were intercepted to a greater extent than at present. With no agreement whatever as to what the causes and conditions of glaciation are, it is not possible satisfactorily to predicate the conditions which would reglaciate any given region.

Summarizing the possible causes of glaciations, the above-quoted authors present the following:

Conclusions: Briefly, then, we may conclude that the markedly varying climates of the past seem to have been due primarily to periodic changes in the sun and in the topographic form of the earth's surface, plus variations of the amount of heat stored by the oceans. The transformed face of the earth altered the configuration of the continents and oceans, the air currents (moist or dry), the ocean currents (warm, mild or cool), and the volcanic ash content of the atmosphere. The causation for the warmer interglacial climates may lie in oscillations of solar energy.[8]

The members of this group of heterogeneous causes have individually been included in the unacceptable explanations given in the citations from page 660, and it is not shown that the group as a whole is any more acceptable than the individual causes which compose the whole.

Conceding that a transformed face of the earth would really alter the configuration of the continents and oceans, it must be also conceded that such transformations, at the close of long periods of crustal stability, would accelerate denudation of warm strata and the exposure and alteration of fresh radioactive materials, as well as expose new mountains reaching above the snow line of the period to glaciation. The appeal to oscillations of solar energy, when applied to warm interglacial periods of Permo-Carboniferous glaciation, during which genial conditions prevailed in polar latitudes, is, to say the least, not in harmony with the distributions of temperatures now maintained by solar energy, and can not readily be ascribed to oscillations of solar energy not accompanied by similar climatic oscillations elsewhere and particularly with the climatic anomalies of coincident polar geniality and subtropical glaciation.

These citations and the remarks thereon are not made in a spirit of adverse criticism, but to point out that what is now taught on the subject does not afford an adequate basis for an acceptable explanation of the admitted facts or even for a reasonable belief.

The student who would venture upon this sea of assumptions and of heterogeneous causes must embark in a ship whose center of gravity is above its meta-center. The deck-load of assumptions must be jettisoned and a ballast of facts and sound principles substituted therefor. A distribution of glaciation latitudinally ranging between the poles and the equatorial region appears to be contradictory of solar control and manifestly indicates that some essential factors have been overlooked or omitted in the consideration and presentation of the problems of paleoclimates; and that "other factors" must be utilized in place of those which have been strained beyond their limits of elasticity.[9]

This is the great outstanding problem of geologic history. It is of more importance and more far-reaching than any other, and geologists have turned their attention to the minor problems of mineralogy and paleobiology and have let the great problems of the causes and conditions of paleoclimatology fall by the wayside.

MARSDEN MANSON

BERKELEY, CALIF.

[8] p. 663. For relative constancy of solar energy see Curtis's address, SCIENCE, February 18, 1925, pp. 471–472.

[9] "Radio activity and earth history," Holmes, *Jour. of Geog.*, June, 1925, pp. 529–532.

WILLIAM ALBERT HAMILTON

WILLIAM ALBERT HAMILTON was born May 9, 1869, near Zanesville, Indiana. He died at Delaware, Ohio, June 25, 1925. He received his bachelor degree from Indiana University and his doctorate from the University of Chicago.

In 1902 he was called to Beloit College as professor of astronomy, and was later transferred to the headship of the department of mathematics. For twenty-one years Dr. Hamilton gave his best thought and service to the upbuilding of his department and to the support of Beloit College. He was an ideal teacher of mathematics, because he was precision and accuracy personified and he studied constantly to keep abreast of his developing science.

Dr. Hamilton was not willing to leave teaching for administrative work. Nevertheless, when Beloit College requested his assistance as recorder, registrar, director of the summer school and finally chairman of the administrative committee, which was to function during the interval of six months when Beloit College had no president, he consented to serve. In each and every administrative position he was an example of loyalty to high ideals, to unremitting toil and to sacrifice. This sacrifice became supreme when he severed his connection with Beloit College, which he had served for twenty-one years and into which he had put his best endeavors. He resigned because of the treatment accorded one of his intimate associates by the Board of Trustees at the commencement of 1923.

During the summer of 1923 Dr. Hamilton was

invited to join the faculties of Cornell University and the University of Wisconsin. He accepted the offered appointment of lecturer in mathematics at the University of Wisconsin, where he entered joyously again into advanced study and teaching.

Dr. Hamilton's scientific and educational associates may well testify that he was a man whose integrity of mind, purity of heart and unselfish devotion to truth and to worthy friends enrolled him among the truly great educators of his day and generation.

M. A. B.

SCIENTIFIC EVENTS

PALEONTOLOGICAL EXPEDITION OF THE FIELD MUSEUM TO ARGENTINA

THE Captain Field Paleontological Expedition to Argentina returned to Chicago in April, after twenty-six months in Argentina and Bolivia, having obtained three collections of fossils which should exemplify the orders of extinct mammals peculiar to that continent. The expedition was placed in charge of Elmer S. Riggs, associate curator of paleontology, assisted by G. F. Sternberg and J. B. Abbott, collectors, all members of the scientific staff of the Field Museum.

The labors of the expedition were begun in the Santa Cruzean formation at the southern extremity of Argentina. Immediately following the notable discoveries made by the *Beagle,* Captain Sullivan had observed and brought to the attention of English scientists the presence of fossil animals of strange forms in the cliffs about Cape Fairweather. Later researches of Argentine, and of American, paleontologists had made known the strange and interesting system of extinct mammalian life represented by fossils preserved in the rock-ledges of the Patagonian coast.

Employing the method of working from the better known to the less known, the Santa Cruzean Formation at Rio Gallegos was the first of a number of fields to be visited by the Field Museum Expedition. This formation, exposed in a line of cliffs rising 300 feet above tidewater and continuously undercut and eroded by the sea, proved to be a fertile, though an unusual, collecting ground. Fossils were found not only in the vertical wall of the sea-cliff, and in the fallen blocks below, but often in the ledges of sandstone exposed at low tide and extending a mile or more out to sea.

In this region, and among most hospitable, English-speaking sheep-growers, the work of the expedition was begun early in January, 1923. The remaining months of the southern summer enabled the collectors to work over one hundred miles or more of the coast ledges and to make a hurried excursion to the inland region of Lake Cardial. As a result, a valuable collection of nearly three hundred specimens of fossil mammals was secured from the Santa Cruzean Formation before the coming of winter made it necessary to suspend field operations.

The second summer's labors were begun with base at the oil port of Commodoro Rivadavia. In turn the expedition moved inland to Colonia Sarmiento and after a wide circuit returned to the coast at Puerto Deseado. A number of fossil-bearing localities, known and recorded by Argentina and foreign collectors, were visited. A wide reconnaissance in search of new collecting grounds was rewarded by some important discoveries.

The formation designated by Ameghino as Pyrotherium Beds and by American paleontologists as Deseado claimed especial attention. Its rich and varied fauna offered to the collector a most alluring promise. The gigantic and strange Pyrotherium, known to science for nearly forty years, still remains an object of conjecture and a problem in classification. The equally gigantic Parastrapotherium is little better known. Isolated jaws, teeth, tusks and scattered bones of these overlords of ancient Patagonia were found in considerable number, but their complete structure will remain almost as much a problem as before.

The animals of intermediate size and the lesser fauna of this formation yielded more generous returns. A collection of 250 specimens representing twenty-four genera of extinct mammals, together with a small number of birds and fishes, rewarded the expedition's labors. The discovery of two new localities for the occurrence of this fossil fauna and additional light on the geological formation may be added to the sum total of results. The Nothostylops Beds of Ameghino were examined, but only a small collection was secured from them.

The occurrence of fossil dinosaurs of great size was observed in a number of localities in the territories of Santa Cruz and of Chubut. A few specimens, the first known to have been taken out of Argentina, were collected. A fossil forest with stumps standing upright, logs lying prone, branches and fruitage scattered about was discovered. A considerable collection of specimens of these objects was made. Collections of modern plants and animals were also made from the territories of Chubut and Santa Cruz.

The southern winter months of 1924 were devoted to collecting pleistocene fossils in southern Bolivia. The Valley of Tarija, known for many years as a