MEMOIR

OF

JAMES CRAIG WATSON.

1838-1880.

BY

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BIOGRAPHICAL MEMOIR OF JAMES CRAIG WATSON.

At some unknown time prior to the war of revolution the ancestors of James Craig Watson emigrated from Ireland to the colony of Pennsylvania. We know little of the fortunes of this family before the early years of the present century, but they must at that time have been at a low ebb, for in 1811 we find James Watson, the grandfather of the future astronomer, abandoning the land of his birth and pushing westward seven hundred miles to build for himself a new home in the almost unbroken forests of Upper Canada. The journey was made on foot. William, the father of James Craig Watson, then an infant of tender years, was placed upon an ox-sled which, slipping easily over the fallen leaves, bore the scanty household goods of the family.

They reached their destination in safety, and the work of clearing and cultivating was begun, but the times were unpropitious. Before a year had passed war was declared between the United States and Great Britain, and, Canada becoming the scene of hostilities, James Watson was compelled to abandon his farm for a time and to fly to the east for safety. Upon the return of peace he again took up his former residence, prospered in his labors, and was at the time of his death a man of wealth and consequence in the community which had grown up about him. But this man's life was not devoted wholly to clearing up his homestead and increasing his acres; he possessed a taste for books and for learning, for the gratification of which he collected an excellent library whose appreciation and use he taught to his children.

Amid these surroundings William Watson grew to manhood, acquiring his father's tastes and learning, but not his energy and practical ability. At the age of twenty-six he married Rebecca Bacon, a native of Nova Scotia. Four children were the fruit of this union, of whom the oldest, James Craig Watson, was born near the village of Fingal, county of Elgin, Canada West, on January 28, 1838. The boy inherited a genial disposition and the taste for study which we have noted in his father and grandfather, but the restless and tireless activity which was displayed throughout his whole life was clearly derived from his mother.

The first twelve years of his life were spent upon the farm in Canada, his father pursuing by turns the occupations of farmer, carpenter, and schoolmaster, and instructing his children, three sons and a daughter, in that measure of book lore which he himself had acquired. But affairs went ill with William Watson, and in 1850 he found himself compelled to abandon his home and seek elsewhere a livelihood for himself and his family. He turned westward, not knowing where his foot should find a resting-place, but resolved to leave Canada. Arrived in Detroit, Mich., the family found its choice of a home limited to the villages along the single line of railway that then extended west a scant hundred miles from Detroit. A chance remark made by a stranger that the State University was situated at Ann Arbor on this line of railway, only forty miles distant, determined the choice. A vague idea that perhaps her children might derive some educational advantages from it seems to have been in the mind of Rebecca Watson, and the decision was made by her.

The family reached Ann Arbor penniless and more destitute than that ancestor who, forty years before, had emigrated to the frontier of Canada. The father found work in a small factory, and James, now a bright boy of twelve years, was employed in various menial offices at the same place. The following years were years of bitter poverty and want, and they left their imprint deep upon the after life of James Watson; but they were also years of development. He quickly learned the work of the factory and noted the incompetence and faithlessness of the man in charge of the steam-engine, which he reported to his employer. "I know, Jimmy, the man ain't worth his salt, but he is the only one I can get for the job." "I can run the engine, sir," was the reply. "Oh, no, Jimmy, you don't know how to manage an engine." "But I do;" and the dispute was settled by going to the engine-room, where Jimmy satisfied his employer that he did understand the engine. The incompetent man was forthwith discharged and the boy of thirteen became engineer of the factory.

Here he had some chance for study, and a Latin or Greek textbook was kept in a convenient corner and brought out for use whenever a few minutes could be spared from work. In the following winter the factory was closed and Watson was reduced to the necessity of peddling apples and books at the railway station, an occupation which was exceedingly distasteful to him. As spring

approached he disappeared, and for a fortnight nothing was heard from him, until his former employer, who had become much interested in the boy, found him in Detroit, where he had made a bargain with the master of a vessel to go sailing with him in the lake trade, and was to have started on the following day. He was induced to return home, and soon after it was resolved that he should attend school, but at the end of the first half day the relations of teacher and pupil were interchanged; the boy withdrew from school, and the master came to him for instruction in algebra and geometry.

During the next two years Watson's employment was of a desultory character. There were vague hopes that he might at some time enter the University, and he, therefore, pursued by himself the study of Latin and Greek; but he also worked successively at nearly all the trades that were practiced in the village, became a competent workman at most of them, and acquired special skill as a machinist. It was noticeable that during this period he avoided association with boys of his own age and sought the companionship of men, with whom he would discuss topics of current interest, entertaining them with jests and with exhibitions of expert penmanship or of skill in arithmetical operations.

At the age of fifteen Watson entered the University of Michigan as a student, and soon attracted attention for the excellence of his scholarship in every direction. For the classical languages he displayed unusual capacity, and his now venerable instructor, Dr. Frieze, bears witness that "his facility in translation was greater than that of most professors of Latin and Greek;" and the writer of this sketch well remembers the enthusiasm with which he was wont in his later years to refer to his study of the ancient tongues.

The man who, during Watson's university career, exercised the greatest influence over his development was, probably, Francis Brünnow, who had been recently called to the chair of astronomy and the directorship of the new observatory. Brünnow introduced into a western college the methods of a German university, and lectured in broken English to despairing and dwindling classes until Watson remained as his only pupil. He became interested in astronomy early in his college course, and in his junior year began work in the observatory. The theoretical and practical sides of the science seemed to have equal charms for him, and his attention was divided between the *Mécanique Céleste* and the construction

of a refracting telescope. His mechanical talent and the training of the machine shop triumphed over the difficulties of the latter and produced an excellent instrument of four inches aperture, the grinding and polishing of the glass and the construction of the mounting being all done by his own hands. Nor was this work of a purely empirical character. There exists now, in Watson's handwriting, a long manuscript translation from *Prechtl's Dioptrik* upon the theory and construction of achromatic objectives and bearing at its close the signature and date, James C. Watson, Jan'y 8, 1857. He was then 19 years of age.

Watson graduated in 1857, and almost immediately thereafter commenced work in the observatory as a salaried assistant. His earliest contribution to a scientific periodical which I have been able to find appears in Vol. V of Gould's *Astronomical Journal* and bears date April 20, 1857. His great activity at this time is shown by the index to this same volume, which contains under his name the titles of no less than fifteen papers, all published before he had completed his twentieth year.

In 1859 Brünnow resigned his chair in the University of Michigan to assume the directorship of the Dudley Observatory, and Watson was elected Professor of Astronomy and took charge of the observatory, but without the title of director. In 1860 Brünnow returned to Ann Arbor and was re-elected to his former position, Watson being transferred to the chair of physics, which he held until 1863, when, Brünnow again resigning, he was chosen to be Professor of Astronomy and Director of the Observatory. The records of the Board of Regents of the university show that this appointment was made upon the recommendations of B. A. Gould, Elias Loomis, William Chauvenet, Benjamin Peirce, Joseph Winlock, J. M. Gilliss, and others. In the manly communication to the governing board of the university, in which Watson presents his application for appointment to the directorship and sets forth his qualifications for the position, he states that, in addition to the discharge of the duties which his instructorship in the university entailed upon him, he had prepared and published thirty-two original papers upon astronomical subjects. An examination of his contributions to the periodicals shows that this activity was mainly expended in work upon comets and the minor planets. There are numerous communications containing observations and computations of orbits and ephemerides, and an occasional paper of a theo-

retical character upon the determination of orbits. To this period of his life belongs his "Treatise on Comets," a work of a popular character, to whose preparation he was incited by the interest aroused by the great comet of 1858.

In May, 1860, he married Annette Waite, of Dexter, Michigan, who, during the remaining twenty years of his life, maintained a constant interest and partial co-operation in his scientific work. No children were born to them.

Early in the '60's Watson became interested in the reduction of the Washington Zones, which had been undertaken by Dr. Gould, and for several years a considerable part of his time was given to computations upon this work. As a computer he possessed extraordinary skill and rapidity, attested at a later period by the computation of elliptic elements of a planet's orbit at a single sitting. The possession of this skill perhaps acted injuriously upon the character of his scientific work, as it led him to give much of his time, as a paid computer, to work which others of inferior talent could have done equally well, though less rapidly.

Immediately after his appointment to the directorship of the observatory Watson began the preparation of a series of charts of stars lying near the ecliptic, and his reports upon the work of the observatory during the following ten years represent this as being his principal employment, and dwell upon its laborious character. But scant traces of this work can now be found in the records of the Ann Arbor Observatory. The charts which he prepared have become the property of the National Academy of Sciences and are deposited at the Washburn Observatory of the University of Wisconsin. Of these charts, nineteen in number, only two are finished. They are in their general plan similar to Peters's well known charts, but are far from being equally complete. The discovery of the minor planets, with which Watson's name is associated, was a direct consequence of this work; indeed the expectation of such discoveries was probably the incentive to it. His first planet, Eurynome (79), was found in 1863, only three weeks after his election to the directorship of the observatory. Four years elapsed before another was found, but during the ensuing years they came in rapid succession. In all, twenty-two of these bodies were discovered by him, the year 1868 alone contributing six to the list, at that time an unprecedented feat. The Lalande prize, decreed to him July 11th,

1870, by the *Académie des Sciences*, was the reward of his earlier labors in this field.

The composition of his treatise upon *Theoretical Astronomy* belongs to the earlier years of his directorship and stands in close relation with his work as a computer and observer of the minor planets. The completion of this treatise, which appeared when he was but thirty years of age, left Watson's hands free for other work, and in 1869 he became associated with Benjamin Peirce in work upon the improvement of the lunar tables. For five years he was engaged in a comparison of the theories of Hansen and Peirce with observation, and spent much time in the endeavor to simplify Hansen's tables, with results which, though satisfactory to himself, were never published and are now lost.

The eclipse expeditions to Iowa in 1869 and to Sicily in 1870 interrupted the continuity of this work, and in 1874, when he accepted charge of the transit of Venus party to China, it was dropped, never to be resumed. The charge of this expedition was Watson's most important scientific commission. In a letter written to Benjamin Peirce, in 1873, he had, in opposition to LeVerrier's well-known views, expressed the opinion that the transit of Venus should be observed by astronomers as extensively as possible, and that every device known to science should be brought to bear upon these observations for the determination of the solar parallax. It is interesting now to note that in this letter he expresses the opinion that observations of contacts and measurements with the heliometer will be found to give a much more trustworthy determination of the parallax than can be obtained by the photographic method, but he joins to this the statement that the photographic method ought to be thoroughly tested.

Watson undertook the conduct of the expedition to China deeply impressed with the responsibility which it imposed upon him, and the last six months of 1874 were among the most laborious and oppressive of his life. It was, therefore, with a sense of profound relief that he saw this period of arduous labor crowned with the success of his party in the observation of the transit at Peking. It is interesting to note that on October 10, 1874, at Peking, he discovered the minor planet Juewa (139). The return from China was made leisurely *via* India, Egypt, and Europe, several weeks being spent in Egypt, at the invitation of the Khedive, in instructing and co-operating with the engineer officers of the Egyptian

army in the first steps toward a geodetic survey of that country. This work, performed by Watson without pecuniary compensation, won for him the cordial thanks of the Khedive and the decoration of Knight Commander of the Imperial Order of the Medjidich of Turkey and Egypt.

Close following upon Watson's return to America came his appointment as one of the judges at the International Centennial Exposition of 1876, in connection with which he prepared an elaborate report upon the horological instruments there exhibited.

The year 1878 brought a new subject, which engaged much of Watson's attention during the few remaining years of his life. He had corresponded with LeVerrier about the supposed planet Vulcan, and believed firmly in its existence, and, at LeVerrier's request, had co-operated with him in securing observations of the sun's disk at the times of expected transits of the planet. The eclipse of 1878 offered a favorable opportunity of search for this body, of which he eagerly availed himself, and mounted his telescope upon the crest of the Rocky Mountains at Separation, in Wyoming Territory. We need not here recount the details of the observations which led to the announcement of the discovery of two new bodies supposed to be intra-mercurial planets, since Watson has himself given an account of these in the *American Journal of Science* and in the *Astronomische Nachrichten.* Suffice it to say that he returned home firm in the conviction that he had discovered the unknown Vulcan and, perhaps, another planet as well. Uncertainty as to the latter object soon gave way to confidence that both the bodies seen by him must be major planets moving within the orbit of Mercury. The scientific world was skeptical, but he would convince it that its lack of faith was unwarranted.

The directorship of the new observatory founded at Madison, Wisconsin, by the liberality of ex-Governor Washburn had before this been offered him, but he had hesitated, unwilling to leave the surroundings in which the greater part of his life had been passed. But the scale was now turned, and the promised superior equipment of the new observatory carried him to a new home, confident of speedily demonstrating the reality of his discoveries.

He removed to Madison and entered upon the directorship of the Washburn Observatory in the spring of 1879. The observatory was then far from complete; its large equatorial was mounted, but was its only instrument, and Watson's energies were spent, even to

the last hours of his life, in designing and superintending the construction of new buildings and new apparatus. In the midst of this activity time was found for a return to the problem of telescope-building, which had occupied his student days. Optical glass was procured and plans laid for the construction, under his personal supervision, of several objectives which were to embody his own ideas upon this art, and work was actually commenced upon one large reflecting telescope. But no stress of other work or other interests could displace Vulcan from his mind. A scheme was devised whereby he should be able to observe the planet at noon-day without the intervention of an eclipse. The hill upon which the observatory stands slopes sharply to the south. At the foot of this hill was dug a deep cellar with a tube extending from it through the soil, parallel to the earth's axis and terminating in a masonry pier at the top of the hill. A telescope was to be so mounted in the cellar as to point up through the tube to a heliostat mounted at its upper end, by which rays of light coming from the sun or other celestial body might be directed into the telescope. The tube, fifty-six feet in length, was to serve as a long dew-cap and enable the observer to sweep close up to the sun's limb without being blinded by the stray light surrounding it. So confident was Watson of the success of this device, and that by its aid Vulcan could be refound, that he did not hesitate to undertake its construction at an expense to himself of several thousand dollars.

He did not live to see its completion, nor the fruition of any of the plans which he had formed for the observatory. Signs, more easily recognized after his death than at the time of their occurrence, pointed to a diminishing vitality and to a weakening of his physical powers. There was, however, no diminution of an activity which exposed him daily to the inclemencies of an approaching winter, and his rotund figure and ruddy face seemed to give little cause for apprehension. Stricken down by a congestive chill, from which he partially rallied and then relapsed, he died, November 22, 1880, within forty-eight hours after the suspension of his ordinary daily work.

Watson's scientific work was far from being the measure of his life, and any estimate of his career which did not take into account other sides of his character would be far indeed from the mark. The stern experiences of his boyhood had stunted the growth of qualities which a more genial lot might have developed in him, and

in estimating his character as a man this early training must not be overlooked. It had taught him the value of money, and he eagerly sought its acquisition as a source of power. He engaged in business enterprises, and became an insurance agent, a photographer, a bookseller, a printer and publisher, and an insurance actuary, with moderate pecuniary success, but with the result of acquiring a peculiar power and influence over men of affairs, which he used to the marked advantage of the educational and scientific institutions with which he was connected.

The subject of life insurance early attracted his attention and interest, and for nearly half his life he was engaged in its practical workings. I cannot do better than quote in this connection the words of one of his colleagues in the University of Michigan, Hon. Thomas M. Cooley, long upon the supreme bench of that state. "Few knew so well as I did the valuable services he rendered to the people in placing the great interest of life insurance upon a solid foundation. He understood thoroughly the principles of this business and was impatient that irresponsible organizations, by deception and fraudulent contrivances, should draw money from the people under the false pretense of insuring their families against loss by death. He thought, too, that there should be home organizations, whereby the vast and steady flow of money from the State should be stopped, and the accruing profits from insurance retained and expended among our own people. When at last such an organization was perfected he was invited, quite unexpectedly to himself, to be its actuary, and so invaluable have his services been found that his judgment has come to be accepted as law by the able business men who have been at the head of its affairs. * * * Some of us had personal knowledge that more than one state legislature invited his assistance in framing insurance laws, and that he had large influence in preventing crude and mischievous legislation on a subject with which the general public is unfamiliar, and concerning which those who think they know it well are generally most profoundly ignorant."

There lies before the writer of this sketch a letter from the secretary of the company whose actuary Watson was, confirming this estimate of his services and attributing the success of the company largely to his influence. Watson's long connection with insurance matters led in his later years to the preparation and publication of

extensive tables—his Interest and Investment Tables—for facilitating commercial and financial computations.

As a college professor Watson had great popularity among his students, but it was not a popularity of the best kind. His classroom work was conducted upon the avowed theory that his duty was to help those who sought a knowledge of astronomy and not to coerce into study the indifferent and careless. The latter class flocked in great numbers to his lectures and were delighted with the fluency and easy grace which imparted a charm to his discourse, and which carried them over the allotted ground with little expenditure of time or thought. Watson's instruction was mainly given by lectures, and the felicity of his discourse cannot be better illustrated than by a scene which will not readily pass from the memory of those who witnessed it. He had been summoned as an expert witness in an action to recover the insurance upon a building destroyed by a tornado, and was to testify in regard to the laws of storms. The examination began in the usual dry and formal manner, by direct question and answer, but the questions grew fewer and the answers longer until, their surroundings forgotten, judge and jury, attorneys and spectators, sat listening to a popular exposition of the science of meteorology, going far outside the scope of the case at bar.

Watson was singularly indifferent to the opinions of the community in which he lived—an indifference rendered the more remarkable by the fact that he took a lively interest in local affairs and local controversies. He had bitter enemies, and they circulated reports, to the discredit of his personal character, which went uncontradicted and gained an undeserved credence. It cannot be denied that a measure of truth attended many of these statements, but they were habitually distorted and magnified out of all proportion. He wished his life and character to be estimated by the world at large. His scientific reputation he valued more highly than local esteem. "Let that be established," he was wont to say, "and opinion here will fall in with it"—a view partly, but not entirely, justified by the event. Within the circle of his own family he was a generous man, and in his college relations his pre-eminent abilities were freely placed at the service of such of his colleagues as needed them. For the ordinary forms of social intercourse he had no taste, and held himself aloof from them, giving to his work hours that others spent in recreation, thus crowding more of achievement into

the years of his life, but, in the judgment of his friends, lessening their number.

Watson was elected a member of the National Academy of Sciences in 1868, and by his will the National Academy was made the residuary legatee of his estate, which is "to be aggregated, kept, and invested as a petpetual fund, the income from which shall be expended by said academy for the promotion of astronomical science." The academy has accepted this trust, and administers it in accordance with the following provisions of the will:

"In order to carry out the wish hereinbefore expressed as to the disposal of the income from the fund resulting from my estate hereby devised to said National Academy of Sciences, I do hereby direct that the designation of the particular objects and works which may be aided by this fund shall be determined, subject to approval by a vote of the academy, by a board of trustees, three in number, who shall be members of the academy, and elected after the first herein named by said academy whenever a vacancy may occur, by death or otherwise. The trustees so appointed shall hold said office unless voluntarily relinquished by them during the period of their membership in the said National Academy of Sciences, and I do hereby appoint and constitute *Julius E. Hilgard*, of the United States Coast Survey, and *Simon Newcomb* and *J. H. C. Coffin*, professors of mathematics, U. S. Navy, all of Washington, in the District of Columbia, to be the first board of trustees for the purposes herein named.

"It is my wish that the academy may, if it shall seem proper, provide for a gold medal of the value of one hundred dollars, to be awarded, with a further gratuity of one hundred dollars, from time to time, to the person in any country who shall make any astronomical discovery or produce any astronomical work worthy of special reward as contributing to our science. It is my further wish that provision be made for preparing and publishing tables of the motion of all the planets which have been discovered by me as soon as it may be practicable to do so; and I desire that in all cases the trustees and the academy shall act in harmony to obtain results of greatest possible aid to our science from the income fund resulting from my estate. I desire that results so obtained shall be published as speedily as possible, in such manner as may be provided by the academy."

The amount of the fund, principal and accrued interest, was, in April, 1886, a little less than $15,000. The medal provided by the will has been awarded but once. At the April, 1886, meeting of the National Academy it was, at the recommendation of the board of trustees of the Watson fund, "Resolved, That the Watson medal and the further sum of $100 in gold be awarded to Dr. Benjamin Apthorp Gould, for his valuable labors for nearly forty years in promoting the progress in astronomical science, and especially for his successful establishment of the National Observatory of the Argentine Republic, as manifested in the six volumes of observations recently prepared and published by him.

I close this brief sketch of Watson's life with a list of his more important published works, omitting the numerous observations, ephemerides, and notices of the discovery of minor planets which are contained in the astronomical periodicals. In lieu of the latter there is appended a list of the twenty-two planets discovered by him, together with the dates of their discovery.

A List of the More Important Published Writings of James C. Watson.

On the Extraction of Roots: *Michigan School Journal* (1859).

On the Orbit of Pandora (55): *Brünnow's Astron. Not.*, *Vol.* 1, *p.* 59.

On the Orbit of Hestia (46): *Brünnow's Astron. Not.*, *Vol.* 1, *p.* 121.

A Popular Treatise on Comets: *Philadelphia*, 1861.

Correction of the Elements of the Orbit of a Comet: *Am. Jour. Sci.*, 1863, *p.* 218.

Investigation of the Orbit of Eurynome (79): *Astr. Nachr.*, *Vol.* 64, *col.* 23.

Theoretical Astronomy relating to the Motions of the Heavenly Bodies around the Sun in accordance with the law of Universal Gravitation: *Philadelphia*, 1868.

Horological Instruments. United States International Exhibition, 1876. Reports and Awards. Group XXV, p. 56: *Washington*, 1880.

Discovery of an Intra-Mercurial Planet: *Astr. Nachr.*, *Vol.* 93, *col.* 141, 161, 189, 239; *Vol.* 95, 102. *Am. Jour. Sci.*, *Vol.* 16, *pp.* 230, 310.

Watson's Interest and Investment Tables: *Ann Arbor*, 1879.

List of Minor Planets Discovered by James C. Watson.

No.	Name.	Date of discovery.	No.	Name.	Date of discovery.
79	Euryhome	1863, Sept. 14	121	Hermione	1872, May 12
93	Minerva	1867, Aug. 24	128	Nemesis	" Nov. 25
94	Aurora	1867, Sept. 6	132	Aethra	1873, June 13
100	Hekate	1868, July 11	133	Cyrene	" Aug. 16
101	Helena	" Aug. 15	139	Juewa	1874, Oct. 10
103	Hera	" Sept. 7	150	Nuwa	1875, Oct. 18
104	Klymene	" Sept. 13	161	Athor	1876, Apr. 16
105	Artemis	" Sept. 16	168	Sibylla	" Sept. 28
106	Dione	" Oct. 10	174	Phaedra	1877, Sept. 2
115	Thyra	1871, Aug. 6	175	Andromache	" Oct. 1
119	Althaea	1872, Apr. 3	179	Klytaemnestra	" Nov. 11