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SIMON NEWCOMB: A TRIBUTE[1] TO HIS PERSONALITY AND ACCOMPLISHMENTS

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SIMON NEWCOMB, the astronomer, was born in Canada, on the north coast of Nova Scotia, but he was almost wholly of New England descent, through many generations, and his entire adult life was lived in the United States. The first Simon Newcomb was born in Massachusetts or Maine about 1666. His descendants formed the habit of naming their eldest sons after him, and except for the fact that his father was a younger son, the astronomer would have been the sixth Simon Newcomb in unbroken lineal descent. His paternal grandfather, Simon Newcomb, migrated from New England to Nova Scotia in 1761. He was a stonecutter, but he was credited "with unusual learning and with having at some time taught school." He possessed a small collection of books on serious subjects, including an algebra, a Euclid and a volume on navigation, which were destined to influence profoundly the life of the grandson.

The astronomer's father, John Newcomb, was by profession a country school teacher. He had the distinction of being an early exponent of the principles of eugenics. After careful consideration he concluded that a man should marry at the age of 25, and that the wife should have certain temperamental characteristics and be mentally gifted. When John Newcomb "found the age of 25 approaching he began to look about. There was no one in his village who satisfied

[1] Address at the unveiling of the bust of Simon Newcomb in the Hall of Fame at New York University, May 28, 1936. Many items in this tribute have been taken from my brief biography of Simon Newcomb published in *Memoirs of the National Academy of Sciences,* Volume XVII, 1924.—W. W. C.

the requirements. He therefore set out afoot to discover his ideal." His researches were in vain until they had extended nearly a hundred miles from home and into the neighboring province of New Brunswick. Hearing the strains of music from a church he went in, and there found his future wife, Emily Prince, in the person of the organist and leader of the singing. Emily's father had migrated from Maine to New Brunswick early in life.

There is evidence in abundance that our Simon Newcomb (born on March 12, 1835, died on July 11, 1909) was early imbued with the New England philosophy, "life is real, life is earnest"; and those who had the privilege of knowing him through the last decade or two of his great fame had no reason to think that at any time in his seventy-four years did the influence of this philosophy decrease by "one jot or tittle." Simon was well endowed by nature: he was a precocious child and boy, at least as to subjects mathematical in nature; and, though strong of body, he had no great love for physical labor, but he did have a passion for intellectual endeavor.

Concerning his early education Simon Newcomb later in life wrote: "What we now call school training, the pursuit of fixed studies at stated hours under the constant guidance of a teacher, I (Simon) could scarcely be said to have enjoyed. For the most part, when I attended my father's school at all, I came and went with entire freedom. . . ."

Simon's studies in algebra, in Euclid, in navigation and in astronomy (from books found in his grandfather's house and an old book on astronomy secured for him by his father) were pursued eagerly and without the guidance of an instructor.

Following the lamented and early death of Simon's talented mother, the father had come to "The States" in quest of better fortune, leaving Simon behind in the position of an apprentice. For reasons which did him utmost credit, the son, at the age of eighteen and one half years, soon followed the father, who had settled in eastern Maryland. There Simon Newcomb began his distinguished educational career as the teacher of a country school, early in the year 1854. Three decades later he was professor of mathematics and astronomy in Johns Hopkins University, then the American university of highest rating in graduate studies.

In his first summer vacation he paid a visit to the nearby national capital, little dreaming it would ever be his home. He resided there during the last 48 years of his life. He "went as far as the gate of the astronomical observatory, and looked wistfully in, but feared to enter." Only seven years later he became an astronomer in that observatory, with rank and title of professor.

In his three years of teaching he devoted every spare hour to such books of high merit as he could secure or gain access to. These related more especially to books on mathematical subjects, including Sir Isaac Newton's "Principia," and to a few works on political economy.[2] Before the passing of much time he made the acquaintance and won the confidence of Professor Joseph Henry, the distinguished head of the Smithsonian Institution, and of Mr. Hilgard, officer in charge of the Coast Survey. The latter recommended him for appointment as a computer in the office of the Nautical Almanac, then located in Cambridge, Massachusetts; and he was so appointed, on trial, in January, 1857, at $30 per month. This humble start was all he needed.

The splendid astronomical career of Simon Newcomb could have been predicted with confidence, from the character of the first problem he attacked, in 1857, as a side issue, while earning his modest living as a computer on the Nautical Almanac. It was to astronomers then, and still is, a curious and surprising fact that Nature—in other words the processes of astronomical evolution—had not caused a large or major planet to exist, and revolve around the Sun, in an orbit located between Mars's orbit and Jupiter's orbit. In due time, from 1801 up to Newcomb's date, 1857, 42 little planets, or asteroids, were discovered to be revolving around the Sun in the region defined. They seemed to be doing their part in taking the place of one "missing" major planet. A German astronomer, Olbers, had proposed, early last century, the hypothesis that the missing major planet had perhaps, for some unknown reason, exploded in the distant past, and that the minor planets were the fragments thereof.

[2] Newcomb early became a serious and thorough student of economic subjects. His writings in the field of economics are numerous, and many of them have been accorded high rank by leading economists. They include several volumes and a great many magazine articles on timely subjects. In 1865 appeared his first contribution, a volume of 222 pages, entitled "A Critical Examination of our Financial Policy during the Southern Rebellion." "The A B C of Finance," issued in Harper's Half Hour Series, bears date 1877. His "Principles of Political Economy," an extensive treatise of 548 pages, came out in 1886. His contributions to the *North American Review* began in 1866, with a thoughtful article on "Our Financial Future"; and later articles considered such subjects as the "let alone" principle in economics, national debts, the standard of value, the principles of taxation, science and government, our antiquated method of electing a President, etc. Other leading journals contain articles on life insurance, the silver question, the organization of labor, schools of political economy, etc. Newcomb was a lecturer on Political Economy in Harvard College in 1879–80. He was elected president of the Political Economy Club of America in 1887. The first prize, $150, of two citizenship prizes offered by the Anthropological Society of Washington, was awarded to Newcomb in 1894 for his essay on "The Elements Which Make up the Most Useful Citizen of the United States." The indications are that if Newcomb had chosen economics as his chief field of endeavor he would have been in the front rank of economists.

If such had been the case, the several pieces of the exploded body must have been *together* at the point and instant of explosion; and the elliptic orbits of the several pieces in the period immediately following such explosion must all have passed through that common point. In the succeeding thousands and millions of years, the gravitational attractions of the major planets, Jupiter, Saturn, Mars, Earth, etc., would have modified quite materially the orbits of the several fragments. With great mathematical skill, and at the cost of calculations made upon an heroic scale, Newcomb carried back the orbits of several of the little planets to what they were many hundreds of thousands of years ago. In 1860, at age slightly under 25, he published the reasoned conclusion that those asteroids had never passed through one and the same point, and therefore that the Olbers hypothesis as to the origin of the asteroids was not tenable.

As another side issue, in Cambridge, Newcomb immediately registered as a student in mathematics in the Lawrence Scientific School of Harvard College, and was graduated as a bachelor of science a year and a half later. I mention this only because it appears to have been his sole experience as the beneficiary of formal education.

At age 26 years Newcomb was appointed to a full professorship on the staff of the Naval Observatory, in Washington, then easily the leading observatory in the United States. The appointment did not appeal to him strongly, as his tastes and talents were along the line of mathematical astronomy, in contradistinction to observational astronomy. However, in the several volumes entitled, "Astronomical and Meteorological Observations Made at the United States Naval Observatory," Washington, in the years 1861 to 1870, inclusive, one finds abundant evidence of Newcomb's great energy in using the instruments for which he was responsible, and in the prompt publication of the results achieved. His writings revealed a remarkably clear and thorough comprehension of many important astronomical problems ahead, and of methods of attacking them with greatest promise of success. He early urged a homogeneity of observing programs and methods for the Naval Observatory, so that the results would acquire and retain their maximum strategic values in the solution of many problems dealing not only with the bodies composing our solar system, but with thousands of the brighter stars in our great stellar system; and his proposals were approved and put into effect by the naval officers who served, in succession, as superintendents of the Observatory.

The devoting of the resources of the Naval Observatory to the determination of star positions and to the special needs of the Navy Department led naturally to the neglect of that side of astronomical investigation which requires powerful telescopes. This fact was called to the attention of the superintendent of the observatory by Professor Newcomb in 1868, and again in 1869, with the recommendation that the observatory procure a refracting telescope as large as the already celebrated maker, Alvan Clark, would undertake to construct. These recommendations led ultimately to the making of a financial appropriation for the purpose by the Congress of 1870–71, and to the complete installation in 1873 of a telescope with objective lenses 26 inches in diameter, then by far the largest and most powerful refracting telescope in existence.

While the 26-inch telescope was in the planning state Professor Newcomb realized that the discrepancies between the observed positions of the moon and the positions as predicted in the then best tables (Hansen's) for the moon's motion had become a serious matter, and at his request it was arranged that he should be relieved from the duty of making any further observations with the observatory's existing instruments, and from other observatory work, to let him devote his time to a more thorough and comprehensive investigation of the moon's motion. The advancement of the lunar problem developed into one of the leading undertakings of his life; it received an extensive share of his efforts in many of his last 39 years.

Professor Newcomb was appointed superintendent of the "Nautical Almanac" in 1877. He has written:

> The change was one of the happiest of my life. I was now in a position of recognized responsibility, . . . where I could make plans with the assurance of being able to carry them out. . . . The program of work which I mapped out, involved as one branch of it a discussion of all the observations of value on the positions of the Sun, the Moon, and (the 8 major) planets, and incidentally on the bright fixed stars, made at the leading observatories of the world since the year 1750 . . . the number of meridian observations on the Sun, Mercury, Venus, and Mars alone numbered 62,030. They were made at the observatories of Greenwich, Paris, Königsberg, Poulkovo, Cape of Good Hope, Washington and seven others—13 in all. The other (principal) branches of the work were . . . the computation of . . . the perturbations of the various planets by each other.

Such stupendous tasks, the largest and by far the most ambitious ever undertaken by any astronomer up to that time or since, could not, of course, be performed by one individual unaided. On this point Newcomb wrote in 1882: "Both Congress and the Navy Department have supplied all the assistance which has been asked for, and a force of from eight to ten computers, some of the highest order of mathematical ability, has been actively employed during the past year, and may, if necessary, be increased in the future." In his autobiography he has spoken most generously of the contributions made by his chief assistants in this work.

It is not possible to give here an adequate impression of the immense labor involved in carrying to completion the programs of lunar and planetary investigations referred to. In fact, a correct impression can not be gained, even at the price of a careful perusal of the voluminous papers describing the results, unless the reader himself has dipped into the complexities of gravitational astronomy and has had extensive experience in making astronomical calculations. It means relatively little to say that the work was of herculean and monumental proportions. Some of the investigations are described in the publications of the United States Naval Observatory, others in the various astronomical journals, and yet others in special mediums; but the theory and tables of the planetary and lunar motions are contained chiefly in a special series known as the "Astronomical Papers," of which eight and one-half large quarto volumes exist. These papers continue to rank amongst the priceless treasures of astronomical literature.

Technically and administratively a naval officer, Newcomb was automatically retired from the "Nautical Almanac" superintendency and service on reaching the age of 62 years, in 1897, but fortunately his influence was potent in having certain unfinished items on the great program carried through to substantial completion in the "Nautical Almanac" office. His chief regret was that his studies on the motion of the moon, the most difficult of all studies having to do with the motions of the celestial bodies, was left unfinished. Fortunately, the Carnegie Institution of Washington, from time of its organization in 1902, made annual grants to Professor Newcomb for computing assistance and other facilities to carry on his lunar program; and it is a matter for congratulation that he was able to complete this work, under the patronage of the Carnegie Institution, and to prepare the results for publication, less than a month before his death in 1909, at the age of 74 years. Newcomb was fully aware that his results for the elements of the Moon's motion did not enable him to predict the future motion of the Moon with utmost precision. The gravitational interactions of the Earth and the Moon are so complicated, principally because the two bodies are relatively so close together, and concurrently for other and as yet not accurately determinable conditions within the bodies, that with the passing of time discrepancies develop between the predicted positions of the Moon and its actually observed positions. Newcomb's results were of course a great improvement upon those secured by earlier students of the subject.

The commanding place in astronomical science attained by Professor Newcomb is accurately indicated by the long list of honors conferred upon him. In the number and the character of the learned societies in which he held honorary memberships, and in the number of honorary academic degrees received, Newcomb stood alone in America, and in a very small company in the world. He was an honorary member of more than 40 academies of science and other similar organizations in some 18 nations; and he held honorary doctorate degrees from at least 17 leading universities in 10 nations.

The high esteem in which Newcomb was held by his astronomical colleagues and by devotees of other physical sciences is attested by the honors they paid him. Limitations of time permit me to mention only two of the many such items.

The American Astronomical Society was founded in 1899. Newcomb was elected, in effect by acclamation, as the society's first president, and his election was repeated annually for six years until 1905, when he requested and insisted on relief from the duty.

The Astronomical Society of the Pacific, with membership consisting of several hundred professional and private astronomers in many countries, established the Bruce Gold Medal Foundation in 1897. The rules of award made this medal international in character: the directors of six leading observatories—Greenwich, Paris, Berlin, Harvard, Lick and Yerkes—were called upon to nominate each a limited number of astronomers worthy to receive the medal, and the directors of the society must by the society's statutes select the recipient of the medal from this list. For the initial award of the medal the director of each of the six observatories nominated Simon Newcomb as his first choice. As the president of the Astronomical Society at that time announced, "The Directors of the Society could but set the seal of their approval upon the verdict of his peers, and award the first Bruce Gold Medal to Professor Simon Newcomb."

Newcomb's superlative program of investigation concerned the solar system, but the basic needs of that great program extended to the stellar system. He devoted much time and successful endeavor to comparative studies of the accurately observed positions, not only of the members of the solar system, but also of thousands of the brighter stars distributed over the entire sky, made at a score or more of observatories, in order that the small systematic errors in those literally hundreds of thousands of observations should be eliminated, and the whole of the observational data be rendered as nearly homogeneous as possible, to let all these observations be applied to the solution of many of the great astronomical problems of his time. In 1902 he published an important volume on "The Stars—A Study of the Universe," whose twenty chapters made notable contributions to our understanding of as many divisions in the astronomy of our great stellar system.

Newcomb's interest in the progress of mathematics was strong throughout his life. While an assistant in the "Nautical Almanac" office at Cambridge, he contributed valuable articles to the mathematical journals, especially on the theory and practice of probabilities, a subject applicable to every division of astronomical science. His contributions to pure mathematics were limited by other demands upon his time, and the subjects that received his attention were mainly those which related more or less intimately to celestial mechanics and probabilities. There could be no question, however, of a great underlying mathematical ability. Professor Cayley, one of the most eminent mathematicians of Cambridge University, when presenting the Gold Medal of the Royal Astronomical Society of London to Professor Newcomb in 1874, three years before Newcomb became superintendent of the "Nautical Almanac," spoke of Newcomb's memoir on the theory of the perturbations of the moon which are due to the gravitational attractions of the planets, in these words: "The memoir is, from the boldness of the conception and beauty of the results, a very remarkable one, and constitutes an important addition to theoretical dynamics." I have already mentioned the fact that Simon Newcomb was a professor of mathematics and astronomy in Johns Hopkins University in 1884, and later—altogether during 11 years.

Newcomb possessed in remarkable degree the power of writing successfully for the intelligent public. Dozens of his articles on subjects of timely interest, not "written down" to the level of the readers, but in logical, admirable, understandable language, appeared in the leading American magazines and newspapers.

Newcomb wrote several splendid text-books on astronomy. His "Popular Astronomy," a comprehensive treatise on the fundamental principles of astronomy, issued in 1878, has, in my opinion, never been equaled in merit by any other book aiming to cover, in general, the same ground. Notwithstanding the tremendous advances of the past fifty-eight years in astronomical science, the original edition remains a book which all students of astronomy could read with profit and pleasure. It has passed through eight editions in this country, it has been translated into several languages, and in Germany, between 1881 and 1922, it was made the basis of seven editions brought up to date by German astronomers.

Newcomb's work, driven by untiring energy and guided by philosophic intelligence and dependable judgment for more than a half century, placed him at the head of his profession in America, and gave him membership in a small class of the most productive astronomers of all countries and all centuries. A survey of his activities must lead to the conclusion that Simon Newcomb was intellectually a giant; and fortunately this rare quality was accompanied by deep and abiding interest, by clear visions of objectives, and by the exercise of executive ability of an extremely high order.

In closing, I venture to repeat and record the opinion prevailing throughout the learned world that Simon Newcomb was not only the leading American astronomer but the leading American scientist up to and including his time.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE SEATTLE MEETING OF THE PACIFIC DIVISION. II

By Dr. J. MURRAY LUCK
SECRETARY

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS, PACIFIC SLOPE BRANCH

(*Report by J. F. Lamiman*)

The meetings were attended by about seventy-five entomologists, including the national president, L. S. McLaine. Some thirty-five papers were presented, the most interesting of which was the invitation address by Professor R. W. Doane on "Forty-five Years of Entomology."

The papers presented were on an unusually wide range of subjects, with four devoted to wireworms and their control and four on codling moth control.

In addition to the above, A. L. Strand and J. H. Pepper presented a new criterion for the classification of petroleum oil sprays; G. F. MacLeod reported on some quantitative problems of insect injuries to potatoes; R. N. Chapman discussed egg eating as a factor in the life cycle of flour beetles; F. P. Keen and R. L. Furniss reported on the effects of sub-zero temperatures upon populations of the western pine beetle; F. R. Lawson and J. C. Chamberlain discussed the flight habits and dispersal of the beet leafhopper; C. W. Getzendaner reported on recent developments in parasitizing the European earwig, and G. Allen