control Systems, A. Dover (being a portion of the work on Electric Traction by the same author, with additions and revisions), illustrated. *John Wiley and Sons, Inc. (New York).*—American Engineers' Pocket Book, A. H. Blanchard; Testing for the Flotation Process, A. W. Fahrenwald; Meter Rates for Waterworks, A. Hazen; Ingeniería de Ferrocarriles, V. L. R. Havens; Printing, F. S. Henry; Shore Processes and Shore Development, D. W. Johnson; Hydroelectric Power Stations, E. A. Lof and D. B. Rushmore; Mining Engineers'