SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, DECEMBER 4, 1908

CONTENTS

WILLIAM KEITH BROOKS

AT sunrise November the twelfth there passed peacefully away, at his home "Brightside," on the shores of Lake Roland, one of the foremost of the few greatest of American zoologists.

William Keith Brooks owed his early education in part to the excellent public school teachers of Cleveland, Ohio, and in part to such elements of his boyhood's environment as his native bent led him to pick out and assimilate. Among such influences were collections of fossils, stored in a neighbor's barn and the wonder of the flocks of carrier pigeons that still came over the lake to be destroyed by clubs and guns on the bluffs, darkening the air till school could no longer "keep."

More significant yet were the self-made aquaria, and the back-yard pond that was sometimes visited by a migrating carrier pigeon and more often the source of rare delight in the study of the habits of aquatic insects. And it was there that was learned an indelible lesson of the power of reflexes and mechanisms, by the observation of a dragonfly that had lost most of its machinery except that of the head, yet continued to chew and swallow food, which, like the water drunk by Munchausen's bisected horse, passed steadily out into the open void.

He was not given to athletic sports, though winning a prize for excellence in calisthenics. Contemplative and studious, he desired to enter college, but his mother did not approve and he began life in his father's counting house. Here he ex-

hibited characteristic interest in the solution of problems and distaste for such mechanical drudgery as had only practical and not theoretical ends in view by the invention of a calculating machine to lessen the amount of unprofitable manual work.

To get the higher education despite lack of financial support he became a teacher at Hobart College and there entered upon a second marked period in necessary preparation for his life-work. He learned the boy mind and the simple way to teach by arousing interest in the truths of nature. Some others profited by this much later when he was induced to give private lessons in natural history to boys in Newport and the same bent always made his university lectures the opposite of that ill-digested verbiage that is sometimes heard. At Hobart two great opportunities were utilized: communion with nature as presented along the rapids below the falls of Niagara and communion with the thought of philosophers he met in his readings in the library. It was then that he became so strongly impressed by the writings of Bishop Berkeley as never to be oblivious of the relation of observational science to the fundamental character of the ego. In the woods about Hobart, Brooks made those observations upon the habits of squirrels, that were probably his first publications and perhaps his last contributions in print to the study of mammals, for his life-work was largely in the field of the lower animals though the complex psychology of the mammal appealed to him strongly.

After two years he entered Williams College where a love of natural history was fostered by the society that sent out an expedition across South America. Receiving the A.B. degree he was drawn by the fame of Agassiz to his first experience with marine life at the famous experiment, the Penikese school, where he shared the discomforts and the delights of the beginnings of that hastily materialized ideal. Sailing to that island by fishing vessel the poetic strain in his composition long treasured the glimpse of his point of departure, the then picturesque hamlet of South Dartmouth, much later recognized, for its rare atmosphere, by the artist, Tyron.

At Harvard College, he received the degree of Ph.D. He had the stimulus of contact and friendship with Hyatt and McCrady and the environment of the museums of Agassiz and of the Boston Natural History Society. With Hyatt's aid he added to his own studies of the embryology of pond snails, such intimate knowledge of the large collections of gasteropod shells that he could distinguish and identify them in the dark. By McCrady he became inspired by the beauties of form and problems of life-history of the medusæ that McCrady's studies at Charleston, S. C., were revealing.

In 1875, he, with H. Tuttle and Theodore B. Comstock, opened a summer school at Cleveland, with some twenty-five, chiefly school teachers, in attendance, with lectures, excursions and laboratory study of both local and marine animals and plants.

With the opening of the Johns Hopkins University, Dr. Brooks saw an opportunity to devote himself to the study of zoology untrammelled by tradition and with the freedom to express the genius that was in him. Appointed fellow, he was at once made instructor, and having no administrative routine was enabled to give himself wholly to investigation—not that he was lacking in initiative and practical expedients. By personal representation he obtained from prominent citizens a nucleus of support for the founding of the Chesapeake Marine Laboratory, the first school for study of marine life to take the field opened by Agassiz's initial experiment. He also induced the civic authorities to open a public aquarium in Druid Hill

Park, though this was subsequently abandoned, since the city had not then grown sufficiently mature to feel the need of such mild expression of intellectual interest and means of instruction.

His summer schools in the Chesapeake, at Crisfield, at the old fort on the Rip Raps off Old Point Comfort, and at Hampton, at first provided instruction for elementary students and school teachers as well as opportunity for research by naturalists, but later this latter side was the one exclusively developed. His study of the fauna of the Chesapeake soon made it evident that the fundamental problems of marine biology could be more profitably attacked at some point on the ocean shore farther south and it revealed also the hitherto unknown fact that the practical problems here in pressing need of solution could be solved by common sense application of scientific principles.

Professor Brooks's discovery that the eggs of the American oyster could be fertilized outside the body suggested the development of an oyster industry along the lines in use by the fish hatching stations and led to the establishment of the Maryland Oyster Commission. As leading and working member of this body, Professor Brooks made an extensive survey of the oyster beds of Maryland and concluded that the state had there a vast means for development, which needed but the application of good business management to rescue it from its condition of neglect. From that date, 1882, Professor Brooks lived in the belief that the people of Maryland would utilize the great natural gifts of the Chesapeake by legislation that would remove the oyster industry from a mere hunt to the level of scientific agriculture. To this end he stimulated popular interest and sought to appeal to those of slow comprehension both by popular lectures and by his popular book, "The Oyster," which was issued in 1891 and reedited later. With characteristic persistence of purpose he was loath to let the truth be swamped by popular conservatism and ignorance and became so determined to see the state enter upon the enjoyment of the fruits of his labors that the oyster question and its ultimate solution played no small part in keeping Professor Brooks in Baltimore when alluring opportunities for enlarged activities were offered at a more northern university. However, he was temperamentally more at home in the non-nervous community of his adoption than in the bustle of the strenuous life of denser populations.

This interest in the practical value of zoological work was sustained by several of his students, who, following Professor Brooks's lead, made advances in the culture of the oyster, in New England, in New Jersey, in Oregon, in Louisiana, in the Carolinas and in Maryland itself. For at the eleventh hour a good beginning was made and Brooks's disciple, Professor Caswell Grave, the zoological member of the present Shell Fish Commission of Maryland, has utilized the new legislation for a most promising realization of Professor Brooks's dreams of scientific knowledge and control of the vast natural resources of the state.

But the philosophical problems of biology always took first place in Brooks's mind and it was at Beaufort, N. C., that he found marine life presenting the problems best suited to his patient and enthusiastic labor. The yearly work of his laboratory, established in the old Gibbs house (that boasted the distinction of being built of cypress and put together with copper nails), added much to the facts of marine embryology and to the number of now well-known investigators.

Upon that foundation was ultimately builded the present well-known marine

station of the Bureau of Fisheries at Beaufort, embodying a dream that Professor Brooks could not himself realize as the university became no longer able to maintain the "Chesapeake Laboratory."

Financial embarrassments of the university led to the abandonment of steam launch and sloop and discontinuance of the university's summer school at Beaufort, but from year to year, when it was possible, temporary stations were established by Professor Brooks and his men; in the Bahamas, at Green Turtle Cay, at Nassau, at the Bimini Islands; and later in Jamaica at Port Henderson, and again at Port Antonio.

Meantime, as director of the United States Fish Commission Laboratory, at Woods Hole, in 1888, and while upon expeditions of the *Grampus* he had opportunity to renew his acquaintance with the fauna of the North Atlantic and to explore the Gulf Stream.

From this varied experience of marine life arose those contributions to the embryology and life histories of non-vertebrates that will long endure as a monument to the industry, keen observation and no little artistic skill of Professor Brooks. His chief observations were made upon the hydromedusæ and the mollusca and crustacea and notably upon those exceptional kin of the vertebrates, the pelagic tunicates, the salpas.

Among these contributions to the facts of marine life might be recalled his papers upon gasteropods and amellibranchs, beginning in 1875, with a communication to the American Association for the Advancement of Science, the papers on *Lingula,* on the development of the squid, on squilla and the other stomatopods, on lucifer with its exceptional cleavage, on the macrura: and a series of papers upon salpa, culminating in 1893, after a continued interest from the first publication upon this animal in 1875, in his great monograph upon salpa, a quarto volume of nearly four hundred pages and fifty-seven plates. From his trips to the Bahamas came also his monograph on the skulls of the Lucayan Indians.

While some of this work appeared in various journals, in the publications of the Philosophical Society, the National Academy, the *Philosophical Transactions* and in the results of the *Challenger* Expedition, much of his earlier work came first to light in "Studies of the Biological Laboratory," but later he assumed editorship of the work in his laboratory in a series of well illustrated quartos published by the university, as "Memoirs from the Biological Laboratory."

Professor Brooks made some contributions to systematic zoology, but his work was chiefly embryological and it is well represented by his monograph upon salpa. This is not merely an account of the embryology and organology of salpa, but creative, philosophical thought upon such problems as: the probable origin of salpa, the origin of the chordates, the origin of pelagic animals, and the discovery of the ocean bottom and its effects upon the evolution of animals.

As is well known Brooks's work was inspired throughout by his interest in the intellectual problems presented by animal life as well as by his love of their forms and activities. And it was this tendency to the philosophical application of zoological facts that was expressed in his later essays and lectures and finally in his book "The Foundations of Zoology." He was not a writer of text-books, yet his "Handbook of Invertebrate Zoology" shows his original and novel treatment of what was then an almost unexplored field in text-book writing, the study by the student at the seashore, of the life histories and eggs and larvæ of marine animals as a basis for

the philosophic study of morphology. And with a more fortunate choice of publisher the book might have long continued to widen the sphere of his influence.

Dr. Brooks married, in 1877, Amelia Katherine Schultz, of Baltimore. His happy home life furnished the environment for the development of his very domestic social needs and the loving care of his devoted wife tided him through many difficult contests between his over-zeal for work and his physical restrictions.

But Mrs. Brooks, in the spring of 1901, after long years of suffering, lightened we hope for a time by the appreciation that came to Professor Brooks when his students requested him to sit for the portrait that they presented on his fiftieth birthday, and which came more for her comfort than for his, passed away from life, to be followed for us too soon by the man whose life we rejoice in, whose death we mourn.

To the students who were taken so freely into that home life a hope of attaining the best that life has to offer, despite financial restrictions, was held forth, and there are many who recall the delightful evenings of reading and talk when they met at his house on terms of equality and free intercourse. His two children he strove to educate with freedom from too much of the burden of inherited custom and regretted the unavoidable interference of some who knew but one orthodox way for the saving of souls. As an example of the thoroughness with which he sought to apply the best to the problem of education may be cited that he would have none but the best "Windsor and Newton" colors for the boy who was entering upon that period of color-love that all go into and most through, fearing lest the mind would be injured by muddy and overlapping tints, and not kept clear as he sought to hold his own. That his two children should have what he had so hardly won, the higher education, he freely spent himself.

His son, as student in mathematics, received the degree of Ph.D. at the Johns Hopkins University, and is now an actuary in Jersey City. His daughter graduated at Vassar and was able to comfort the last days of her father who had had clean-cut ideas as to the highest mission of the perfect woman.

Their inheritance is that education and the privilege of such parentage and nurture.

The condition of Professor Brooks's health was long a source of anxiety to his friends who knew of his heart trouble. As years passed the problem of continuing hard work with increasing bodily handicaps became very difficult. He felt that he ought not to take a period of rest and absence on account of the needs of his children, thinking to work to the end.

In 1908 difficulty in breathing added to his burdens and his machinery was most seriously out of order. He continued to come to his lectures and worked earnestly to complete a final paper on salpa, for which the drawings were finished and which he planned to write out in the summer. This, he said, would probably be his last piece of serious microscopic research, since trouble with his eyes made the employment of immersion lenses too difficult; and his mind was eager to digest the facts of his long experience and the recent work of others. But his strength was not equal to the task. Sudden attacks confined him to his home, but yet his will brought him back to his laboratory, till one last day, February 12. After preparatory rest, driven by his conscientiousness, he forced himself to attend an oral examination of a candidate for the degree of Ph.D. Then walking to the train that brought him home, he was there overcome by a serious collapse. He was persuaded to go to the

hospital and, after most severe attacks there, rallied; but in nine long months that followed he scarcely left his wheel-chair.

When he returned to his home he got such comfort as might be from the advent of spring, the passing of summer and the long lingering of autumn, amidst scenes so familiar and dear. Despite his critical state he was deeply interested in such news as came to him from the university. His last official act was a strong, successful plea for another when his own interests might well have absorbed his attention. His was real friendship growing out of his own wide sympathies.

While having some strength to correct the proofs of papers in press he felt most keenly his inability to put his last work upon paper, and till this work was done he would not deem it right to retire or seek a pension.

The end was imminent, but could not be predicted. His mind was still interested in books and objects of nature, down to a week from the end. Back of the weakness of organs, which he deplored, lay indomitable will and soul, masked not absent. Finally came stuporous death.

After services in Trinity Church, his friends, the faculty and his students, followed the body to its resting place, on the bow of a hill overlooking a broad valley, in the cemetery of the county seat of Baltimore County.

In person, Professor Brooks was of short stature and with ruddy abundant flesh, but yet with small refined boning. Early photographs show him a strikingly thoughtful, quiet but resolute man, with the seeing eyes that remained to the last. Later, when first he came to Baltimore, Brooks was a noticeable, short man, with bushy beard and square, thoughtful brow, very slow of speech, lacking in all superficial conversational art, content with his own thoughts and the worship of his college companion and long most faithful friend, his great St. Bernard dog, "Tige."

To many he is known only from Corner's portrait, which recalls to his older students his characteristic, Buddha-like, quiet and peaceful absorption in thought, till some inner conclusion, or strong outer compulsion caused the peculiar rising glance of the eyes that saw so much and seemed to question so strangely one's inner self.

Born with a physical heart that failed to become completed as in the average man, he learned to conduct his life within the limits set by his peculiar physical organization and avoided all intense muscular efforts and sudden movements. Owing to these habits he was often misunderstood. Yet on right occasion he could exchange his slow rate of living for strong effort. With sympathy for all suffering he once lifted his great St. Bernard dog, "Jupiter," when too tired to longer follow the carriage, and thus he received a severe strain that cost him weeks of pain.

Knowing both the physical and the financial handicaps of his life's race we can appreciate his saying:

> The only necessary law of progress that I can discover is that it is necessary to fight pretty hard for everything worth the getting, and that it is no light or easy task to keep what has been won.[1]

Brooks was no friend of conventionalities, and at times might extend his absorption in the essentials of thought-life to some neglect of many superficialities that others highly prized. In the stress that comes, at times, to those who live in the country and journey daily, some factors of his dress, such as a necktie, might at times be forgotten, but if the loss were discovered, replaced by quick purchase through the faithful laboratory janitor, who honored, and, with good cause, loved

[1] Address Western Reserve University, 1899.

the man whose kindness expressed itself in deeds not made public.

Professor Brooks was very fond of good reading and familiar with the classics of English literature and though he was not able to acquire a library he did get and keep at hand his favorite authors—not for their bindings but for their thoughts and modes of expression. His enviable use of English came in part from his reading but was primarily a habit of mind.

For one of his dogs that chewed up Shakespeare and Tennyson, he had only praise, as exhibiting the tastes of a gentleman, but the other that destroyed cheap novels, was a worthless rascal. An even more characteristic judgment was expressed when one of his students told him that it required three generations to make a gentlemen, and he replied that he thought a gentleman was one who had consideration for the feelings of others.

In later years he developed a strong love of music, and when it became impossible to work through the evenings, as of old, he passed many an hour in the enjoyment of classical music that mechanical devices have made reproducible by one who has had no leisure for musical education. Beethoven's fifth symphony, the overture to Tannhäuser and some fugues of Bach were favorites of his.

His love of flowers led him to make what use he could of a city window and when fate brought him a residence outside the city, a great solace to him was the diminuive greenhouse he was finally able to indulge in. Denied the opportunities that Darwin had, he could not carry on the experiments upon the breeding and heredity of plants that he wished, but when, too late, he had some little space he did such work as circumstances allowed. But it was largely as a source of pleasure and relaxation that he reared his favorite flowers. His attitude of mind towards all forms of life was expressed in the following sentence:

> As for myself, I try to treat all living things, plants as well as animals, as if they may have some small part of a sensitive life like my own, although I know nothing about the presence or absence of sense in most living things; and am no more prepared to make a negative than a positive statement.[2]

Brooks was not an experimenter, but an observer of natural processes, from which he endeavored to interpret logically. He saw too many facts to be long satisfied with the sharp cut result that seemed to follow from experimentally severing some portion of the phenomena from the rest. He was a recorder of nature and a philosophic reasoner about the outside universe as it appeared to his consciousness.

While there was a grain of truth in the remark of an artist who said that Brooks owed his success to the hand drawings he was able to make so well, his long labors with the painfully slow methods of pen stippling contributed to success, not so much from artistic skill as from the leisure to think which this calm, sedentary occupation afforded.

If directness be one hundred per cent. of genius, Brooks also has this claim to be regarded as a genius, for laboratory paraphernalia were always means and not ends to him and while he enjoyed the perfection of a lens or a microtome, or a typewriting machine, or the brilliance of a selective staining fluid, technique was always reduced to its simplest terms in his work. With customary pertinacity he continued to use a simple friction tube when a larval student would have none but a bright complexity of screws, however ill made. However, when his work demanded it he would use all the refinements of Zeiss's apochromats and he wished that samples of all makes of instruments might be in the

[2] "Foundations of Zoology," 1899, p. 17.

laboratory in order that students might learn to use and select what was fitted to their work. From a spirit of patriotism he sought to aid American instrument makers at a period when their product was but the poor things that now lie wrecked from attempts to use them.

He was sure to surprise with unexpected thought. The canals of Mars, if really due to the work of organisms, were, he suggested, on the basis of what we know her, more likely, formed by social arthropods than by man-like beings, as they would be work carried on by great coordinate efforts through long periods.

His interest in the topics of the day was deep and real, but he was not a man to serve in public life. He contributed to the welfare of society by doing the best possible as a trained specialist.

In the question of the admission of women to universities made for men he took his stand upon the basic biological facts as he saw them, but, finally, with his usual effort to be fair thought that the experiment might be tried as one way of finding the proper solution.

Born a decade before the appearance of the "Origin of Species," Brooks's intellectual life unfolded during that remarkable period of an overwhelming acceptance of the doctrine of evolution by means of natural selection. Most of his hard-earned facts were brought to the support of evolution as revealed by embryology. Yet the defects in Darwinism were long considered by him and after ten years of thought upon the problems of heredity Brooks, in 1883, put forth in his first book, "Heredity," many ingenious thoughts that led him, then, to an attempt to reconcile the subsidiary hypothesis of Darwin, the pangenesis hypothesis, with the opposing facts of Galton. This attempt to make pangenesis acceptable as the basis of an understanding of heredity will always rank as an interesting contribution to the history of thought upon this subject, though, as Brooks expected, his special views have not been accepted. This book was put forth as a stimulus to research, "to incite and direct new experiments," he said. Its main interest lies in its revelation of the best that could then be done toward solution of problems that yet wait such experimental evidence as alone may make their solution possible.

The lectures and essays that grew into his book, "The Foundations of Zoology," published in 1899, and again in a revised edition, show Professor Brooks's breadth and depth of philosophical thought, and it is upon this work that his claim to a place amongst our immortals will largely rest.

But the estimate of Brooks as a leader of philosophical zoology can best be left to the perspective that time will bring and to the minds of another generation biased neither by love of Professor Brooks as a man nor, on the other hand, an absorption in the activities of our present transition period of zoological methods and ideals.

What we can most surely appraise at the present moment is the work of Brooks as friend and teacher, an inspiration and example. Men who have worked in close contact with Brooks now hold commanding positions in the intellectual life of the world: the influence of their living presence is exerted in Japan, and in England, in South Africa and in Canada, and through his native country from Maine to the gulf and from ocean to ocean. On March 25, 1898, sixty of these students and friends contributed with genuine feeling to celebrate his fiftieth birthday. It was truly an unique personality that had added to their rational enjoyment of life and helped in their own struggles for ideals.

These students of a pioneer in the field of American embryology have naturally followed his lead and their observations

have been an extension and elaboration of his work, whether in the same field or in newer ones recently opened. His philosophical mind left its impress upon their ways of thought in whatever part of zoology they labored. The old problems of heredity are now attacked by new methods, but some of the foremost investigators are bound to Professor Brooks, more or less intimately, by nurture got when he was a stimulating if not also a formative part of their environment. Thus William Bateson, the present leader in studies of variation and heredity, coming to the Chesapeake laboratory to continue embryological studies on *Balanoglossus* and the origin of the vertebrates, first heard the problems of heredity, from Brooks, in long and intimate discussion and exposition.

Professor Brooks's religious *beliefs* remain unknown to me but the view-point of his intellect may be inferred from the following extracts from the "Foundations of Zoology":

> If any believe they have evidence of a power outside nature to which both its origin and its maintenance from day to day are due, physical science tells them nothing inconsistent with this belief. If failure to find any sustaining virtue in matter and motion is evidence of an external sustaining power, physical science affords this evidence; but no one who admits this can hope to escape calumny; although it seems clear that the man of science is right, . . . for refusing to admit that he knows the laws of physical nature in any way except as observed order.
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> Many will, no doubt, receive with incredulity the assertion that the ultimate establishment of mechanical conceptions of life has no bearing, either positively or negatively, upon the validity of such beliefs as the doctrine of immortality, for example. The opinion that life may be deducible from the properties of protoplasm has, by almost universal consent, been held to involve the admission that the destruction of the living organism is, of *necessity*, the annihilation of life. Yet it seems clear that this deduction is utterly baseless and unscientific; . . . if it be admitted that we find in nature no reason why events should occur together except the fact that they do, is it not clear that we can give no reason why life and protoplasm should be associated except the fact that they are? And is it not equally clear that this is no reason why they may not exist separately?

Those who were with him during long periods of work continued despite illness know his control, those few who saw him seized with bitter pain know his fortitude.

Beneath his passive exterior much went on that rarely came to the surface and he had strong antipathies and emotions held in check by a strong will and philosophical balance. That he could take risks will be recalled by those whom he, as licensed pilot, brought safely into harbor, though the keel of the schooner scraped the bar in the trough of the heavy ground swell.

His stern sense of duty drove him to many tasks he neither liked nor felt he had the natural bent for. His conscientiousness and punctilious regard for justice and honesty brought him into antagonism with many customs and with persons of less sharply defined honesty.

In many excellencies he was a child to whom wisdom of experience had come; his spirit retained the simplicity of the child and a child's interest in the outer world as something apart from self, and did not readily acquire the conventional content with mere getting and eating.

Many have warm hearts for the clear teacher and wise friend who lived much on a higher plane of work and thought, above many petty considerations of immediate expediency. His faults but add to the charm of that large, luminous picture of virtues that the recollection of him calls up in our minds.

Who again will teach us, as Brooks did, that

> The hardest of intellectual virtues is philosophic doubt, and the mental vice to which we are most prone is our tendency to assume that lack of

evidence for an opinion is a reason for believing something else.[3]

May the Johns Hopkins University treasure as ever living the example of Brooks, the naturalist—one of the two members of her illustrious faculty of whom their great leader, Gilman, said they pre-eminently were "men born for lives of research."

E. A. Andrews

November 26, 1908

THE CONVOCATION WEEK MEETINGS OF SCIENTIFIC SOCIETIES

The American Association for the Advancement of Science and the national scientific societies named below will meet at the Johns Hopkins University, at Baltimore, during convocation week, beginning on December 28, 1908.

American Association for the Advancement of Science.—Retiring president, Professor E. L. Nichols, Cornell University; president-elect, Professor T. C. Chamberlin, University of Chicago; permanent secretary, Dr. L. O. Howard, Cosmos Club, Washington, D. C.; general secretary, Dr. J. Paul Goode, University of Chicago.

Local Executive Committee.—William H. Welch, M.D., chairman local committee; Henry Barton Jacobs, M.D., chairman executive committee; William J. A. Bliss, secretary, Joseph S. Ames, William B. Clark, R. Brent Keyser, Eugene A. Noble, Ira Remsen, John E. Semmes, Francis A. Soper, Hugh H. Young.

Section A, Mathematics and Astronomy.—Vice-president, C. J. Keyser, Columbia University; secretary, Professor G. A. Miller, University of Illinois, Urbana, Illinois.

Section B, Physics.—Vice-president, Professor Carl E. Guthe, State University of Iowa; secretary, Professor A. D. Cole, Vassar College, Poughkeepsie, N. Y.

Section C, Chemistry.—Vice-president, Professor Louis Kahlenberg, University of Wisconsin; secretary, C. H. Herty, University of North Carolina, Chapel Hill, N. C.

Section D, Mechanical Science and Engineering.—Vice-president, Professor Geo. F. Swain, Massachusetts Institute of Technology; secretary, G. W. Bissell, Michigan Agricultural College, East Lansing, Mich.

Section E, Geology and Geography.—Vice-president, Bailey Willis, U. S. Geological Survey; secretary, F. P. Gulliver, Norwich, Conn.

Section F, Zoology.—Vice-president, Professor C. Judson Herrick, University of Chicago; secretary, Professor Morris A. Bigelow, Columbia University, New York City.

Section G, Botany.—Vice-president, Professor H. M. Richards, Columbia University; secretary, Professor H. C. Cowles, University of Chicago, Chicago, Ill.

Section H, Anthropology.—Vice-president, Professor R. S. Woodworth, Columbia University; secretary, George H. Pepper, American Museum of Natural History, New York City.

Section I, Social and Economic Science.—Vice-president, Professor G. Sumner, Yale University; secretary, Professor J. P. Norton, Yale University, New Haven, Conn.

Section K, Physiology and Experimental Medicine.—Vice-president, Professor Wm. H. Howell, Johns Hopkins University; secretary, Dr. Wm. J. Gies, College of Physicians and Surgeons, Columbia University, New York City.

Section L, Education.—Vice-president, Professor John Dewey, Columbia University; secretary, Professor C. R. Mann, University of Chicago, Chicago, Ill.

The American Society of Naturalists.—December 31. President, Professor D. P. Penhallow, McGill University; secretary, Dr. H. McE. Knower, The Johns Hopkins Medical School, Baltimore, Md. *Central Branch.* President, Professor R. A. Harper, University of Wisconsin; secretary, Professor Thomas G. Lee, University of Minnesota, Minneapolis, Minn.

The American Mathematical Society.—December 30, 31. President, Professor H. S. White, Vassar College; secretary, Professor F. N. Cole, 501 West 116th St., New York City.

American Federation of Teachers of the Mathematical and Natural Sciences.—December 28, 29. President, H. W. Tyler, Boston, Mass.; secretary, Professor C. R. Mann, University of Chicago, Chicago, Ill.

The American Physical Society.—President, Professor E. L. Nichols, Cornell University; secretary, Professor Ernest Merritt, Cornell University, Ithaca, N. Y.

The American Chemical Society.—December 29–January 1. President, Professor Marston T. Bogert, Columbia University; secretary, Professor Charles L. Parsons, New Hampshire College, Durham, N. H.

[3] "Science or Poetry," 1895.