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The Young Prodigy

John Frederick William Herschel, only child of the great astronomer Sir William Herschel, was born at Slough, England, on March 7, 1792, into a home of extraordinary distinction. The household was described by the astronomer Charles Pritchard as "singularly calculated to nurture into greatness any child born, as John Herschel was, with natural gifts capable of wide development.... At the head of the house there was the aged, observant, reticent philosopher; and rarely far away, was his devoted sister, Caroline Herschel, whose labours and whose fame are still cognisable as a beneficent satellite to the brighter light of her illustrious brother. It was in the companionship of these remarkable persons, and under the shadow of his father's wonderful telescope, that John Herschel passed his boyish years. He saw them, in silent but ceaseless industry, busied about things which had no apparent concern with the world outside the walls of that well-known house."[1]

At the time of his son's birth Frederick William Herschel (1738-1822) was at the height of his astronomical career, which had taken him from the most humble beginnings to the pinnacle of fame. The great advantages enjoyed by his son – an excellent education which provided the opportunity for a brilliant career – combined with a care-

fully nurtured and wholly untroubled youth – had been lacking in the case of the father. William Herschel was the son of a simple army musician in Hanover. He adopted the same profession as a boy of fourteen. In 1758 he came to England, a penniless refugee from the confusion and misery brought upon his native city by the Seven Years' War, and for some years eked out a bare existence, first as a musical copyist and then as instructor of music to a small military band in the north of England. Finally, in 1766, he was appointed to the post of organist at Bath, at that time a famous and fashionable spa; later he also became director of the Bath Orchestra.

There in his spare time he began to read works on mathematics and astronomy and to make attempts at grinding telescope mirrors. Soon it became his dearest longing to possess a telescope of his own. "I resolved," he once wrote, "to take nothing upon trust, but to see with my own eyes all that other men had seen before."

His first homemade instrument was a reflecting (or mirror) telescope of 7-foot focal length. Its principal concave mirror was about 6 inches in diameter, and it was constructed on the Newtonian principle (deflection of the converging rays by means of a small flat mirror into an eye-piece placed at the side of the tube). William Herschel made the eye-pieces himself; the strongest one had a magnifying power of 6450. The telescope was mounted on a wooden framework with rollers. The orientation of the tube was achieved by a system of ropes and screws.

With this first telescope he undertook a survey of the whole northern sky, observing everything that came within its field of view. His interest in astronomy now became the great passion of his life. Every minute that he could steal from his job was used in grinding telescope mirrors and observing the stars.

He found faithful and enthusiastic helpers in his sister Caroline and his brother Alexander, who had joined him

at Bath after the death of their father. Caroline became his astronomical assistant, while Alexander helped in the construction of telescopes. Carried along by their brother's enthusiasm, they formed an ideal partnership – a rare example of three people serving a common purpose with equal devotion. Their interest almost reached the point of obsession, so absorbed were they in their esoteric activities.

The great turning point in William Herschel's life resulted from an event that did not seem to him at the time to have any great significance. On March 13, 1781, he observed in the constellation of Gemini an object which he could not find on any celestial chart. Assuming that he had found a comet, he reported the discovery to the Royal Society of London, to which he had already communicated several of the results of his observations, in a short paper entitled "Account of a Comet," which was published in the Philosophical Transactions of the Society.[2]

Several observatories undertook the search for Herschel's object. As was soon discovered, it showed no resemblance to a comet, and furthermore was not describing a cometary orbit. The famous French astronomer Pierre Simon de Laplace (1749-1827) finally carried out an exact computation of the orbit on the basis of the observational data and found that Herschel had discovered, not a comet, but a new planet, the seventh in the solar system, circling around the central sun at twice the distance of Saturn.

This brought about a sensation in the scientific world such as can hardly be imagined today. From the earliest beginnings of astronomy in ancient times, only five planets – Mercury, Venus, Mars, Jupiter, and Saturn – had been known, although since the time of Copernicus earth had been counted as the sixth. The assumption that the solar system was bounded by the ringed planet Saturn was so deeply ingrained in astronomical thinking that it had never occurred to anyone to look for an additional planet. Her-

schel himself stumbled upon it only by accident. The new planet, which was named Uranus, had actually been observed some twenty times since 1690, but it had always been recorded on celestial charts as a fixed star.[3]

With his discovery, the hitherto unknown amateur astronomer of Bath had advanced the knowledge of the solar system into undreamed-of depths of space. Soon Herschel's name was on everyone's lips. The first reactions were enthusiastic eulogies on the one hand; skepticism, distrust, and envy on the other. But Herschel had made his mark. King George III received him at court and encouraged his activities by providing him and his sister with fixed annual salaries of 200 pounds and 50 pounds, respectively. This enabled Herschel to give up his position as orchestra director and organist and to devote all his time to astronomical researches.

In 1786 the Herschel family moved to Slough, a town in the neighborhood of Windsor, where a house with a large garden was acquired. Work was immediately begun on the installation of an observatory on the property. Supported by a considerable grant from the royal purse, Herschel undertook the construction of a huge telescope with a focal length of 40 feet and a main mirror 48 inches in diameter.

Until it was dismantled in 1839, this telescope ranked as the largest reflector in the world. The eye-piece was placed at the front end of the tube and was accessible from a movable platform. The telescope was constructed on the now obsolete Herschelian principle, in which the primary mirror was slightly inclined to the optical axis and so reflected the light rays directly into the eye-piece; this eliminated the secondary plane mirror of the Newtonian form, which obstructs some of the incident beam, and thereby somewhat increased the light-gathering power of the instrument.

After three years of constructional work, Herschel was

able to point the great tube at the sky, and the first notable success that he achieved with it was the discovery of the sixth and seventh satellites of Saturn. The enormous mounting, with its tall ladders and beams that overshadowed all the rooftops of the little town, became not only a landmark in Slough but the symbol of a new epoch in astronomy.

William Herschel's activities now steadily increased. Day after day, with Alexander's help, he produced mirrors and telescopes which found purchasers all over Europe. At night he sat at his telescope with Caroline and observed double stars, nebulae, and star clusters, which the great light-gathering power of his telescopes enabled him to discover by the hundred. In well over 3000 areas of sky, he carried out star counts – "gauges," he called them – for the purpose of using the distribution and brightness of the stars to determine the form and spatial extent of the Milky Way system. He discovered the systematic or "peculiar" motion of the solar system through space – a brilliant piece of work which would in itself have been sufficient to ensure his permanent scientific fame. His great lists of star clusters and nebulae, along with his catalogue of double stars, bear witness to the indefatigable industry of this extraordinary man.

Such, then, was the scientific career of the "observant, reticent philosopher" described by Pritchard. William Herschel, then in his late forties, had never married, but not long after the move to Slough he changed his state. He married Mary Pitt, née Baldwin, the young widow of a well-to-do London merchant, on May 8, 1788. The marriage appears to have been a happy and harmonious one. Although not endowed with outstanding intellectual gifts, Mary Herschel had a winning, radiant personality, which brought warmth and liveliness into the austere astronomical household. Their son was born after four years of marriage.

The environment in which John Herschel grew up,

despite all its advantages and unique educational opportunities, had one unavoidable disadvantage: the age of his parents. (William was 54 when John was born.) John always regretted that his half-brother, Paul Pitt, died before he was old enough to know him. His cousin, Sophia Baldwin, who was part of the family, was eight years older but they were good companions. He was thus surrounded by adults whose activities he followed with shy admiration. Often when his father and aunt were resting from their night-time astronomical activities, silence was imposed on the household during the day, and noisy games were not allowed. While there was no lack of company in the Herschel house and at times guests arrived almost every day, they were mostly astronomer friends of William Herschel's. The conversations to which little John was allowed to listen were usually beyond a child's comprehension.

Serious and adult as his home was, however, John's youth seems to have been cheerful enough. Dreamy, and mature beyond his years, he may have been but he was also a normal boy. His Aunt Caroline recounted that he hung about among his father's craftsmen and builders, received instruction from them in the use of tools, and then one day set about undermining the family home with a hammer and chisel. He also seems to have terrified his parents on several occasions by daredevil climbs on the ladders and scaffoldings of the telescopes.

Caroline developed a great affection for her nephew, and the hours he spent with her in the small house to which she had moved after her brother's marriage were especially happy ones for the boy. "Many a half or whole holiday he was allowed to spend with me," Caroline wrote later, "was dedicated to making experiments in chemistry, where generally all boxes, tops of tea-canisters, pepper-boxes, teacups, etc., served for the necessary vessels and the sand-tub furnished the matter to be analysed. I only had to take care to exclude water, which would have

produced havoc on my carpet."[4] It is characteristic of John Herschel that he should choose a branch of science for his childish games. He continued to pursue chemistry enthusiastically in later years, even though it did not become his principal life work.

On May 1, 1800, just before he reached the age of eight, John was sent as a boarding pupil to Eton, which was only a mile from Slough on the highway to Windsor. The Herschels could well afford to have their son educated at the most expensive, famous, and exclusive school in England, but John's period in residence did not last long. One day his mother, no doubt overanxious about his somewhat delicate health, saw her son inveigled into a boxing match by an older and stronger boy and knocked to the ground. Fearing the effect on the boy of such rough episodes, which were by no means unusual at Eton, Mary Herschel summarily withdrew him from the school. He was then sent to a private school run by his father's friend Dr. Gretton at Hitcham, a village in the neighborhood of Slough, and a private tutor was also engaged to instruct him at home with the object of preparing him to enter a university. The tutor was a Scottish mathematician named Rogers, who seems to have been a highly capable man. He not only taught his pupil the elements of the natural sciences but also introduced him to modern languages, literature, and music, thus providing a most valuable complement to the purely classical course provided by Dr. Gretton. In mathematics, however, his efforts were at first completely unsuccessful. This failure is especially surprising in view of John Herschel's subsequent career: he was made a Fellow of the Royal Society at the early age of twenty-one as a result of a brilliant mathematical investigation; a few years later he made a superb contribution to the introduction of continental methods of mathematical analysis into England; and in 1821 was awarded the Copley Medal, again for a series of mathe-

matical papers. After a short time, however, Rogers' instruction seems to have yielded excellent results. There is an interesting parallel here with Herschel's great fellow countryman Sir Isaac Newton (1642-1727), who is also reported to have been a poor mathematician at school.

During the summers of the pre-university years, John was allowed to accompany his parents on some major journeys. His father wished to show the boy, who had grown up in undue isolation at Slough, something of the world into which he would soon be entering on his own account. They traveled in their carriage round England, Wales, and Scotland, visiting in turn the towns in which William Herschel had led a hard and poor but also a happy life as a young musician. There was even a trip to Paris, where John was shown the sights by his godfather Count Komarzewskï, while his father, accompanied by Laplace, had an audience with Napoleon.

In October 1809, at the age of seventeen, John Herschel took up residence at the University of Cambridge, where he matriculated as a student of mathematics and physics in St. John's College. The beginning of his university career marked a decisive step in his intellectual development. A wealth of new impressions overwhelmed him. The quiet, somewhat dreamy boy from the astronomer's household in the little country town of Slough was probably bewildered at first by the cosmopolitan university town. But he soon found a stimulating circle of friends in the relatively small and intimate study group at St. John's. He developed particularly close friendships with George Peacock (1791-1858), a mathematician who later became a theologian and Dean of Ely, and with another mathematician, Charles Babbage (1792-1871), who was to devote most of his life to the invention of a calculating machine.

Every Sunday morning after chapel the three friends were accustomed to spend a few hours together in lively

scientific and philosophical discussion. With youthful and romantic ardor, they sealed their friendship with a resolution "to do their best to leave the world wiser than they found it."

The first fruit of their exacting program was the Analytical Society of Cambridge, which they founded in 1812. The object of this society was to make known in England the modem methods of infinitesimal calculus that had been developed chiefly in France and Germany and to replace the rather cumbersome notation of Newton's "calculus of fluxions" by the more elegant usages practiced on the Continent. This ambitious project of the three undergraduates was to achieve remarkable success within five years.

The task which the Analytical Society had set itself was revolutionary, not only from a purely mathematical point of view, but from that of the history of thought in general. There was probably no university in England where the supreme authority of Newton was more completely and devotedly maintained than at Cambridge, where Newton himself had taught. His *Principia*[5] provided the basic apparatus of every student of mathematics and natural sciences. John Herschel himself, in order to enter completely into the spirit of the work, is reported to have cast aside the English translation normally used by students and read the *Principia* in the original Latin, no mean linguistic achievement in view of the forbidding character of seventeenth-century scientific Latin. Newton's authority was held to be unassailable, even in fields having a more speculative and philosophical content, such as the theory of light.*

* Newton supposed that light consisted of minute material particles which are expelled by the source and propagated in straight lines in all directions, but the emission theory was much more sophisticated than it is often represented to be and included features of a very modern flavor, such as the probability notions of "Fits of Easy Reflection and Transmission."

This veneration of Newton, reinforced by the strong traditionalism in English universities and by immense national pride, had prevented the adoption of the analytical methods of Newton's contemporary, the German mathematician and philosopher Gottfried Wilhelm von Leibnitz (1646-1716) or those of Laplace. Attempts made at the beginning of the nineteenth century by two British mathematicians, Robert Woodhouse (1773-1827) and James Ivory (1765-1842) to introduce these methods into English science achieved no success, although Woodhouse's textbook on trigonometry[6] was well received and had a marked influence on Herschel. The revolution seems to have required the infectious youthful dynamism of Herschel and his friends.

Herschel and Peacock translated Traité du calcul différentiel et du calcul intégral by the French mathematician Sylvestre François Lacroix (1765-1843).[7] The translation, which appeared in 1816, was enthusiastically received by the younger generation of mathematicians and college lecturers. Soon it became generally adopted as a university textbook. Herschel and Babbage supplemented it with two volumes containing examples, published in 1820; one of them, written by Herschel, contains a wealth of material on the calculus of finite differences.[8] Questions based on the new continental methods introduced by the Analytical Society were used in the examinations held at Cambridge in 1817 and 1819, and these methods were accepted all over England in an amazingly short time, displacing Newton's fluxions.

Their struggles for mathematical reform in no way reflected an intention to belittle the supreme scientific greatness of Newton, which Herschel and his contemporaries fully recognized. Herschel's burial next to Newton's grave in Westminster Abbey, half a century after these events, was more than merely a pious gesture.

Herschel's student years at St. John's were marked by

an uninterrupted series of successes. Caroline Herschel, overflowing with almost childish pride in her nephew, wrote in her diary that "from the time he entered the University till his leaving he had gained all the first prizes without exception." In Nicholson's Journal, in February 1812, Herschel published anonymously a collection of analytical formulas,[9] which was the first printed result of his introduction of new methods of mathematical analysis; this was followed shortly afterward by a compilation of trigonometric formulas in the same periodical.[10] In October of the same year John Herschel submitted to the Royal Society, through his father, a mathematical paper "On a remarkable application of Cotes's Theorem."[11] This paper, inspired by reading Woodhouse's textbook, aroused much admiration by the elegance of its argument. On May 27, 1813, its author was elected a Fellow of the Royal Society – a most unusual honor for a young student. This was a precursor of three later papers on analytical topics, published in *Philosophical Transactions* in 1814, 1816, and 1818,[12] which won for Herschel in 1821 the Copley Medal, the highest scientific award bestowed by the Royal Society.

The year 1813 was a successful one for Herschel in another respect. In January he took the tripos (the university examination in mathematics) for his Bachelor of Arts degree and was classed Senior Wrangler (best candidate) and Smith's Prizeman. Peacock only managed second place, while Babbage voluntarily withdrew, having seen that he could not successfully compete with Herschel. This incident, however, caused no breach between Herschel and Babbage. Apart from the personal affection in which each held the other, their common preoccupation with the new analytical ideas formed a strong bond between them. They exchanged letters the length of respectable scientific papers on mathematical problems, the solutions to which Herschel developed with such facility

and elegance as to make them seem completely obvious. Plans were laid for the future of the Analytical Society, statutes[13] drafted, and members elected. The first volume of *Memoirs of the Analytical Society* came out, also in 1813, and included an extensive contribution by Herschel on differential equations and their applications.[14]

With this series of publications, the society hoped to win supporters outside the confines of the university and thus to introduce the new methods of analysis into the studies and lecture rooms of British mathematicians and scientists. In a letter to Babbage in 1813 Herschel writes, "For I repeat it again and again: we must not be a Cambridge Analytical Society."[15]

In addition to his mathematical studies, Herschel now turned to chemistry. Whether he was stimulated by Babbage, who had taken up chemistry after "migrating" to Trinity College, is not clear from the two friends' correspondence. Herschel installed his own small laboratory in his father's house at Slough, where he spent his vacations. Full of enthusiasm, he plunged into the new science, which at that time was undergoing profound changes as a result of fundamental research by the English chemist Sir Humphry Davy (1778-1829), the French chemist Joseph Louis Gay-Lussac (1778-1850), and others. Aware of the limitations imposed on his creative drive by the amount of time available, if by nothing else, Herschel once wrote to Babbage: "God knows how ardently I wish I had ten lives, or that capacity, that enviable capacity, of husbanding every atom of time, which some possess, and which enables them to do ten times as much in one life…."[16]

John Herschel was now at the crossroads of his intellectual development. He hesitated whether to devote himself to a purely scientific career or to take up a more lucrative occupation and restrict his scientific pursuits to his leisure. He decided in favor of a gainful occupation, feeling that, despite his preference for mathematics, his

scientific interests were so manifold, urgent, and fragmented that it would have been difficult for him to commit himself to any one particular field. His restless spirit required a high degree of freedom of movement. Yet he may have felt the need for the firm line of duty which is the inevitable concomitant of any profession, as a healthy counterpoise to the dangers of the very diversity of his interests. He was perfectly well aware of these dangers, as various remarks to his friends show. His extraordinary intellectual adaptability, his limitless capacity for enthusiasm at a new idea, and the almost hectic restlessness of his scientific efforts remained characteristic even in old age. These traits were a part of his heritage from his father, but in William Herschel they were associated with the essential qualities of a scientific pioneer and revolutionary thinker, qualities that were less prominent in the son.

In January 1814, Herschel wrote to Babbage[17] that he had decided to become a lawyer and intended forthwith to move to London and read for the bar at Lincoln's Inn (one of the four legal societies of London through which young lawyers receive their training and their admission to the bar). This decision seems to have been made very suddenly and against the wishes of his father. The elder Herschel would have liked his son to become a clergyman, a desire that seems very strange if one makes the reasonable assumption that his greatest hope would have been for John to be an astronomer and continue and complete his own researches. However, the wish seems to have arisen, not from religious feeling or any basic preference for a clergyman's calling, but from the somewhat superficial and indeed questionable assumption that clerical duties would provide more leisure for the pursuit of private hobbies and scientific interests than any other profession could offer.

John, however, did not relish the prospect of this peace-

ful and narrow existence, although his father presented it in the most glowing colors in a long letter. In spite of his father's low opinion of the legal profession he finally received permission to enter it. He began to read for the bar in February 1814, and was introduced to the practical handling of cases in the chambers of a Mr. Sander.

From the very beginning Herschel does not seem to have been happy in this new and radically different environment. His regular attendance at meetings of the Royal Society continually drew his interest back to science, the more so as he became increasingly aware of the emptiness of the lawyer's existence as it was presented to him at Lincoln's Inn. His distaste appears in his letters to James Grahame,* a friend he first met in Glasgow, although he wrote to Babbage: "I am determined, as the profession is of my own chusing, much against the wish of my parents, that I will pursue it in good earnest."[18]

Certainly he never felt any genuine love for the law; instead, his scientific interests were only strengthened during his stay in London. A decisive influence was his acquaintance with the chemist William Hyde Wollaston (1766-1828), whose fascinating lectures revived all his former interest in chemistry.

During Herschel's London period he also made the acquaintance of the astronomer Sir James South (1785-1867), with whom he was later to carry out a systematic revision and continuation of William Herschel's astronomical observations. South, who came from a well-to-do family, had studied medicine and practiced as a doctor

* James Grahame, sometimes described as a "historian" and known as a matchmaker friend of both Herschel and his future wife's family (see Chapter 3) and as the author of verses, is a slightly mysterious figure. He may have been one of the sons of the Scottish poet the Reverend James Grahame, who died in Glasgow in 1811, and the James Grahame who entered St. John's College from Glasgow in 1811 at the age of twenty. The background in each case fits very well. Nothing is at present known of Grahame's later life except that he remained friendly with the Herschels.

for a few years, but at the time John Herschel met him he was devoting himself entirely to astronomy and had installed a private observatory with excellent instruments in his London house in Blackman Street.

Soon Wollaston and South completely deflected Herschel from a legal career, and his eighteen months at Lincoln's Inn were a period of intensive studies in science rather than in law. In March 1815, he applied for the Chair of Chemistry that had just become vacant at Cambridge, but his rival was elected by a majority of one vote. Resignedly he wrote to Babbage: "I made my retreat with as good a grace as might well be and have nothing for my pains but the satisfaction of knowing that if Tennant [the previous occupant of the Chair] had lived a twelvemonth or two years longer I should in all probability… have been his successor. I do not care much about it and on the whole I believe it is better as it is. – I have been attending Clarke's* lectures and am become half a mineralogist – and have been analysing some of his specimens for him…."[19]

Herschel's legal career came to an abrupt end in the summer of 1815. The exertions demanded by his double course of studies and by his restless mind, and the unaccustomed pressures of life in the metropolis, had undermined his health, never very robust, and he required medical attention. Several weeks at the seaside resort of Brighton restored his vigor, but at the beginning of November he wrote to Babbage: "Indeed I begin to fear I must throw up the profession altogether as a lost game and I endeavour to reconcile myself to it…."[20]

He did not return to Lincoln's Inn, although it was not until a year later that he had his name struck from the register. After lengthy consideration, he accepted an offer that had been made to him in May 1815 by one of his former teachers at St. John's, the mathematician the

* Edward Daniel Clarke (1769-1822), English mineralogist.

Reverend Thomas Waldron Hornbuckle (1775-1848). The post was that of sub-tutor and examiner in mathematics at St. John's and, though modest, did at least offer the opportunity of an academic career. Herschel had originally declined the offer because at that time he still had the firm intention of preparing for the bar.

It was not difficult for him to take leave of the legal career which he had entered upon halfheartedly and purely for considerations of prudence. Once more and with redoubled enthusiasm, he plunged into his mathematical researches and renewed old friendships, especially that with his friend of undergraduate days, William Whewell (1794-1866), the gifted mathematician, physicist, and philosopher who later became Master of Trinity College. Whewell, undoubtedly one of the most remarkable men at Cambridge University in the first half of the nineteenth century, was, like Babbage and Peacock, an enthusiastic supporter of the new methods in mathematical analysis. His *Textbook of Mechanics,* which was imbued with the spirit of modern analysis, appeared in 1819. Herschel's warm friendship with Whewell lasted until the latter's death.

The year 1816 began with a phase of intensive work for Herschel. His duties as sub-tutor were exacting and somewhat monotonous. He complained to Babbage: "You are pretty well aware what a job it must be to be set from 8 to 10 or 12 hours a day examining 60 or 70 blockheads, not one in ten of whom knows his right hand from his left, and not one in ten of whom knows anything but what is in the book.… In a word, I am grown fat, full and stupid. Pupillizing has done this – and I have not made one of my cubs understand what I would have them drive at."[21]

This disappointment did not impair his own enthusiasm for mathematics. The translation which he and Peacock made of Lacroix's Traité was carried out in this period of

"pupillizing," as was the preparatory work for the collection of examples on the method of finite differences published in 1820 as a supplement to the translations of Lacroix.

On July 3, 1816, Herschel took the degree of Master of Arts and was elected a Fellow of St. John's College – that is, a member of the academic faculty. The end of his years of study and wandering appeared to have been reached, and a promising academic career seemed to lie before him. His scientific publications, his leading role in the Analytical Society, and his Fellowship in the Royal Society had already established for him a reputation that was not merely a reflection of his father's achievements but had a brilliance and character of its own. But new circumstances now intervened to turn his life in a completely different direction.

In the summer of 1816 he accompanied his father on a trip to Dawlish, a popular resort on the Devonshire coast. William Herschel, who was then in his seventy-eighth year, had for some time suffered from various ailments brought on by advancing age and had been compelled to restrict his astronomical observations more and more. Caroline also could no longer bear the strain of long nights of watching at the telescope. However, William Herschel could not make up his mind to give up his astronomical researches entirely. After forty years he had become so involved in his work that he could not tear himself away from it. Important parts of his life's work were still incomplete, while others required revision, reevaluation, and systematic collation. The task was too great for the aged astronomer to cope with alone, and the choice of a successor who would continue and complete it, in his spirit and using his methods, pressed on him with ever-increasing urgency.

Father and son must have held many earnest conversations on these matters. In the end, John Herschel offered

to become his father's astronomical assistant. This decision, arising out of love and respect for his father in the last stage of his restless life, started John Herschel on what ultimately became his own life work, despite all his other, often mutually contradictory interests. The choice must have been made with great hesitation and uncertainty and could not have been motivated by either romantic enthusiasm or cold calculation, but nevertheless it was to lead to achievement and fortune.

Parting from Cambridge – unlike leaving the law – was not easy. Although at the time he had not decided to give up forever the career he had begun, he seems to have sensed that the departure was to be final. On October 10, 1816, he wrote to Babbage: "I shall go to Cambridge on Monday where I mean to stay but just time enough to pay my bills, pack up my books and bid a long – perhaps a last farewell to the University.… I always used to abuse Cambridge as you well know with very little mercy or measure, but, upon my soul, now I am about to leave it, my heart dies within me. I am going, under my father's directions, to take up the series of his observations where he has left them (for he has now pretty well given over regularly observing) and continuing his scrutiny of the heavens with powerful telescopes.…"[22]