Biographical Encyclopedia of Astronomers

Hill, George William

Born New York, New York, USA, March 3, 1838

Died West Nyack, New York, USA, April 16, 1914

George Hill was one of the great masters of 19th-century mathematical astronomy. His parents, John William Hill and Catherine Smith, were farmers; both his father and grandfather were also artists. When Hill was about eight years old, his family moved to West Nyack, where he was to spend the majority of his life.

Hill attended Rutgers College (1855–1859), where he was deeply influenced by his mathematics teacher, Theodore Strong. From Strong's library, Hill borrowed classical texts in mathematical astronomy stretching back to the works of Leonhard Euler, many of whose methods he seems to have absorbed. After receiving his degree, Hill pursued graduate studies in mathematics and astronomy at Harvard University, under Benjamin Peirce. In 1861, Hill was hired as an assistant by John D. Runkle of the United States Nautical Almanac Office (then located in Cambridge, Massachusetts). After about two years, however, Hill obtained permission to continue his work from the family's home in New York, where he remained until 1877. He never married.

Hill's first important works in celestial mechanics were developed there. He calculated the definitive orbit of Donati's comet (C/1858 L1) from 363 observations. He performed the calculations relating to the forthcoming transits of Venus that were witnessed in 1874 and 1882. But it was Hill's original contributions to lunar theory (regarding the complex motions of the Moon) that earned him the broadest recognition

In Hill's day, lunar theory had been advanced along two fronts by Peter Hansen and Charles Delaunay, whose methods were somewhat opposed yet complementary. Although Hill seems to have favored Delaunay's theoretical treatment (to which he one day hoped to return), he adopted Hansen's more pragmatic, computational approach, but with notable differences. In working to solve this three-body problem—the Moon's orbit around the Earth is notably affected by the gravitational pull of the Sun—Hill developed entirely new methods, including that of an infinite determinant, whose elegant solution yielded the mean motion of the Moon's perigee, which he calculated to fifteen significant figures. Hill's research into lunar theory was published in 1877, the same year in which he was called back to the Nautical Almanac Office (which had been relocated to Washington). As a consequence, Hill was never able to develop a more complete lunar theory along the lines of Delaunay This task fell to his eventual successor at the Nautical Almanac Office, Ernest Brown.

When Simon Newcomb became director of the Nautical Almanac Office in 1877, he formulated the goal of recalculating the orbits of the planets to the highest precision. Jupiter and Saturn possessed the most complex motions; their mutual perturbations arose not only from their large masses but also because of the near-resonance between them. Five Jupiter

orbits roughly equaled two Saturnian orbits. Newcomb entrusted the investigation of their orbits to no one but Hill, who reluctantly took up residence in Washington. Over the next fifteen years, he analyzed the positions and motions of these planets, extending back to 1750. Although aided by one or more assistants, Hill performed the bulk of the calculations himself He published his methods in volume 4 of the *Astronomical Papers Prepared for the Use of the American Ephemeris*, followed in 1895 by tables of planetary motions. These tables remained in use until 1960. But as with the case of the Moon's orbit, Hill did not particularly advance the theories of the two planets' motions. His work in celestial mechanics was characterized not so much by elegant formulas as by the utmost precision in the determination of astronomical quantities. Newcomb's praise of Hill's achievements styled him "perhaps the greatest living master in the highest and most difficult field of astronomy, [while] receiving the salary of a department clerk."

In 1892, Hill retired to his home in New York and rarely left it except on special occasions. He was named an associate editor of the *Astronomical Journal* and elected president of the American Mathematical Society (1894–1896). Between 1898 and 1901, Hill delivered a course of lectures on celestial mechanics at Columbia University, but attracted only a handful of students, one of whom was Frank Schlesinger.

Hill received the Gold Medal of the Royal Astronomical Society (1887), the (Gold) Bruce Medal of the Astronomical Society of the Pacific (1909), and the Copley Medal of the Royal Society of London (1909). Named a member of the United States National Academy of Sciences and the Institut de France, Hill was awarded honorary doctorates by Cambridge University (1892), as well as by Columbia, Princeton, and Rutgers universities

Four volumes of Hill's collected papers were published in 1905–1907 by the Carnegie Institution of Washington.

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