George Bishop (1785-1861) and his South Villa Observatory in Regent's Park.

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George Bishop was a successful businessman who, when nearly fifty years of age, decided to devote his time, energy and wealth to furthering the cause of astronomy. He built a private observatory at South Villa, Regent's Park, and for it he acquired the best instruments and equipment then available. The facilities of South Villa Observatory were used by a succession of noted observers under Bishop's patronage and many important discoveries were made there.

He was also successively Treasurer, Secretary and President of the Royal Astronomical Society. This paper summarises Bishop's life and work as a patron of astronomy and records the many achievements of those who worked at South Villa Observatory.

The businessman

George Bishop was born at Leicester on 1785 August 21, but from the age of eighteen he lived in London and was employed by a British wine-making concern. Bishop came from a family of well-to-do merchants and would seem to have either inherited or acquired the same business acumen, since the wine company prospered and Bishop eventually became its proprietor. So successful was the business, in fact, that at one point half of all home-produced wines shown on Excise returns originated from his firm[1].

By his mid-forties Bishop was a wealthy man with a stable and prosperous business behind him. Sometime about the year 1830 he made a firm decision to indulge his long held interest in the science of astronomy. Within a short space of time Bishop gave the care of his business largely into the hands of his children so that he could devote more of his time to scientific rather than commercial interests.

Astronomical beginnings

On 1830 January 8 Bishop was elected a member of the Astronomical Society of London and his scientific career can almost be said to date from that time. (The following year this society became the Royal Astronomical Society by Royal Charter.) To further his knowledge of astronomy, Bishop initially immersed himself in a study of mathematics. He took lessons in algebra from Professor de Morgan with the intention of mastering sufficient mathematics to allow him to comprehend Laplace's great work, *Traité de Mécanique Céleste*, published in Paris between 1799 and 1825.

By 1833 Bishop had been elected Secretary of the Royal Astronomical Society. In this role he was in the ideal situation to meet and seek the advice of many of the distinguished astronomers and scientists who were associated with the Society in its formative years. Never an extrovert, Bishop (according to contemporary accounts) had "an earnest but very quiet desire of making his tastes useful, and investing some of his money in a way which would produce a higher return than can be measured by percentage"[2]. He had always nurtured a desire to establish an observatory and, following a change of residence from Avery Hill, Eltham, to South Villa in the Inner Circle of Regent's Park (a site until recently occupied by Bedford College), Bishop was able to realise his long-held ambition. This observatory was not to be either, as so many were, simply a rich man's toy: "I am determined" Bishop said to a contemporary when choosing the site, "that this observatory shall *do something*"[3].

The South Villa Observatory, comprising the tapered dome of the equatorial room, and the adjoining transit room.

The South Villa Observatory

South Villa had been built in 1827 for William Henry Cooper. The third house to be erected in the Inner Circle at Regent's Park, South Villa was "a fine house with a podium raised on an arched loggia and a bow-window at the eastern end overlooking the lake". All in all, an ideal residence for a man of Bishop's wealth and position. In 1836, "... with approval and support of the Crown commissioner"[4], George Bishop built an observatory in the grounds to the southwest of his residence. Assistance and advice were given by Captain Smyth regarding its construction.

The following year an eleven-foot (3.4m) equatorial with an excellent seven-inch (18cm) objective by Dollond was installed[5]. The observatory proper comprised a circular equatorial room and dome of some 4.7m diameter for the main instrument, with a transit room measuring 4.6m by 2.7m extending to the west. In the latter room were installed a 0.8m long transit instrument by Troughton and Simms and a Barraud clock. Time was obtained by this transit telescope from 1836 to 1840 March, after which an altazimuth instrument, erected on a slab placed across the piers formerly supporting the transit telescope, was used for this purpose. A two-day chronometer, Arnold 84, was also employed for time-keeping purposes[6].

The main equatorial telescope was built for Bishop by George Dollond of St Paul's Church Yard and was mounted in the cross-axis English style, copying Smyth's Bedford equatorial. The polar axis was some 4.2m long and was supported by a south pier of 2.5 tonnes and a 3.6 tonne north pier. The clockwork mechanism to drive the telescope was seated on its own stone pedestal, isolated from the floor, and could drive the telescope for nearly two hours. A sidereal clock used in the equatorial room was also sited in this fashion to avoid any unwanted vibrations emanating from the observer or the instrument. The circles of the telescope were 0.9m in diameter: the hour circle could be read to 1 second of time and the declination circle to 10 arcseconds by the use of verniers. The instrument was very well equipped with three different types of micrometer and a range of eyepieces which provided magnifications from 45x to 1200x[7].

The dome of the equatorial room was built of wood, braced by iron sections, and tapered upwards to a point "... for the sake of ornament". The machinery of the dome was finally adjusted by a Mr Penn of Greenwich[8].

A good description of Bishop's observatory and the work carried out there about the year 1850 is given in reference 8. The excellence of the Dollond objective was indicated by the fact that η Coronae could be separated with a power of 800x. (Maximum separation of this double star is about 1 arcsecond, every 41½ years, and it would not then have been at its widest separation.) The location of South Villa Observatory was given as $0^m\ 37^s{\cdot}1$ W, 51° 31′ 29″.8 N.

Bishop was enough of a realist to acknowledge that his own leisure would not allow him to be a full-time observer, and he determined that the best possible person would be recruited to work there. With a fine new observatory at his command, all that Bishop required to achieve his aim of systematic and useful observations was an observer whose ability matched the equipment and facilities provided. He found his man in William Rutter Dawes (1799-1868).

Dawes's period at South Villa Observatory

The Rev. W. R. Dawes, some fourteen years Bishop's junior, was then already well known for his observations and measurements of double stars. He had, like Bishop, been admitted a member of the Astronomical Society of London in 1830. Dawes successfully combined his astronomical activities with the responsibility for a small independent congregation at Ormskirk in Lancashire. His particularly keen vision and his careful, accurate observations well fitted him for the line of research he had undertaken. Dawes's *Micrometrical measurements of 121 double stars, taken at Ormskirk during the years 1830, 1831, 1832 and 1833* were published during 1835 in Volume VIII of the *Memoirs* of the Royal Astronomical Society.

Chronic ill-health eventually forced Dawes to give up his pastoral work at Ormskirk, and in the autumn of 1839 he took charge of Bishop's new observatory at South Villa[9]. There he continued to devote most of his time to the task he knew so well, and between 1839 and 1844 he measured approximately 250 double stars, some of which were very close pairs. The results of Dawes's work during this period were published later, in 1852, by Bishop. The latter did some observing himself but a lot of his time was by then devoted to the affairs of the Royal Astronomical Society, and he became Treasurer in 1840, a post he was to hold for the next 17 years.

Dawes's time at South Villa Observatory came to an end in 1844 May[10] when he moved from St John's Wood to Campden Lodge, near Cranbrook in Kent[11]. He continued as an indefatigable observer until 1867, despite ill-health, and he was awarded the Royal Astronomical Society's Gold Medal in 1855 for his work on double star measurement and his observations of Saturn.

Hind: the search for minor planets

Dawes's successor at South Villa Observatory was John Russell Hind (1823-1895). Hind, who was recommended to Bishop by the Astronomer Royal, G. B. Airy, worked at Greenwich Observatory as an assistant in the Magnetical Department. After resigning his post at Greenwich he took over the running of Bishop's observatory in 1844 October[12].

The work at South Villa Observatory was now soon to take a new direction, one which would, even more than Dawes's efforts had done, establish it as an observatory where notable new discoveries were made.

At that time the known Solar System comprised only the seven major planets, and the four minor planets Ceres, Pallas, Juno and Vesta in the gap between Mars and Jupiter. Since the discovery of these four minor planets at the beginning of the nineteenth century no further ones had been found. Then, on 1845 December 8, Karl Hencke, postmaster and amateur astronomer of Driesen in Neumark, discovered a fifth minor planet, Astraea, after a fifteen-year search.

Bishop now decided that the resources of South Villa Observatory and Hind's talents should be turned to a hunt for more minor planets. A systematic search was commenced in 1846 November, with existing Berlin star charts being used by Hind for the task. An area of the sky would be examined using a low power 'sweeping' eyepiece and stars of magnitude 9 or 10 not marked on the charts were added as they were found. If, on subsequent sweeps of the same area, a new object was found, the sweeping eyepiece was changed for the position-wire micrometer, and any motion relative to the other stars in the field was determined over a period of time[13].

Hind's energy and enthusiasm for this search did not prevent him from carrying out much other useful work, however, and he continued to observe assiduously, concentrating on comets and double stars. He observed, amongst many others, Biela's and Encke's comets, and discovered two new comets himself during 1846 and 1847[14]. Hind also married during 1846.

On 1847 July 1 a sixth minor planet, Hebe, was discovered by Hencke. Only five weeks later, on the evening of 1847 August 13, Hind discovered the seventh, subsequently named Iris. Three months later on the night of October 18 he found another, Flora, the eighth to be discovered.

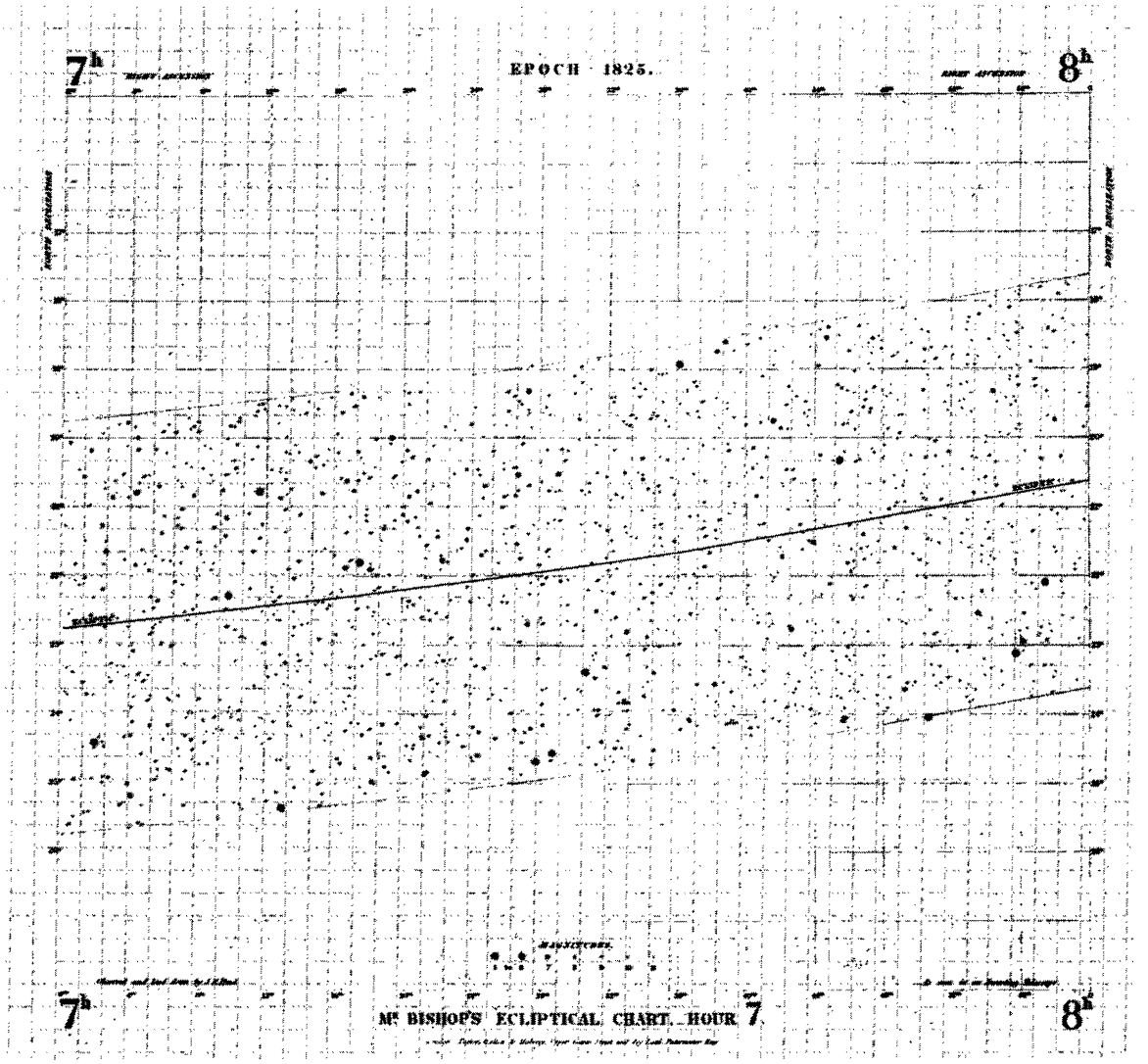
An indication of Hind's competence, and confidence, is conveyed in the words of Sir John Herschel who, as President of the Royal Astronomical Society, presented a testimonial to Hind in 1848 June. "The circumstances of the discovery of Flora were remarkable. Owing partly to the excellent mounting and optical power of the instrument employed, and partly to his own dexterity and precision in its use, Mr

Hind was enabled to satisfy himself, within little more than three hours of his first noticing it, that a star supernumary in the 5th hour of the Berlin Maps had sensibly changed its place, and consequently felt himself authorised to announce it formally, as assuredly a planet, on the very night of its discovery."[15]

Testimonials were also awarded on this occasion to Encke, for his earlier minor planet discoveries, and to Bishop, as patron of South Villa Observatory and its observers. "It does not fall to the lot of every private observatory to have added two planets to our list," said Herschel, who then continued to praise the patronage of Bishop, and the efforts of Dawes and Hind, in listing the results achieved by the observatory: "observations ... of no less than fifteen comets, ... including three therein first, or at least independently discovered; ... a mass of observations of solar spots, measures of the satellites of Saturn, diameters of the planets, places of nebulae, variable and missing stars, ..."[16]

On 1848 June 9 George Bishop was elected a Fellow of the Royal Society, further tangible confirmation of his steadily ascending status in the scientific community. He was also elected a Fellow of the Society of Arts, which body presented a cash prize and medal for the design and construction of a mahogany observing chair of ingenious construction used in the equatorial room at South Villa Observatory[17].

Bishop soon felt that new and improved charts were required to facilitate the search for minor planets in the region of the ecliptic. The Berlin Charts, useful as they had been initially, only extended to -2° in declination, and Bishop decided to produce a series of twenty-four hourly charts covering all stars down to magnitude 10 and lying within 3° either side of the ecliptic. By the end of 1848 the first chart, for the epoch 1825, had been published, Bishop acknowledging his warmest thanks for Hind's "great care and indefatigable zeal" in the preparation of the chart[18]. Unfortunately, the latter's exposure to long cold



One of Bishop's Ecliptical Charts, showing stars to magnitude 11. Drawn up by Hind, the chart is inverted for telescopic viewing.

nights of observation, and overwork, led to Hind's indisposition and there were delays in producing new ecliptical charts during 1848 and the summer 1849[19,20]. However, on 1850 September 13 Hind discovered his third minor planet, Victoria, the twelfth such body to be found.

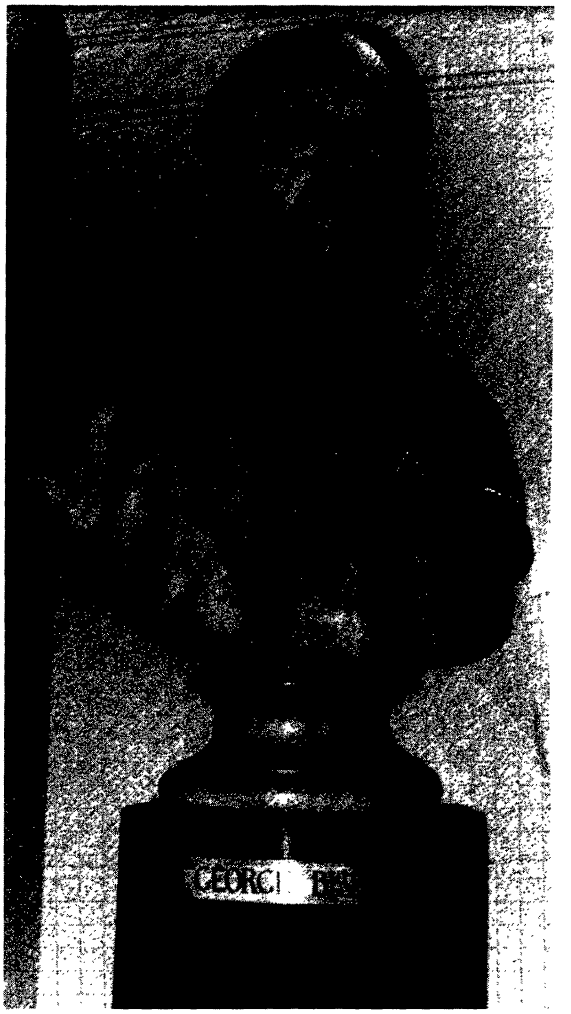
About this time N. R. Pogson (1829-1891) was appointed as second assistant at South Villa Observatory. An observer who was later to achieve wide fame, Pogson had been coached from the age of eighteen by Hind in the calculation of cometary orbits, and had carried out calculations of the orbit of the newly-discovered minor planet Iris. This work led to his appointment at Bishop's observatory[21].

Bishop had earlier decided to extend the scope of his ecliptical charts to cover all stars down to magnitude 11, and two more charts, for hours 2 and 3, were published early in 1851[22]. Soon after, on 1851 May 9, Hind discovered his fourth minor planet (the 14th), for which Sir John Herschel chose the name Irene[23].

Hind had a break from his labours at South Villa Observatory when Bishop requested him to travel to Sweden to observe the total eclipse of the Sun in 1851 July 28[24]. Hind went to Engelholm with his predecessor, Dawes, leaving Pogson in sole charge of the observatory since Bishop was also away on a visit to the continent. By this time Pogson had decided to accept an appointment as an assistant at the Radcliffe Observatory in Oxford. The salary was less than paid by Bishop, but the position was to be a permanent one and Pogson felt that that was preferable[25]. His short term at South Villa Observatory came to an end in the autumn of 1851.

Pogson went on to discover several minor planets, became a noted variable star observer (Pogson's Step Method of estimating the brightness of variables is still in use today), and he went on to run Lee's Hartwell observatory in 1859. Two years later he was appointed government astronomer at Madras where he remained until his death some 30 years later. Pogson's career subsequent to his work at South Villa was always to be a source of some gratification to Bishop[26].

Hind continued the search for minor planets and in 1851 tangible recognition of his work came in the form of an award of £100 from the Royal Bounty Fund[27]. The following year Bishop published a quarto volume: *Astronomical observations taken at the Observatory, South Villa, Inner Circle, Regent's Park, London, During the years 1938-1851.* In it Bishop provided a detailed description of his observatory and its equipment. He also included the invaluable series of double-star observations made by Dawes and continued by Hind. The volume concluded with observations of minor planets discovered by Hind and others, the observations of many comets and a variable star in Ophiuchus. (It is of interest to note that Bishop's own account of his initial motives for building the observatory do not coincide with those attributed to him in his obituary notice. In the latter, as has already been mentioned, he was credited with a very firm determination, from the beginning, to construct and equip his observatory for a definite purpose. In the preface to his *Astronomical Observations*, however, he states that he erected the observatory "only with the view of passing there some leisure hours in my favourite pursuit of Astronomy" and only later did it occur to him that "a nobler object might be attained, and that what I only intended for my own amusement might be the means of advancing science.")



Bust of Bishop at the Royal Astronomical Society, of which he was Secretary, Treasurer and eventually President.

The fame of Bishop's South Villa Observatory was now at its height and work continued apace. The ecliptical charts up to Hour 10 had been published and Eduard Vogel (1829-1856) had been recruited to replace Pogson as second assistant. Hind observed, supervised Vogel's work, and continued the search for new minor planets. Further formal appreciation of his work was given to Hind in 1852 by the award of a Civil List pension of some £200, obtained largely via the good offices of the Earl of Rosse and granted for "important astronomical discoveries"[28].

As if this award was a spur to even greater achievement, Hind found a further four minor planets in 1852 between June 24 and December 15. They were Melpomene (18) on June 24, named by Bishop at the request of the Astronomer Royal, and Fortuna (19) on August 22, Bishop deputing Hind this time to choose the name. Then followed Calliope (22) on November 26 and Thalia (23) on December 15. Within a period of six months the number of minor planets found by Hind at South Villa Observatory had doubled from four to eight!

In 1853, on the death of W. S. Stratford, Hind was appointed Superintendent of the Nautical Almanac Office which was then situated at Gray's Inn. He managed to combine his new official duties with the continuing superintendence of George Bishop's observatory. Hind received the award of the Gold Medal of the Royal Astronomical Society in this year for his outstanding work. Vogel then left Bishop's employment to join an expedition to Africa in the role of astronomer and botanist[29]. He was replaced, in 1853, by Albert Marth (1828-1897), a young German astronomer who had studied at Berlin and Königsberg.

Three more minor planets were discovered at South Villa Observatory. Euterpe (27) on 1853 November 8 and Urania (30) on 1854 July 22, both by Hind. The third, Amphitrite (29), was discovered a few months earlier on 1854 March 1 by Marth, who beat Pogson's independent discovery of the same body by only one day.

George Bishop's death

With the reputation of his South Villa Observatory an established fact, the work of his observers internationally respected, and discoveries being made there on almost a routine basis, George Bishop's ambitions had been largely fulfilled. Following his roles as Secretary and then Treasurer of the Royal Astronomical Society, Bishop was elected to its highest office, that of President, in 1857 February. Sadly however, his health began to decline from about this time and he was never able to take the chair at meetings. A succession of notable astronomers such as Lee, Airy and Main would act on his behalf on these occasions[30].

For the next four years, Hind continued to direct the work of Bishop's observatory at South Villa. Charles George Talmage (1840-1886) followed Marth as second assistant, although the observatory lacked anyone in the post for some five years between Marth's departure in 1855 to take over from Rumker as assistant at Durham Observatory and Talmage's arrival in 1860. Talmage's astronomical career had started at the Royal Observatory, Greenwich, in 1856 and he spent some four years there before joining Hind at South Villa Observatory. After only a brief period in Bishop's employment, however, ill-health forced him to undertake a move to a warmer climate and he left England to take up a private secretary's post at Nice[31].

George Bishop died on 1861 June 14, at the age of 76 after "a long debilitating illness which left him bodily weak but still sound of mind until he died without pain." At the time of his death some 17 of his 24 ecliptical charts had been completed[32].

Sequel

Soon after Bishop's death the astronomical instruments, and the dome of the equatorial room, were removed from South Villa Observatory to the residence of his son, George Bishop Jr, at Meadowbank, Twickenham, since observational conditions were considered to be better at this new location. A new observatory was erected in the summer of 1863 and work was continued on the same lines as before. Hind also moved to Twickenham to facilitate his continuing superintendence of the observational work. Talmage, after spending four years in the south of France observing double stars and re-examining Smyth's Bedford Catalogue, felt that his health was sufficiently restored to allow his return to England[33]. He rejoined Hind for a short while at the newly-relocated observatory.

By 1876 George Bishop Jr decided to relinquish any further observational work and in 1877 the active life of the observatory came to an end when the instruments and much of his father's valuable library of astronomical works were presented to the Royal Observatory of Naples. The observatory building at Meadowbank was still extant in 1935[34].

Conclusions

In reviewing Bishop's life and work it is difficult for one not to think that, given a fine telescope of moderate aperture, talented observers, adequate charts and a clearly-defined objective to search the region of the ecliptic for new bodies, similar results would have been achieved by almost anyone. They could have been; and, indeed, they were. Herman Goldschmidt (1802-1866), for example, discovered fourteen minor planets between 1852 and 1861 from Paris, beating the total found at South Villa Observatory by three.

George Bishop's achievement was very much a personal one in many ways. He is quoted as wanting his observatory to "*do something*", and it did, in noble style! Bishop retained a succession of very capable observers, and they made good use of the excellent facilities that he provided at South Villa Observatory. George Bishop had the satisfaction of seeing his assistants make many discoveries and go on to greater things in their subsequent careers. Although he did some observing himself, he always ensured that the

Close-up of the RAS bust of Bishop. (All photographs courtesy of the Royal Astronomical Society.)

credit for these discoveries went to his observers. This fact was acknowledged by Bishop's contemporaries who recorded their recognition of "his own personal share in the observations, which he has never on any occasion brough forward as interfering with the claims to the credit of discovery of those to whom he has confided the charge of his instruments."[35]

Bishop also devoted twenty-five years of his life to the affairs of the Royal Astronomical Society, from its early formative years until his death in 1861. He was "this good friend of our Society, and most active, though quiet, promoter of its cause."[36]

George Bishop promoted and encouraged astronomy in the best manner possible and his patronage "raised him to the front rank of amateurs" —he would probably have asked for no more suitable remembrance than this.

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