

THE HERSCHEL DYNASTY – PART I: WILLIAM HERSCHEL

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ABSTRACT

Brief notes on Sir William Herschel, 1738–1822, are presented, with emphasis on his early family life, his transition from musician to astronomer, and the present location of some of the antiquities relevant to the Herschel family.

Introduction. It is a good time to turn our thoughts to the Herschel family since next year, 1981, is the bicentennial of the discovery of Uranus, the first planet in the entire history of astronomy to which the word “discovery” can be properly applied. The five planets easily visible to the unaided eye have been known from antiquity, long before the age of written records. In these brief notes, which will appear in three successive issues of the JOURNAL, I am making no attempt to write biographies of the Herschels, much less to cover adequately their scientific careers and their significant contributions to our knowledge of space and the galaxy of stars which we inhabit. Rather, I wish to chronicle some of the less well-known incidents in Herschel family life to assist us in a better appreciation of the very human problems we all face, no matter what our individual occupations or professions. In addition, I will include notes on the present condition and locations of the Herschel memorabilia, in so far as I have been able to observe them personally. There will be many errors of omission, which the reader must excuse, as I am very far from being a qualified historian of science.

Early Years. Friederich Wilhelm Herschel, as he was originally named, was born at Hanover on 15 November, 1738, the fourth child in the very musical family of Isaac and Anna Ilse (Moritzen) Herschel. To sense the political atmosphere of the period it must be remembered that George, the Elector of Hanover, was also George II of England, and that eleven years earlier he had succeeded to both these positions on the death of his father, George I. Isaac Herschel was an oboist in the Hanoverian Foot-Guards, having deserted a family tradition of landscape gardening. He was anxious to give all his children a good musical education and his oldest son Jacob also became a member of the Foot-Guards’ band. At a very early age Wilhelm was given a small violin made especially for him and he recollected being



FIG. 1—Portrait of Sir William Herschel by William Artaud, now hanging in the re-designed Frank Dyson Gallery of the Old Royal Observatory, Greenwich. (Photo by P. M. Millman)

set on a table at the age of four to play solos. When he was 14 Wilhelm became a professional oboist, joining his father and his older brother Jacob in the regimental band. Three years later the regiment was posted to Kent in England and this was the occasion where both Jacob and Wilhelm made friends with several English families interested in music, a connection that would prove very helpful in later years. At this time international tensions were fast building towards the outbreak of the Seven Years' War, and when France threatened Hanover the Foot-Guards were recalled to Germany where, on 26 July, 1757, Wilhelm and Isaac came under direct fire in the battle of Hastenbeck. Night after night they had to pitch their tent in water-soaked plowed fields and suffered many hardships. In the confusion that followed this defeat of the Hanoverian forces nobody seemed to care

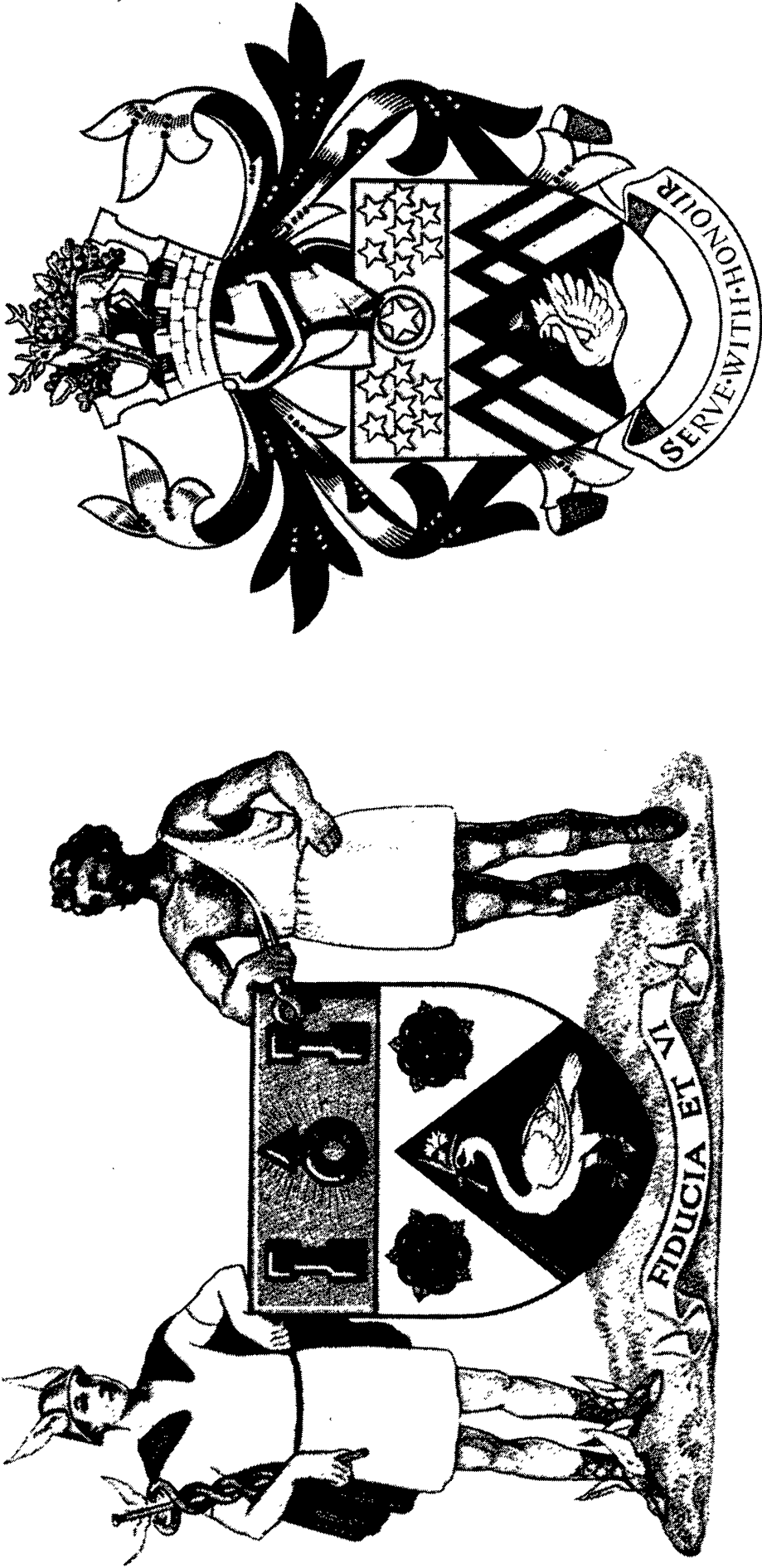


FIG. 2—Armorial bearings of the Borough of Slough; *left* — before 1774, Slough, Buckinghamshire, central on the chief is the astronomical symbol for Uranus, commemorating its discovery by William Herschel; *right* — after 1774, Slough, Berkshire, the star with a ring around it at the centre of the chief stands for Uranus, a somewhat apocalyptic representation. (Courtesy of the Slough Borough Council)

what happened to the musicians and, on his father's advice, Wilhelm left the regiment and made his way to England. Owing to his youth he had never been formally sworn in for military service, but Isaac did secure for his son a formal discharge from the band, duly signed by the Colonel. This discharge certificate was preserved by the Herschel family at Observatory House in Slough, along with other family documents. The story often repeated¹ that George III gave Wilhelm a pardon in 1782 for his desertion from the army would seem to be completely unfounded.

Yorkshire. When Wilhelm arrived in England near the end of 1757 he was almost penniless, but managed to make enough to live on by copying music. Later, along with his brother Jacob, he was involved in some private concerts, and notes that “we were able to live pretty comfortably in the winter”. In the summer they visited some of the friends they had met previously in Kent. Eventually, Jacob returned to Hanover, having secured a place in the Court Orchestra, and Wilhelm obtained a post in Yorkshire as a musician in the Militia of the Earl of Darlington. For the next five or six years, from 1760 to 1765, very little of the details of Wilhelm's life are known. He seems to have been busy teaching music and composing for performances in various Yorkshire towns. He visited his family in Hanover in 1764; it was the last time he saw his father.

There is a delightful story about a visit he made to Italy “to improve himself in his profession of music”, most probably in 1765 when he was living in Halifax, Yorkshire. Herschel himself, shortly before his death, told the story to Neimeyer, Chancellor of the University of Halle. On his way back from Italy he found himself stranded in Genoa with no travel funds. He raised the necessary money to return home by giving a novelty concert, playing a harp and two horns simultaneously, the latter being fastened to his shoulders. This is surely not the mental picture we normally have of Sir William Herschel, discoverer of Uranus. However, there is no doubt about his versatility with different instruments. On one occasion he gave a benefit concert, playing mostly his own compositions, and performing solo on the violin, the oboe and the harpsichord. It may be noted paranthetically here that his first recorded astronomical observations were made in Halifax during February, 1766. Also in 1766 a new organ had been installed in the church at Halifax, and on August 30 there was a competition for the post of organist. The candidate who played just before Herschel demonstrated extreme dexterity in his fingering and appeared to be a difficult contender to defeat. However, when Herschel played he had such a fulness of tone and played “the Old Hundredth psalm-tune” so magnificently that he was chosen as the new organist. When asked by a



FIG. 3—Monument at the site of Observatory House, Slough. The inscription on the plaque reads “SIR WILLIAM HERSCHEL K.G.O. (1738–1822) DISCOVERER OF THE PLANET URANUS 1781. THIS SCULPTURE BY FRANTA BELSKY SYMBOLIZES THE TRIANGULAR STRUCTURE OF THE FORTY FOOT TELESCOPE THROUGH WHICH HE REACHED UP TO ENCOMPASS THE INFINITE”. (Photo by P. M. Millman)

friend how he managed to produce such full harmony from the organ he took from his pocket two small lead weights. By placing these on the appropriate keys activating the bass notes he had produced the effect of four hands, and he commented “I told you fingers would not do”.

Bath, Somerset (now Avon). William Herschel, as he came to be known in England, did not remain long as organist at Halifax, playing the organ for just 13 Sundays, for which he received 13 guineas. He had been offered an appointment as organist in the new Octagon Chapel at Bath and, although “the gentlemen at Halifax” promised to increase his salary if he would stay, he resigned at the end of the quarter and left Halifax on December 1st, 1766, arriving in Bath on December 9th. This fashionable west-country spa was to be Herschel’s home for over 15 years. The Octagon Chapel was opened with appropriate fanfare on October 4th, 1767, and there followed a month of performances to mark the occasion. Brother Jacob had arrived in Bath at the end of June, and William records him as sometimes being at the organ for oratorios while William himself conducted the orchestra.

Another brother, Alexander, seven years younger than William, came to live in Bath during the summer of 1770. But the most significant family change was the result of a trip to the continent which William Herschel made in 1772. When he reached Hanover he found that his sister Caroline Lucretia, nearly twelve years his junior, was being made a family drudge by her mother and by the lordly Jacob, now head of the family after the death of Isaac Herschel in 1767. Jacob saw no point in girls receiving an education. Their place was in the home, doing the housework. I am afraid that Jacob was a less-than-lovable character. Caroline has recorded that he considered the teaching of music to be beneath his dignity, in view of his skill as a violinist and an oboist. As a result brother William had to pay Jacob’s travelling expenses and tailor’s bills when he ran short of ready cash.

Before going back to England in 1772 William bailed Caroline out of her bondage by settling a sum of money on his mother to compensate her for the loss of her household help. He then took Caroline back with him to Bath where she settled down with her two brothers, William and Alexander, in No. 7, a house on the north side of New King St. Apparently Alexander lacked the cheerful disposition that was characteristic of his brother and sister, and within the family they called him Dick Doleful. But he was a big help to Caroline as she attempted to learn English while buying the necessary groceries at the local market. Alexander appointed himself his sister’s unofficial bodyguard and made sure she wasn’t cheated. Caroline’s thrifty up-bringing was just what the Herschel household needed, and within six

weeks she was in charge of the house accounts and looking after the general management of the establishment. Also, Caroline was launched on an intensive course of music study and practice in preparation for singing the solo parts in oratorios conducted by William.

In 1773 William Herschel started reading mathematics to assist him with his harmony, and progressed from there to a book on astronomy. The die was cast. From this time on, the hours spent on music became fewer and fewer as the hours spent on astronomy steadily increased. The cost of telescopes was found to be far beyond the modest resources of the family purse, so William decided to make his own telescopes. In this he was ably assisted by his brother Alexander, who was a good mechanic. But he was a musician as well, since his sister wrote “His solos on the violoncello were divine”. It wasn’t long before Caroline was lamenting that every room in the house had been turned into a workshop. A cabinet-maker was making telescope tubes and stands in the drawing room, Alexander was turning patterns, grinding glasses and turning eyepieces in a bedroom, while William was composing glees, catches and anthems, or holding rehearsals, at the house. Meals were taken in snatches and served without interrupting the work on hand. If William was spending long hours grinding a speculum without removing his hands from the task, Caroline would feed him.

The industriousness of William Herschel during these years is almost beyond belief. He was giving between 30 and 40 private music lessons per week, conducting several series of concerts, composing music and building numerous telescopes, not to mention observing during clear periods at night. It is general knowledge that Herschel made his own telescopes. But the extent of his telescope production is not widely known. Speaking of mirrors figured from speculum metal he writes “at Bath in my leisure hours, by way of amusement – I made not less than 200, 7-feet; 150, 10-feet; and about 80, 20-feet mirrors², not to mention those of Gregorian form”. He carefully numbered his experiments in casting, grinding and figuring mirrors, both by hand and by machine; they totalled 2160. Roughly half were carried out before the end of 1793. The composition of speculum metal preferred by Herschel was 5 lbs of tin to 12 lbs of copper. Eventually he employed a number of assistants to perform the preliminary rough grinding, leaving only the final figuring for his own practised hands. The products of these labours were sold all over Europe, and many of the royal families appear on the list of purchasers. It was this commercial activity that helped to support the astronomical research for which William Herschel became famous.

But let us return to the early years at Bath. Caroline’s musical career was short-lived, and she soon became involved in astronomical observation,

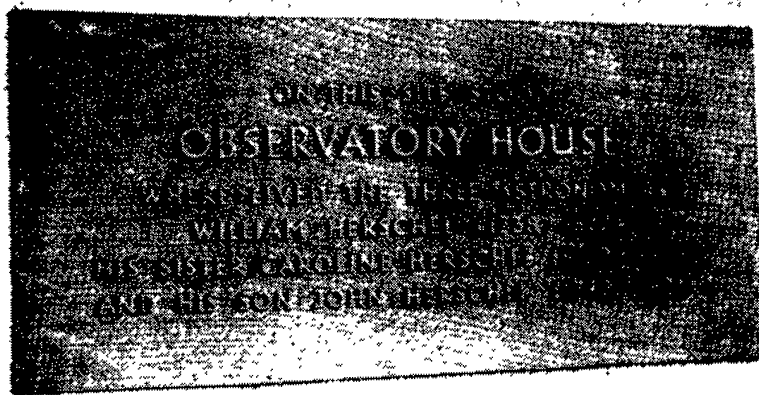


FIG. 4—Plaque on the outside wall of the office building, now occupying the site of Observatory House in Slough. (Photo by P. M. Millman)

taking notes for her brother as he called out the details of observations made with the telescope. In 1777 the Herschels moved to No. 19 New King St., a house on the south side of the street, and in 1779 William commenced a systematic survey of the sky, sweeping with a telescope of seven-foot focal length. It was in the yard³ of the house at No. 19 that the planet Uranus was first recorded on the night of March 13, 1781, in the course of the survey sweeps. Originally described as a comet, the motion of the newly found object, together with its uniformly circular image under high magnification, soon revealed it as a major planet moving about the sun on a path well outside the orbit of Saturn.

Science was not slow in paying homage to this discovery. The Royal Society awarded the Copley Medal to William Herschel in November, 1781, and in December of the same year elected him a Fellow of the Society. A meeting with His Majesty, George III, was arranged for July, 1782, but prior to this Herschel's seven-foot telescope was taken to the Greenwich Observatory. The Astronomer Royal, Dr. Nevil Maskelyne, tested it and declared that the Herschel telescope was superior in quality to any they had previously examined. On July 2 at the Queen's Lodge, Windsor, the King, Queen and Royal Family were duly shown "the planets Jupiter and Saturn and other objects" by William Herschel. The outcome was that at the end of July, 1782, Herschel was appointed astronomer to the King at a salary of £200 a year, with the understanding that he would live near Windsor and "occasionally attend in the evening to show something of interest to members of the Royal Family".

Slough, Buckinghamshire (now Berkshire). William played the organ in Bath for the last time on May 19, 1782. From August 2, 1782, the sky survey was continued for some years without pause at several residences in towns near Windsor, where the living conditions were far from satisfactory. Finally, at the end of March, 1786, the Herschels moved into a comfortable house on the Windsor Rd. in Slough, and observing commenced there on April 3rd. This final residence of William Herschel became known as Observatory House and was occupied by the Herschel family⁴ until shortly before it was demolished. In spite of the valiant efforts of several local societies, the house was torn down in 1963 to make way for a modern high-rise office building.

At the time of the move to Slough, Herschel's most important observing instrument was a 20-foot telescope with a mirror just under 19 inches in diameter. With it he discovered the two brightest moons of Uranus, Titania and Oberon, in January, 1787 and, two years later, the sixth and seventh moons of Saturn (in order of discovery).⁵ Meanwhile, since August of 1782, Caroline had been searching for comets when not busy recording for her brother. Success came on 1st August, 1786, when she discovered her first comet with a small telescope of two-foot focal length that William had made especially for her. By 1797 Caroline Herschel had discovered eight comets in all. But her most valuable contributions to astronomy were the reductions of her brother's observations and the various publications which she compiled. Particular mention should be made of her *Zone Catalogue*, unfortunately never published, of all of the nebulae and star clusters observed by William. For this she was awarded the Gold Medal of the Royal Astronomical Society in 1828.

Apart from observing, the main project at Slough was the design and construction of the great telescope with a mirror of 40-foot focal length, 49½ inches in diameter. The construction was financed by the King to the extent of £4000 plus yearly upkeep. The speculum weighed over 2100 lbs and problems were encountered in grinding and figuring something of this weight. Herschel had difficulty designing a grinding machine and actually tried out a technique using 20 men moving simultaneously. It proved impractical, and eventually a satisfactory mechanical device was constructed. The telescope tube, some 58 inches in diameter, was completed long before the mirror was ready, and many interested visitors had the novel experience of walking through the tube as it lay on the ground. George III preceded the Archbishop of Canterbury on this pedestrian exercise, and the King is reported to have held out his hand and said "Come, my Lord Bishop, I will show you the way to Heaven". The 40-foot telescope was completed in 1789 and first used on August 28 of that year in

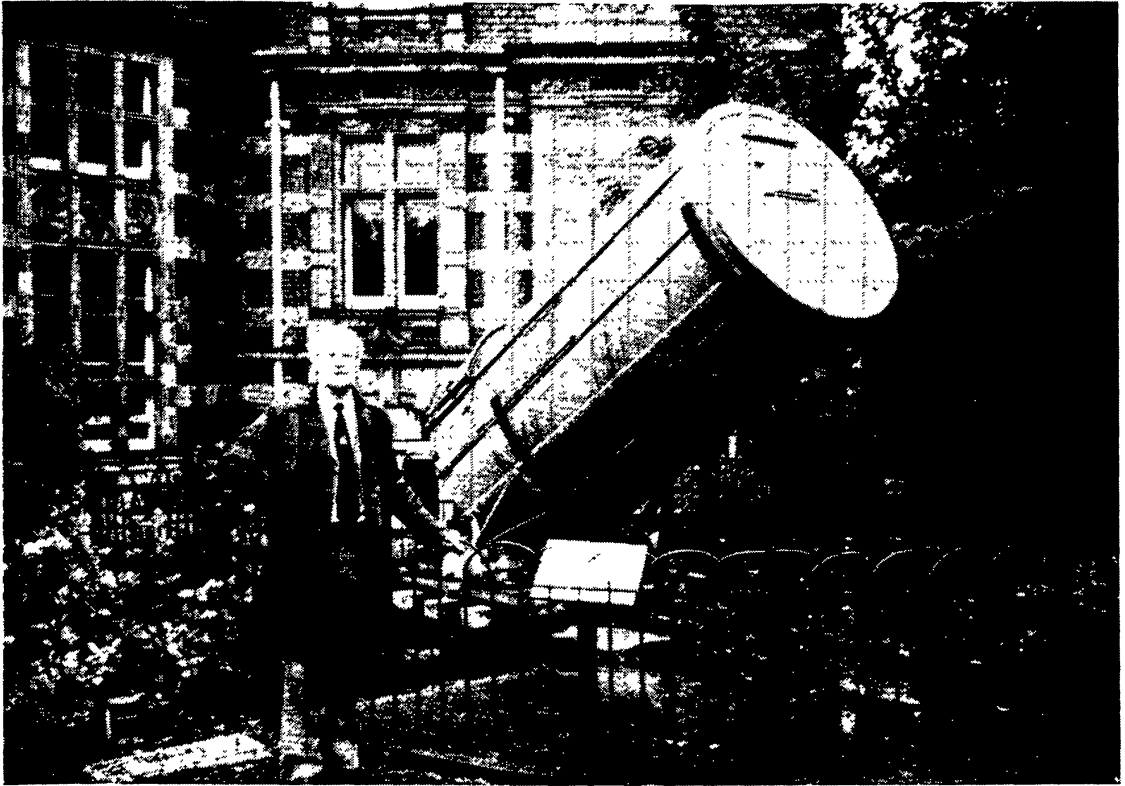


FIG. 5—David W. Waters of the National Maritime Museum, with the only surviving fragment of the tube of the famous Herschel 40-foot telescope, South Building, Old Royal Observatory, Greenwich. (Photo by P. M. Millman)

confirming the existence of Enceladus, the sixth moon of Saturn to be discovered. Three weeks later the existence of the seventh moon discovered, Mimas, was confirmed. But the large instrument was never employed as regularly as the 20-foot telescope and it is probable that Herschel found it too cumbersome in its adjustments to be efficient in continuous observing.

On 8th May, 1788, in his 50th year, Herschel married Mrs. Mary Pitt (née Baldwin), the widow of a neighbour. William and Mary's only child, John Frederick William, was born on March 7, 1792. This marriage was at first a traumatic experience for Caroline. She moved out of Observatory House and from then on occupied a succession of lodgings in Slough. Eventually, Caroline was won over by Mary's kindness and continued as William's assistant in astronomy until his death in 1822.

The last 30 years of William Herschel's life are in marked contrast to the earlier periods. His position in the world of science was then assured and honours, both national and international, continued to come. He received a gold medal from the King of Poland, and was made a foreign member of the

French Academy of Sciences. In England he was made a Knight of the Guelphic Order in 1816, and became the initial⁶ President of the Astronomical Society in 1821, on condition that he would not be required to attend meetings. Night observing gradually became less frequent even though he continued this activity until June of 1821. Some of the earlier spark seemed to have faded, no doubt owing to a severe illness suffered during 1808. In 1816 John Herschel was appointed his father's assistant. Sir William Herschel died peacefully at his home in Slough on the 25th of August, 1822. He was buried under the tower in the Church of St. Laurence at Upton, just half a mile from his home of over 35 years. On a stone tablet erected over the grave there is a Latin inscription some 150 words in length, composed by Dr. Goodall, Provost of Eton College. It has been reproduced in full in *The Observatory*, Vol. 4, p. 274, 1881.

William Herschel left us with a planetary domain in the solar system expanded to twice its former diameter. More important, he bequeathed the concept of using star-counting to explore our galaxy of stars by quantitative techniques. In his later papers he recognized that the large number of nebulae which he had catalogued, some 2500 including the star clusters, could be either clusterings of unresolved stars, or gas with occasional stars imbedded in it.

In Slough he was remembered affectionately by his friends as a charming and modest man with a cheerful disposition and a willingness to talk to anyone. In Science he is remembered as the man who pointed the way to an observational and statistical study of our stellar system, reaching far beyond the local assemblage of planets, satellites and comets. No man had a better right to use the words, found on the inscription around the base of the monument erected at the site of Observatory House in Slough: "I HAVE LOOKED FURTHER INTO SPACE THAN EVER HUMAN BEING DID BEFORE ME W. H. 1813".

The Herschel Telescopes. The mirror of the 40-foot telescope tarnished quickly and had to be repolished at frequent intervals if it were to be used regularly. For example, the records show that in 1798 it was polished in May, June, October and November. Since this mirror weighed over a ton and required a crane for handling, the time spent keeping it in serviceable condition must have been considerable. Even before William Herschel's death the wood of the triangular mounting had started to decay, and by 1839 it was too dangerous to leave standing and was taken down by John Herschel. The entire 40-foot tube of iron was left in a horizontal position for some years, supported on low piers, until a storm blew a tree down and all

but about ten feet of the tube was destroyed. This last remaining fragment is now mounted in the grounds of the Old Royal Observatory at Greenwich, part of the National Maritime Museum, and can be seen just outside the South Building which houses the planetarium. The Herschel Collection of telescopes, mirrors, polishing machines, eyepieces and micrometers, acquired by the Maritime Museum over the last two decades, is now displayed in the re-designed Frank Dyson Gallery at the Old Royal Observatory in Greenwich, and was opened on September 19, 1979. Items of particular note in this display are the 20-foot telescope made by William and John Herschel in England and used later by John Herschel in South Africa, the original mirror of the 40-foot telescope, and a seven-foot telescope made by William Herschel and similar to the instrument with which Uranus was discovered.

Acknowledgements. In writing these notes I am indebted to many sources, including: *William Herschel and His Work* by James Sime, Charles Scribner's Sons, New York, 1900; *The Torch-Bearers* by Alfred Noyes, William Blackwood and Sons, Edinburgh and London, 1924; *William Herschel* by Angus Armitage, Thomas Nelson and Sons Ltd., London, 1962; *Dictionary of Scientific Biography* (Vol. 6), Charles Scribner's Sons, New York, 1972; *The History of Slough* by Maxwell Fraser, Slough Corporation, 1973; and *The Scientific Papers of Sir William Herschel* edited by J. L. E. Dreyer, Royal Society and Royal Astronomical Society, London, 2 volumes, 1912. Special mention should be made of the introduction to the last-named publication, entitled "A Short Account of Sir William's Life and Work, Chiefly from Unpublished Sources". It contains many pages of direct excerpts from William Herschel's personal diaries and was found extremely useful in verifying events and dates.

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NOTES

¹For example, by E. S. Holden, *Sir William Herschel: His Life and Works*, W. H. Allen and Co., London, 1881, p. 17; A. M. Clerke, *History of Astronomy During the Nineteenth Century* (Fourth Edition), Adam and Charles Black, London, 1902, p. 11.

²Herschel normally described telescopes and telescope mirrors by their focal lengths.

³A picture of this yard by the late Margaret Harwood is in *Sky and Telescope*, **8**, 121, 1949.

⁴Except for a period following 1840 when Sir John Herschel moved to Kent.

⁵Although Enceladus and Mimas, satellites of Saturn, are listed by some authors as discoveries made with the 40-foot telescope, both objects were actually first seen with the 20-foot telescope and later confirmed with the 40-foot instrument.

⁶Actually, the first president elected in 1820 to the newly-formed Astronomical Society was Edward Adolphus Seymour, 11th Duke of Somerset, but he withdrew when he learned that the President of the Royal Society, Sir Joseph Banks, strongly opposed the formation of a specialist society that might threaten the pre-eminence of the Royal Society. The Astronomical Society received a royal charter in 1831 and became the Royal Astronomical Society.