ganizations maintained by educational institutions or government departments, or by means of research laboratories under the control of their own trade associations. On account of the development now in progress, the National Research Council Division referred to is appropriately turning its promotional efforts from "why do research" to "how do research," and plans are under consideration for bridging the gap between industry and educational institutions by means of conferences between leading institutions and industrial executives—also bringing the trade associations into the plan because they undoubtedly have a helpful influence for small companies.

The Division already has examples of such endeavors. Thus, in the welding field some ten leading institutions are undertaking investigational work of specific problems with coordination through an appropriate committee. Specimens needed in the investigational work are made up by industry under the exact conditions required by the laboratories. Special apparatus is supplied where needed. Some of the smaller companies, and even some of the larger ones, will find that for certain types of work the educational institutions will return more accomplishment for the research dollar than can be obtained in any other manner. But it must be remembered, in educational institutions and in industry, that mere projects of testing are not research, while it is the latter which brings progress and prosperity to industry.

The relation between any typical industry and the engineering schools can not be nationally uniform or nation-wide. Selectivity and discrimination (in the sense of recognition of fitness) are necessary to avoid waste of money and effort in cooperative relations which grow up between the industries and the engineering schools. In the engineering schools, we should aim to make our efforts at industrial cooperation primarily with those industries which have establishments within nearby territory and whose interests lie principally within the range of our individual school curricula and equipment, but the sources of our students may be world-wide and the employment of men who take our degrees may be nationally spread. The engineering schools expect individual industries to give their cooperation primarily for their own welfare, but additionally because it is for the best interest of processes of higher education which associate generally with the industrial welfare of the country. The engineering faculties devote their lives to work of beneficial interest to the industries and it is reasonable for the faculties to expect constructive cooperation and aid from the industries.

OBITUARY

WILLIAM DILLER MATTHEW, PALEONTOLOGIST

(1871–1930)

THE death of William Diller Matthew on September 24, 1930, cut short at the height of his career a man who had contributed immensely to the science of paleontology, one who realized the value of this science for the philosophy and art of human living and who was in the midst of a sustained and highly successful effort to open wide its broad fields, especially to great numbers of his own well-trained students.

In 1894 Matthew was a red-cheeked Canadian youth in the department of geology at Columbia. His main interests at that time were in crystallography, in trilobites and in the structure of the intrusive and effusive rocks of his native country around St. John, New Brunswick. His father, George F. Matthew, was an amateur geologist in the best sense, since he was a recognized authority on the geology, fossil plants and early amphibian footprints of New Brunswick. His mother successfully reared a large or "old-fashioned" family and imparted to all her children her irrepressible cheer and good humor, as well as her high ideals of service. Fire consumed the elder Matthew's collection of fossils and his scientific library; but he set to work to build them up again. The son was a young man of almost Spartan simplicity of life: frugal and self-denying but early learning to achieve excellent results with slender resources.

With such a background the young Matthew, after obtaining his doctorate at Columbia in 1895, came to the American Museum of Natural History at the invitation of Professor Henry Fairfield Osborn to be a scientific assistant in the then young department of vertebrate paleontology. His first big task was to go down to Philadelphia to catalogue and pack up for shipment the great private collection of vertebrate fossils which had been amassed by Professor E. D. Cope, and had recently been sold to the American Museum. In this way Matthew gained his first extensive contact with Cope's life-work and collection. During the next thirty-five years it was his lot to catalogue and identify tens of thousands of vertebrate fossils for the ever-growing collections of which the Cope collection was the foundation. More cautious than Cope and far more critical, with the advantage of great stores of additional material, he corrected, revised and extended Cope's work in many fields, conserving and strengthening as much as he reasonably could of Cope's results. For instance, in all his extensive researches on the classification of the Eocene carnivores he clung tenaciously to Cope's definition of the Creodonta, which had been so framed as to include both the typical specialized creodonts and their differently specialized relatives, the ancestors of the higher carnivores. This was not because he doubted the ancestral kinship of the miacid creodonts to the higher carnivores but simply because, like Cope, he was a stout defender of the "group method" of classification, which insists on the formal definition of groups of related organisms that possess in common the characters cited in the definition, this method being in opposition to the "phylogenetic method," which defines "phyla" according to their supposed trends of evolution and which includes in these phyla even the earliest and little-differentiated representatives that have not yet acquired all the visible characteristics of their descendants. For example, the earliest so-called "horse" (*Eohippus*) is so closely related to the earliest so-called tapir (*Systemodon*) that even Matthew and his colleague Walter Granger have found it difficult to distinguish the molar teeth of certain species of *Eohippus* from those of a certain species of *Systemodon* (=*Homogolax*). From this and other evidence Matthew contended that these two closely related genera along with many other related forms of Eocene perissodactyls, including the ancestors of the paleotheres and rhinoceroses, ought to have been referred to a "horizontal" family, the Lophiodontidae. This family would have been defined by the retention of many primitive dental and skeletal characters which were subsequently lost by their divergent descendants the paleotheres, horses, titanotheres, rhinoceroses, tapirs, etc.

Another instance of his conservative progressiveness may be found in his most widely known work, "Climate and Evolution" (1915). Being a student of Alfred Russell Wallace's works on geographic distribution, he sided with that great naturalist in opposing those who lightly reconstructed "land-bridges" across the oceans of any and every geologic epoch in order to account for the presence of related animals and plants on opposite shores of ocean barriers. From his vast and intimate knowledge of the fossil record of the vertebrates, he was able to show that many groups whose representatives are now found dispersed in far distant tropical and southern continents are the specialized descendants of known fossil types which in the Eocene and later epochs were inhabitants of the northern lands. His excellent distribution maps were "North Polar projections" of the continental land masses, upon which was plotted: first, the distribution of the Eocene and later ancestors of the horses, tapirs, rhinoceroses, camels, pigs, ruminants, dogs, cats, etc., which were all known only in the northern hemisphere; second, the present distribution of the scattered representatives of many of these families in tropical and southern land masses. His inference was that these forms had originated in the northern hemisphere, had then spread southward into the tropical and southern countries, while the original stock often became extinct in the northern homeland.

On the geologic side he adopted the theory of isostasy, in so far as it was developed at the time. According to this theory, the continents and oceans are held in balance in such a way that only minor oscillations of level have occurred; thus, although the land was at intervals submerged under shallow invasions of the sea, while at other times the continents emerged to higher levels, yet the main continental masses have remained substantially intact, at least throughout the period covered by the records of vertebrate life. In order to account for the first colonization by mammals of continental islands, including Madagascar, Australia, New Zealand, he followed Wallace in evoking the agency of those "natural rafts," which emerge in great numbers from continental rivers and carry sometimes a stray small mammal. Once in a million or more chances, he argued, this castaway might be a gravid female whose progeny could subsequently colonize the whole island. He cited the evidence that tended to support the view that even the most gigantic Australian marsupials had been derived eventually from small arboreal ancestors, which were the only kind that might be conceived to be capable of living in a tangled mass of vegetation during its long drift across the sea and through subsequent perils of landing on a strange shore.

Thus Matthew came to deny the validity not only of all the supposed sunken "land-bridges" across the Atlantic and Pacific which had been evoked by various authors, but also the supposed former connections of South Africa, Australia and South America with the Antarctic continent. Accordingly he ascribed to "parallelism" the rather striking resemblances of the extinct "sparassodonts" of Patagonia with the existing thylacines of Tasmania.

Whatever may be the ultimate verdict of science upon these features of his zoogeographical theory, it is somewhat unfortunate that this more or less debatable aspect of his work should have been discussed by dozens of writers of varying competence, while his immense contributions to the orderly development of mammalian paleontology were really well known only to those two or three specialists who, with fossil specimens in hand, wanted to identify their material by comparison with his excellent descriptions and figures.

The greater part of his scientific writings deals with the revision of mammalian fossil faunae, including the Basal Eocene Puerco and Torrejon, the Lower Eocene Wasatch, the Middle Eocene Bridger formations of the Eocene and many horizons of the Oligocene and later Tertiary. To all these faunae he contributed extensive technical reports or memoirs. His faunal lists of the Tertiary horizons of Western North America, though embodying the work of his predecessors and colleagues, nevertheless represented his own labors in identifying thousands of fossil specimens; they were also based upon his personal studies of the precise geologic level of specimens collected in field parties under his direction.

He was always a geologist as well as a paleontologist and geological considerations occupy a good share of his published writings. As a result of his field and museum experience he successfully attacked (1899, 1901) the theory that the deposits of the supposed ancient "Lake Basins" of the West had been laid down in great lakes, showing that the geological and paleontological facts indicated rather the derivation of these formations by flood-plain playa and aeolian deposition.

His conclusion that the Basal Eocene formations of New Mexico and Wyoming represented a very long period of time (to which he gave the name Paleocene) between the Uppermost Cretaceous and the true Eocene has recently been confirmed by the intensive explorations carried on in northwestern Wyoming by parties from Princeton University.[1]

Owing to the great scarcity of fossil mammals, except in a very few museums, and to the necessarily technical nature of most of his work, Dr. Matthew's greatest discoveries concerning the evolution of the mammals were known at first hand only to his immediate colleagues and to a very few specialists scattered over a world which, for the most part, is impervious to paleontological science. But, as practically his entire scientific career was spent amid the most compelling evidences of evolution, it is not surprising that when he did write for the public on the subject he was able to do so with conviction and with authority. His vigorous honesty and cautious testing both of fact and of inference inspired confidence in the reader. Among the most important of these writings on evolution were his popular "guide" to the evolution of the horse[2] and his admirable articles on the evolution of the horse family and of the dog family,[3] his summary of the evolution of Eocene mammals in the Proceedings of the Zoological Society of London (1928), and especially his handbook "Outline and General Principles of the History of Life."[4]

In 1927 Dr. Matthew accepted the call of the University of California and went there to be head of the department of geology, professor of paleontology and director of the paleontological museum. He was brilliantly successful in attracting very large numbers of students to his lectures in spite of the difficulty of his courses; he also stimulated new exploration and research and attracted young men of great promise into the field of paleontology. In the summer months he came back to his old collections in the American Museum to continue and complete his monograph on the Paleocene mammals. But in the midst of all these successful activities he was interrupted in May of 1930 by the first serious indications of the grave illness to which he finally succumbed after a long fight. He is survived by his widow, two daughters and a young son.

In fine, Dr. Matthew's greatest contributions to the cause of science and enlightenment may be summarized as follows:

He identified, catalogued and kept in close touch with tens of thousands of specimens of fossil mammals. He took part in and directed field exploration in many western localities and in Florida, and made extended studies of vertebrates in the museums of Europe and in the field in Mongolia, Java and elsewhere. With this background of practical experience he compiled, and repeatedly revised and extended, faunal lists of all the Tertiary horizons of Western North America and took a prominent part in correlating the horizons of different localities with each other and with the faunae of Europe, Asia and other regions. He published a long series of memoirs, bulletins, *novitates*, etc., on the fossil mammalian faunae of North America, especially those of the Puerco and Torrejon, Tiffany, Wasatch, Bridger, White River, Lower Harrison, Rosebud, Sheep Creek and several later formations. In these reports he dealt effectively with the stratigraphic relations of the formation, mode of deposition, ecology of the various groups, revision of species and genera, osteology and allied topics.

In the course of the foregoing and other work he made significant contributions to the classification of mammals and knowledge of phylogeny in nearly all the orders and suborders of mammals, but especially the Creodonta, Arctoidea, Aleuroidea, Insectivora,

[1] Jepsen, G. L., *Proc. Amer. Philos. Soc.*, lxix, p. 467, map.

[2] *Quarterly Review of Biology*, Vol. 1, No. 2, April, 1926.

[3] *Journal of Mammalogy*, Vol. 11, No. 2, May, 1930.

[4] University of California Publications, Syllabus No. 213, 1928.

Rodentia, plesiadapids, lemuroids, tarsioids, ganodonts, teniodonts, Xenarthra, Condylarthra, Taligrada, Amblypoda, Hippoidea, Rhinocerotoidea, bunodonts, bunoselenodonts, Tylopoda, hypertraguloids, Pecora. Even in a much fuller review of this aspect of his work (to be published elsewhere) it has been impossible to do more than touch upon a few of the evolutionary problems which he either definitely solved or left with significant enrichment. It must suffice in this place to state that the younger generation of American paleontologists, which is now fortunately coming forward, is already finding that Dr. Matthew, while giving final answers of fact to thousands of specific questions, has also bequeathed to them other thousands of problems that will challenge their best efforts for a lifetime.

WILLIAM K. GREGORY

FRITZ PREGL

PROFESSOR FRITZ PREGL, head of the Institute of Medical Chemistry at the University of Graz, Austria, died quite unexpectedly on December 13 at the age of 61. Professor Pregl was the originator of the methods of quantitative organic microanalysis bearing his name, which have found so widespread application in recent years. In recognition of the eminent practical importance of this work he was awarded the Nobel Prize in Chemistry in 1923. Pregl originally received a medical training and was actually practising in ophthalmology, but later turned back to the preclinical sciences and became interested in certain physiological-chemical problems. This inclination brought him in contact with K. B. Hofmann, Abderhalden and Emil Fischer and resulted in a number of publications on various subjects (bile acids, composition of proteins, starch). In the course of an investigation on bile acids lack of material put before him the choice of either abandoning the problem or of inventing new methods of analysis. Within a few years (1911–1914) he was able to substitute for practically all the conventional methods of quantitative organic analysis equivalent micromethods requiring only 3 to 5 mg. of substance and involving substantial savings of time and reagents. His work drew considerable interest in the scientific world and ever since then students of all nationalities, some of them renowned investigators, gathered in his laboratory to acquire the special technique and "microchemical asepsis" of manipulation. In this country a number of chemists will remember with gratitude the hours spent in his institute, not only because of the knowledge gained, but also for the contact with an outstanding and original personality of fine human qualities.

O. W.

MEMORIALS

As a memorial to the late Louis Agassiz Fuertes, who until his death in 1927 was generally recognized as America's foremost painter of birds, the Field Museum of Natural History has published in a limited edition an album of reproductions in colors of thirty-two of his finest pictures of birds and mammals. The paintings selected for this portfolio represent the last work of the artist, having been made in Africa while he was a member of the Chicago *Daily News* Field Museum Abyssinian Expedition of 1926–27. Mr. Fuertes was killed in an automobile accident shortly after his return to this country from that expedition. The originals of the paintings were purchased and presented to Field Museum by C. Suydam Cutting, of New York, who was also a member of the expedition. Mr. Cutting in addition paid the cost of the publication of the memorial album. The portfolio is of large size, the plates being eight by ten inches with a ten-inch margin. The album has a preface about Fuertes, the man and his work, written by Dr. Wilfred H. Osgood, the museum's curator of zoology, who was leader of the Abyssinian expedition.

WE learn from the *Journal* of the American Medical Association that the memory of Professor Laveran, who discovered the hematozoon of malaria, and to whom a monument was unveiled last spring at Constantine during the ceremonies commemorating the centenary of the conquest of Algeria, has again been honored at Paris by commemorative ceremonies held at the military hospital of the Ecole du Val-de-Grâce, where he was professor until he reached the army age for retirement, after which he was director of a laboratory at the Institut Pasteur until his death. The ceremonies were held in the great hall of the school. Dr. Roux, director of the Institut Pasteur, presided. Professor Sieur, president of the alumni association of the Ecole de santé militaire du Val-de-Grâce, expressed the thanks of the association to those who had subscribed to the monument. Mr. Calmette gave an account of the life of Laveran and of his discovery. Addresses were delivered by Troussaint, a former coworker of Laveran; by Marchoux, and by Rouvillois, the director of the school. An historical niche was established in the school, in which a glass case encloses the microscope and the observation records of Laveran. Then the audience proceeded to a spot in front of the entrance to the school, which will bear henceforth the name of "Place du docteur Laveran." A commemorative tablet was affixed to the house in which Laveran lived.

RECENT DEATHS

BERNARD BARHAM WOODWARD, librarian and bibliographer at the British Museum of Natural History until his retirement in 1920, died on November 17 at